



## Chapter Four: Environmental Consequences

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## INTRODUCTION

The National Environmental Policy Act of 1969 mandates that environmental impact statements disclose the environmental impacts of a proposed federal action. In this case, the proposed federal action is the implementation of the GMP for Great Sand Dunes National Park and Preserve. The alternatives in this document provide broad management direction. Thus, this environmental impact statement should be considered a programmatic document. Prior to undertaking specific actions to implement the GMP, park managers will need to determine if more detailed environmental documents must be prepared, consistent with the provisions of NEPA.

The first part of this chapter discusses terms and assumptions used in the discussions of impacts. The next two parts cover policy and terminology related to cumulative impacts and impairment of park resources. The third part discusses the

relationship of the impact analyses to requirements of section 106 of the National Historic Preservation Act. The impacts of the alternatives are then analyzed in the order they appear in Chapter 2: Alternatives. Each impact topic includes a description of the impacts of the alternative, a discussion of cumulative effects, and a conclusion. At the end of the discussion for each alternative there is a brief discussion, as required by NEPA, of unavoidable adverse effects, effects from short-term uses and long-term productivity, and irreversible and irretrievable commitments of resources.

Mitigation measures that are common to each action alternative are provided in chapter 2. In this chapter, mitigation measures are only included for cultural resources, and where mitigation measures specific to that alternative would avoid, minimize, and/or mitigate adverse impacts to the particular resource topic.

## TERMS AND ASSUMPTIONS

Each impact topic area includes a discussion of impacts, including the intensity, duration, and type of impact. *Intensity* of impact describes the degree, level, or strength of an impact as negligible, minor, moderate, or major. Because definitions of intensity vary by resource topic, separate intensity definitions are provided for each impact topic.

*Duration* of impact considers whether the impact would occur over the short term or long term. *Short-term* impacts are those that, within a short period of time, generally less than 5 years, would no longer be detectable as the resource or value

returns to its pre-disturbance condition or appearance. *Long-term* impacts refer to a change in a resource or value that is expected to persist for 5 or more years. The *type* of impact refers to whether the impact on the resource or value would be *beneficial* (positive), or *adverse* (negative).

The impact analyses for the action alternative (NPS preferred, dunefield focus—maximize wildness, and three public nodes) describe the difference between implementing the no-action alternative and implementing the action alternative. In other words, to understand the consequences of any action alternative,

the reader must also consider what would happen if no action were taken.

Note that aside from evaluating the cumulative impacts for certain topics, the planning team did not reexamine decisions and impacts identified by the National Park

Service in *Great Sand Dunes Interagency Fire Management Plan, Environmental Assessment / Assessment of Effect* (NPS 2005), and *Environmental Assessment / Assessment of Effect, Rehabilitate Main Park Roads* (NPS et al. 2005).

## CUMULATIVE IMPACTS

Council on Environmental Quality regulations, which implement NEPA, require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person takes such other actions” (40 CFR 1508.7).

Cumulative impacts are considered for both the no-action and the action alternatives. These impacts were determined by combining the impacts of the alternatives with the impacts of other past, present, and reasonably foreseeable future actions. To do this, it was necessary to identify other such projects or actions at the Great Sand Dunes and in the surrounding area. The geographic scope for this analysis was the northern San Luis Valley, and the temporal scope was within 5 to 7 years of 2005. The following actions or projects were identified for the purposes of conducting the cumulative effects analysis:

### **GREAT SAND DUNES NATIONAL PARK AND PRESERVE ACT (2000)**

This act authorized a change in the designation of Great Sand Dunes from a national monument to a national park, established the national preserve, and

authorized establishment of the 92,617-acre Baca National Wildlife Refuge. A comprehensive conservation plan for the refuge, scheduled to begin in 2008, will provide details regarding future management. The act also added Kit Carson Peak and surrounding lands (13,599 acres in all) to the Rio Grande National Forest. Planning for the new USFS lands is several years off.

### **NATIONAL PARK SERVICE VISITOR CENTER RENOVATION (2004)**

Renovations to the NPS visitor center at the Great Sand Dunes were completed in September 2004. The project included constructing additions to the southwest and northeast ends of the existing building; providing expanded and improved spaces for visitor information, orientation, and interpretation; providing new exhibits; and supplying more functional spaces for NPS operations (interpretive offices and work space, ranger offices, first-aid room, conference room, curatorial storage, etc.).

### **DISCONTINUATION OF CATTLE GRAZING ON THE FORMER BACA RANCH (2004)**

In the fall of 2005, ownership of the Baca Ranch was transferred to the federal government. Soon thereafter, cattle grazing

was discontinued on these former ranch lands lying within the national park.

### **GREATER SAND DUNES INTERAGENCY FIRE MANAGEMENT PLAN (2005)**

This plan outlines prescribed fires, fire suppression, and fuel reduction/management activities for approximately 275,000 acres of the greater Sand Dunes area, including the park, Baca National Wildlife Refuge, and The Nature Conservancy's Medano-Zapata Ranch.

### **DEVELOPMENT/EXPANSION OF RETREAT CENTERS IN THE BACA GRANDE AREA (PAST, ONGOING)**

The Baca Grande is a private, mostly residential development on the north part of the expanded national park. The eastern-most portion of the Baca Grande was set aside to accommodate various spiritual and religious retreat centers located primarily in the forested foothills. The number of retreat centers continues to grow, and today includes about 20 organizations representing a wide cross-section of world spiritual and religious institutions. Many of these retreats have short- and/or long-term visitors and residential members/staff.

### **GROWTH OF THE CRESTONE / BACA GRANDE AREA (PAST, ONGOING)**

Development interest in the Baca Grande subdivision and adjacent community of Crestone increased during the period leading up to and since the Great Sand Dunes Act of 2000. The Baca Grande subdivision currently has over 600 dwelling units, many of which are currently used occasionally or seasonally. This residential

community has experienced an increased pace of growth recently, and the number of residential units could more than triple during the life of this GMP.

### **WILDERNESS RESTORATION IN THE SOUTH COLONY LAKES BASIN AREA (ONGOING)**

South Colony Lakes basin, located within the Sangre de Cristo Wilderness and the San Isabel National Forest, lies just north of the national preserve. The basin is ringed by rugged alpine peaks and is heavily used by recreationists. The USFS, with assistance from the Rocky Mountain Field Institute, is working to improve the natural ecological conditions and wilderness values of the basin through mitigation of recreational threats to biological and physical resources and restoration of damaged sites. Recent work includes refining hiking/ climbing routes and trails, closing social trails, and restoring damaged sites and slopes.

### **OIL AND GAS EXPLORATION ACTIVITIES ON FORMER BACA RANCH LANDS (PAST, FUTURE)**

Lexam Explorations, Inc. ("Lexam") retains subsurface mineral rights to most of the former Baca Ranch. Lexam has conducted oil and gas exploration activities on lands that were formerly part of the Baca Ranch, but are now within the national park. Continuation of these activities, which include exploratory drilling and seismic testing using "thumper trucks," is reasonably foreseeable for the near future. However, Lexam and others retaining subsurface mineral rights within Great Sand Dunes National Park and Preserve must now conduct such activities according to 36 CFR Part 9, Subpart B, which regulate activities in the exercise of

rights to oil and gas that are not owned by the United States. These regulations are designed to ensure that such activities are conducted in a manner consistent with: park purposes, preventing or minimizing damage to the environment and other resource values, and ensuring to the extent feasible that all national park system units are left unimpaired for the enjoyment of future generations. The regulations require an NPS-approved plan of operations.

### **REHABILITATE MAIN PARK ROADS AND PARKING (FUTURE)**

The National Park Service plans to rehabilitate the main park road, the dunes lot access road, and associated parking areas at Great Sand Dunes by improving the condition of the pavement and its underlying structure. The dunes parking lot will be expanded (~5% additional paved surface) and reconfigured to improve traffic flow and increase parking for buses and RVs.

### **ESTABLISHMENT OF A WATER RIGHT TO FULFILL THE PURPOSES OF THE NATIONAL PARK AND PRESERVE (FUTURE)**

The Great Sand Dunes Act of 2000 directed the Secretary of the Interior to appropriate water for maintaining groundwater levels, surface water levels, and stream flows on, across, and under the national park and preserve, to accomplish the purposes of the national park and preserve, and to protect park resources and park uses. The National Park Service has filed for such a right in state water court and park managers are working to establish this water right.

### **RELOCATE HORSE LOADING AREA AND DUMP STATION FROM AMPHITHEATER PARKING LOT (FUTURE)**

The National Park Service plans to relocate the horse loading area and RV dump station from the amphitheater parking lot to the west side of the main park road. The horse loading area would have a dirt surface and the dump station surface would be paved.

### **SALE/DEVELOPMENT OF PRIVATE LAND PARCELS NEAR THE ENTRANCE TO THE PARK (FUTURE)**

At the time of this writing, a private land parcel, about 40 acres in size, was for sale near the park entrance. The parcel is located on the west side of SH 150, just inside the expanded park boundary. This parcel is currently zoned rural. Within rural zoning, agricultural operations are allowed, including construction of single-family residences. Because there is a commercial operation across SH 150 from this parcel, it is reasonably foreseeable that the parcel, once purchased, could be rezoned to commercial.

### **ELK HERD REDUCTION (FUTURE)**

The size of the northern San Luis Valley elk herd has grown to nearly 6,000 animals, which is well above the 1,500-animal herd objective set by CDOW. A 3-year cooperative research study is underway that will provide much needed information on elk movements, distribution, and habitat selection. This information will be used in the preparation of an interagency elk management plan, which is expected to include strategies for reducing the size of the elk herd.

## IMPAIRMENT OF NATIONAL PARK RESOURCES

National Park Service *Management Policies 2001* require analysis of potential effects to determine whether or not alternatives or actions would impair park resources. The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must seek ways to avoid, or minimize to the greatest degree practicable, adversely impacting park resources and values. However, laws do give NPS managers discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of the park, so long as the impact does not constitute impairment of the affected resources and values.

Although Congress has given the National Park Service the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values. An

impact to any park resource or value may constitute impairment, but an impact would be more likely to constitute impairment to the extent that it has a major or severe adverse effect on a resource or value whose conservation is:

- necessary to fulfill specific purposes in the establishing legislation or proclamation of the park
- key to the natural or cultural integrity of the park
- identified as a goal in the park's general management plan or other relevant National Park Service planning documents

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, or others operating in the park. A determination on impairment is made in the "Conclusion" section for the following resource topics: archeology, historic structures, cultural landscapes, vegetation, ecologically critical areas, federal threatened and endangered species, wildlife, soils and geologic resources, wetlands, and water resources.

## IMPACTS TO CULTURAL RESOURCES AND SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

In this GMP, impacts to cultural resources are described in terms of type, context, duration, and intensity, which is consistent with the regulations of the Council on Environmental Quality that implement NEPA. These impact analyses are intended, however, to comply with the requirements

of both NEPA and section 106 of the National Historic Preservation Act. To achieve this, a section 106 summary is included for each of the cultural resource topics discussed (NPS preferred alternative only). The section 106 summary is intended to meet the requirements of section 106

and is an assessment of the effect of the undertaking (implementation of the alternative) on cultural resources, based on the criterion of effect and criteria of adverse effect found in the Advisory Council's regulations. A letter dated January 5, 2005, was sent to the Colorado SHPO informing this office of the National Park Service plans to use a combined document to meet section 106 obligations.

Under Advisory Council regulations, a determination of *no historic properties affected, adverse effect* or *no adverse effect* must be made for affected historic properties that are eligible for or listed on the NRHP. A determination of *no historic properties affected* means that either there are no historic properties present or there are historic properties present, but the undertaking will have no effect upon them (36 CFR 800.4(d)(1)). An *adverse effect* occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the NRHP, e.g., diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association. *Adverse effects* also include reasonably foreseeable effects caused by the alternatives that would occur later in time, be farther removed in distance, or be cumulative (36 CFR 800.5, *Assessment of Adverse Effects*). A determination of *no adverse effect* means there is an effect, but the effect would not diminish the characteristics of the cultural resource that qualify it for inclusion in the NRHP.

In accordance with the Advisory Council on Historic Preservation's regulations

implementing section 106 of the National Historic Preservation Act (36 CFR Part 800, *Protection of Historic Properties*), impacts to cultural resources were identified and evaluated by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that were either listed in or eligible to be listed in the NRHP; (3) applying the criteria of adverse effect to affected NRHP-eligible or listed cultural resources; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

Council on Environmental Quality regulations and National Park Service *Conservation Planning, Environmental Impact Analysis and Decision-making* (Director's Order 12) also call for a discussion of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact (e.g., reducing the intensity of an impact from major to moderate or minor). Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect, as defined by section 106, is similarly reduced. Cultural resources are nonrenewable resources and adverse effects generally consume, diminish, or destroy the original historic materials or form, resulting in a loss in the integrity of the resource that can never be recovered. Therefore, although actions determined to have an adverse effect under section 106 may be mitigated, the effect remains adverse.

## METHODS AND ASSUMPTIONS FOR ANALYZING IMPACTS

### ARCHEOLOGY

Archeology site locations within the park were obtained from the Colorado SHPO. Recent archeological survey reports that contained survey boundaries and recently recorded sites and their locations were obtained from the consultant that conducted the research in the area. Referenced material included the prehistoric context, literature of archeological research in the San Luis Valley, 36 CFR 800, compliance documents, and park literature and map. Professional archeologists were also consulted regarding site integrity and distribution.

The threshold for the intensity of an impact is defined as follows:

**Negligible:** Impacts are at the lowest levels of detection—barely perceptible and not measurable.

**Minor: Adverse:** Impacts are measurable or perceptible, but slight and localized within a relatively small area of a site or group of sites. Impacts do not affect the character-defining features of a NRHP-eligible or listed site.

**Beneficial:** Impacts would act as a preservation mechanism.

**Moderate: Adverse:** Impacts are measurable and perceptible, change one or more character-defining features, but do not diminish the integrity of the site to the extent that its NRHP eligibility is jeopardized. **Beneficial:** Stabilization of a site.

**Major: Adverse:** Impacts are substantial, noticeable, and permanent. The impact is severe or of exceptional benefit. For NRHP-eligible or listed sites, the impact changes one or more character-defining features, diminishing the integrity of the resource to the extent that it is no longer eligible for listing on the NRHP. **Beneficial:** Intervention and preservation of a site.

### HISTORIC STRUCTURES

Information regarding historic structures was compiled from a variety of resources. The Colorado SHPO was consulted for building and structure site records as well as planning and compliance reports. Secondary historical references from libraries, and planning, compliance, research, and survey reports were compiled from consultants who have conducted research in the area. Park resource specialists and knowledgeable individuals were also consulted.

**Negligible:** Impacts are at the lowest levels of detection—barely perceptible and not measurable.

**Minor: Adverse:** Alteration of a feature(s) would not diminish the overall integrity or character-defining features of a NRHP-eligible or listed building structure or district. **Beneficial:** Stabilization/preservation take place of building in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Moderate: Adverse: Impacts to a NRHP-eligible or listed building, structure, or district would change the character-defining features of the resource, but does not diminish the integrity of the resource to the point of being ineligible. Beneficial: Rehabilitation of a structure takes place in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Major: Adverse: Impacts to a NRHP-eligible or listed building, structure, or district would change character-defining features of a resource, diminishing the integrity of the resource to the extent that it is no longer eligible for listing on the NRHP. Beneficial: Restoration of a structure would take place in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

## CULTURAL LANDSCAPES

Information regarding cultural landscapes was compiled from a variety of resources. The Colorado SHPO was consulted for resource locations and site records as well as planning and compliance reports. Secondary references were collected from libraries, and planning, compliance, research, and survey reports were compiled from consultants who have conducted research in the area. Park resource specialists and knowledgeable individuals were also consulted.

The threshold for the intensity of an impact is defined as follows:

Negligible: Impacts are at the lowest levels of detection—barely perceptible and not measurable.

Minor: Adverse: Alteration of a feature(s) would not diminish the overall integrity or character-defining features of a NRHP-eligible or listed cultural landscape. Beneficial: Preservation of landscape patterns and features would occur in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*.

Moderate: Adverse: Impacts to a NRHP-eligible or listed cultural landscape would change the character-defining features of the landscape, but does not diminish the overall integrity of the resource to the point of being ineligible. Beneficial: Rehabilitation of a landscape or its patterns and features would occur in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*.

Major: Adverse: Impacts to a NRHP-eligible or listed cultural landscape would change character-defining features of a landscape, diminishing the integrity of the resource to the extent that it is no longer eligible for listing on the NRHP. Beneficial: restoration of a landscape or its patterns and features would occur in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*.

## VEGETATION

Available information describing vegetation included existing research reports, planning documents, regional taxonomic keys, state programs, national databases and mapping efforts, and consultation with park specialists; this information was gathered, reviewed, and summarized. Vegetation distribution and species composition information was obtained from written reports and plant lists prepared by the CNHP and from CDOW GAP mapping efforts. Wetlands and rare plant species and habitats are discussed under the “Wetlands” and “Ecologically Critical Areas” sections, respectively, and are not re-examined here. Specific impact elements are discussed here in relation to the life zones and in relation to each assessed alternative.

Impacts to vegetation were evaluated by comparing projected changes resulting from GMP alternatives to existing conditions or the no-action alternative, as appropriate. These evaluations were based on consideration of the park fundamental resources and values, information concerning life zone and plant community distribution and species composition, and professional experience. Driving variables used to examine impacts included habitat parameters such as soils and their stability, topography, presence of nonnative plant species, existing land use and adjacent land use, and the potential for social trail establishment.

The thresholds to determine vegetation/plant community impacts are defined as follows:

**Negligible:** Impacts are barely detectable and/or would affect a minimal area of vegetation. Impacts to the plant communities at key

organizational levels are not detectable in the short term and are not expected in the long term.

**Minor:** Impacts are slight, but detectable, and/or would affect a small area of vegetation. The severity and timing of changes are not expected to be outside natural variability and not expected to have long-term effects on plant communities. Vegetation patterns may have short-term disruptions on a broad spatial scale. Key ecosystem processes may have short-term disruptions that are within natural variability, and habitat for all species remains functional.

**Moderate:** Impacts are readily apparent and/or would affect a large area of vegetation. The severity and timing of changes are expected to be outside natural variability for short periods and changes within natural variability may be long term in nature. Vegetation patterns may experience permanent disruption or loss on a limited spatial scale. Key ecosystem processes may have short-term disruptions that are outside natural variability, and habitat for all species remains functional.

**Major:** Impacts are severely adverse or exceptionally beneficial and/or would affect a substantial area of vegetation. The severity and timing of changes are expected to be outside natural variability for short to long periods or to be permanent. Changes within natural variability may be long term or permanent. In extreme cases, species may be extirpated from the park and vegetation patterns simplified, key ecosystem processes may be

disrupted, or habitat for species rendered not functional.

## **ECOLOGICALLY CRITICAL AREAS**

Available information describing ecologically critical areas (defined for this GMP as CNHP potential conservation sites with a rank of B1 or B2) was compiled and reviewed from existing research reports, planning documents, state and federal natural areas and state heritage programs, and consultation with park specialists. During analysis of the ecological aspects of the park area and selection of ecologically critical areas, several potential impact types recognized and described by state heritage program and university researchers (e.g., hydrologic modification, residential development, mining, grazing livestock, recreation, road construction, and invasion of nonnative species) were noted. These potential impact types and others (e.g., visitor use) were then considered for each GMP alternative. This section also addresses impacts, in an ecosystem context, to rare park plants identified by the CNHP as deserving of special attention and protection (CNHP 1998).

Impact thresholds for this topic are defined as follows:

**Negligible:** The impact is barely detectable and/or would affect a minimal area of upland, riparian, or wetlands habitat, but no individuals or populations of important plant and/or animal species and/or plant communities within an ecologically critical area. Impacts to the composition and function of ecosystems at key organizational levels are not detectable in the short term and are not expected in the long term.

**Minor:** The impact is slight, but detectable, and/or would affect a small area of upland, riparian, or wetlands habitat, but no individuals or populations of important plant and/or animal species and/or plant communities within an ecologically critical area. The severity and timing of changes to parameter measurements are not expected to be outside the natural variability and not expected to have any long-term effects on biological, abiotic, or ecosystem resources. Certain common patterns may have short-term disruptions on a broad spatial scale. Key ecosystem processes may have short-term disruptions that are within natural variability, and habitat for all species remains functional.

**Moderate:** The impact is readily apparent and/or would affect a large area of upland, riparian, or wetlands habitat for, and individuals or populations of important plant and/or animal species and/or plant communities within an ecologically critical area. The severity and timing of changes to parameter measurements are expected to be outside the natural variability for short periods and changes within the natural variability may be long term in nature. Ecosystem patterns may experience permanent disruption or loss on a limited spatial scale. Key ecosystem processes may have short-term disruptions that are outside natural variability, and habitat for all species remains functional.

**Major:** The impact is severely adverse or exceptionally beneficial and/or would affect a substantial

area of upland, riparian, or wetlands habitat for, and/or many individuals or populations of important plant and/or animal species and/or plant communities within an ecologically critical area. The severity and timing of changes to parameter measurements are expected to be outside the natural variability for short to long periods or to be permanent. Changes within natural variability may be long term or permanent in nature. In extreme cases, species may be extirpated from the park and ecological patterns simplified, key ecosystem processes may be disrupted, or habitat for any important species is rendered not functional.

## FEDERAL THREATENED AND ENDANGERED SPECIES

In accordance with 50 CFR § 402(a), federal agencies are required to review all actions to determine whether an action may affect listed species or critical habitat. If such a determination is made, formal consultation is required, unless the federal agency determines, with the written concurrence of the USFWS, that the proposed action is not likely to adversely affect any listed species or critical habitat. It is NPS policy to survey for, protect, and strive to recover all species native to national park system units that are listed under the Endangered Species Act. The NPS strives to fully meet its obligations under the National Park Service Organic Act and the Endangered Species Act to both pro-actively conserve listed species and prevent detrimental effects on these species, by cooperating with the USFWS to ensure that National Park Service actions comply with both the written requirements and the spirit of the Endangered Species Act (NPS 2001), and cooperating with the

USFWS and other agencies/entities to facilitate delineation of critical habitat, development and implementation of species recovery plans and candidate conservation agreements, and to pro-actively manage for proposed and candidate species.

Federally listed threatened and endangered species were evaluated using NEPA analysis and Endangered Species Act determinations as defined in 50 CFR § 402 and the *Endangered Species Consultation Handbook* (1998). Based on this analysis, the federally listed threatened and endangered species and federal candidate species that have the potential to occur within the park, with the exception of the Canada lynx, were dismissed as impact topics (see table 2). Anticipated impacts to the Canada lynx are discussed in this chapter.

Impacts to Canada lynx were evaluated by comparing projected changes resulting from GMP alternatives to existing conditions or the no-action alternative, as appropriate. These evaluations were based on the potential presence of lynx in the park, as no established population is known. Recent releases in the Rio Grande National Forest on the opposite side of San Luis Valley from the park, and subsequent tracking efforts, resulted in three records of remotely sensed lynx in or near the park. Available data do not indicate whether these records represent one or more different individuals, or three separate locations for the same individual. No critical habitat for the Canada lynx occurs in the park or preserve.

Interagency meetings were held throughout the development of this GMP. Input from these meetings indicated two aspects of the plan alternatives that should be evaluated relative to potential impacts on Canada lynx. These two aspects related

to (1) the potential for increased visitor use of backcountry areas, particularly in the upper reaches of the preserve where potential lynx habitat occurs, and (2) differences in the alternatives relative to leashed dogs.

Impact thresholds for Canada lynx are defined as follows:

**Negligible:** An action that could result in a change to a population or individuals of a species, but the change would be so small that it would not be of any measurable or perceptible consequence.

**Minor:** An action that could result in a change to a population or individuals of a species. The change would be measurable, but small and localized and of little consequence.

**Moderate:** An action that would result in some change to a population or individuals of a species. The change would be measurable and of consequence, beneficial, or adverse.

**Major:** An action that would result in a noticeable change to a population or individuals of a species. The change would be measurable and either result in a major beneficial or adverse impact on a population, or individuals of a species.

## **WILDLIFE, INCLUDING COLORADO STATE-LISTED SPECIES**

National Park Service policy (NPS 2001) dictates that, to the greatest extent possible, parks will inventory, monitor, and manage state and locally listed species in a manner similar to the treatment of federally listed

species. In addition, the parks are to inventory other native species that are of special management concern to parks (such as rare, declining, sensitive, or unique species and their habitats) and manage them to maintain their natural distribution and abundance (NPS 2001).

The National Park Service determines all management actions for the protection and perpetuation of federally, state, or locally listed species through the park management planning process, and includes consultation with lead federal and state agencies, as appropriate.

Animal species listed by the state of Colorado as threatened, endangered, or as species of special concern that have the potential to occur within the park (see table 2), were analyzed relative to the anticipated impacts of, and differences of those impacts among the four alternatives. The analysis indicated that the alternatives may have the potential to affect species associated with riparian corridors, including the following state-listed species:

- Rio Grande sucker – state endangered
- Rio Grande chub – state species of special concern
- Rio Grande cutthroat trout – state species of special concern
- Townsend’s big-eared bat – state species of special concern

and wetlands-associated species, including:

- greater sandhill crane – state species of special concern

These taxa are evaluated below, along with general wildlife members of their communities including, as a group, migratory bird species associated with wetlands habitats that may be affected by cessation of irrigation on the former

Medano Ranch. This grouping of species is intended to focus the reader on impacts to species sharing habitats, and to simplify explanation of those impacts. Additional wildlife that may be differentially affected by the proposed alternatives includes mule deer, elk, and bighorn sheep. Management of elk numbers may vary under the different alternatives, having different consequences for mule deer and bighorn sheep numbers and herd health; therefore, potential impacts to these species are evaluated jointly below. The alternatives differ with regard to the presence of leashed dogs within the preserve. As these differences may have varying impacts on bighorn sheep, potential impacts to bighorn sheep are also evaluated.

Impacts to Colorado state-listed wildlife species and wildlife (includes terrestrial and aquatic species) were evaluated by comparing projected changes resulting from GMP alternatives to existing conditions or the no-action alternative, as appropriate. Input from management agencies such as USFS and CDOW was acquired via interagency meetings and subsequent interactions. Input from these meetings and interactions indicated the following topics relating to Colorado state-listed wildlife species and wildlife species need to be addressed:

- potential impacts of alternatives on species occurring in or associated with riparian corridors (Rio Grande sucker, Rio Grande cutthroat trout, and Townsend's big-eared bat)
- potential impacts of alternatives on greater sandhill cranes and other wetlands-associated migratory bird species
- potential impacts of alternatives on ungulate (elk, mule deer, and

bighorn sheep) herd numbers and health

- potential impacts of alternatives, specifically relative to leashed dogs in the national preserve, on bighorn sheep

Impact thresholds for Colorado state-listed wildlife species and wildlife are defined as follows:

**Negligible:** Impacts to Colorado state-listed wildlife species and wildlife species would not be observable or measurable and would be well within the range of natural variability.

**Minor:** Impacts to species or their habitat would be detectable, but still within the range of natural variability, and would be short term. Demographic and genetic factors may have small, short-term changes, but long-term characteristics would remain stable. No interference with feeding, reproduction, or other activities affecting population viability would result from the impacts. Sufficient functional habitat would remain to support viable populations.

**Moderate:** Impacts on activities necessary for survival, and on species habitats, can be expected on an occasional basis, but are not anticipated to threaten potential or continued existence of the species in the park. Changes to species demography, behavior, or genetic structure could be outside the natural range of variability, but only for short periods of time.

**Major:** Impacts to Colorado state-listed species and wildlife species or

their habitats would be detectable, outside of the natural range of variability, and long term or permanent.

resources; the effects would be regionally important.

## SOILS AND GEOLOGIC RESOURCES

Information describing soils and geologic resources was compiled and reviewed from existing research reports, planning documents, and consultation with park specialists. During analysis of the soils and geologic resources of the park area, several potential impact types were recognized and described: soil compaction and erosion (from visitor use), disruption of geologic processes, and soil disturbance or destruction. These are discussed in relation to each assessed alternative.

The thresholds to determine the intensity of impacts to soils or geologic resources are defined as follows:

**Negligible:** The impact is barely detectable and/or would result in no measurable or perceptible changes to soils or geologic resources.

**Minor:** The impact is slight, but detectable, and/or would result in small but measurable changes in soils or geologic resources; the effects would be localized.

**Moderate:** The impact is readily apparent and/or would result in easily detectable changes to soils or geologic resources; the effects would be localized.

**Major:** The impact is severely adverse or exceptionally beneficial and/or would result in appreciable changes to soils or geologic

## WETLANDS

Available information describing wetlands included existing research reports, planning documents, state programs, national mapping efforts, and consultation with park specialists; it was gathered, reviewed, and summarized for this document. Wetlands distribution information was obtained from written reports prepared by the CNHP and from CDOW GAP and USFWS National Wetlands Inventory mapping efforts. Based on the available National Wetlands Inventory maps for the park, it seems that efforts to map wetlands to date have focused on particular areas (e.g., the southwest portion of the national park, Sand Creek, and Medano Creek). As a result, wetlands in other park areas (for example, those along Deadman Creek, Cold Creek, and Pole Creek) are not shown on the National Wetlands Inventory maps. For the purposes of assessing impacts, it was assumed that wetlands (as defined by the National Park Service) do in fact, exist in such areas despite the fact that they are not shown on the National Wetlands Inventory map.

Wetlands are a protected resource managed under federal executive and director's orders:

Executive Order 11990 was issued in 1977 "to avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative." This order directs the National Park Service to: (1) provide leadership and to take action to minimize the destruction,

loss, or degradation of wetlands; (2) preserve and enhance the natural and beneficial values of wetlands; and (3) to avoid direct or indirect support of new construction in wetlands unless there are no practicable alternatives to such construction and the proposed action includes all practicable measures to minimize harm to wetlands.

Approved in 1998, Director's Order 77-1: *Wetland Protection* (NPS 1998) was developed for use by the National Park Service in carrying out its responsibilities under Executive Order 11990. The general policies, requirements, and standards included in the manual are: (1) no net loss of wetlands and a long-term goal of net wetlands gain, (2) parkwide wetlands inventories, (3) restoration and enhancement of degraded wetlands habitats, (4) planning and siting facilities to avoid or minimize effects to wetlands, (5) restoration of degraded wetlands as compensation for adverse effects to wetlands, and (6) compliance with federal environmental regulations.

Impacts to wetlands were evaluated by comparing projected changes resulting from GMP alternatives to existing conditions or the no-action alternative, as appropriate. These evaluations were based on consideration of the park's fundamental resources and values, information concerning wetlands distribution and functional values, and professional experience. Driving variables used to examine impacts included surface and groundwater hydrology, water quality and quantity, topography, and existing land use. Because it can be difficult to separate wetlands from riparian habitats, both are included in this analysis.

The thresholds to determine wetlands impacts are defined as follows:

**Negligible:** The impact is barely detectable and/or would result in no measurable or perceptible changes to wetlands.

**Minor:** The impact is slight, but detectable, and/or would result in small but measurable changes in wetlands and/or wetlands hydrology; the effects would be localized.

**Moderate:** The impact is readily apparent and/or would result in easily detectable changes to wetlands and/or wetlands hydrology; the effects would be localized.

**Major:** The impact is severely adverse or exceptionally beneficial and/or would result in appreciable changes to wetlands and/or wetlands hydrology; the effects would be regionally important.

## WATER RESOURCES

Information describing water resources was compiled and reviewed from existing research reports, planning documents, and consultation with park specialists. During analysis of the water resources of the park area, several elements were considered to determine impacts, including: water rights, surface and groundwater hydrology, surface and groundwater quality and quantity, topography, and existing land use. Specific impact elements are discussed in relation to each assessed alternative.

The thresholds to determine water resources impacts are defined as follows:

**Negligible:** The impact is barely detectable and/or would result in

no measurable or perceptible changes to water resources.

Minor: The impact is slight, but detectable, and/or would result in small but measurable changes in water resources; effects would be localized.

Moderate: The impact is readily apparent and/or would result in easily detectable changes to water resources; effects would be localized.

Major: The impact is severely adverse or exceptionally beneficial and/or would result in appreciable changes to water resources; effects would be regionally important.

## **VISITOR USE AND EXPERIENCE**

Information concerning visitors and their opinions in and around the Great Sand Dunes was gathered and reviewed. This information included visitor surveys, public use statistics, casual and written visitor and public comments, and impressions gathered by experienced park staff.

Visitor use projections were based on analysis of past visitation trends and patterns at the park, input developed by the planning team regarding reasonably foreseeable use associated with the various management zones and activity sites, and long-term development and population forecasts for nearby communities, the region, state, and nation. The use projections are presented here to help readers understand how visitor experience would be affected by changes in use levels. However, the use projections also provide a context for other impact topics (for example, socioeconomic impacts and

impacts on NPS operations) discussed elsewhere in this chapter.

Impacts on the visitor experience were evaluated by comparing projected changes resulting from the GMP alternatives to existing conditions or the no-action alternative, as appropriate. These evaluations were based on consideration of the park's fundamental resources and values, information about what contributes or detracts from desirable visitor experiences at the park (from visitor surveys and comments), and professional experience.

The thresholds for this impact topic are as follows:

Negligible: The impact is barely detectable to individual visitors.

Minor: The impact is small but detectable to individual visitors.

Moderate: The impact is of medium intensity and is readily apparent to individual visitors.

Major: The impact is severely adverse or exceptionally beneficial and is conspicuous to individual visitors.

## **SCENIC RESOURCES AND VISUAL QUALITY**

Information on scenic resources and visual quality was compiled from planning documents, research reports, surveys, and consultation with park resource specialists. Impacts were evaluated by comparing projected changes resulting from the GMP alternatives to existing conditions or the no-action alternative, as appropriate. These evaluations were based on consideration of the park's fundamental resources and values, information about what contributes

or detracts from scenic and visual quality in and around the park (from public comments and visitor surveys), and professional experience.

Intensity impact thresholds for this topic are as follows:

Negligible: Effects would be at or below the level of detection.

Minor: Effects would be small, but detectable and mostly localized.

Moderate: Effects would readily apparent, but not widespread.

Major: Effects would be severely adverse or exceptionally beneficial or readily apparent and widespread.

## SOCIOECONOMICS

Economic effects are commonly expressed in terms of the number and types of jobs supported, changes in income, the number of visitors to the park, and the resulting changes in local tourism spending. Less well-defined economic effects include the indirect effects from ongoing park operations and the effects on local government fiscal conditions. Examples of social impacts include effects on regional population growth, housing, community facilities and services, land use, and community attitudes and lifestyles.

The analytical approach to address these issues was based on four key factors directly linked to implementation of the GMP:

- estimated costs of building new facilities and infrastructure
- changes in the number of park staff and federal spending to operate the park

- changes in the number of visitors to the park
- visitor characteristics, including where they are from, their spending patterns, how long they stay, and which park entrance they use

Indirect consequences of those four factors, such as impacts on traffic, are also considered.

Construction costs for the GMP alternatives were estimated by the project team based on actual costs of construction projects at other NPS units. Future staffing levels and operating costs were also estimated by the project team, assuming maintenance and service levels remain about the same as those currently provided at the park. Actual future costs could be different than the estimates in this analysis because they would be based on future NPS policies, operations and maintenance policies adopted at the park, and budgets approved by Congress for the National Park Service in general, or the Great Sand Dunes specifically.

Projected visitor use is based on past visitation patterns at the park, assumptions developed by the planning team about reasonable use for the management zones and new activity sites, and long-term population growth in the region, state, and nation. The results anticipate increased annual visitor use for all alternatives, generally rising over time, with possible temporary and multi-year variation, including short-term declines due to extended drought, economic recession, or other factors.

Projected annual visitor use is used along with other data and assumptions to describe each alternative in monetary terms; for example, future payroll at the park. The monetary values are inputs to the

Money Generation Model II (MGM2)<sup>6</sup> which is used to estimate the total number of jobs, spending, and income in the surrounding region.

Estimates of the number of jobs in the region are tied to NPS operations, GMP-related construction, and visitor spending. The estimated jobs include park staff; construction contractors; suppliers of equipment, material, and other goods and services supported by those activities and the secondary impacts on local retail stores, restaurants, motels, other types of private businesses, and governments as the money from those activities circulates through the regional economy. MGM2 estimated the total number of jobs; some would be full-time, others part-time or seasonal.

Estimated personal income includes wages and salaries of employees, self-employment earnings, and allowances for dividends, interest, retirement, social security, unemployment, and similar sources of income. Personal income estimates are reported without any adjustments for inflation.

Economic impacts associated with the GMP alternatives are assessed in terms of scale/ intensity, duration, and type/character. These three parameters are defined as follows.

### **Scale/Intensity**

The scale or intensity of the social and economic impacts refers to the change(s) associated with the GMP alternatives when compared to current conditions or future conditions under the no-action alternative.

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<sup>6</sup> The MGM2 is an economic model developed for the National Park Service to produce quantifiable measures of economic benefits that can be used for planning, concessions management, budget justifications, policy analysis, and marketing. More information about the MGM2 can be obtained at <http://planning.nps.gov/mgm/>.

Changes are described in numerical terms where possible to do so with the available information, otherwise they are described in qualitative terms. In addition to the relative magnitude of change, factors considered in describing scale and intensity include how likely people are to be aware of the changes, how easy it would be to measure the effects of the changes, and how many people or how large an area would be affected. The scale/intensity impact thresholds for economic and social conditions are defined below.

**None/Negligible:** Effects on adjacent landowners, neighbors, businesses, agencies, community infrastructure, social conditions, etc., would be nonexistent, barely detectable, or detectable only through indirect means and with no discernible impact on local social or economic conditions.

**Minor:** Effects on adjacent landowners, neighbors, businesses, agencies, community infrastructure, social conditions, etc., would be small, but detectable, localized in terms of geographic area, affect a small number of people, comparable in scale to typical year-to-year or seasonal variations, and not expected to substantively alter established social or economic structures over the long term.

**Moderate:** Effects on adjacent landowners, neighbors, businesses, agencies, community infrastructure, social conditions, etc., would be readily apparent or observable across a larger geographic area, affect many people, and could have noticeable effects on the established economic or social structure and conditions over the long term.

Major: Effects on adjacent landowners, neighbors, businesses, agencies, community infrastructure, social conditions, etc., would be readily detectable or observable, affect a large segment of the population, extend across much of a community or region, and have a substantial influence on the established social or economic conditions.

## Duration

Social and economic changes caused by the alternatives may be temporary or last for longer periods of time. Temporary impacts may be noticeable at the local level, but still not result in long-term changes of the core economic and social conditions. Long-term impacts, on the other hand, may lead to changes in the economic base, construction or closure of public facilities, major changes in private real estate markets, how people and groups relate to one another, and other changes to established social and economic conditions.

Short Term: Short-term effects are those that occur during and in response to the planning, design, construction, and major maintenance of buildings, trails, parking lots, and other improvements associated with federal spending for each alternative. These effects diminish or disappear after the project is completed. Short term may also describe the first or early response in social or economic conditions to more fundamental changes in park management and operations and to increasing visitor use, but which give way to broader changes over time. Generally, short term

describes those effects that may last up to 5 years.

Long Term: Long-term effects are those that last longer than 5 years, including some of which may not begin until after completion of direct activities associated with the initial federal government spending or changes in management associated with each alternative. Such changes include increases in the park's base budget for operations and maintenance, those related to changes in visitation over time.

## Type/Character

Social and economic consequences may be beneficial, adverse, or indeterminate.

Beneficial: Effects that many individuals or groups would accept or recognize as improving economic or social conditions, either in general or for a specific group of people, businesses, organizations, or institutions. Examples of beneficial effects include lower unemployment, higher personal income, and economic and social diversity and sustainability.

Adverse: Effects that most individuals or groups would accept or generally recognize as diminishing economic or social welfare, either in general or for a specific group of people, businesses, organizations or institutions. Examples of adverse effects include fewer job opportunities, increases in the cost of living without matching increases in higher income, or an erosion of public

sector fiscal resources to fund public facilities and services.

Indeterminate: Those for which the size, timing, location, or individuals, or groups that would be impacted cannot be determined, or those which include both beneficial and negative effects, in some instances affecting different communities, populations, or public entities or jurisdictions, such that the net effect is indeterminate.

## HEALTH AND SAFETY

Information about health and safety was compiled from various sources, including the National Park Service, surrounding agencies and organizations (e.g., Baca Grande Property Owners Association), other knowledgeable individuals, and secondary sources such as park studies, visitor surveys, planning documents, and research reports.

Thresholds for the intensity of impacts are defined as follows:

**Negligible:** Public health and safety would not be affected, or effects would be at low levels of detection.

**Minor:** Effects would be small but detectable. If mitigation were needed, it would be relatively simple and would likely be successful.

**Moderate:** Effects would be readily apparent, but localized. Mitigation measures would probably be necessary and would likely be successful.

**Major:** The effects would be readily apparent, substantial, and would

affect health and safety on a regional scale. Extensive mitigation measures would be needed, and their success would not be guaranteed.

## NATIONAL PARK SERVICE OPERATIONS

Information about park operations was compiled from various sources including the Great Sand Dunes National Park and Preserve, the National Park Service, other surrounding agencies and organizations, and knowledgeable individuals. The information gathered includes park staffing and maintenance records, campground locations and capacities, and secondary sources such as park environmental assessments, visitor surveys, and other planning documents and research reports. Examples of operational considerations include needs for maintenance, protection, and patrol activities, and time required for park staff to get to/from monitoring, and areas requiring attention (e.g., trailheads, campsites, research sites, etc.).

Impact thresholds for NPS operations are defined as follows:

**Negligible:** Effects would be at or below the level of detection.

**Minor:** Effects would be small but detectable. The change would be noticeable to staff, but probably not to the public.

**Moderate:** Effects would be readily apparent to staff and possibly to the public in terms of effects on visitor experience.

Major: Effects would be readily apparent to staff and the public, and would result in substantial, widespread changes

The thresholds for this impact topic are as follows:

Negligible: Effects on other management agencies or organizations would be nonexistent or barely detectable.

Minor: The impact is small, but detectable or would affect relatively few management actions, agencies, or organizations.

Moderate: The impact is readily apparent or would affect many management actions, agencies, or organizations.

Major: The impact is severely adverse or exceptionally beneficial and would affect the majority of adjacent or relevant management agencies and organizations.

## **OPERATIONS OF OTHER ENTITIES AND MANAGEMENT AGENCIES**

Interagency and public meetings were held during the development of the GMP alternatives to acquire information concerning the potential impacts of the alternatives on the operations of other public land and resource management agencies, and other organizations. This information was considered in the development of the alternatives as presented in this document, and is used below to evaluate potential impacts of those alternatives.

## **IMPACTS OF THE NO-ACTION ALTERNATIVE**

### **ARCHEOLOGY**

Management of cultural resources would continue according to current policies. Visitor use would increase over time and remain focused in frontcountry areas and on established roads and trails. Areas with concentrations of archeological resources located in the frontcountry, along creeks, and along established trails would have impacts from trampling of sites, vandalism, and theft. However, the incidence of unintentional or incidental damage would likely remain relatively low. Impacts would be site specific, adverse, and would range from minor to moderate, depending on the site and type of impact activity.

Continuation of current access to park expansion lands, which is limited, would

have a continued beneficial impact because access to sensitive cultural resources is also limited. The Nature Conservancy would continue to manage Medano Ranch. Thus, there would be no general public access to sensitive archeological resources in this large area. Potential effects from trampling and vandalism would be minimized or avoided in these areas. Impacts would be long term, beneficial, and minor.

**Cumulative Impacts.** Residential and spiritual retreat growth in the Crestone/Baca Grande area has undoubtedly adversely affected archeological resources. Additional, as yet undisturbed resources would likely be disturbed or destroyed in the future as this area continues to grow (from ground disturbance during construction and from

looting and unintentional disturbance). The foreseeable development of private land near the park entrance could similarly affect archeological resources. Rehabilitation of main park roads and parking could have potential long-term, localized, minor to moderate, adverse impacts to a NRHP-eligible archeological site (5AL405) from construction activities and heavy equipment. The interagency fire management plan could have beneficial effects if areas identified for prescribed burns or fuel reduction are first surveyed for archeological resources. This would expand identification of and knowledge about regional archeological resources. The no-action alternative would contribute both adverse and beneficial effects on archeological resources, and these impacts would be confined within the park. Combined with past, present, and reasonably foreseeable future actions, the no-action alternative would have minor to moderate adverse impacts and minor beneficial effects on archeological resources.

**Mitigation.** In general, facilities would be located and designed to minimize direct and indirect adverse effects to archeological resources. If avoidance is not possible, mitigation measures would be developed in consultation with the Colorado SHPO and federally recognized American Indian tribes.

**Conclusion.** Impacts related to visitor use would continue to be site specific, adverse, and would range from minor to moderate. Continuation of current access (limited) to park expansion lands and The Nature Conservancy management of Medano Ranch would have minor beneficial impacts. There would be *no impairment* of archeological resources from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## HISTORIC STRUCTURES

Under the no-action alternative, current NPS maintenance practices at park headquarters would continue. Medano Ranch headquarters would continue to be managed and maintained by The Nature Conservancy. This agency’s maintenance practices would continue and public access would continue to be restricted, thus preserving ranch integrity. As a result, negligible, long-term, beneficial impacts would occur at Medano Ranch headquarters. The no-action alternative is not anticipated to affect other historic structures.

**Cumulative Impacts.** No cumulative effects would be anticipated.

**Mitigation.** No mitigation measures for historic structures are proposed for the no-action alternative.

**Conclusions.** Medano Ranch would experience negligible, long-term, localized, beneficial impacts from continued maintenance practices by The Nature Conservancy. There would be *no impairment* of historic structures from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## CULTURAL LANDSCAPES

Potential cultural landscapes (Medano Ranch and NPS administrative) would not be affected by elements of the no-action alternative. Thus the no-action alternative would have no impacts on cultural landscapes.

**Cumulative Impacts.** No cumulative effects would be anticipated.

**Mitigation.** No mitigation measures for cultural landscapes are proposed for the no-action alternative.

**Conclusion.** The no-action alternative would not affect cultural landscapes. There would be no impairment of cultural landscapes from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## **VEGETATION**

Under the no-action alternative, visitation at the eastern portion of the dunefield would increase over time (see “Visitor Use and Experience” section for projections) so the dunefield in this area would experience more use and sparse dunefield plant communities would experience increased trampling, wind erosion, and landslide effects. Popular locales within the subalpine and tundra life zones could also experience increased use over time. Day-use hiking would increase near the northern park boundary, but equestrian use would not increase much because there would be no horse gate at the northern boundary, nor would there be a trailhead in the northern portion of the national park. Higher use levels in these areas over time would mean more potential for introduction of nonnative plant species, social trail establishment, and incidental trampling of vegetation. The likelihood of nonnative plant species being spread by seed from hiker’s boots and clothing, dog fur, horsehair and manure, and wind, with increased visitation and ground disturbance. Effects would be short and long term, negligible to minor, and adverse.

The park would identify and manage nonnative plant populations, reducing their effect on native plant communities or possibly eliminating some stands from the

landscape, thus improving species composition and habitat quality. This would have a long-term, minor to moderate, beneficial impact on plant community composition and habitat quality.

Managed bison grazing would continue on Medano Ranch under The Nature Conservancy management; as such, bison would continue to be confined in an area smaller than that over which they would roam under natural conditions. Some adverse effects to plant communities of the sabkha and sand sheet life zones could occur (e.g., from streambank trampling, shifts in species composition due to selective consumption of more palatable species, and introduction of nonnative plant species). The end result would be long-term, minor to moderate, adverse impacts on Medano Ranch upland plant communities.

**Cumulative Impacts.** Generally, native plant communities of the San Luis Valley and of the park have been affected by over a century of livestock grazing and the effects are sometimes intensified by periods of drought. Depending on the local environment, grazing effects can range from minor shifts of plant and animal species composition to more serious wind and water erosion (e.g., blowouts and gulying) and nonnative plant introductions. Cattle grazing was discontinued on the former Baca Ranch lands in 2004, and some past adverse livestock impacts may gradually be reversed in the future. Rehabilitation of main park roads and parking areas, which includes increasing the capacity of the dunes lot by 5%, would result in minor, long-term, localized, adverse impacts on vegetation. Introduction of nonnative landscape plants from adjacent developed lands would result in adverse effects to native plant communities. Some native plant

communities have undergone historic disturbance during past land-use activities and are therefore subject to such nonnative plant species invasion. The no-action alternative could have adverse effects on vegetation from increased visitor use. Combined with past, present, and reasonably foreseeable future actions, the no-action alternative would have long-term, minor to moderate, adverse, and minor to moderate beneficial effects on plant communities.

**Conclusion.** Increased visitation over time would mean more potential for introduction of nonnative plant species, trampling of vegetation, and establishment of social trails. Continued existence of a managed bison herd could also adversely affect plant communities. Adverse impacts would be long term and minor to moderate. Control of nonnative plant species, especially noxious weeds, would have long-term, moderate, beneficial impacts on plant communities. There would be *no impairment* of vegetation from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## ECOLOGICALLY CRITICAL AREAS

Under the no-action alternative, visitation at the eastern portion of the dunefield would increase over time, so the dunes, which comprise a portion of the Great Sand Dunes ecologically critical area, would experience more use and the seven rare sand sheet and dunefield plant communities, rare plant species (James cryptanth and slender spider-flower), and rare wildlife (insects and small mammals) could be subject to increased trampling, wind erosion, and landslide effects. Day-use hiking would increase near the northern park boundary, but equestrian use would not because there would be no

horse gate on the northern boundary, nor a trailhead in the northern portion of the park. This activity could affect the Deadman Creek ecologically critical area, which supports three rare plant communities (including narrowleaf cottonwoods), rare plant species (Smith whitlow grass and canyon bog orchard), and rare wildlife (Townsend’s big-eared bat and Rio Grande cutthroat trout). Higher use levels over time would mean more potential for introduction of nonnative plant species, social trail establishment, and incidental trampling of vegetation and soils. The end result would be long-term, minor to moderate, adverse impacts on ecologically critical area plant communities and wildlife habitat.

Backcountry use by hikers would increase in the northern portion of the park, having its greatest effect (vegetation trampling and social trail establishment) within the Deadman Creek and San Luis Lakes / Sand Creek ecologically critical areas. The likelihood of nonnative plant species being spread by seed from hiker’s boots and clothing, dog fur, horsehair and manure, and wind increases with increased visitation and ground disturbance. The effects would be short and long term, minor to moderate, and adverse.

The park would identify and manage nonnative plant populations, reducing their effect on native plant communities or possibly eliminating some stands from the landscape improving species composition and habitat quality. This would have a long-term, minor to moderate, beneficial impact on ecologically critical area plant communities and wildlife habitat.

Under Nature Conservancy management, managed bison grazing would continue on Medano Ranch. Some adverse effects to plant communities of the sabkha and sand sheet life zones within the San Luis Lakes /

Sand Creek ecologically critical area (e.g., from streambank trampling, shifts in species composition due to selective consumption of more palatable species, and introduction of nonnative plant species) would be expected. The end result would be long term, minor to moderate, adverse impacts on Medano Ranch portions of the San Luis Lakes / Sand Creek ecologically critical area plant communities and wildlife habitat.

**Cumulative Impacts.** Generally, native plant communities of the San Luis Valley, the park, and the ecologically critical areas within have been affected by over a century of livestock grazing and the effects are sometimes intensified by periods of drought. Depending on the local environment, grazing effects can range from minor shifts of plant and animal species composition to more serious wind and water erosion (e.g., blowouts and gulying) and nonnative plant introductions. Cattle grazing was discontinued on the former Baca Ranch lands in 2004, and some past adverse livestock impacts may gradually be reversed in the future. Introduction of nonnative landscape plants from adjacent developed lands would result in adverse affects to native plant communities. Some native plant communities have undergone historic disturbance during past land-use activities and are therefore subject to such nonnative plant species invasion. The no-action alternative would have impacts on ecologically critical areas from increased use. Combined with past, present, and reasonably foreseeable future actions, the no-action alternative would have long-term, minor to moderate, adverse, and minor to moderate beneficial effects on ecologically critical areas.

**Conclusion.** Increased visitation over time would mean more potential for introduction of nonnative plant species,

trampling of vegetation, and establishment of social trails. Continued managed bison grazing could also adversely affect plant communities. Effects would be long term, minor to moderate, and adverse. Control of nonnative plant species, including noxious weeds, would have long-term, minor to moderate, beneficial impacts on ecologically critical areas within the park. There would be *no impairment* of ecologically critical areas from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## FEDERAL THREATENED AND ENDANGERED SPECIES

Under the no-action alternative, recreation would remain concentrated in the existing developed area east of the dunes and the eastern-most portion of the dunefield. Dispersed use in the preserve and areas of the park west of the dunefield would increase modestly over time because access would be limited to foot and horseback. Backcountry use would be focused around upper Sand Creek, Medano Pass primitive road, the Mosca Pass corridor, and the northern-most portion of the national park because of relatively easy access to these areas, although their isolation dampens the potential impact of human population growth in the surrounding areas. Day-use hiking may increase in the vicinity of Deadman Creek, near the northern park boundary. The numbers of visitors to these areas would remain relatively low, and would decrease with elevation and topographic complexity. Given the difficulty of reaching much of the higher reaches of the preserve, visitor use is not anticipated to have detectable or measurable impacts on any Canada lynx moving through or attempting to take up residence in those areas. Impacts of visitation under this alternative would be

no to negligible, short and long term, adverse.

Under the no-action alternative, unleashed dogs used for hunting would continue to be allowed in the preserve. Leashed dogs not used for hunting would also continue to be allowed in the preserve. Thus, in this alternative, both leashed and unleashed dogs would be allowed in the preserve; a continuation of the current condition. Given that dogs are often used to track and tree Canada lynx for research purposes without any apparent effects on lynx behavior, the presence of leashed dogs and unleashed hunting dogs in the preserve is not anticipated to noticeably affect any lynx passing through or establishing territories in the preserve. Therefore, although temporary disturbance of individuals may occur due primarily to unleashed hunting dogs, impacts to potential lynx or their habitat due to dogs in the preserve would be short and long term, and only negligibly adverse.

**Cumulative Impacts.** Past, present, and reasonably foreseeable actions that might interact with aspects of the no-action alternative to affect potential Canada lynx or lynx habitat within the park include general growth of the human populations surrounding the park and preserve, wilderness restoration efforts in the South Colony Lakes basin area (just north of the national preserve), and a potential elk herd reduction in the future. Population growth is anticipated to be a contributor to modest increases in visitation within the preserve. Wilderness restoration efforts north of the preserve may increase the potential habitat for Canada lynx along the range, and reduction of elk would avoid or reduce the impacts overly large populations of this native ungulate can have on a range of habitats and the food chains based on those habitats. Taken in combination with these cumulative impacts, the no-action

alternative is anticipated to have no to negligible adverse impacts on potential Canada lynx establishment within the park.

**Conclusion.** Impacts on potential lynx within the park due to increased visitation over time would be moderated or reduced with the increase in elevation and ruggedness of the terrain such that only no to negligible, short- and long-term, adverse impacts on potential lynx or their habitat in the park are anticipated. The continued presence of unleashed hunting dogs, as well as leashed nonhunting dogs in the national preserve is anticipated to continue to have no to negligible, adverse effects, in the short and long terms, on lynx passing through or trying to establish ranges within the national preserve. The no-action alternative is anticipated to have no to negligible, adverse impacts on potential lynx establishment within the park. These impacts correlate to a determination of “*may affect—not likely to adversely affect*” for Canada lynx for this alternative. There would be *no impairment* of federal threatened and endangered species from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## **WILDLIFE, INCLUDING COLORADO STATE-LISTED SPECIES**

### **Species Associated with Riparian Corridors**

Visitation in and near the eastern portion of the dunefield would increase over time so Medano Creek and Mosca Creek would experience more use. The Medano and Little Medano drainages serve as actual or potential refugia for the Rio Grande sucker, Rio Grande chub, and Rio Grande cutthroat trout. Higher use levels over time could result in impacts to these riparian

corridors such as decreased water quality due to increased sedimentation, introduction of pollutants, and introduction of nonnative species and diseases. However, given standard monitoring and mitigation practices, such adverse impacts would be anticipated to be only negligible to minor.

Day-use hiking would increase in the vicinity of Deadman Creek, near the northern park boundary. Equestrian use would not increase much—without a horse gate or trailhead, it would remain difficult for equestrians to access this portion of the park. The mature narrowleaf cottonwood groves along the banks of Deadman Creek would likely attract hikers for resting and other passive pursuits. There would be no trails to direct use away from this area, so the Deadman Creek corridor could become the preferred route of east-west hiking travel in this portion of the park. The wildlife issue for consideration in Deadman Creek is the potential impacts of increased use on Townsend's big-eared bats. These bats often forage along riparian corridors in the western United States and are moth specialists (Schmidt 2003). Degradation of the Deadman Creek corridor could potentially result in a decrease in the prey base for this species if woody vegetation, some of which probably serves as host plants for moths, is adversely affected. Assuming standard monitoring and remediation of habitat conditions, such impacts would be anticipated to be negligible to minor, and adverse.

### **Wetlands-Associated Species**

Under the no-action alternative, livestock watering ponds and structures would be removed, resulting in long-term, negligible to minor, adverse impacts (from drying) on species associated with introduced wetlands. When watering ponds and

structures are removed, natural flows could be reintroduced to other areas. Expansion or reestablishment of wetlands plant communities in those areas may have long-term, negligible to minor, beneficial impacts on wetlands-associated species. The result of this scenario would be a combination of negligible to minor, adverse impacts on wetlands-associated species within the park, and negligible to minor, beneficial impacts to the same species both inside and outside (downstream of) the park.

Under management by The Nature Conservancy, bison would continue to graze on Medano Ranch within the park. Irrigation of hay meadows with flows from Sand, Big Spring, and Little Spring creeks as a means of improving bison forage would also continue. Although bison may cause wetlands impacts such as streambank and bottom erosion, these impacts are typically less severe than those caused by cattle. Bison, unlike cattle, tend not to remain in and around wet areas after they drink (Wuerthner 1998). Continued irrigation of meadows would maintain wetlands that were introduced or expanded over a century ago (e.g., wet meadow, emergent wetlands, aquatic, etc.), when irrigation was first introduced. Thus, under the no-action alternative, bison grazing and irrigation of hay meadows would continue to have minor beneficial and minor adverse impacts on wetlands-associated migratory bird species such as the greater sandhill crane.

### **Ungulate Herd Numbers and Health**

Under the no-action alternative, access points into the park would remain as they currently exist. Access across the northern boundary of the park would continue to be limited to pedestrian traffic. The no-action alternative does not provide for possible

future evaluation of public vehicle access routes to the mountain front; a goal of both the USFS and CDOW. Administrative access via Liberty Road would be permitted under this alternative, as it is under all alternatives.

Adverse impacts to ungulates from continued limited hunting access to USFS lands adjacent to the park would continue. Low hunting pressure on elk in this area may exacerbate rapid population increases that may be linked to declines of other native ungulate populations (bighorn sheep and mule deer), and to habitat degradation in the Sangre de Cristo Wilderness. Estimated numbers of hunters who might want to access the preserve and adjacent USFS lands to hunt elk range from 20 to 30 for each of the three 5-day seasons; equating to 60 to 90 hunters annually. The preserve and adjacent USFS lands are in CDOW game management unit 82. The success rate for elk hunters in game management unit 82 in 2004 was 34% total, with 66% of harvested elk being cows. Based on the 2004 harvest rates and CDOW estimates for numbers of hunters, the potential number of elk not harvested from the preserve and adjacent USFS lands is estimated to range from 14 to 20 cows, and 6 to 9 bull elk. Given that, at an estimated herd size of nearly 6,000 elk, the San Luis Valley herd is approximately four times larger than the 1,500-animal goal established by CDOW, removal or nonremoval of 14 to 20 cow elk and 6 to 9 bull elk would not make a substantial difference in efforts to reduce the size of the herd. Therefore, this aspect of the alternative is expected to have only minor adverse impacts on ungulate herd numbers and health.

## Bighorn Sheep

Under the no-action alternative, unleashed dogs used for hunting would continue to be allowed in the preserve. Leashed dogs not used for hunting would also continue to be allowed in the preserve. Thus, in this alternative, both leashed and unleashed dogs would be allowed in the preserve; a continuation of the current condition.

Bighorn sheep, as prey animals, are anticipated to react negatively to dogs, whether on-leash or off. In a study of bighorn sheep, which were already partially habituated to humans, MacArthur et al. (1982) conducted human-disturbance trials on bighorn sheep that were already partially habituated to humans. In this study, a person approached a group of sheep from a road, from the road accompanied by a dog on-leash, and from a ridge away from the road. The strongest negative reactions in the sheep were recorded when a human with a leashed dog approached (MacArthur et al. 1982). Furthermore, no reduction in heart-rate response was observed with repeated trials; instead, heart-rate response actually increased successively with each leashed-dog trial. In earlier studies, these same authors demonstrated that free-ranging dogs and coyotes evoked the maximum heart-rate responses (MacArthur et al. 1979). In their later study, MacArthur, Geist, and Johnston (1982) concluded that, among all the stimuli they studied, "The presence of dogs on sheep range should be discouraged."

The mere presence of dogs, which wild prey animals do not distinguish from other predators, can cause stress in prey species (Simes 1999). While sight and sound of the dogs are obvious direct cues, the scent of dogs and the wastes they leave behind have a much longer impact on prey species of an

area, potentially preventing such species from approaching and using essential resources such as watering holes or cover for a period of time.

The presence of unleashed hunting dogs in the preserve is a component of all alternatives proposed for this GMP and would be a continuation of the current condition (see chapter 3 “Health and Safety—Dogs” section for details). What is being evaluated is the difference among the alternatives relative to leashed dogs in the preserve. If only leashed dogs were allowed in the preserve, the stress impacts attributable to their presence would be larger. However, given that unleashed hunting dogs would be free to roam within the limits established by their handlers, the presence of leashed dogs is not anticipated to add significantly to dog-related stresses. As such, leashed dogs allowed in the preserve under the no-action alternative are anticipated to contribute minor to moderate adverse impacts on bighorn sheep populations within the park.

**Cumulative Impacts.** Cumulative actions contributing to impacts on riparian-associated species as described above include growth of the human population in the area surrounding the park, oil and gas exploration on former Baca Ranch lands, and elk herd reduction. The first two of these would contribute adverse impacts, while elk herd reduction would contribute beneficial impacts, specifically to the riparian corridor habitats. In combination with these cumulative actions, the no-action alternative is anticipated to contribute negligible to minor, adverse impacts.

Cumulative actions contributing to ungulate herd numbers and health include the enabling legislation for the expanded park and preserve (negative impacts from hunting of elk not being permitted in

expansion areas of the national park), but also beneficial impacts from increased protection for habitats and species (from conservation-based NPS management). Also contributing to ungulate herd numbers and health would be the interagency fire management plan, which should provide beneficial impacts through habitat management and enhancement. Finally, the elk herd reduction tentatively planned for the future, pending justification stemming from ongoing research and appropriate NEPA analysis, would most likely provide beneficial impacts to elk by reducing numbers to levels closer to the predicted carrying capacity of the area, and reducing the risk of diseases often associated with high herd densities. Beneficial impacts to other ungulates (mule deer and bighorn sheep) would stem from reduced elk impacts on shared habitats, and reduced likelihood of exposure to diseases. Combined with past, present, and reasonably foreseeable future actions, the no-action alternative would be anticipated to contribute minor adverse impacts to ungulate herd numbers and health.

Cumulative actions contributing to impacts on bighorn sheep would include growth of the human population in the area surrounding the park, and elk herd reduction. The first of these would contribute adverse impacts (from more leashed dogs in the preserve), while elk herd reduction would contribute beneficial impacts by reducing competition from, habitat impacts due to, and the threat of diseases from, elk. In combination with these cumulative actions, the no-action alternative is anticipated to contribute minor, adverse impacts and negligible to minor beneficial impacts on bighorn sheep within the park.

**Conclusion.** The no-action alternative would have negligible to moderate, adverse

impacts on species associated with riparian corridors due to increased recreational use; negligible to minor, adverse impacts on wetlands-associated species within the park due to removal of artificial water sources, and negligible to minor, beneficial impacts to the same species outside (downstream of) the park due to possible increase of downstream waters; minor adverse impacts on ungulate herd numbers and health due to continued limited access for elk hunting; and minor to moderate adverse impacts on bighorn sheep populations within the park due to the presence of leashed dogs in the national preserve. There would be *no impairment* of wildlife from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## SOILS AND GEOLOGIC RESOURCES

Increased day-use hiking in the northern portion of the national park would cause social trails in that part of the park. Vehicles parking along road shoulders (when the dunes parking lot fills) would cause localized disturbance and soil compaction. The end result would be long-term, mostly localized, minor to moderate, adverse impacts to soil resources.

**Cumulative Impacts.** Establishment of a water right to fulfill the purpose of the national park and preserve would minimize further lowering of local groundwater levels or surface water flows, which could indirectly benefit sand recycling. Oil and gas exploration on lands that were formerly part of the Baca Ranch, but are now within the national park, has occurred and these activities could continue in the near future; however, any activities would be subject to 36 CFR 9B (*Nonfederal Oil and Gas Rights*), which require such activities be conducted in a manner consistent with

park purposes and preventing or minimizing damage to the environment. Minor expansion and reconfiguration of the dunes parking area and relocation of the horse loading area and dump station would also cause localized soil disturbance and destruction. The no-action alternative would contribute adverse, localized impacts to soils and geologic resources. Combined with past, present, and reasonably foreseeable future actions, the no-action alternative would have long-term, minor to moderate, mostly localized adverse impacts on soils and geologic resources.

**Conclusion.** Increased day-use hiking in certain areas and vehicles parking along road shoulders (when the dunes parking lot fills) would cause localized soil disturbance, compaction, and social trailing. Impacts to soil resources would be long term, mostly localized, minor to moderate, and adverse. There would be *no impairment* of soils and geologic resources from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## WETLANDS

Recreation use would remain concentrated in the existing developed area east of the dunes and the eastern-most portion of the dunefield, so Medano Creek wetlands in these areas would experience more use. Day-use hiking would increase in the vicinity of Deadman Creek, near the northern park boundary. Equestrian use would not increase much—without a horse gate or a trailhead, it would remain difficult for equestrians to access this portion of the park. The mature narrowleaf cottonwood groves along the banks of Deadman Creek would likely attract hikers for resting and other passive pursuits. There would be no trails to direct use away from this area, so

the Deadman Creek corridor could become the preferred route of east-west hiking travel in this portion of the park. In each case, higher use levels over time would mean more potential for introduction of nonnative species and incidental trampling of soils and vegetation in wetlands areas. The end result would be long-term, negligible to minor, adverse impacts on creek-associated wetlands and riparian habitats.

Livestock watering ponds and structures would be removed, resulting in long-term, negligible to minor, adverse impacts (from drying) on introduced wetlands. When watering ponds and structures are removed, natural flows could be reintroduced to other areas. Expansion or reestablishment of wetlands plant communities in those areas would have long-term, negligible to minor, beneficial impacts. The park would identify and manage nonnative plant populations, reducing their effects on native wetlands communities and possibly eliminating some nonnative stands from the landscape. This would have long-term, minor to moderate, beneficial impacts on wetlands species composition and habitat quality.

Under management by The Nature Conservancy, bison would continue to graze on Medano Ranch within the park. Irrigation of hay meadows with flows from Sand, Big Spring, and Little Spring creeks as a means of improving bison forage would also continue. Although bison may cause wetlands impacts, such as streambank and bottom erosion, these impacts are typically less severe than those caused by cattle; unlike cattle, bison tend not to remain in and around wet areas after they drink (Wuerthner 1998). Continued irrigation of meadows may aid groundwater recharge and maintain wetlands that were introduced or expanded over a century ago (e.g., wet meadow, emergent wetlands,

aquatic, etc.), when irrigation was first introduced. Thus, under the no-action alternative, bison grazing and irrigation of hay meadows would likely continue to have long-term, minor, beneficial, and minor, adverse impacts on wetlands.

**Cumulative Impacts.** Livestock grazing typically adversely affects wetlands and riparian resources by causing shifts in species composition, erosion of streambanks and bottoms, and browsing of wetland grasses, shrubs, and tree seedlings. Cattle grazing was discontinued on the former Baca Ranch lands in 2004, and some past adverse livestock impacts may gradually be reversed in the future. Under the no-action alternative, beneficial and adverse wetlands impacts would result from higher use levels (especially in certain areas), removal of livestock-related water control structures, control of nonnative noxious plant populations, and continued bison grazing and hay meadow irrigation. Combined with past, present, and reasonably foreseeable future actions, the no-action alternative would have long-term, minor, beneficial impacts and minor to moderate adverse effects on wetlands resources.

**Conclusion.** Higher use levels over time would mean more potential for introduction of nonnative species and incidental trampling of soils and vegetation in wetlands areas. The end result would be long-term, negligible to minor, adverse impacts on creek-associated wetlands and riparian habitats. Removal of livestock watering ponds and structures would have long-term, negligible to minor, adverse impacts (from drying) on introduced wetlands, and long-term, negligible to minor, beneficial impacts on naturally occurring wetlands. Management of nonnative plant populations in new park areas would have long-term, minor to moderate, beneficial impacts on wetlands

species composition and habitat quality. Bison grazing and irrigation of hay meadows would likely continue to have long-term, minor, beneficial, and minor adverse impacts on wetlands. There would be *no impairment* of wetlands from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## WATER RESOURCES

Under the no-action alternative, visitation would increase in general over time, and it would increase proportionally in certain areas (e.g., in the north portion of the park). Higher use levels over time would mean more potential for trash and human or dog waste to be washed into streams and lakes, thus degrading water quality. Because there would be no new trails in the northern part of the park that would direct use away from Deadman Creek, social trails could be a problem in this stream corridor and could cause bank erosion that would contribute to stream sedimentation. The end result of these actions would be long-term, negligible to minor, localized, adverse impacts to surface water and potentially to shallow groundwater quality (due to the close relationship between surface water and shallow groundwater).

Medano Ranch would be managed by The Nature Conservancy. Bison would continue to graze there, and irrigation of hay meadows with flows from Sand, Big Spring, and Little Spring creeks would continue as a means of improving bison forage. Continued irrigation of hay meadows could aid local groundwater recharge if surface waters are diverted locally to more permeable soils (instead of flowing to less permeable playas, where more water would evaporate). Because groundwater levels are closely related to local creek flows, sustained irrigation could

also support local stream flows. More research is needed to determine the nature of potential impacts on groundwater and surface water. Prior to discontinuing irrigation, a study would be conducted to provide more information about possible effects of this action.

**Cumulative Impacts.** Establishment of a water right to fulfill the purposes of the park would minimize additional lowering of local groundwater levels. Oil and gas exploration activities on lands that were formerly part of the Baca Ranch (but are now within the national park) are reasonably foreseeable in the near future; however, any such activities are subject to 36 CFR 9B, which requires that such activities be conducted in a manner that is consistent with protection of water resources (among other resources). The no-action alternative would have both beneficial and adverse effects on water resources, as discussed above. Combined with past, present, and reasonably foreseeable future actions, the impact of the no-action alternative on water resources would be long term, minor to moderate, and adverse.

**Conclusion.** Higher use levels would result in increased wastes and sediments in certain surface waters. Social trails could cause bank erosion and stream sedimentation in the Deadman Creek stream corridor. These actions would result in short- and long-term, negligible to minor, localized, adverse impacts to surface water and potentially shallow groundwater quality. Irrigation of hay meadows on Medano Ranch is likely to continue to have impacts on surface and groundwater quality, but more information is needed to understand the nature of those impacts. There would be no impairment of water resources from this alternative (see specific definition of impairment in the

“Impairment of National Park Resources” section).

- park expansion and change in designation to a park and preserve
- absence of new public vehicle access to interior areas of the park

**VISITOR USE AND EXPERIENCE**

**Visitor Use Projections**

Long-term growth in visitor use would include increases in annual visits by both permanent and seasonal residents of the San Luis Valley and surrounding region, and by nonresidents visiting Great Sand Dunes as part of a day trip or multiday outing. The principal influence driving long-term visitor use under this alternative would be population growth, particularly in the San Luis Valley and Colorado. Net population growth of nearly 30% is projected in Alamosa and Saguache counties between 2005 and 2025. Colorado’s population is projected to reach 6.65 million during the same period, an increase of more than 2.0 million over the estimated 2004 population of 4.6 million (CDLG 2004 and Census 2004a). The nation’s population is projected to approach 350 million residents by 2025, an increase of almost 56 million as compared to the 293.7 million residents in 2004 (Census 2004b).

Other factors affecting future visitor use under the no-action alternative include:

- increased development and growth of the year-round and seasonal population along the park’s northern boundary (Baca Grande/Crestone area)
- maintenance of current campground capacity and trails and trailheads
- continued management of Medano Ranch by The Nature Conservancy

Annual use, given the above, is projected to increase to nearly 375,000 by 2025 (table 22). The period of heaviest use would remain the 3-month period of June through August.

**TABLE 22. CURRENT AND PROJECTED ANNUAL VISITORS IN 2025 NO-ACTION ALTERNATIVE**

2004 (recorded)	2004 (adjusted baseline)	2025 (projected)
268,400	291,000	374,800
Increases Over 2004 (adjusted)		
Annual Visits (number)		+83,800
Annual Visits (percent)		+29%

Recreation use would remain concentrated in the existing developed area east of the dunes and the eastern-most portion of the dunefield. Dispersed use in the preserve and areas of the park west of the dunefield would increase modestly over time because public access would be limited to foot and horseback. An increase in day use would occur along the park’s northern boundary with the Baca Grande subdivision. Subdivision residents, seasonal occupants, and their guests would account for much of the increase, though access and use by the general public would also occur in this area. Day-use increases in winter and other traditionally lower-use months would be relatively higher here during the off-season, due to the proximity to the Baca Grande/Crestone area.

Although most visitor use would remain focused in the eastern part of the dunefield, some people would visit backcountry areas. Backcountry use would be focused around upper Sand Creek, Medano Pass primitive

road, the Mosca Pass corridor, and the northern-most portion of the national park because of ease of access.

### **Visitor Experience**

Opportunities for types and locations of activities (hiking, camping, scenic driving, exploring the dunes environment) would be similar to now. Many equestrian users would undoubtedly be frustrated by having no easy way to access the north part of the park (no trailhead or horse gate would be provided). The only way to get a horse to the north part would be to ride from the southeast part of the park, or from one of the mountain passes. Continued limited access for equestrians would represent a long-term, minor, adverse impact on visitor experience.

Over the long term, as summertime visitor use increased, visitors would encounter more people at: the area of focused use east of the dunefield (main park road, visitor center, dunes parking lot, Medano Creek area, and Pinyon Flats campground), along the Medano Pass primitive road, and along trails in the national park and in the preserve. The dunes parking lot would fill often, so visitors would be left to park along the shoulders of the dunes access road and main road. This would be frustrating, both to visitors who must walk along the roadway to reach the dunes, and to drivers who are trying to find a parking spot. Some potential repeat visitors would undoubtedly choose not to return to the park due to dissatisfaction with crowded conditions (e.g., at the campground or Medano Pass primitive road). Crowding and other visitor frustrations related to visitor numbers in the focused use area east of the dunefield would have a long-term, moderate, adverse impact on visitor experience.

Interpretation, information, and education activities would remain focused in the area east of the dunefield (visitor center, amphitheater, dunes area, day-use trails, etc.); there would be little change with respect to these services and opportunities.

Dogs would continue to be allowed in all areas of the park, provided they are on a leash. This means that visitor experiences would continue to be affected, both positively and negatively, by dogs in the park. People who like to travel and/or recreate with their dogs would enjoy substantial freedom to do so, provided their dogs are kept on-leash. Dog-related problems and concerns (e.g., dog waste, aggressive dogs, and barking dogs) would continue and perhaps increase as visitor use increased over time. Maintenance of the current policy regarding dogs would have long-term, minor, adverse, and beneficial impacts on visitor experience.

This alternative would offer enjoyable wilderness experiences within most of the park's existing wilderness (Great Sand Dunes Wilderness and Sangre de Cristo Wilderness). There would be no new points of access, so more remote areas would continue to offer ample opportunities for solitude and primitive experiences. This would be a long-term, moderate, beneficial impact. However, increasing visitor numbers over time could affect wilderness values (opportunities for solitude, evidence of human use, etc.) in less remote parts of the wilderness. This would constitute a long-term, moderate, adverse impact. There would be no new wilderness opportunities because no new wilderness is recommended for the no-action alternative.

**Cumulative Impacts.** Rehabilitation of main park roads and parking areas, which includes increasing the capacity of the dunes lot by 5%, is planned for the near

future and would modestly improve pedestrian and vehicle traffic flow in the immediate area. The no-action alternative provides no comprehensive means to address crowding and frustrations related to vehicle and pedestrian circulation in the frontcountry area. Ongoing wilderness restoration efforts in the South Colony Lakes basin area are improving wilderness experiences in the Sangre de Cristo Wilderness. The no-action alternative would help to maintain wilderness experiences in the portion of the Sangre de Cristo Wilderness area that lies within the Great Sand Dunes. Combined with past, present, and reasonably foreseeable future actions, the no-action alternative would have minor adverse and moderately beneficial effects on visitor experience.

**Conclusion.** Crowding and other visitor frustrations related to visitor numbers in the focused use area east of the dunefield would have a long-term, moderate, adverse impact on visitor experience. Maintenance of the current policy regarding dogs would have long-term, minor, adverse, and beneficial impacts on visitor experience. Maintenance of existing wilderness experiences in remote areas would have a long-term, moderate, beneficial impact, and degradation of such values in less remote areas would have a long-term, moderate, adverse impact.

## **SCENIC RESOURCES AND VISUAL QUALITY**

Under the no-action alternative, there would be no new human-made structures or vehicle areas in the national preserve that would affect scenic quality. The no-action alternative would not include new human-made structures, construction, or vehicle access in the new park lands that would affect scenic quality. This alternative would not introduce new sources of

outdoor light, and therefore, would not affect the ability to view the night sky. People wishing to access the northern part of the park on foot would continue to park their vehicles at certain points within the Baca Grande subdivision, along the north side of the park boundary. Scenic views would continue to be adversely affected by this practice, and impacts would likely increase over time as the subdivision grew and if the practice became more common. Impacts would be long term, localized, adverse, and minor to moderate in intensity.

**Cumulative Impacts.** Rehabilitation of main park roads and parking areas, that includes increasing the capacity of the dunes lot by 5%, would result in a negligible, long-term, localized, adverse impact on scenic resources. Prescribed burns (fire management) would have short-term, minor, adverse, localized impacts on scenery and visibility. Continued residential growth in the Baca Grande subdivision, located north of the national park, means that more homes, retreat centers, commercial structures, and vehicles would be visible in this area of the landscape in the future. Expanded residential development could also bring more dust and wood smoke. The private land parcel that is for sale near the park entrance could be rezoned to commercial and developed. Overall, such new development would intrude upon the area's natural scenery (at least from some vantage points), affect visibility, and introduce new light sources into the night sky. Regional population growth and development would also continue to introduce additional light into the night sky. The no-action alternative would contribute long-term, localized, negligible to moderate, adverse impacts to scenery, but would not affect visibility or the night sky. Combined with other past, present, and reasonably foreseeable future impacts

on scenery and visual quality, the no-action alternative would have minor to moderate localized and regional adverse impacts on scenery.

**Mitigation.** No mitigation is proposed for the no-action alternative.

**Conclusion.** The no-action alternative would have long-term, localized, minor to moderate, adverse impacts on scenery, but would not affect visibility or the night sky. There would be *no impairment* of scenic resources and visual quality from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## SOCIOECONOMICS

Implementation of the no-action alternative would occur at the same time as other economic, demographic, and social changes across the San Luis Valley. The valley is expected to gain 13,000 more residents between 2005 and 2030, 27% more than the current population of 48,000. Most of the population growth is expected to occur in Alamosa and Saguache counties, the latter including substantial growth in the Baca Grande subdivision. The Baca Grande Property Owners Association forecasts as many as 2,700 new homes in the subdivision by 2025, and an eventual total of more than 4,500 units. However, the Baca Grande community recently started a new long-term visioning and planning process that may result in revisions to those forecasts.

### Visitor Related Economic Impacts

Recreational visitor use at the park is projected to increase to nearly 375,000 visits per year by 2025, which is 106,000 (or 40%) more than in 2004 (266,800). Visitor

use is expected to increase steadily over time, though year-to-year changes will vary, with some periods of faster or slower growth, and even periods of short-term declines. Peak visitor use is expected to continue to occur in July, with 80,800 visitors per month projected in 2025, compared to about 65,200 in July 2004.

Nonresidents who would come to the Great Sand Dunes as part of a one-day or multiday trip would account for most of the visitor growth over time. Economic and population growth in the San Luis Valley would result in more visitor use over the long term by permanent and part-time residents of the valley and surrounding region. Residents of Crestone and the Baca Grande subdivision are expected to account for a larger share of future local use.

Visitors to the park under the no-action alternative would result in an estimated 192,660 party-days of visitation annually by 2025, which is 55,490 party-days more than that estimated for 2004 (137,170 party-days)<sup>7</sup>. Increased local visitor spending at stores, motels and hotels, and other tourism related businesses and attractions would accompany the rising visitation with annual spending projected to reach \$18.43 million by 2025, a \$5.30 million increase over 2004 levels. Future visitor use and spending would vary by season, with peak visitor use in the summer. Of the total future visitor spending, \$432,000 would be for entry fees and sales of various passes, with another \$380,000 in annual merchandise sales through the Western National Parks Association operation at the visitor center.

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<sup>7</sup> Party-days are a measure of visitor activity used to account for varying lengths of stay and different spending patterns among visitors. The conversion is necessary because spending data are typically collected and reported on “per day” or “per trip” basis, with spending on lodging or other accommodations a key category of spending.

Projected spin-offs from visitor spending include personal income of \$5.75 million per year, supporting a total of 472 jobs across the region. Those levels are \$1.65 million higher in terms of annual income and 135 new jobs compared to the contributions related to park visitors in 2004. The visitor-related impacts would result in long-term benefits, but minor relative to the 2003 total employment of 13,271 jobs and \$470.4 million in total personal income in the two-county region.

Most of the visitor spending under the no-action alternative would be concentrated in the Alamosa area because the majority of users would use the park's main entrance, traveling from and to the west (SH 17) and south (SH 150). Market opportunities created by the higher spending could, over time, trigger more commercial development along the access roads to the park's main entrance and provide opportunities for more small-scale business activities, including more of the services already provided via incidental business permits issued by the park.

Businesses in smaller communities, including Crestone, Baca Grande, Mosca, Moffat, Hooper, Blanca on the west, and Westcliffe and Gardner on the east, would also see increases in future sales to park visitors. However, the scale of such increases would be relatively small.

The state and some local governments would collect additional sales tax from the increases in visitor spending. County governments may also see property tax revenues climb due to new development and rising property values. Saguache County does not levy a sales tax, but could benefit indirectly from population growth under the no-action alternative because such growth would raise the cap on federal PILT. Alamosa County could also realize

additional PILT from the acquisition of Medano Ranch.

The visitor-related economic impacts would be beneficial, but negligible in the short term and minor and beneficial over the long term.

### **Economic Impacts Related to GMP Implementation and Park Operations**

Choosing the no-action alternative would provide an economic boost to the region in the form of \$6.8 million in future construction spending, \$7.4 million in other major spending, and increases in operating and maintenance expenditures. Over time, more staff would be needed to maintain and achieve current service levels across the expanded park and increased visitation, although such increases would depend on the park receiving budget increases. The additional staffing need is estimated at five FTEs, at an annual cost of approximately \$260,000.

Future capital construction and major maintenance spending at the park would create a series of short-term economic impacts in the region. Local construction and related industries would capture much of that spending. It is uncertain when that spending would happen because it depends on the timing and size of budgets approved by Congress for the National Park Service, the allocation of those budgets within the National Park Service, and future collections of entry and camping fees at the park, which can then be used to support projects. Annual payroll, operations, and maintenance by the park would produce long-term effects on employment, business sales, income, and other related measures. The economic effects associated with this federal spending are summarized below:

- capital construction (short term): 122 job-years<sup>8</sup> of employment and \$3.39 million in personal income over time, between 2006 and 2025
- nonannual recurring (short term): 121 job-years of employment and \$3.38 million in personal income over time, between 2006 and 2025
- park operations (long term): 43 jobs (compared to 37 at present), including 33 FTEs of direct NPS staffing, and \$1.95 million per year in annual income

No major changes in the economic contributions made by The Nature Conservancy operation of Medano Ranch would occur over the long term under the no-action alternative. The economic effects associated with park operations would be beneficial, but negligible to minor in the short term, and beneficial and minor over the long term.

### Community Services

Over time, the rising number of visitors to the park would indirectly increase demands on community services and facilities across the region. Local water and wastewater systems would be affected by more people traveling through the area and staying in local lodging accommodations. However, the incremental demands associated with the increased visitation would not require additional capacity or staffing due to its seasonal nature, limited scale, and geographical dispersion. Tax revenues generated directly and indirectly

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<sup>8</sup> Temporary job impacts are expressed in terms of "job-years" to account for the variation in employment over time and prevailing employment patterns in the region. Total job-years does not distinguish between full-time and part-time jobs. The totals do, however, account for the effects of seasonal jobs on overall employment.

by visitor spending would help provide resources to meet future needs.

Effects on community services under this alternative would be indeterminate and negligible over the short term and long term.

### Traffic and Emergency Services

Traffic volumes on area highways and roads would increase as a result of travel associated with the no-action alternative. Traffic increases would be most noticed on SH 150 or Alamosa County Lane 6N, the main access roads to the park, though future traffic would still be well below design capacity of these roads. Most park-related traffic would consist of light-duty vehicles and self-contained RVs that do not result in heavy wear on the paved road and thus, these roads would require little additional maintenance.

Traffic volume increases would occur on Saguache County Road T between SH 17 and Crestone/Baca Grande, and on roads within the Baca Grande subdivision. This would occur because the easiest way to get to the northern part of the park would be through the subdivision (although this alternative does not provide for public vehicle access into the north part of the park). Thus, visitors would park on local and county roads near the northern boundary of the park, as they do now. From there, they would walk into the park. Some people would drive around the subdivision to explore different routes of approach to the park boundary. Effects would be greatest on summer weekends and might increase over time as word spreads about easy access points, and as visitor volume increases over time. Given expected traffic volume from residential and spiritual retreat growth in the Baca Grande subdivision, the contribution of

park visitor-related traffic would be minor. However, vehicle congestion from visitors parking (or trying to park) near the terminus of county roads could be an annoyance to some residents.

More travelers would cause more traffic accidents and demands on local law enforcement, emergency medical, and fire protection agencies. The scale of changes associated with the no-action alternative would not require law enforcement agencies to hire more staff, though they could contribute to overall needs for additional staff. While the frequency of incidents would remain relatively low, the distances and response time involved and the fact that many emergency medical and fire protection agencies in the area are staffed by volunteers, would impose a burden on these providers. The effects of the no-action alternative on traffic and emergency services would be long term, adverse, and minor in intensity.

### Attitudes and Lifestyles

The Great Sand Dunes National Park and Preserve community is broad based, including representatives at the local, state, and national level. The no-action alternative would effectively maintain a form of status quo regarding the park's direct influences on community attitudes. Continuing National Park Service and Nature Conservancy operations, primarily within the context of the existing management, would not alter established visitor use opportunities or patterns within what were the boundaries of the national monument, and lack of new access would somewhat discourage use on most of the new national park lands. The lack of access would also achieve a type of *de facto* wilderness, which some would support, although it would limit opportunities to enjoy the solitude it offers.

For many, the no-action alternative could be a source of apprehension or frustration because it fails to establish clear management direction for the expanded park. Those who were actively engaged in efforts to promote establishment of the park might be particularly disaffected with this alternative. Others may see some advantage to this alternative, either because it avoids certain outcomes or impacts that they might find objectionable, or because it is perceived to leave open management options for further consideration.

**Cumulative Impacts.** From an economic and social point of view, one cannot easily isolate the park from many of the cumulative actions. Past and present actions, mainly the development and continued operation of large ranches, combined with the subsequent set-asides of public lands, were instrumental in the establishment of the park and adjacent land-use patterns that presently exists. Without those actions, more of the land would likely have been subdivided for farm and ranch development, forever changing the landscape and lowering the likelihood that park expansion would occur.

Areas for potential cumulative interaction include development in the Crestone/Baca Grande subdivision and the potential sale and development of private lands along the major access roads to the park's main entrance. The development of the Baca Grande subdivision, including the spiritual centers, resulted in a situation where the park and the community became neighbors, each with interests and concerns regarding management and access in that portion of the park. Changes in either affect the other. Increased visitor use under the no-action alternative raises concerns for the community, particularly with respect to traffic and the presence of more nonresidents in the community. The incremental effects due to the no-action

alternative would happen even as the community itself grows and changes with new residential construction and as new property owners and guests arrive in the community.

Over time, increases in the number of visitors to the park may increase the commercial development potential for private lands near the park's main entrance. Any sales and subsequent development would have economic implications, as well as changing visitor experience. The incremental effects of the no-action alternative would be negligible to minor in the short term and minor in the long term, and generally beneficial, as compared to other social or economic effects resulting from the cumulative actions.

**Conclusion.** The economic and social effects of the no-action alternative include negligible to minor short-term and minor long-term economic benefits, and negligible indeterminate or adverse effects on demands for community services and facilities. Long-term consequences on attitudes and lifestyle are indeterminate, but in general are more likely to be adverse than beneficial.

## HEALTH AND SAFETY

The no-action alternative would not change management practices related to fires (including campfires) in the park, so risks from wildfire would remain the same.

Roads, access, and vehicle traffic management within the park would remain essentially the same. However, with increased visitation and vehicles over time, there would be some additional risk of traffic accidents within the park. Although there have been no visitor/bison incidents to date, bison would remain on private land within the national park, so there would

continue to be a negligible risk associated with their presence. Overall, impacts of the no-action alternative on health and safety would be long term, negligible, and adverse.

**Cumulative Impacts.** No cumulative impacts would be expected from the no-action alternative.

**Conclusion.** The no-action alternative would have long-term, negligible, adverse impacts on visitor safety.

## NATIONAL PARK SERVICE OPERATIONS

Under the no-action alternative, NPS operations would be conducted much as they are now. Operations would continue to be based in facilities (park headquarters, visitor center, maintenance center, etc.) located east of the dunes. With a few minor exceptions, these facilities would be generally adequate to operate the park under the no-action alternative. Operational activities such as interpretation, resource protection, inventory and monitoring, research, and resource management would continue to be conducted, both in the former national monument and in the park expansion area. National Park Service staff would continue to work cooperatively with neighboring agencies and entities to address concerns and meet goals. The Nature Conservancy would continue to maintain its facilities at Medano Ranch. Assuming the park was eventually fully staffed, the no-action alternative would have no to negligible impacts on NPS operations.

**Cumulative Impacts.** There would be no cumulative effects on NPS operations from the no-action alternative.

**Conclusion.** The no-action alternative would have no to negligible effects on NPS operations.

## **OPERATIONS OF OTHER ENTITIES AND RESOURCE MANAGEMENT AGENCIES**

### **Public Vehicle Access To/Through North Portion of the Park**

Under the no-action alternative, access points into the park would remain as they currently exist. Access across the northern boundary of the national park would continue to be limited to pedestrian traffic. The no-action alternative does not provide for possible future evaluation of public vehicle access routes to the mountain front—a goal of both the USFS and CDOW. Administrative access via Liberty Road would be permitted under this alternative, as it is under all alternatives.

Continued lack of public vehicle access to and through the northern reaches of the national park may impede visitation to and use of USFS lands adjacent to that portion of the national park and the preserve. Reduced visitation could have both adverse and beneficial impacts. Adverse impacts could result from continued limited hunting access to USFS lands adjacent to the northern boundary of the park. Continued limited hunting pressure on elk in this area may exacerbate rapid population increases that may be linked to declines of other native ungulate populations (bighorn sheep and mule deer), and to habitat degradation in the Sangre de Cristo Wilderness. Estimated numbers of hunters who might want to access the preserve and adjacent USFS lands to hunt elk range from 20 to 30 for each of the three 5-day seasons; equating to 60 to 90 hunters annually. The preserve and

adjacent USFS lands are in CDOW game management unit 82. The success rate for elk hunters in game management unit 82 in 2004 was 34% total, with 66% of harvested elk being cows. Based on the 2004 harvest rates and CDOW estimates for numbers of hunters, the potential number of elk not harvested from the preserve and adjacent USFS lands is estimated to range from 14 to 20 cows, and 6 to 9 bull elk. Given that, at an estimated herd size of nearly 6,000 elk, the San Luis Valley herd is approximately four times larger than the 1,500-animal goal established by CDOW. Removal or nonremoval of 14 to 20 cow elk and 6 to 9 bull elk would not make a substantial difference in efforts to reduce the size of this herd. Over time, as elk move into the national park proper in response to hunting pressure in the national preserve and adjacent USFS lands, the number of individuals interested in hunting elk in those areas is expected to decline (CDOW, R. Rivale, pers. comm., April 28, 2005). Therefore, this aspect of the no-action alternative is expected to have only minor, short- and long-term, adverse impacts relative to elk management.

Visitation, in general, is anticipated to increase in the future, which would result in adverse impacts to natural resources, particularly ecologically sensitive resources. Under the no-action alternative, remediation expenses for degradation of near-pristine conditions on adjacent USFS lands would not be anticipated to increase beyond those projected due to visitation trends.

Because this alternative does not provide for future consideration of a public vehicle access route into the northern portion of the national park, no burden is placed on the USFWS or the Baca Grande subdivision / Saguache County to consider potential access routes across their

respective lands in their planning processes.

### **Designation of Additional Wilderness Areas within the Park**

Under the no-action alternative, no new areas within the park would be designated as wilderness. Therefore, this alternative would have no new wilderness-related effects on activities of other agencies and organizations.

**Cumulative Impacts.** The Great Sand Dunes Act (2000) authorized a change in designation of Great Sand Dunes from a national monument to a national park, established the national preserve, and created the Baca National Wildlife Refuge. The act also added Kit Carson Peak and surrounding lands to the Rio Grande National Forest. A comprehensive conservation plan for the refuge, scheduled to begin in 2008, will provide details regarding future management. Planning for the new USFS lands is tentatively to begin in 2006 or 2007. The no-action alternative imposes relatively little extra work on the part of these two agencies relative to resource management planning. The potential impact of this alternative on USFS and CDOW elk management activities is somewhat reduced when considered cumulatively with the future elk management study and plan. Therefore, combined with past, present, and reasonably foreseeable future actions, the no-action alternative would have minor adverse effects on the management actions of other agencies.

**Conclusion.** The no-action alternative would be anticipated to have short- and long-term, minor, adverse impacts on the management actions of other agencies or entities, specifically CDOW and the USFS.

### **UNAVOIDABLE ADVERSE EFFECTS**

Some impacts caused by human use (especially minor, inadvertent impacts to archeological sites, vegetation, soils, water resources, etc.) are essentially unavoidable because barring people from the park would be inconsistent with the National Park Service mission.

### **IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES**

Irreversible impacts are permanent. An irretrievable commitment of resources refers to resources that, once removed, cannot be replaced. Archeological resources that are stolen or vandalized are irreversibly lost. Even moving or disturbing such resources constitutes an irreversible commitment of resources because information is lost if the context (location and condition) is changed, even inadvertently. Thus, there would be some irreversible loss or commitment of archeological resources from this alternative.

### **RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY**

There would be no adverse effects on biological or economic productivity from implementation of this alternative.

## IMPACTS OF THE NATIONAL PARK SERVICE PREFERRED ALTERNATIVE

### ARCHEOLOGY

Under the NPS preferred alternative, much visitor use would remain focused in frontcountry areas and on established roads and trails. Areas with concentrations of archeological resources located in the frontcountry, along creeks, and along established trails would have impacts from trampling of sites, vandalism, and theft. The new backcountry zone in the north area of the park (includes an access road and trailhead) would improve visitor access into the north portion of the national park and to other core park areas. Much of this area has not yet been surveyed for archeological resources because it has until recently been privately owned. However, based on archeological information that is available from other areas of the park, archeological resources are likely present. Other trails would be added in as yet undetermined locations (within the backcountry adventure zone) in the northern portion of the national park and national preserve, so there would be potential for impacts to sites in more areas of the park. Impacts would be site specific, adverse, and would range from minor to moderate, depending on the site and type of impact activity.

Assuming The Nature Conservancy transferred management of Medano Ranch to the National Park Service, Medano Ranch headquarters would be used for NPS administrative purposes and opened on a limited, scheduled basis for public use (environmental education, etc.). The nearby guided learning zone would help protect archeological resources because visitors would be escorted. Guided use would help direct use in a way that would prevent most inadvertent adverse effects. Also, guides would help monitor resources

on a regular basis, at least during the warmer, busier months. Under this alternative, park staff would be in the general area of Medano Ranch regularly, serving as a deterrent to those who might otherwise intentionally harm sensitive archeological resources. The substantial wilderness recommendation in this alternative would help to protect resources in much of the park expansion area—it is much more difficult to gain access to remote areas if vehicles are not permitted, plus any signs of vehicle use (e.g., dust, tire tracks, or headlights at night) would alert the National Park Service to possible illegal activity. Nonetheless, it would still be possible for one person on foot or horseback to do intentional harm to archeological sites. Closer monitoring, the guided learning management zone, and the wilderness recommendation would provide long-term, minor, beneficial impacts to archeological resources.

**Cumulative Impacts.** Residential and spiritual retreat growth in the Crestone/Baca Grande area have undoubtedly adversely affected archeological resources. Additional, as yet undisturbed resources would likely be disturbed or destroyed in the future as this area continues to grow (from ground disturbance during construction and from looting and unintentional disturbance). The foreseeable development of private land near the park entrance could similarly affect archeological resources. Rehabilitation of main park roads and parking could have potential long-term, localized, minor to moderate, adverse impacts to a NRHP-eligible archeological site (5AL405) from construction activities and heavy equipment. The interagency fire management plan could have beneficial effects if areas identified for prescribed

burns or fuel reduction are first surveyed for archeological resources. This would expand identification of and knowledge about regional archeological resources. The NPS preferred alternative would contribute both adverse and beneficial effects on archeological resources, and these impacts would be confined within the park. Combined with past, present, and reasonably foreseeable future actions, the NPS preferred alternative would have minor to moderate adverse impacts and minor beneficial effects on archeological resources.

**Mitigation.** In general, facilities would be located and designed to minimize direct and indirect adverse effects to archeological resources. If avoidance is not possible, mitigation measures would be developed in consultation with the Colorado SHPO and federally recognized American Indian tribes. Areas under consideration for new facilities (e.g., trails, etc.) would be surveyed for archeological resources before any ground-disturbing activities took place. If archeological sites were discovered during such project-specific surveys, they would be evaluated and, if necessary, new locations for facilities would be identified.

**Section 106 Summary.** After applying Advisory Council on Historic Preservation criteria for adverse effect in 36 CFR § 800.5, the National Park Service determined that there is potential for minor to moderate adverse impacts to archeological resources. This would constitute an adverse effect, requiring compliance with section 106, mitigation, and consultation.

**Conclusion.** Impacts from visitor use in existing areas, new vehicle access, and new trails would be site specific, adverse, and would range from minor to moderate. Closer monitoring, the guided learning management zone, and the wilderness

recommendation would provide long-term, minor, beneficial impacts to archeological resources. There would be *no impairment* of archeology from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## HISTORIC STRUCTURES

Assuming management of Medano Ranch were transferred to the National Park Service, the headquarters complex would be used as an NPS administrative center, and for public uses on a limited, scheduled basis. Such uses would require some initial stabilization, as well as constant upkeep of the complex. This would prevent further deterioration of historic structures and constitute a minor, long-term, localized, beneficial impact. Adaptive reuse of these buildings would require modifications to the buildings, which, if not properly designed and implemented, could change character-defining historic features. Some minor buildings may be removed as well. These actions could have minor to major, long-term, localized, adverse impacts.

Opening the Medano Ranch headquarters area on an occasional basis for scheduled public activities would bring increased vehicle and pedestrian access and traffic. There would be more potential for vandalism, although such activity would be discouraged by the presence of NPS staff. Also, depending on the type and exact location of public use, there could be increased general wear and tear on historic structures. Impacts would be minor, long term, localized, and adverse.

In the frontcountry zone, an unevaluated ditch segment could be disturbed by the proposed hiking/biking path that would connect Pinyon Flats campground to the visitor center. If the ditch segment were

determined eligible for the NRHP, effects could be long term, moderate to major, and adverse.

The large amount of recommended wilderness in this alternative would cause minor, long-term, localized, adverse impacts to peripheral ranch elements due to removal of fences and neglect of other elements such as roads and ditches.

**Cumulative Impacts.** No cumulative effects would be anticipated.

**Mitigation.** Mitigation measures are undertaken to reduce potential impacts to cultural resources. Mitigation would occur in consultation with the Colorado SHPO. The most effective mitigation measure for the canal segment would be to avoid it completely. If avoidance were not possible, an eligibility determination would be required, and if it were found to be eligible, documentation would likely be required. Mitigation of impacts at Medano Ranch would include consultation with the Colorado SHPO regarding restoration, rehabilitation, or removal of any structure, or construction of new facilities. This would ensure that the historic character and integrity of the ranch is not affected.

**Section 106 Summary.** After applying Advisory Council on Historic Preservation criteria for adverse effect in 36 CFR 800.5, the National Park Service determined that there is potential for moderate to major adverse impacts to Medano Ranch structures and the ditch segment. This would constitute an adverse effect, requiring compliance with section 106, mitigation, and consultation.

**Conclusion.** Potential effects to Medano Ranch would include minor, long-term, localized, beneficial impacts (from rehabilitation associated with adaptive use) and minor to major, long-term, localized,

adverse impacts (from potential modifications to structures, public use, and vandalism). If an as yet unevaluated ditch segment were found to be eligible for the NRHP, and if this feature were disturbed, impacts could be moderate to major and adverse. If this feature were found to be ineligible or if it were avoided, impacts would be negligible. Through compliance with section 106 of the National Historic Preservation Act, consultation with the Colorado SHPO, and mitigation, the severity of impacts can be reduced below the “major” threshold. There would be *no impairment* of historic structures from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## CULTURAL LANDSCAPES

Under the NPS preferred alternative, the Medano Ranch potential cultural landscape could experience various impacts. The ranch headquarters complex, the core of the cultural landscape, would be adaptively used as an administrative center with limited, scheduled public access for special events, environmental education, etc. Limited new facilities, such as public restrooms and a covered outdoor meeting structure, might be needed to support these public purposes. Parking areas and changes to vehicle and pedestrian access would be needed as well. Minor to moderate, site-specific, beneficial impacts would occur with adaptive reuse of buildings for offices, storage, park programs, etc. because stabilization and maintenance would be assured. However, minor, long-term, site-specific, adverse impacts could occur from renovation and rehabilitation (adaptive reuse), or if other changes were not done carefully (that is, with the integrity of the cultural landscape in mind). Other potentially contributing elements of the landscape, such as roads and ditches, could

experience negligible, long-term, site-specific, adverse impacts through neglect and deterioration.

The NPS administrative potential cultural landscape could also be affected by this alternative. A nonhistoric fee booth located within this landscape (adjacent to the historic superintendent's residence and entrance station) would be removed. This would constitute a moderate, long-term, site-specific, beneficial impact.

**Cumulative Impacts.** No cumulative effects would be anticipated.

**Mitigation.** Mitigation measures are undertaken to reduce potential impacts to cultural resources. Mitigation would occur in consultation with the Colorado SHPO, and would be required if Medano Ranch and NPS administrative landscapes were found to have integrity. For the Medano Ranch landscape, mitigation would include consultation regarding restoration, rehabilitation, construction, and removal of buildings and measures designed to preserve the historic integrity of the ranch landscape.

**Section 106 Summary.** After applying Advisory Council on Historic Preservation criteria for adverse effect in 36 CFR 800.5, the National Park Service determined that there is potential for negligible to minor adverse impacts to the Medano Ranch potential cultural landscape. This would constitute an adverse effect, requiring compliance with section 106, mitigation, and consultation.

**Conclusion.** The NPS preferred alternative could potentially have minor to moderate, beneficial impacts and negligible to minor adverse impacts on the Medano Ranch potential cultural landscape. This alternative would also have beneficial, moderate impacts on the NPS

administrative potential cultural landscape. There would be *no impairment* of cultural landscapes from this alternative (see specific definition of impairment in the "Impairment of National Park Resources" section).

## VEGETATION

Visitation in the frontcountry and dunes play management zone would increase over time (see "Visitor Use and Experience" section for projections), so the dunefield in this area would experience more use and sparse dunefield plant communities would experience increased trampling, wind erosion, and landslide effects. Popular locales within the subalpine and tundra life zones could also experience increased use over time. Providing guided hiking and equestrian trails in the guided learning management zone of Medano Ranch would minimize impacts to plant communities in this area. Unspecified new trails and trail links to adjacent lands (some would be located near the park perimeter) would result in adverse effects from construction and potential for nonnative plant species establishment. In general, impacts to vegetation from increased use and use in new park areas (including horse use) would be tempered by monitoring and management actions tied to a management zone-based carrying capacity approach (see chapter 2 "Management Zones" section for details). The overall result would be short- and long-term, minor to moderate, adverse impacts, and short- and long-term, minor, beneficial impacts to plant communities.

Relocation of the fee booth to near the southern boundary, addition of bike lanes to the main entrance road (from the park boundary to the dunes parking lot), and constructing a biking/walking path to connect the Pinyon Flats campground to the visitor center would result in short- and

long-term, minor to moderate, adverse impacts to onsite plant communities of the sand sheet and dunefield life zones due to grading and placement of runoff control structures (disturbance and potential for nonnative plant species invasion) and paving (burial). Similar impacts to plant communities would be expected during and following construction of any cooperative or joint facilities (access routes, trailheads, ranger stations, etc.) with private partners and/or neighboring management agencies. A parking area and trailhead (with access route) to allow hiker and equestrian access to the northern park backcountry would adversely affect sand sheet plant communities due to grading and placement of runoff control structures (disturbance and potential for nonnative plant species invasion) and use of gravel overlays (habitat burial). The mature narrowleaf cottonwood groves present on the banks of Deadman Creek would be potentially attractive to hikers and horseback riders for resting, watering animals, and other passive pursuits. Trails constructed from the trailhead to the mountain front could result in impacts related to vegetation removal, social trail establishment, and potential for nonnative plant species establishment. Seeking and finding a previously disturbed site, such as a drill pad on which to situate the trailhead and parking area, would result in beneficial effects to local plant communities. Visitors would use the existing Cow Camp Road for access, thus avoiding the surrounding plant communities. The overall result would be short- and long-term, minor to moderate, adverse, and minor to moderate beneficial impacts to plant communities in the northern portion of the park.

If The Nature Conservancy were to transfer Medano Ranch lands to the National Park Service, managed bison grazing would be discontinued. Over time, plant communities in this area would

recover from impacts of managed bison grazing (e.g., streambank trampling, shifts in species composition from selective consumption of more palatable species, etc.). This would have short- and long-term, minor, beneficial impacts on sabkha and sand sheet plant communities.

The park would identify and manage nonnative plant populations, reducing their effect on native plant communities or possibly eliminating some stands from the landscape resulting in short- and long-term, minor to moderate, beneficial impacts on the species composition of plant communities and their habitat quality.

**Cumulative Impacts.** Generally, native plant communities of the San Luis Valley and of the park have been affected by over a century of livestock grazing and the effects are sometimes intensified by periods of drought. Depending on the local environment, grazing effects can range from minor shifts of plant and animal species composition to more serious wind and water erosion (e.g., blowouts and gullying) and nonnative plant introductions. Cattle grazing was discontinued on the former Baca Ranch lands in 2004, and some past adverse livestock impacts may gradually be reversed in the future. Rehabilitation of main park roads and parking areas, which includes increasing the capacity of the dunes lot by 5%, would result in minor, long-term, localized, adverse impacts on vegetation. Introduction of nonnative landscape plants from adjacent developed lands would result in adverse effects to native plant communities. Some native plant communities have undergone historic disturbance during past land-use activities and are therefore subject to such nonnative plant species invasion. Contributions of the NPS preferred alternative to vegetation impacts would be from increased visitation

(especially in certain areas), elimination of bison grazing, new facilities (trailheads and trails), and management of nonnative, invasive plant species. Combined with past, present, and reasonably foreseeable future actions, the NPS preferred alternative would have long-term, negligible to moderate, adverse impacts, and minor to moderately beneficial impacts on plant communities.

**Conclusion.** Increased visitation; new access points; new trails, roads, and parking areas; and improvements to existing infrastructure would have long-term, negligible to moderate, adverse impacts on plant communities. Cessation of managed bison grazing on Medano Ranch, carrying capacity monitoring and actions, and control of nonnative plant species would have long-term, minor to moderate, beneficial impacts on plant community species composition and habitat quality. There would be *no impairment* of vegetation from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## ECOLOGICALLY CRITICAL AREAS

Visitation in the frontcountry and dunes play management zone would increase over time (see “Visitor Use and Experience” section for projections). Thus, the dunefields in this management zone, which comprise a portion of the Great Sand Dunes ecologically critical area, would experience more use and the seven rare sand sheet and dunefield plant communities, rare plant species (James cryptanth and slender spider-flower), and rare wildlife (insects and small mammals) would experience increased trampling, wind erosion, and landslide effects. New trails and trail links to adjacent lands (some would be located near the park’s

perimeter) would result in adverse effects from construction, social trail establishment, and potential for nonnative plant species establishment. In general, impacts would be tempered by monitoring and management actions associated with a carrying capacity approach. Providing guided hiking and equestrian trails in the guided learning zone, located within the San Luis Lakes / Sand Creek ecologically critical area, would provide beneficial impacts to the rare plant communities present; rare wetlands and aquatic plant associations and the slender spider-flower areas could be avoided by directing and carefully monitoring use. The overall result would be short- and long-term, minor to moderate, adverse impacts, and short- and long-term, minor, beneficial impacts to ecologically critical areas whose boundaries include the sabkha, sand sheet, and dunefield life zones.

Relocation of the fee booth to near the park entrance, addition of bike lanes to the main entrance road (from the park boundary to the dunes parking lot), and constructing a biking/walking path to connect the Pinyon Flats campground to the visitor center would result in short- and long-term, minor to moderate, adverse impacts to a portion of the Great Sand Dunes ecologically critical area due to grading and placement of runoff control structures (disturbance and potential for nonnative plant species invasion) and paving (burial). Similar impacts to ecologically critical areas would be expected during and following construction of any cooperative or joint facilities (access routes, trailheads, ranger stations, etc.) with private partners and/or neighboring management agencies; the specific impacts would depend on location and details.

A parking area/trailhead (and access route) for hiker and equestrian access to the

northern park backcountry would adversely affect sand sheet plant communities of the Deadman Creek ecologically critical area due to grading and placement of runoff control structures (disturbance and potential for nonnative plant species invasion) and use of gravel overlays (habitat burial). The narrowleaf cottonwood groves along the banks of Deadman Creek would likely attract some hikers and horseback riders for resting, watering animals, and other passive pursuits that could result in streambank and vegetation impacts. Most visitors would likely remain on designated trails (e.g., Cow Camp Road), which would avoid this riparian corridor for natural resource reasons. Finding a previously disturbed site, such as a drill pad, on which to situate the trailhead and parking area would mean most direct impacts to the Deadman Creek ecologically critical area would be avoided. The overall result would be short- and long-term, minor to moderate, adverse impacts to ecologically critical areas in the northern portion of the park.

If The Nature Conservancy were to transfer Medano Ranch lands to the National Park Service, managed bison grazing would be discontinued, and local plant communities would recover over time from associated streambank disturbance, impacts from selective consumption of more palatable plants, etc. The end result would be long-term, minor, beneficial impacts on Medano Ranch portions of the San Luis Lakes / Sand Creek ecologically critical area plant communities and wildlife habitat.

The park would identify and manage nonnative plant populations, reducing their effect on native plant communities or possibly eliminating some stands from the landscape resulting in short- and long-term, minor to moderate, beneficial impacts on the species composition of

plant communities and their habitat quality.

**Cumulative Impacts.** Generally, ecologically critical areas within the park have been affected by over a century of livestock grazing and the effect is sometimes intensified by periods of drought. Depending on the local environment, grazing effects can range from minor shifts of plant and animal species composition to more serious wind and water erosion (e.g., blowouts and gulying) and nonnative plant introductions. Cattle grazing was discontinued on the former Baca Ranch lands in 2004, and some past adverse livestock impacts may gradually be reversed in the future. Some native plant communities have undergone historic disturbance during past land-use activities and are therefore subject to such nonnative plant species invasion. Contributions of the NPS preferred alternative to ecologically critical area impacts would be from increased visitation (especially in certain areas); elimination of managed bison grazing, new facilities (access routes, trailheads, and trails); and management of nonnative, invasive plant species. Combined with past, present, and reasonably foreseeable future actions, the NPS preferred alternative would have long-term, negligible to moderate, adverse, and minor to moderate beneficial effects on ecologically critical areas.

**Conclusion.** Higher use levels over time, use in new areas, and limited new facilities (access routes, trailheads, and trails) would mean more potential for introduction of nonnative plant species, trampling of vegetation, and establishment of social trails. The end result would be long-term, minor to moderate, adverse impacts on three ecologically critical areas. Cessation of bison grazing, control of nonnative plant species, and management zone-related carrying capacity actions would have long-

term, minor to moderate, beneficial impacts on ecologically critical areas. There would be *no impairment* of ecologically critical areas from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## FEDERAL THREATENED AND ENDANGERED SPECIES

Under the NPS preferred alternative, most of the anticipated increase in park visitation would be focused in the frontcountry and dunes play zones. Dispersed day and overnight use across the remainder of the national park and preserve is projected to nearly double from about 26,000 visitors per year under current conditions and 37,000 under the no-action alternative, to over 52,000 with the NPS preferred alternative. Most of that increase would occur in the backcountry access and backcountry adventure zones in the northwest portion of the park and around Medano Ranch in the southwest portion of the park. Backcountry use in the preserve is projected to grow over time, although the Mosca, Music, and Medano Pass access points would remain relatively isolated from substantial levels of nearby development and associated population growth.

The numbers of visitors to the preserve would remain relatively low and would decrease with elevation and topographic complexity. Given the difficulty of accessing much of the higher reaches of the preserve, visitor use is not anticipated to have detectable or measurable impacts on any Canada lynx moving through or attempting to take up residence in those areas, and is therefore anticipated to range from none to negligibly adverse.

Under the NPS preferred alternative, unleashed dogs used for hunting, and leashed dogs not used for hunting would continue to be allowed in the preserve. Thus, in this alternative, both leashed and unleashed dogs would be allowed in the preserve; a continuation of the current condition. Therefore, impacts to potential Canada lynx or their habitat due to dogs in the preserve would be the same as those for the no-action alternative: no to negligible, short- and long-term, adverse effects.

**Cumulative Impacts.** Past, present, and reasonably foreseeable actions that might interact with aspects of the NPS preferred alternative to affect potential lynx or lynx habitat within the park include general growth of the human populations surrounding the park and preserve, wilderness restoration efforts in the South Colony Lakes basin area (just north of the national preserve), and a potential elk herd reduction in the future. Population growth is anticipated to be a contributor to modest increases in visitation within the preserve. Wilderness restoration efforts north of the preserve may increase the potential habitat for Canada lynx along the range. Reduction of elk would avoid or reduce the impacts that overly large populations of this native ungulate can have on a range of habitats and the food chains based on those habitats. Taken in combination with these cumulative impacts, the NPS preferred alternative is anticipated to have no to negligible, adverse impacts on potential lynx establishment within the park.

**Conclusion.** Impacts on potential lynx within the park due to increased visitation over time would be moderated or reduced with the increase in elevation and ruggedness of the terrain such that only no to negligible, short- and long-term, adverse impacts on potential lynx or their habitat in the park are anticipated. The continued presence of unleashed hunting dogs, as well

as leashed nonhunting dogs in the national preserve, is anticipated to continue to have no to negligible, adverse effects, in the short and long terms, on lynx passing through or trying to establish ranges within the national preserve. These impacts correlate to a determination of “*may affect—not likely to adversely affect*” for Canada lynx for the NPS preferred alternative. There would be *no impairment* of federal threatened and endangered species from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## **WILDLIFE, INCLUDING COLORADO STATE-LISTED SPECIES**

### **Species Associated with Riparian Corridors**

Visitation in the frontcountry and dunes play management zones would increase over time (see “Visitor Use and Experience” section for projections), so Medano Creek wetlands in these zones would experience more use. Use levels in the northern portion of the national preserve (backcountry adventure zone) would similarly increase due to population increases and improved access. Higher use levels over time could result in impacts to riparian corridors (e.g., Sand, Castle, Medano, Little Medano, and Cold creeks), and could include decreased water quality due to increased sedimentation, introduction of pollutants, and introduction of nonnative species or diseases. The overall result would be minor to moderate adverse impacts to species associated with these riparian corridors such as the Rio Grande sucker, Rio Grande chub, and the Rio Grande cutthroat trout.

New trails in backcountry adventure and guided learning zones have the potential to disturb or displace wildlife, or cause areas to be avoided by wildlife; some species are more sensitive than others. Adverse effects could be mitigated by considering potential impacts on wildlife when siting new trails (Trails and Wildlife Task Force 1998). Assuming trails were carefully sited with wildlife in mind, impacts would be short and long term, localized, minor to moderate, and adverse.

A parking area and trailhead would encourage more hiker and equestrian use in the northern backcountry portion of the national park. The mature narrowleaf cottonwood groves on the banks of Deadman Creek would likely attract some hikers and horseback riders for resting, watering animals, and other passive pursuits. However, most visitors would likely keep to designated trails (e.g., Cow Camp Road), which would avoid this riparian corridor for natural resource reasons. Improved hiking access to the mountain front might lead to increased use in the upper (USFS) portion of Deadman Creek, which includes a designated research natural area (high elevation wetlands that currently receives little visitation). The wildlife issue for consideration in Deadman Creek is the potential impacts of increased use on Townsend’s big-eared bats. These bats often forage along riparian corridors in the western United States and are moth specialists (Schmidt 2003). Degradation of the Deadman Creek corridor could potentially result in a decrease in the prey base for this species if the woody vegetation, some of which likely serves as host plants for moths, is affected. Assuming standard monitoring and remediation of habitat conditions, such impacts would be anticipated to be negligible to minor and adverse.

### **Wetlands-Associated Species**

Under the NPS preferred alternative, livestock watering ponds and structures would be removed and irrigation on Medano ranch would cease, resulting in long-term, negligible to minor, adverse impacts (from drying) on species associated with introduced wetlands in the immediate area. When watering ponds and structures are removed and irrigation is ended, natural flows could be reintroduced to other areas. Expansion or reestablishment of wetlands plant communities in those areas may have long-term, negligible to minor, beneficial impacts on wetlands-associated species. The result of this scenario would be a combination of negligible to minor, adverse impacts on wetlands-associated species within the park, and negligible to minor, beneficial impacts to the same species outside (downstream of) the park. A detailed study of the potential changes to the hydrologic regime of the park and surrounding area would be conducted before irrigation of wet meadows was eliminated.

### **Ungulate Herd Numbers and Health**

The NPS preferred alternative provides for future consideration of potential access routes to the park via the USFS, USFWS, and county/local planning processes. Under this alternative, as under the other two action alternatives, a route or routes across NPS lands in the north would be designated (via the Superintendent's Compendium) for hunter access to USFS lands where hunting is permitted. According to the *Code of Federal Regulations*, provision for such access may be provided when other access is impracticable; hunters must stay on designated routes and firearms must be broken down or disassembled so as to prevent their ready use.

Eventual development of public vehicle access to and/or through the north portion of the park could help ameliorate adverse impacts to ungulates resulting from continued limited hunting access to USFS lands near the park's north area. Reduction of hunting pressure on elk in this area may exacerbate rapid population increases that may be linked to declines of other native ungulate populations (bighorn sheep and mule deer), and to habitat degradation in the Sangre de Cristo Wilderness. Estimated numbers of hunters who might want to access the preserve and adjacent USFS lands to hunt elk range from 20 to 30 for each of the three 5-day seasons; equating to 60 to 90 hunters annually. The preserve and adjacent USFS lands are in CDOW game management unit 82. The success rate for elk hunters in game management unit 82 in 2004 was 34% total, with 66% of harvested elk being cows. Based on the 2004 harvest rates and CDOW estimates for numbers of hunters, the potential number of elk not harvested from the preserve and adjacent USFS lands is estimated to range from 14 to 20 cows, and 6 to 9 bull elk. Given that, at an estimated herd size of nearly 6,000 elk, the San Luis Valley herd is approximately four times larger than the 1,500-animal goal established by CDOW, removal or nonremoval of 14 to 20 cow elk and 6 to 9 bull elk would not make a substantial difference in efforts to reduce the size of this herd. Therefore, while providing public vehicle access to the northern portion of the park might facilitate hunting of elk in the preserve and on adjacent USFS lands, this beneficial impact is expected to be only negligible to minor.

### **Bighorn Sheep**

Under the NPS preferred alternative, unleashed dogs used for hunting would continue to be allowed in the preserve. Leashed dogs not used for hunting would

also continue to be allowed in the preserve (see chapter 3 section, “Health and Safety—Dogs” for details). Thus, anticipated impacts of the NPS preferred alternative on viability and persistence of bighorn sheep within the park would be the same as for the no-action alternative: leashed dogs allowed in the preserve are anticipated to contribute minor to moderate adverse impacts on bighorn sheep populations within the park.

**Cumulative Impacts.** Cumulative actions contributing to impacts on riparian-associated species as described above include growth of the human population in the area surrounding the park, oil and gas exploration on former Baca Ranch lands, and elk herd reduction. The first two of these would contribute adverse impacts, while elk herd reduction would contribute beneficial impacts, specifically to the riparian corridor habitats. In combination with these cumulative actions, the NPS preferred alternative is anticipated to contribute minor to moderate, adverse impacts.

Cumulative actions contributing to ungulate herd numbers and health include the enabling legislation for the expanded park and preserve (negative impacts from hunting of elk not being permitted in expansion areas of the national park), but also beneficial impacts from increased protection for habitats and species (from conservation-based NPS management). Also contributing to ungulate herd numbers and health would be the interagency fire management plan, which should provide beneficial impacts through habitat management and enhancement. Finally, the elk herd reduction tentatively planned for the future, pending justification stemming from ongoing research and appropriate NEPA analysis, would most likely provide beneficial impacts to elk by reducing numbers to

levels closer to the predicted carrying capacity of the area, and reducing the risk of diseases often associated with high herd densities. Beneficial impacts to other ungulates (mule deer and bighorn sheep) would stem from reduced elk impacts on shared habitats and reduced likelihood of exposure to diseases. Combined with past, present, and reasonably foreseeable future actions, the NPS preferred alternative would be anticipated to contribute negligible to minor beneficial impacts to ungulate herd numbers and health.

Cumulative actions contributing to impacts on bighorn sheep would include growth of the human population in the area surrounding the park, and elk herd reduction. The first of these would contribute adverse impacts, as this would be anticipated to increase the number of leashed dogs in the preserve, while elk herd reduction would contribute beneficial impacts by reducing competition from, habitat impacts due to, and the threat of diseases from, elk. In combination with these cumulative actions, the NPS preferred alternative is anticipated to contribute minor adverse impacts and negligible to minor beneficial impacts on bighorn sheep within the park.

**Conclusion.** The NPS preferred alternative would have minor to moderate, adverse impacts on species associated with riparian corridors due to increased recreational use; negligible to minor, adverse impacts on wetlands-associated species within the park due to removal of artificial water sources, and cessation of surface irrigation; and negligible to minor, beneficial impacts to the same species inside and outside (downstream of) the park due to possible increase of downstream waters; negligible to minor beneficial impacts on ungulate herd numbers and health due to facilitation of elk hunting; and minor to moderate adverse impacts on bighorn sheep

populations within the park due to the presence of leashed dogs in the national preserve. There would be *no impairment* of wildlife from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## SOILS AND GEOLOGIC RESOURCES

In the NPS preferred alternative, construction of new trails in the backcountry adventure zone would cause site-specific soil disturbance and compaction. Nonetheless, provision of such trails would help direct visitor foot traffic, which would mean fewer social trails (and fewer associated soil effects) compared with the no-action alternative. The backcountry access zone in the north part of the park would eventually include a public vehicle access route and small trailhead. Disturbed sites for these facilities would be used as much as possible, but where that is not possible there is potential for localized soil disturbance and compaction. Thus, these actions would have long-term, minor to moderate, site-specific, adverse impacts and localized minor beneficial impacts.

In the frontcountry zone, the modest shuttle system would reduce the incidence of visitor vehicles parking alongside roads. Adding bike lanes to the main park road would disturb and destroy soils within the narrow corridor adjacent to the road. The proposed biking/walking path between Pinyon Flats campground and the dunes parking lot and visitor center would also disturb soils within the path corridor, but the result of directing use along this path would be fewer social trails (and fewer associated soil effects) compared to the no-action alternative. These actions would result in long-term, minor to moderate,

site-specific, adverse impacts and localized minor beneficial impacts.

**Cumulative Impacts.** Establishment of a water right to fulfill the purpose of the national park and preserve would minimize further lowering of local groundwater levels or surface water flows, which could indirectly benefit sand recycling. Oil and gas exploration on lands that were formerly part of the Baca Ranch, but are now within the national park has occurred and these activities could continue in the near future; however, any activities would be subject to 36 CFR 9B (*Nonfederal Oil and Gas Rights Regulations*), which require such activities be conducted in a manner consistent with park purposes and preventing or minimizing damage to the environment. Minor expansion and reconfiguration of the dunes parking area and relocation of the horse loading area and dump station would also cause localized soil disturbance and destruction. The NPS preferred alternative would contribute both beneficial and adverse, localized impacts to soils and geologic resources. Combined with past, present, and reasonably foreseeable future actions, the no-action alternative would have long-term, minor to moderate, mostly localized beneficial and adverse impacts on soils and geologic resources.

**Conclusion.** Construction of new trails would cause localized soil disturbance and compaction. Provision of trails would mean fewer social trails (and fewer associated soil effects). Limited proposed facilities (vehicle access route and small trailhead) in the north part of the park could cause site-specific soil disturbance and compaction, especially where it is not possible to use already disturbed sites. Impacts to soils would be long term, minor to moderate, site specific, and adverse, and long term, localized, minor, beneficial. Frontcountry zone actions (modest shuttle system, bike

lanes along the main park road, and biking/walking path) would have long-term, minor to moderate, site-specific, adverse impacts and localized minor beneficial impacts. There would be *no impairment* of soils and geologic resources from the NPS preferred alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## WETLANDS

Under the NPS preferred alternative visitation in the frontcountry and dunes play management zones would increase over time, so Medano Creek wetlands in these zones would experience more use. Providing guided hiking and equestrian trails in the guided learning management zone would direct use around sensitive wetlands areas and prevent or minimize most direct wetlands impacts in this area. In general, however, visitation increases and visitor use (including horse use) in new park areas could increase the incidence of trampling, encourage establishment of nonnative species, and compact wetland soils and streambanks. Natural chemical and biological processes and wetlands species composition could be affected. The overall result would be minor to moderate adverse impacts to wetlands resources.

A parking area and trailhead would encourage more hiking and equestrian use in the northern backcountry portion of the national park. The mature narrowleaf cottonwood groves on the banks of Deadman Creek would likely attract some hikers and horseback riders for resting, watering animals, and other passive pursuits. However, most visitors would likely keep to designated trails (e.g., Cow Camp Road), which would avoid this riparian corridor for natural resource reasons. Improved hiking access to the

mountain front might lead to increased use in the upper (USFS) portion of Deadman Creek, which includes a USFS-designated research natural area; it includes high elevation wetlands and currently receives little visitation. Visitation increases and visitor use (including horse use) in new areas could increase trampling, introduce nonnative plant species, and compact wetland soils and streambanks. Natural chemical and biological processes and wetlands species composition could be affected. Effects would be long term, minor to moderate, and adverse.

Assuming Medano Ranch is eventually transferred to NPS management, irrigation of hay meadows for bison forage in this area would be discontinued. Wetlands that are not supported by natural surface and groundwater flows (e.g., introduced or artificial wetlands) would be adversely affected by drying. Natural flows in Sand, Big Spring, and Little Spring creeks would increase, at least seasonally, when irrigation is discontinued, and other wetlands types (e.g., ephemeral ponds, playas, mudflats, etc.) would expand and/or become reestablished. Also, more water would likely be delivered to San Luis and Head lakes in San Luis Lakes State Park and Wildlife Area, stabilizing water levels and providing wetlands support in those areas. Overall, anticipated wetlands impacts would be long term, moderate to major, beneficial, and long term, moderate, and adverse. A future study would examine expected impacts in more detail.

Eliminating bison grazing from Medano Ranch lands within the park would benefit some wetlands plant species, particularly the most palatable grasses. Some areas of channel and streambank erosion might gradually stabilize, improving wetlands structure and function. Livestock watering ponds and structures would be removed; some introduced wetlands would likely dry

up, but other naturally occurring wetlands would be re-established or expand from restoration of natural flows. The park would identify and manage nonnative plant populations in new park areas, reducing their effects on native wetlands communities or possibly eliminating some nonnative stands from the landscape. Wetlands species composition and habitat quality would improve as a result. Overall, these actions would have long-term, minor to moderate, beneficial, and negligible to minor, adverse impacts on wetlands.

**Cumulative Impacts.** Livestock grazing typically adversely affects wetlands and riparian resources by causing shifts in species composition, erosion of stream-banks and bottoms, and browsing of wetland grasses, shrubs, and tree seedlings. Cattle grazing was discontinued on the former Baca Ranch lands in 2004, and some past adverse livestock impacts may gradually be reversed in the future. Under the NPS preferred alternative, beneficial and adverse wetlands impacts would result from higher use levels, new trails and trailheads, establishment of the guided learning zone, removal of livestock-related water control structures, control of nonnative noxious plant populations, and discontinuation of bison grazing and hay meadow irrigation. Combined with past, present, and reasonably foreseeable future actions, the NPS preferred alternative would have long-term, moderate, beneficial impacts, and minor to moderate adverse effects on wetlands resources.

**Conclusion.** Visitation increases in new areas would affect chemical and biological processes and wetlands species composition, resulting in long-term, minor to moderate, adverse impacts to wetlands resources. Discontinuing irrigation of wet meadows on Medano Ranch is expected to have long-term, moderate to major, beneficial, and long-term, moderate,

adverse impacts on wetlands. Eliminating bison grazing, removing livestock water ponds and structures, and managing nonnative plants in new areas would have long-term, minor to moderate, beneficial, and negligible to minor adverse impacts on wetlands. There would be *no impairment* of wetlands from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

According to the procedural manual for Director’s Order 77-1: *Wetland Protection*, “a draft environmental impact statement that identifies a preferred alternative that would have adverse impacts on wetlands must be accompanied by a separately identifiable draft “statement of findings” that explains why an alternative with such impacts was chosen.” Thus, a draft statement of findings for wetlands is required and is attached to this document (appendix J).

## WATER RESOURCES

Under the NPS preferred alternative, visitation would generally increase over time, and it would increase proportionally in certain areas (e.g., in the north portion of the park and in the guided learning zone). Higher use levels over time would mean more potential for trash and human, dog, and horse waste to be washed into streams and lakes, thus degrading water quality. However, within the national park, dogs would be allowed only within the front-country and dunes play zones, which would improve water quality in the remaining areas. Also, providing designated trails in backcountry adventure zones and in the guided learning zone would serve to minimize social trails, direct use away from sensitive areas, and restrict impacts to localized areas. Backcountry toilets would be installed if/when visitor use levels

become high enough that human waste disposal and sanitation is a concern. The end result of these actions would be long-term, negligible, localized, adverse impacts, and long-term, minor, beneficial impacts to surface water and potentially to shallow groundwater quality.

If and when The Nature Conservancy transferred Medano Ranch lands to National Park Service, surface irrigation of hay meadows for bison forage would be discontinued. Non-diverted creek flows would be allowed to remain within their natural drainages (e.g., Sand, Big Spring, and Little Spring creeks) rather than being redirected to meadow areas. Thus, discontinuation of meadow irrigation would affect surface water flow and possibly groundwater levels, but additional research would be needed to determine the nature (scope, direction, intensity, etc.) of these impacts. Prior to discontinuing irrigation, a study would be conducted to provide more information about possible effects of this action.

**Cumulative Impacts.** Establishment of a water right to fulfill the purposes of the park would minimize additional lowering of local groundwater levels. Oil and gas exploration activities on lands that were formerly part of the Baca Ranch (but are now within the national park) are reasonably foreseeable in the near future; however, any such activities are subject to 36 CFR 9B, which requires that such activities be conducted in a manner that is consistent with protection of water resources (among other resources). The NPS preferred alternative would have both beneficial and adverse effects on water resources, as discussed above. Combined with past, present, and reasonably foreseeable future actions, the impact of the no-action alternative on water

resources would be long term, minor to moderate, and adverse.

**Conclusion.** Higher use levels would result in increased wastes and sediments in certain surface waters. However, providing designated trails would help to limit social trails, direct use, restrict impacts to local areas. Restricting dogs to certain areas within the national park and providing backcountry toilets would improve water quality. These actions would have long-term, negligible, localized, adverse impacts, and long-term, minor, beneficial impacts to surface water and potentially to shallow groundwater quality. Discontinuing surface irrigation of hay meadows on Medano Ranch would affect surface water hydrology and possibly groundwater levels, but research would be needed to determine the nature of these impacts. There would be no impairment of water resources from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section)

## VISITOR USE AND EXPERIENCE

### Visitor Use Projections

Annual visitor use at Great Sand Dunes under the preferred alternative is projected at 427,100 by 2025. As for the no-action alternative, the principal factor driving increases in visitor use is population growth in the San Luis Valley and Colorado. That level of use represents an increase of 136,100 annual visitors over the 2004 adjusted total and more than 52,000 additional visitors, or 14%, compared to the no-action alternative (table 23).

**TABLE 23. CURRENT AND PROJECTED ANNUAL VISITORS IN 2005  
NPS PREFERRED ALTERNATIVE**

2004 (recorded)	2004 (adjusted baseline)	No-Action Alternative	NPS Preferred Alternative
268,400	291,000	374,800	427,100
<u>Increases over 2004 (adjusted)</u>			
Annual Visits (number)		+85,320	+136,100
Annual Visits (percent)		+29%	+47%
<u>Increases over the No-action</u>			
Annual Visits (number)		NA	+52,300
Annual Visits (percent)		NA	+14%

Factors contributing to the incremental increases in annual visitor use include the following: enhanced recreation and education opportunities available at Medano Ranch, if and when the ranch is acquired from The Nature Conservancy, and in the guided learning zone:

- addition of bicycle lanes along the main entrance road and a biking/hiking path between the campground and dunes parking lot
- wilderness recommendation for most of the area added to the national park
- provision of backcountry access and a trailhead in the northwest portion of the park
- additional foot and horseback access into the natural/wild and backcountry adventure zones provided through cooperative opportunities such as San Luis Lake State Park and the Oasis area near the main park entrance

By 2025, visitation during the 3-month summer period is projected to increase by more than 30,000 visitors, or 14% over the

221,300 visitors projected for the summer months under the no-action alternative. Most of the increase would be focused in the frontcountry and dunes play zones, with an anticipated increase of about 11,000 visitors during July. That increase could translate into as many as 500 to 600 more visitors per day on weekend days. Over time, the rise in visitation at peak periods would be expected to encourage others to visit earlier or later in the year—that is, the shoulder seasons.

Dispersed day and overnight use across the remainder of the national park and preserve is projected to nearly double from about 26,000 visitors per year under current conditions and 37,000 under the no-action alternative, to over 52,000 with the preferred alternative. Most of that increase would occur in the backcountry access and adventure zone in the northwest portion of the park and the Medano Ranch and San Luis Lake State Park entries in the southwest portion of the park. backcountry use in the preserve is projected to grow over time, although the Mosca, Music, and Medano Pass access points would remain relatively isolated from substantial levels of nearby development and associated population growth.

## **Visitor Experience**

The area of heaviest visitor use would remain at and near the eastern part of the dunefield. However, new access points, trails, and other opportunities would disperse use in the park compared to the no-action alternative. Medano Ranch headquarters would serve as an administrative zone, but the area would be opened for scheduled, guided activities and would serve as the western entry point to the guided learning zone located west of the dunefield. The Oasis area, located near the park's main entrance, could serve as a base for hiking and horseback trips into the guided learning zone from the east.

The new trailhead located in the national park's north part would provide improved hiking and horseback access to new park lands, the mountain front, and the north part of the national preserve. With more options for loop trips and longer "through trips," the Sand Creek and Sand Ramp trails would probably receive substantially more hiking and equestrian use. Such new options would allow more diverse visitor experiences and increase the average length of stay in the park.

Interpretation, information, and education activities would be concentrated primarily in the area east of the dunefield (visitor center, amphitheater, dunes area, day-use trails, etc.), but scheduled programs and tours would also be available, especially for groups at Medano Ranch headquarters and in the guided learning zone. Having two "bases" for interpretation (and possibly a third cooperative base) would likely permit increased diversity of visitor programs and services, including environmental education for school groups.

The bike lanes from the park boundary and the hiking/biking path from the

campground, both of which would lead to the dunes play zone, would provide another recreational and access option for visitors. These options would also reduce the number of pedestrians and cyclists using the main park road, which would benefit drivers.

Opportunities to see and enjoy wildlife in the park would be increased by expanded access to new areas. More hunters might be drawn to the national preserve and adjacent USFS lands, where hunting is allowed, because the north-end trailhead would provide better hiking, horseback, and vehicle access to certain hunting grounds. Numbers of hunters would also depend, of course, on how CDOW manages hunting in the area.

The new access points, new recreational opportunities, and increased diversity of visitor programs and services discussed in the preceding paragraphs, taken together, would result in long-term, moderate, beneficial impacts on the visitor experience.

Summertime visitors would experience higher levels of congestion in the visitor center and dunes parking areas, and the campground would fill more often and earlier in the day. Such conditions could prompt activation of a modest shuttle bus system for transporting visitors, on a voluntary basis, to the visitor center and dunes access points. A visitor shuttle system would reduce some of the frustrations visitors experience when the dunes parking lot fills during the peak visitor season. When the shuttle runs, visitors would not have to park along road shoulders, nor walk in the road to reach the dunes play zone. Nor would drivers have to maneuver around visitors (including families with small children) who are using the road as a walkway. The shuttle system would also funnel more visitors into the

visitor center, picnic area, and dunes play zone. This would increase visitor encounter rates, which could lead to localized crowding, especially in the visitor center and picnic area. The dunes play zone, on the other hand, has the capacity to absorb a relatively large number of visitors without many undesired social consequences. A visitor shuttle system would have long-term, moderate, beneficial, and minor adverse impacts.

The NPS preferred alternative would offer positive wilderness experiences within existing park wilderness areas. However, new access points would result in some wilderness areas becoming less remote. Increasing visitor numbers could detract from wilderness values (opportunities for solitude, evidence of human use, etc.) over time, especially in portions of the wilderness served by new visitor access points (e.g., the Sand Creek drainage). Diminished wilderness values in portions of existing wilderness areas would have a long-term, minor, adverse impact on visitor experience. This alternative would provide new wilderness opportunities due to the wilderness recommendation for most lands added to the national park in 2000. Most of the recommended wilderness is in the sand sheet and sabkha life zones, which provide a setting unlike that in adjacent dunes and forest wilderness areas. This alternative would make it possible to hike or ride on horseback around the massive dunefield while remaining almost entirely within designated wilderness. New wilderness opportunities would result in long-term, major, beneficial impacts to visitor experience.

Visitors who like to travel and/or recreate with their dogs would have less freedom to do so compared to the no-action alternative—dogs (on leashes) would be restricted to the national preserve, and to the frontcountry and dunes play zones

within the national park. This might discourage some dog lovers from visiting the park. Visitor complaints and concerns about dogs would undoubtedly continue, as problems most often occur within the frontcountry and dunes play zones. However, some visitors would appreciate that certain areas of the national park would be dog-free. New policies regarding dogs in the park would have long-term, minor, adverse, and beneficial impacts on visitor experience.

**Cumulative Impacts.** Rehabilitation of main park roads and parking areas, which includes increasing the capacity of the dunes lot by 5%, is planned for the near future and would modestly improve pedestrian and vehicle traffic flow in the immediate area. The modest shuttle system in the NPS preferred alternative addresses the larger issue of crowding and frustrations related to vehicle and pedestrian circulation in this area. Ongoing wilderness restoration efforts in the South Colony Lakes basin area are improving wilderness values in the Sangre de Cristo Wilderness. The NPS preferred alternative would result in some diminishment of wilderness experiences in some portions of the Sangre de Cristo Wilderness that lies within the Great Sand Dunes. However, this alternative would also provide additional wilderness opportunities due to a wilderness recommendation for most new park lands. Renovations to the Great Sand Dunes visitor center have improved the visitor experience by enlarging indoor space available for information, education, and interpretive services. In the NPS preferred alternative, diversified services and programs (from actions at Medano Ranch headquarters and the guided learning zone) would also provide benefits. Combined with past, present, and reasonably foreseeable future actions, the NPS preferred alternative would have

minor adverse and major beneficial effects on visitor experience.

**Conclusion.** New access points, new recreational opportunities, and increased diversity of visitor programs and services would result in long-term, moderate, beneficial impacts on visitor experience. A visitor shuttle system would have long-term, moderate, beneficial, and minor adverse impacts. Diminished wilderness experiences in portions of existing wilderness areas would have a long-term, minor, adverse impact on visitor experience. New wilderness opportunities (from new areas recommended for wilderness designation) would result in long-term major beneficial impacts. New policies regarding dogs in the park would have long-term, minor, adverse, and beneficial impacts on visitor experience.

## SCENIC RESOURCES AND VISUAL QUALITY

Under the NPS preferred alternative, there would be no new human-made structures or vehicle areas in the national preserve that would affect scenic quality. However, in the frontcountry and dunes play zones, bike lanes would be added to the main park road, a new multiuse path would connect the campground and dunes lot, and a new fee booth would be added near the park entrance. These projects would be relatively small in scale and would have negligible to minor, long-term, localized, adverse impacts to scenery.

The NPS preferred alternative would also introduce limited new human-made facilities and human activities on park expansion lands. A small trailhead parking area would be added in the northwest portion of the park to enhance backcountry access. Medano Ranch headquarters would be adaptively used for

administrative and scheduled public purposes, and a new structure or two may be needed to accomplish this. Such new facilities and activities would mean more frequent vehicle use and localized concentrations of passenger vehicles. Because sunlight often reflects off of vehicle windshields, concentrations of vehicles may be visible from some higher vantage points in and around the national park and preserve (e.g., mountain slopes and portions of the dunefield).

Increased vehicle activity associated with the backcountry access zone in the north (access road(s), Cow Camp Road and trailhead) and at Medano Ranch (access road and headquarters area) would mean dust is kicked up more frequently, at least during dry periods. Once airborne, dust tends to linger in the air for short periods, affecting both scenic quality and visibility. Overall, limited new facilities and activities in park expansion areas would have short- and long-term, localized, negligible to minor impacts on scenery and visibility.

New sources of outdoor lights at Medano Ranch would be minimal; public activities would generally be scheduled for daylight hours, and any new lighting needed for administrative purposes would be shielded. Night time vehicle traffic would be minimal at Medano Ranch and in the northern backcountry zone, so this source of light would also be minimized. Impacts on the night sky from the NPS preferred alternative would be negligible to minor, long term, and adverse.

**Cumulative Impacts.** Rehabilitation of main park roads and parking areas, which includes increasing the capacity of the dunes lot by 5%, would result in a negligible, long-term, localized, adverse impact on scenic resources. Prescribed burns (fire management) would have short-term, minor, adverse localized impacts on

scenery and visibility. Continued residential growth of the Baca Grande subdivision would mean that more homes, retreat centers, commercial structures, and vehicles would be visible in this area in the future. Expanded residential development could also bring more dust and wood smoke. The private land parcel that is for sale near the park entrance could be rezoned to commercial and developed. Overall, such new development would intrude upon the area's natural scenery (at least from some vantage points), affect visibility, and introduce new light sources into the night sky. Regional population growth and development would also continue to introduce additional light into the night sky. The NPS preferred alternative would contribute negligible to minor, short- and long-term, localized, adverse impacts to scenery, visibility, and the night sky. Combined with other past, present, and reasonably foreseeable future impacts, impacts of the NPS preferred alternative would be long term, minor to moderate, and adverse.

**Mitigation.** Parking areas would be placed and designed to help mitigate or avoid impacts to visual and scenic resources. The natural and built landscape would be used to help shield reflections and glare from vehicles. Environmentally friendly dust binders would be used as needed to help control dust on park roads.

**Conclusion.** The NPS preferred alternative would have negligible to minor, short- and long-term, localized, adverse impacts on scenery, visibility, and the night sky. There would be *no impairment* of scenic resources and visual quality from this alternative (see specific definition of impairment in the "Impairment of National Park Resources" section).

## SOCIOECONOMICS

Implementing the NPS preferred alternative would occur against the same backdrop of economic, demographic, and social changes across the San Luis Valley described under the no-action alternative. The economic and social effects of the NPS preferred alternative would add to those changes, but not fundamentally change the area's economic and demographic outlook.

### Visitor-Related Economic Impacts

Under the NPS preferred alternative, annual visitor use at the park is projected to reach 427,100 recreation visits by 2025; most of this increase would be associated with population growth in the San Luis Valley and Colorado. Recreation visits are projected to be 47% higher than in 2004, and 52,300 visits above projected use under the no-action alternative. Peak visitation of 91,900 visitors would occur in July 2025, as compared to about 80,800 with the no-action alternative. Visitors to the park from outside the valley are expected to account for the majority of future visits, although the number of visits by residents of the region would also increase.

Future visitor use with the NPS preferred alternative would result in 220,820 party-days of use, 28,160 more party days than that estimated for the no-action alternative. Retail, lodging, and other tourism-type spending would accompany the increased use with expenditures projected to reach \$21.18 million per year, \$8.05 million higher than in 2004 and \$2.75 million per year more than for the no-action alternative. The park would collect more in entry fees and sales of various passes and the Western National Parks Association would sell more merchandise at the visitor center.

Economic spin-offs of visitor spending include personal income of \$6.61 million per year and a total of 543 jobs in Alamosa and Saguache counties. Those levels would be \$0.87 million more in annual income and 71 more jobs compared to the economic contributions of park visitors in 2025 under the no-action alternative. The visitor-related impacts would be long term and moderate relative to current employment and personal income in the two counties. The guided learning zone opportunities and a modest shuttle system may create opportunities for private concession or incidental business activities and educational partnerships that would not exist under the no-action alternative. This alternative could create more economic boost for stores, overnight lodging, or trail and other recreational services in the Crestone/Baca Grande community than would the no-action alternative.

The state and local governments would collect more in sales tax from the increased visitor spending and property taxes on new development than under the no-action alternative. Impacts on property taxes and PILT receipts for Saguache and Alamosa counties would be about the same as under the no-action alternative.

The visitor-related economic impacts would be beneficial, but negligible in the short term and minor and beneficial over the long term.

### **Economic Impacts Related to GMP Implementation and Park Operations**

The NPS preferred alternative would result in \$21.2 million in future capital spending by 2025, along with \$7.7 million in other major maintenance spending. General operating and maintenance expenditures

would also be higher. The spending would provide an economic boost across the regional economy. More staff would be needed to maintain current service levels, but when more staff would be hired depends on increases in the park's base funding. A total of eight FTEs of additional staffing, at an annual cost of approximately \$415,000 over the current budget and \$155,000 more than for no-action alternative, would be needed during the life of this GMP under the NPS preferred alternative.

Planned capital and major maintenance spending would create short-term economic impacts, supporting local construction and related businesses. The specific timing of this spending is not known because it is dependent upon when Congress budgets the funds, along with allocations within the National Park Service, and future entry and camping fees that can support such projects. The annual payroll and other operating spending by the park would create long-term benefits on local jobs, business sales, household income, and other related measures. The economic effects tied to these economic stimuli include:

- capital construction (short term): 328 job-years of employment and \$9.45 million in personal income over time, between 2006 and 2025
- non-annual recurring (short term): 126 job-years of employment and \$3.49 million in personal income over time, between 2006 and 2025
- park operations (long term): 47 jobs, including 36 FTEs of direct National Park Service staffing, and \$2.13 million per year in annual income

Of these economic effects, only the short-term jobs and income impacts associated with the capital construction program—328 job-years (NPS preferred alternative) compared to 122 job-years (no action)—would be much different than those under the no-action alternative. The differences reflect \$14.4 million in higher spending for buildings, trails and paths, and other facilities under the NPS preferred alternative. The short-term impacts on jobs associated with the major maintenance spending for the NPS preferred alternative are only 4% higher than with the no-action alternative, and the long-term impacts include four additional jobs and \$180,000 in additional personal income in the region.

The long-term economic benefits from park operations from the NPS preferred alternative could be offset, in part, by reduced benefits associated with discontinuation of the bison operation of Medano Ranch—reduced revenue from livestock sales, a loss of farm employment, and fewer purchases of goods and services by the ranch from local businesses. If and when the reductions would occur depends on when the federal government completes acquisition of the ranch and a decision by The Nature Conservancy to stop its bison operations. Those events determine when full National Park Service management of the ranch facilities and structures, including some reuse, would occur.

The end of the bison operation on Medano Ranch would also mark a transition in land use from agriculture to a more natural setting. Fencing would be removed and other vestiges of active agricultural operations would be removed or become less noticeable as natural processes are allowed to re-establish themselves.

The economic effects associated with the park's operations would be beneficial, but

negligible to minor in the short term and beneficial and minor over the long term.

### **Community Services**

Demands on community services and facilities would result from the growing number of visitors and staff at the park. These demands would grow over time, mirroring the growth in visitors. Local utility infrastructure, such as water and wastewater systems, would be the most direct impacts, due to more people traveling through the area and staying the night. However, facility expansions and additional staff would not be needed to meet these demands because the number of visitors would be relatively small in comparison to the resident population and overall number of visitors and travelers being served and because the demands would be seasonal and dispersed across several communities.

Effects on community services under the NPS preferred alternative would be indeterminate and negligible over the short and long term.

### **Traffic and Emergency Services**

Traffic impacts of the NPS preferred alternative on the highways and roads that serve the park would be similar to, but slightly higher than under the no-action alternative. Most of the additional traffic would be concentrated on SH 150 and Alamosa County 6N, the primary access roads to the park's main entrance. During summer, some travelers might have to wait longer to turn at the SH 17/County Road 6N and SH 150/SH 160 intersections, but most travelers would possibly notice slight change in travel conditions due to the NPS preferred alternative. Even with the increases in traffic, future traffic volumes

would still be well below the design capacity of the roads and would not dramatically increase the need for road maintenance.

A new public vehicle access point would be provided in the north part of the national park (backcountry access zone), assuming a feasible route for getting there is identified by the involved entities. This new access would lead to a traffic increase (from park visitors) on some local roads, including Saguache County Road T. Traffic increases would be greatest on summer weekends and holidays, and would increase over time as park visitor levels grow. If the new access route uses Saguache County roads within the Baca Grande subdivision, traffic would increase on those county roads. However, with the only real destination within the backcountry access zone a small trailhead (capacity 10 to 15 vehicles), the traffic increase would be minor, especially when considered against the backdrop of expected traffic increases from residential and spiritual retreat growth in Crestone and the Baca Grande subdivision.

Assuming there were signs to direct visitors along the preferred route, the traffic increases would be limited primarily to that route. Nonetheless, some park visitors might explore other subdivision roads while they were in the area. In contrast to the no-action alternative, there would be little localized traffic congestion from visitors parked along roads within the subdivision near the park boundary. Instead, visitors would travel along the designated route, enter the national park, and proceed to the backcountry access zone trailhead. If, on the other hand, access were through the Baca National Wildlife Refuge, there would be little, if any, traffic increase on roads within the Baca Grande subdivision. Instead, eastbound visitor traffic on County Road T would divert southward through the refuge before it reached the subdivision.

Impacts on the number of traffic accidents and demands on first responders would be about 10% higher than those under the no-action alternative. The scale of demands associated with the NPS preferred alternative is such that they would not require additional law enforcement or emergency response staffing, though increases in the number of “call outs” would burden many area first response agencies because they are staffed by volunteers.

The effects of the NPS preferred alternative on traffic and emergency services would be adverse, but negligible over the short and long term across most of the region. Impacts to traffic north of the park (Crestone/Baca Grande area) would be long term, minor, and adverse.

## **Attitudes and Lifestyles**

The NPS preferred alternative establishes future management direction for the park reflecting the diversity of public input, fundamental park resources and values, the foundation established by management of the former national monument, and weighing of concerns and perspectives of those nearest to the park and the broader virtual community. In terms of attitudes, some individuals may view this alternative with dismay because certain aspects (e.g., application of the natural/wild zone, or provision of public access) do not go far enough to achieve their individual preferences. As such, this alternative could be characterized as offering something for many to appreciate and something for many to disfavor.

The recreation, conservation, and resource management opportunities associated with the NPS preferred alternative would have both direct and indirect lifestyle consequences, with the direct

consequences most apparent to neighbors and visitors to the park. For example, future visitors would have access to a broader range of experiences and options, including wilderness of a different character than existing wilderness at the park, reduced dependency on personal motor vehicles for travel in the park, and enhanced access for backcountry opportunities in the northern portion of the park. The latter would be spurned by some in the Crestone/Baca Grande community as it would be seen as encouraging more use and traffic near and through their community, compromising individual and collective lifestyles and some of the fundamental qualities that underlie their decisions to live and/or provide services in the community.

**Cumulative Effects.** Cumulative social and economics arising from the NPS preferred alternative are of the same type, but somewhat greater than those occurring under the no-action alternative. The cumulative effects include slightly higher traffic on Saguache County Road T and in the Crestone/Baca Grande community, higher spending by visitors that would bolster tourism-oriented businesses across the valley, and additional tax revenues to fund public services and facilities. The incremental effects on traffic would be small compared to traffic created by area residents, commercial vehicles, and other travelers passing through the area. More visitors to the park under the NPS preferred alternative would enhance the commercial development potential for private lands near the park's main entry. Any sales and subsequent development of those lands would have economic implications, as well as changing the visitor experience. The incremental effects of the NPS preferred alternative would be negligible to minor in the short term and minor in the long term, and generally beneficial, as compared to other social or

economic effects resulting from the cumulative actions.

**Conclusion.** The economic effects of the NPS preferred alternative include negligible to minor short-term and minor long-term economic benefits, the latter due to increased visitation (primarily from population growth) tied to this alternative. Long-term social consequences include a negligible to minor contribution to demands on community infrastructure and services. Short- and long-term lifestyles and attitudes are indeterminate, as some interested parties support the alternative, but others would be disappointed in one or more aspects of the alternative.

## HEALTH AND SAFETY

The NPS preferred alternative would not change management practices or safety risks related to fires in or around the park. The proposed modest shuttle system would help keep vehicle numbers and traffic congestion down around the main park road and turnouts, and at the visitor center and dunes parking lots. This would aid in limiting the anticipated rise in traffic accidents in these busy visitor areas as visitation increases over time. Adding bike lanes along the main park road means that cyclists would no longer have to share the road with passenger and recreational vehicles. This would provide an increased measure of safety for cyclists, particularly as numbers of vehicles increase with time. The proposed hiking/biking path linking the campground, dunes parking lot, and visitor center would help reduce the number of short vehicle trips to and from the campground and separate pedestrians and cyclists from vehicle traffic along these road sections. However, some pedestrian/bicycle accidents could result from mixing pedestrians and cyclists on the same path. Compared to the no-action

alternative, the NPS preferred alternative is expected to have a long-term, minor, beneficial impact on safety from these actions.

Most park land that was once part of Baca Ranch would remain relatively remote. Emergency response times to this area would be longer compared with the no-action alternative due to limited access and the wilderness recommendation. Thus, visitors would assume some additional risk in visiting this area. In contrast, guides would accompany visitors in the guided learning zone, and there would be a National Park Service presence at Medano Ranch. Thus, emergency response to this area of the park would be relatively efficient. Bison would no longer graze within the park, so this negligible risk to visitor safety would be eliminated. In sum, these actions would have long-term, localized, minor, adverse impacts, and negligible to minor beneficial impacts.

**Cumulative Impacts.** Relocation of the horse loading area east of the dunes is planned for the near future. This would include providing a dirt surface, allowing surer footing for horses, and reduced accident risk. The *Greater Sand Dunes Interagency Fire Management Plan* (2005) includes measures for safely and efficiently managing wildland fires within the park and preserve, the Baca National Wildlife Refuge, and The Nature Conservancy's Medano Zapata Ranch. The dunes parking lot within the national park is planned for minor expansion (~5%) and reconfiguration to improve vehicle circulation and increased capacity. Although the incidence of traffic accidents in the dunes lot is very low (that is, two accidents in the past 5 years despite nearly a million visitors to the park), this action would likely provide some small measure of increased safety as visitor use increases over time. The NPS preferred alternative

would contribute minor adverse and negligible to minor beneficial impacts on visitor safety. Combined with other past, present, and reasonably foreseeable future actions, the NPS preferred alternative would have a long-term, negligible to minor, beneficial effect on safety.

**Conclusion.** The NPS preferred alternative would provide negligible to minor beneficial safety impacts from the proposed modest shuttle system, bike lanes on the main park road, a local hiking/biking path, elimination of bison from the park, and from NPS and guide presence around Medano Ranch and the guided learning zone. Long-term, minor, negative impacts would accrue from reduced administrative access and from the wilderness recommendation.

## NATIONAL PARK SERVICE OPERATIONS

Limited new or improved facilities are proposed as part of the NPS preferred alternative. Examples include a new access road and trailhead in the north part of the national park, new trails and trail connections in several areas, bike lanes along the main park road, and a new fee booth located near the main entrance. Assuming The Nature Conservancy eventually transferred Medano Ranch to the National Park Service, facilities there would be improved to allow for administrative and scheduled public uses, and maintenance of the area would become the responsibility of the National Park Service. The NPS preferred alternative is conservative in terms of new facilities, especially considering that the park is four times larger than it was before the Great Sand Dunes Act of 2000 was passed. Nonetheless, these limited new facilities must be maintained, and this would be an additional burden on maintenance staff.

Maintenance of additional facilities would have a moderate, long-term, adverse impact on park operations. If funds for modest improvements at Medano Ranch are not forthcoming and if partnerships do not adequately support the limited administrative and public uses proposed, the long-term maintenance backlog of the park will grow.

Other activities that would require more NPS planning, coordination, and management include: administering scheduled public activities at Medano Ranch, managing public use of the guided learning zone, managing a visitor shuttle system, patrolling the northern access/trailhead, patrolling new trails, and managing nonnative invasive species. Most of the park expansion area would be recommended for wilderness. Thus, certain activities (including activities by the National Park Service, other resource management agencies, and researchers) would require a wilderness minimum requirements analysis, which would take staff time to conduct. Plus, if the minimum requirements analysis indicated that an activity should be conducted using nonmotorized/mechanized travel and techniques, the time required to conduct (or support) such an activity could substantially increase. New or expanded management responsibilities and wilderness stipulations would have long-term, moderate, adverse impacts on park operations.

**Cumulative Impacts.** Expansion of nearby communities, fire management responsibilities, elk herd reduction, pursuing a NPS water right, management of oil and gas exploration activities, and similar management needs would require time and attention by senior NPS staff. Cooperation and coordination with neighboring agencies and entities regarding planning, proposals near the park, etc., also

require substantial amounts of staff time. The NPS preferred alternative would place an additional burden on NPS staff, but this burden would be lessened if the park were adequately staffed. Combined with past, present, and reasonably foreseeable future impacts, the NPS preferred alternative would have moderate, long-term, adverse impacts on NPS operations.

**Conclusion.** Maintenance of limited additional facilities (frontcountry zone, Medano Ranch, and northern part of the national park) would have moderate, long-term, adverse impacts on park operations. New or expanded management responsibilities and wilderness stipulations would also have long-term, moderate, adverse impacts on park operations.

## **OPERATIONS OF OTHER ENTITIES AND MANAGEMENT AGENCIES**

### **Public Vehicle Access To/Through North Portion of Park**

Under this alternative, as under the other two action alternatives, a northern route or routes across NPS land would be designated via the Superintendent's Compendium for hunter access to USFS lands, where hunting is permitted. According to the *Code of Federal Regulations*, provision for such access may be provided when other access is impracticable; hunters must stay on designated routes and firearms must be broken down or disassembled so as to prevent their ready use. Administrative access via Liberty Road would be permitted under this alternative, as it is under all alternatives.

The NPS preferred alternative provides the direction and flexibility to consider potential routes for public vehicle access to

the backcountry access zone in the north part of the national park. One potential option for such access is via the Baca National Wildlife Refuge; this option would be studied by the USFWS. The other potential option is to enter the national park via a public county road (e.g., Camino Real) from the Baca Grande subdivision. (This option would likely require a connector road to join the county road to the national park's backcountry access zone). This option would be studied by the National Park Service in cooperation with Saguache County and the Baca Grande Property Owners Association. It is also possible that some intermediate or combination solution could be found. In any event, consideration by Baca Grande/Crestone and the USFWS of potential access routes to the northern portion of the national park would unavoidably place an additional responsibility on these two entities during their comprehensive planning processes. This additional responsibility would be anticipated to add to the duration, complexity, and cost of the planning process for both entities. As such, this component of the alternative would have a short- and long-term, moderately adverse impact on the management actions of other agencies or entities.

Two additional (subsequent) public vehicle access options could be considered in a separate future joint National Park Service/USFS public planning and environmental analysis process if USFS planning indicated that such access was needed. These options are: (1) an eastward extension of Cow Camp Road to the mountain front to connect with Liberty Road (to allow public vehicle access to the portion of Liberty Road that is administered by the USFS), and (2) the 0.7-mile segment of Liberty Road within the national park could be converted to a backcountry access zone for the same

purpose. Either would permit public vehicle access to the new national forest lands, an option that the USFS would like to preserve. Environmental impacts of these options would be addressed by a future study; they are not addressed in this environmental impact statement.

Should an acceptable route through the northern portion of the park to USFS lands be identified, concerns of the USFS relative to public vehicle access closer to the mountain front for general recreation would be appeased. Such a route would also provide public vehicle access closer to private in-holdings in Liberty, Short Creek, and Pole Creek. Finally, public vehicle access into the northern portion of the park would help address CDOW and USFS concerns about limited hunter harvest of elk in adjacent USFS lands due to lack of vehicle access. This specific concern is also addressed by this alternative in the form of hunter access provided through use of the Superintendent's Compendium. Therefore, this component of the NPS preferred alternative is anticipated to have minor, long-term, beneficial impacts on other agencies.

Increased visitor use and anthropogenic impacts to natural resources, particularly ecologically sensitive resources, on affected USFS lands may translate to a decrease in rare, near-pristine conditions and an increase in remediation expenses on the USFS land. This would result in short- and long-term, minor to moderate, adverse impact to the USFS.

### **Designation of Additional Wilderness Areas within the Park**

The NPS preferred alternative would recommend additional areas of the park be designated as wilderness. Agencies with monitoring or management responsibilities

in and surrounding the park, such as Colorado Division of Water Resources for water quality monitoring and CDOW for elk management, as well as organizations such as The Nature Conservancy and Lexam, would be required to conduct their activities accordingly. Wilderness designation does not necessarily preclude the use of ATVs or other vehicles or equipment to carry out necessary actions. The “minimum requirement” concept and “minimum tool” and “primitive tool” procedures, as specified in the Wilderness Act (1964), NPS *Management Policies* (NPS 2001), NPS *Reference Manual 41*, and *Minimum Requirement Decision Guide* (ACNWTWC 2004), could be applied for water quality monitoring, elk management, and other activities within designated and recommended wilderness areas. The needs and protocols for water quality monitoring are well-established at multiple levels. The need for active elk management, and the selection of strategies and tactics, would have to be clearly demonstrated and justified by the elk/bison study currently being conducted at the park. Monitoring and management activities such as these would be conducted using minimum impact tactics. Strategies and tactics would be selected commensurate with the resource, and with park values to be protected, as well as to minimize long-term environmental impacts.

In summary, activities carried out within wilderness areas, whether carried out by the National Park Service or other land management agencies, must be conducted in such a way that wilderness values are protected. Activities must adhere to National Park Service wilderness management policy through the minimum requirements process. Cooperation with the park in following the policies and processes associated with the additional wilderness areas would require more time

and resources on the part of other agencies. The additional burden would be readily apparent, and would apply to management agencies or others needing to conduct activities in wilderness that normally would require structures, mechanized equipment, or motorized vehicles. The impact of this alternative on other management agencies, therefore, is expected to be short and long term, moderate, and adverse.

**Cumulative Impacts.** The most relevant past, present, and reasonably foreseeable future actions that may interact cumulatively with this alternative to affect other agencies are the Great Sand Dunes National Park and Preserve Act (2000), and expansion of communities near the park. Impacts of the act are exemplified by this GMP. Increased human habitation in the area would reduce options for wildlife and wildlife management activities, as well as complicating the logistics of mineral exploration, among other activities. Combined with past, present, and reasonably foreseeable future actions, the impact of the preferred alternative would be long-term, minor to moderately adverse impacts on other entities and agencies.

**Conclusion.** Provision for evaluation of potential access routes to and through the northern portion of the park places much of the onus of evaluating such routes on the USFWS and Baca Grande/Saguache County—a short- and long-term, moderately adverse impact, depending on the duration of their respective planning processes. However, should an acceptable route be identified and implemented, it would partially address USFS and CDOW concerns about public vehicle access to the mountain front and about hunter harvest of elk. As such, this alternative is also anticipated to have minor, long-term, beneficial impacts on other agencies. There would also be short- and long-term, minor to moderate, adverse impacts from

increased planning, documentation, and remediation expenses required to carry out management activities in wilderness areas.

### **UNAVOIDABLE ADVERSE EFFECTS**

Some impacts caused by human use (especially minor, inadvertent impacts to archeological sites, vegetation, soils, water resources, etc.) are essentially unavoidable because not allowing people in the park would be inconsistent with the NPS mission.

### **IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES**

Irreversible impacts are permanent. An irretrievable commitment of resources

refers to resources that, once removed, cannot be replaced. Archeological resources that are stolen or vandalized are irreversibly lost. Even moving or disturbing such resources constitutes an irreversible commitment of resources because information is lost if the context (location and condition) is changed, even inadvertently. Thus, there would be some irreversible loss or commitment of archeological resources from this alternative.

### **RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY**

There would be no adverse effects on biological or economic productivity from implementation of this alternative.

## **IMPACTS OF THE DUNEFIELD FOCUS—MAXIMIZE WILDNESS ALTERNATIVE**

### **ARCHEOLOGY**

In the dunefield focus—maximize wildness alternative, visitor use would remain focused primarily in frontcountry areas and on established roads and trails. Areas with concentrations of archeological resources located in the frontcountry, along creeks, and along established trails would have impacts from trampling of sites, vandalism, and theft. Impacts would be site specific, adverse, and would range from minor to moderate, depending on the site and type of impact activity.

The proposed multiuse trail from the park entrance to the visitor center, dunes lot, and Pinyon Flats campground has potential to disturb a specific archeological site (5AL397). If this site were not avoided, impacts would be adverse and could range from minor to moderate. If demand

warranted, parking in the frontcountry zone located east of the dunes could also be expanded, and additional restrooms provided. Depending on their location, such new facilities could also adversely affect archeological resources. Any impacts (from construction and increased localized visitor use) would be minor to moderate and adverse.

Access to park expansion lands would be improved only via a new horse gate (or gates) on the northern park boundary. The incidence of unintentional or incidental damage would be slightly higher than in the no-action alternative due to increased equestrian use. However, access in general would remain fairly limited. This would benefit archeological resources because access to sensitive cultural resources would remain limited. Assuming The Nature Conservancy were to transfer Medano Ranch to the National Park Service, the

ranch would be opened to general public use, although routes of public access would remain very limited. Nonetheless, determined individuals could access remote park areas containing sensitive archeological resources on foot or horseback without guides. The substantial wilderness recommendation in this alternative would help to protect resources in much of the park expansion area—it is much more difficult to gain access to remote areas if vehicles are not permitted, and any signs of vehicle use (e.g., dust, tire tracks, or headlights at night) would alert the National Park Service to possible illegal activity. There would be no regular presence at Medano Ranch (and generally reduced administrative access), so such sites would not be regularly monitored. Effects from vandalism and theft would be possible despite very low use levels in remote areas. Changes in public access, administrative access, management presence, and the wilderness recommendation would have long-term, minor, beneficial, and minor to moderate adverse impacts.

**Cumulative Impacts.** Residential and spiritual retreat growth in the Crestone/Baca Grande area have undoubtedly adversely affected archeological resources. Additional, as yet undisturbed resources would likely be disturbed or destroyed in the future as this area continues to grow (from ground disturbance during construction and from looting and unintentional disturbance). The foreseeable development of private land near the park entrance could similarly affect archeological resources. Rehabilitation of main park roads and parking could have potential long-term, localized, minor to moderate, adverse impacts to a NRHP-eligible archeological site (5AL405) from construction activities and heavy equipment. The interagency fire management plan could have beneficial

effects if areas identified for prescribed burns or fuel reduction are first surveyed for archeological resources. This would expand identification of and knowledge about regional archeological resources. The dunefield focus—maximize wildness alternative would contribute both adverse and beneficial effects on archeological resources, and these impacts would be confined within the park. Combined with past, present, and reasonably foreseeable future actions, the no-action alternative would have minor to moderate adverse impacts and minor beneficial effects on archeological resources.

**Mitigation.** In general, facilities would be located and designed to minimize direct and indirect adverse effects to archeological resources. If avoidance is not possible, mitigation measures would be developed in consultation with the Colorado SHPO and federally recognized American Indian tribes. Areas under consideration for new facilities, such as trails and expanded parking, would be surveyed for archeological resources before any ground-disturbing activities took place. If archeological sites were discovered during such project-specific surveys, they would be evaluated and, if necessary, new locations for facilities would be identified.

**Conclusion.** Several aspects of the dunefield focus—maximize wildness alternative would affect archeological resources, including: visitor use increases, new facilities (limited), a wilderness recommendation, and changes in public and administrative access and management presence. Impacts would be long term, minor, beneficial, and minor to moderately adverse. There would be *no impairment* of archeology from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## HISTORIC STRUCTURES

In the dunefield focus—maximize wildness alternative, Medano Ranch headquarters structures would be located within the natural/wild zone. Assuming management of Medano Ranch were transferred to the National Park Service, structures would be documented, but not maintained (or if safety concerns arose, the structures could be removed after documentation). Unrestricted visitor access would be allowed in the area of the ranch and monitoring would be relatively infrequent. The buildings could suffer increased rates of deterioration from vandalism and lack of maintenance. Impacts would be long term, moderate to major, and adverse.

Management of large areas as wilderness would cause minor, long-term, localized, adverse impacts to peripheral ranch elements due to removal of fences and lack of maintenance of other elements such as roads and ditches.

**Cumulative Impacts.** No cumulative effects would be anticipated.

**Mitigation.** Mitigation measures are undertaken to reduce potential impacts to cultural resources. Mitigation would occur in consultation with the Colorado SHPO and would likely include some form of documentation so that information about ranch headquarters structures is not lost.

**Conclusion.** Effects to Medano Ranch historic structures would be long term, minor to major, and adverse due to deterioration from discontinued maintenance, possible vandalism, and possible building removal. Through compliance with section 106 of the National Historic Preservation Act, consultation with the Colorado SHPO, and mitigation, the severity of impacts can be

reduced below the “major” threshold. There would be *no impairment* of historic structures from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## CULTURAL LANDSCAPES

In the dunefield focus—maximize wildness alternative, Medano Ranch headquarters structures would be located within the natural/wild zone. Assuming management of Medano Ranch were transferred to the National Park Service, structures would be documented, but not maintained (or if safety concerns arose, the structures would be removed after documentation). Unrestricted visitor access would be allowed in the area of the ranch and monitoring would be relatively infrequent. Deterioration of ranch features (buildings, roads, ditches, etc.) could occur from vandalism and lack of maintenance. If safety concerns arose, structures could be removed after documentation. Impacts to the Medano Ranch potential cultural landscape would be long term, moderate to major, and adverse.

Management of large areas as wilderness would cause minor, long-term, localized, adverse impacts to peripheral ranch landscape elements due to removal of fences and discontinued maintenance of other elements such as roads and ditches.

**Cumulative Impacts.** No cumulative effects would be anticipated.

**Mitigation.** Mitigation measures are undertaken to reduce potential impacts to cultural resources. Mitigation would occur in consultation with the Colorado SHPO and would likely include some form of documentation so that information about the ranch headquarters cultural landscape is not lost.

**Conclusion.** Effects to the Medano Ranch potential cultural landscape would be long term, moderate to major, and adverse due to deterioration from discontinued maintenance, vandalism, and possible building removal. Through compliance with section 106 of the National Historic Preservation Act, consultation with the Colorado SHPO, and mitigation, the severity of impacts could be reduced below the “major” threshold. There would be *no impairment* of cultural landscapes from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## VEGETATION

In the dunefield focus—maximize wildness alternative, the frontcountry and dunes play management zones would be the focus of most visitor use, and visitor numbers would increase substantially over time (primarily due to population growth; see “Visitor Use and Experience” section for projections). Sparse dunefield plant communities would experience increased trampling, wind erosion, and landslide. Popular locales within the subalpine and tundra life zones could also experience increased use over time. A new multiuse hiking and bicycling trail would be constructed from the park boundary near the Oasis to the visitor center, dunes parking lot and picnic area, and to Pinyon Flats campground, which would affect sabkha and sand sheet plant communities occupying the trail’s footprint. Activities related to trail construction include grading, drainage control structures, and surfacing that remove vegetation, destroy soil structure and bury habitat, and provide disturbed sites for nonnative plant species invasion. Supplemental parking and restrooms could be provided in the frontcountry management zone and would affect plant communities by grading

(disturbance and potential for nonnative plant species invasion) and paving (burial). The overall result would be short- and long-term, negligible to moderate, adverse, and short- and long-term, minor, beneficial impacts to plant communities of the sand sheet and dunefield life zones.

A gate or gates would be installed on the northern park boundary to allow equestrian access for backcountry use. The mature narrowleaf cottonwood groves on the banks of Deadman Creek would be potentially attractive to hikers and riders for resting, watering animals, and other passive pursuits. This activity could result in streambank breakdown and erosion, vegetation trampling, grazing and browsing by horses, and potential introduction of nonnative plant species. The lack of established trails from the northern boundary would encourage proliferation of social trails and result in vegetation trampling and the potential for nonnative species introductions. In general, impacts to vegetation from increased use and use in new park areas (including horse use) would be tempered by monitoring and management actions tied to a management zone-based carrying capacity approach. Even so, impacts to plant communities of the sand sheet life zone would be short and long term and minor to moderately adverse.

If The Nature Conservancy were to transfer Medano Ranch lands to the National Park Service, managed bison grazing would be discontinued. Over time, plant communities in this area would recover from impacts of managed bison grazing (e.g., streambank trampling, shifts in species composition from selective consumption of more palatable species, etc.). This would have short- and long-term, minor, beneficial impacts on sabkha and sand sheet plant communities.

The park would identify and manage nonnative plant populations, reducing their effect on native plant communities or possibly eliminating some stands from the landscape resulting in short- and long-term, minor to moderate, beneficial impacts on the species composition of plant communities and their habitat quality.

**Cumulative Impacts.** Generally, native plant communities of the San Luis Valley and of the park have been affected by over a century of livestock grazing and the effects are sometimes intensified by periods of drought. Depending on the local environment, grazing effects can range from minor shifts of plant and animal species composition to more serious wind and water erosion (e.g., blowouts and gullying) and nonnative plant introductions. Cattle grazing was discontinued on the former Baca Ranch lands in 2004, and some past adverse livestock impacts may gradually be reversed in the future. Rehabilitation of main park roads and parking areas, which includes increasing the capacity of the dunes lot by 5%, would result in minor, long-term, localized, adverse impacts on vegetation. Introduction of nonnative landscape plants from adjacent developed lands would result in adverse effects to native plant communities. Some native plant communities have undergone historic disturbance during past land-use activities and are therefore subject to such nonnative plant species invasion. The dunefield focus—maximize wildness alternative would contribute to effects on vegetation from increased use and management of nonnative invasive plants. Combined with past, present, and reasonably foreseeable future actions, the dunefield focus—maximize wildness alternative would have long-term, minor to moderate, adverse, and moderate beneficial effects on plant communities.

**Conclusion.** Increased visitation and new access points, trails, roads, and parking areas (all limited) would have long-term, negligible to moderate, adverse impacts on plant communities. Cessation of managed bison grazing on Medano Ranch, carrying capacity monitoring and actions, and control of nonnative plant species would have long-term, minor to moderate, beneficial impacts on plant community species composition and habitat quality. There would be *no impairment* of vegetation from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## ECOLOGICALLY CRITICAL AREAS

The frontcountry and dunes play management zones would be the focus of most visitor use in this alternative, and the number of visitors would increase over time (see “Visitor Use” section for projections). The dunefields in this area within the Great Sand Dunes ecologically critical area would experience more use, and the four sparse dunefield plant communities (which support the rare James catseye, rare insect species, and habitat for the rare silky pocket mouse subspecies) would experience increased trampling, wind erosion, and landslide. A new multiuse hiking and bicycling trail would be constructed from the park boundary near the Oasis to the visitor center, dunes parking lot and picnic area, and to Pinyon Flats campground, which would affect sand sheet plant communities occupying the trail’s footprint near the boundary of the Great Sand Dunes ecologically critical area. Activities related to trail construction include grading, drainage control structures, and paving that remove vegetation, destroy soil structure and bury habitat, and provide disturbed sites for nonnative plant species invasion. Parking

and restrooms could be expanded in the frontcountry management zone encompassed by the Great Sand Dunes ecologically critical area and would affect plant communities by grading (disturbance and potential for nonnative plant species invasion) and paving (burial). The overall result would be short and long-term, negligible to moderate, adverse, and short- and long-term, minor, beneficial impacts to the Great Sand Dunes ecologically critical area.

A horse gate or gates would be installed on the northern park boundary, which would lead to increased horse use in the northern part of the park. Lack of established trails in the northern part of the park would likely encourage social trailing. Sand sheet plant communities in the watershed of the Deadman Creek ecologically critical area could be affected by social trailing, trampling, and nonnative plant species establishment. In particular, the matured nonhybridized narrowleaf cottonwoods on the banks of Deadman Creek could be attractive to hikers and horseback riders for resting, watering animals, and other passive pursuits. In addition to social trailing, this activity could result in vegetation trampling (including habitat for the rare canyon bog orchid), grazing and browsing of vegetation by horses, and introduction of nonnative plant species. Results of these actions would be short- and long-term, minor to moderate, adverse impacts to plant communities of the Deadman Creek ecologically critical area.

If The Nature Conservancy were to transfer Medano Ranch lands to the National Park Service, managed bison grazing would be discontinued, and local plant communities would recover over time from associated streambank disturbance, impacts from selective consumption of more palatable plants, etc. The end result would be long-term, minor,

beneficial impacts on Medano Ranch portions of the San Luis Lakes / Sand Creek ecologically critical area plant communities and wildlife habitat.

The park would identify and manage nonnative plant populations, reducing their effect on native plant communities or possibly eliminating some stands from the landscape resulting in short- and long-term, minor to moderate, beneficial impacts on the species composition of plant communities and their habitat quality.

**Cumulative Impacts.** Generally, ecologically critical areas within the park have been affected by over a century of livestock grazing and the effect is sometimes intensified by periods of drought. Depending on the local environment, grazing effects can range from minor shifts of plant and animal species composition to more serious wind and water erosion (e.g., blowouts and gulying) and nonnative plant introductions. Cattle grazing was discontinued on the former Baca Ranch lands in 2004, and some past adverse livestock impacts may gradually be reversed in the future. Some native plant communities have undergone historic disturbance during past land-use activities and are therefore subject to such nonnative plant species invasion. Contributions of the dunefield focus—maximize wildness alternative to effects on ecologically critical areas would be from increased use, elimination of bison grazing, management of nonnative invasive plants, and new trails. Combined with past, present, and reasonably foreseeable future actions, the dunefield focus—maximize wildness alternative would have long-term, minor to moderate, adverse, and moderate beneficial effects on ecologically critical areas.

**Conclusion.** Increased visitation and limited new facilities (horse gate on north end, multiuse path, expanded parking in the frontcountry zone, etc.) would result in long-term, minor to moderate, adverse impacts on plant communities. Cessation of managed bison grazing on Medano Ranch, carrying capacity monitoring and actions, control of nonnative plant species, and other actions would have long-term, minor to moderate, beneficial impacts on ecologically critical areas. There would be *no impairment* of ecologically critical areas from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## FEDERAL THREATENED AND ENDANGERED SPECIES

Under the dunefield focus—maximize wildness alternative, backcountry use in the preserve is projected to grow over time, although the Mosca, Music, and Medano Pass access points would remain somewhat isolated from substantial levels of nearby development and associated population growth. The National Park Service would encourage the USFS not to improve the capacity or standard of the Music Pass trailhead parking or the standard of the four-wheel drive access road on the east side of the Sangre de Cristos. This would help keep visitor numbers from growing in parts of the preserve, including the Upper Sand Creek drainage, as would managing much of the park under the conditions of the natural/wild zone. Given this alternative’s emphasis on wild conditions, there would likely be substantial interest in exploring backcountry areas on foot or horseback, but this would be anticipated to decrease with elevation and topographic complexity.

Given the difficulty of reaching much of the higher reaches of the preserve, visitor

use is not anticipated to have detectable or measurable impacts on any Canada lynx moving through or attempting to take up residence in those areas, and impacts are therefore anticipated to range from none to negligibly adverse.

Under this alternative, unleashed dogs used for hunting would still be allowed in the national preserve; however, leashed (nonhunting) dogs would be permitted only in parking areas, picnic areas, and car campgrounds in the rest of the park. This would reduce the number of dogs in the preserve and is anticipated to result in no to negligible beneficial impacts on potential lynx in the preserve. The continued presence of unleashed hunting dogs in the national preserve is anticipated to continue to have no to negligible, adverse effects, in the short and long term, on lynx passing through or trying to establish ranges within the national preserve.

**Cumulative Impacts.** Past, present, and reasonably foreseeable actions which might interact with aspects of the dunefield focus—maximize wildness alternative to affect potential lynx or lynx habitat within the park include general growth of the human populations surrounding the park and preserve, wilderness restoration efforts in the South Colony Lakes basin area (just north of the national preserve), and a potential elk herd reduction in the future. Population growth is anticipated to be a contributor to modest increases in visitation within the preserve. Wilderness restoration efforts north of the preserve may increase the potential habitat for Canada lynx along the range, and reduction of elk would avoid or reduce the impacts overly large populations of this native ungulate can have on a range of habitats and the food chains based on those habitats. Taken in combination with these cumulative impacts, the dunefield focus—maximize wildness alternative is

anticipated to have no to negligible, adverse and no to negligible, beneficial impacts on potential lynx establishment within the park.

**Conclusion.** Impacts on potential Canada lynx within the park due to increased visitation over time would be moderated by restriction of backcountry zones within the preserve to narrow trail corridors, and would be anticipated to decrease with increased elevation and ruggedness of the terrain such that only no to negligible, short- and long-term, adverse impacts on potential lynx or their habitat in the park are anticipated. The continued presence of unleashed hunting dogs in the national preserve is anticipated to continue to have no to negligible, adverse effects in the short and long terms, on lynx passing through or trying to establish ranges within the national preserve. This may be offset somewhat by the elimination of dogs in the preserve (except for hunting dogs), which is anticipated to have no to negligible, beneficial effects over the short and long term. These impacts correlate to a determination of “*may affect—not likely to adversely affect*” for Canada lynx for the dunefield focus alternative. There would be *no impairment* of federal threatened and endangered species from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## **WILDLIFE, INCLUDING COLORADO STATE-LISTED SPECIES**

### **Species Associated with Riparian Corridors**

The frontcountry and dunes play management zones would be the focus of most visitor use in this alternative, and number of visitors would increase over

time (see “Visitor Use” section for projections). Medano Creek wetlands within these zones would therefore experience considerably more use. Higher use levels over time could result in impacts to riparian corridors (e.g., Sand Creek, Castle Creek, Little Medano Creek, and Cold Creek) such as decreased water quality from increased sedimentation, introduction of pollutants, and introduction of nonnative species or diseases. This would have minor to moderate adverse effects on species associated with these riparian habitats such as the Rio Grande sucker, Rio Grande chub, and the Rio Grande cutthroat trout.

Day use would increase in the vicinity of Deadman Creek near the northern park boundary. A gate or gates for horse access on the northern park boundary would encourage more off-trail equestrian use (natural/wild zone) in the northern portion of the national park. The mature narrow-leaf cottonwood groves along the Deadman Creek banks would likely attract hikers and horseback riders for resting, watering animals, and other passive pursuits. As with the no-action alternative, there would be no trails to direct hikers and equestrians away from this area, so the Deadman Creek corridor might become the preferred route of east-west hiking and horseback travel in this portion of the park. Adverse effects from humans and horses might be concentrated along this corridor. The wildlife issue for consideration in Deadman Creek is the potential impacts of increased use on Townsend’s big-eared bats. These often forage along riparian corridors in the western United States and are moth specialists (Schmidt 2003). Degradation of the Deadman Creek corridor could potentially result in a decrease in the prey base for this species, if the woody vegetation, some of which likely serves as host plants for moths, is affected. Assuming standard monitoring and remediation of

habitat conditions, such impacts are anticipated to be negligible to minor and adverse.

### **Wetlands-Associated Species**

Under the dunefield focus—maximize wildness alternative, livestock watering ponds and structures would be removed, and irrigation on Medano ranch would cease, resulting in long-term, negligible to minor, adverse impacts (from drying) on species associated with introduced wetlands in the immediate area. When watering ponds and structures are removed, and irrigation is ended, natural flows could be reintroduced to other areas. Expansion or reestablishment of wetlands plant communities in those areas may have long-term, negligible to minor, beneficial impacts on wetlands-associated species. The result of this scenario would be a combination of negligible to minor, adverse impacts on wetlands-associated species within the park, and negligible to minor, beneficial impacts to the same species outside (downstream of) the park. A detailed study of the potential changes to the hydrologic regime of the park and surrounding area would be conducted before alteration of water sources within the park.

### **Ungulate Herd Numbers and Health**

A gate for horse access would be provided on the north boundary of the park. Access across the northern boundary of the park would be limited to pedestrian and equestrian traffic. The dunefield focus alternative does not provide for possible future evaluation of public vehicle access routes to the mountain front.

Adverse impacts to ungulates could result from continued limited hunting on USFS

lands adjacent to the northern boundaries of the park and preserve. Continued limited hunting pressure on elk in this area may exacerbate rapid population increases that may be linked to declines of other native ungulate populations (bighorn sheep and mule deer), and to habitat degradation in the Sangre de Cristo Wilderness. Estimated numbers of hunters who might want to access the preserve and adjacent USFS lands to hunt elk range from 20 to 30 for each of the three 5-day seasons; equating to 60 to 90 hunters annually. The preserve and adjacent USFS lands are in CDOW game management unit 82. The success rate for elk hunters in game management unit 82 in 2004 was 34% total, with 66% of harvested elk being cows. Based on the 2004 harvest rates, and CDOW estimates for numbers of hunters, the potential number of elk not harvested from the preserve and adjacent USFS lands is estimated to range from 14 to 20 cows, and 6 to 9 bull elk. Given that, at an estimated herd size of nearly 6,000 elk, the San Luis Valley herd is approximately four times larger than the 1,500-animal goal established by CDOW, removal or nonremoval of 14 to 20 cow elk and 6 to 9 bull elk would not make a substantial difference in efforts to reduce the size of this herd. Therefore, this aspect of the alternative is expected to have only minor adverse impacts on ungulate herd numbers and health.

### **Bighorn Sheep**

Under the dunefield focus alternative, unleashed dogs used for hunting would continue to be allowed in the preserve. Leashed dogs would be allowed only in parking areas, picnic areas, and car campgrounds. Bighorn sheep, as prey animals, are anticipated to react negatively to dogs, whether on-leash or off. In a study of bighorn sheep, which were already

partially habituated to humans, MacArthur et al. (1982) conducted human-disturbance trials on bighorn sheep that were already partially habituated to humans. In this study, a person approached a group of sheep from a road, from the road accompanied by a dog on-leash, and from a ridge away from the road. The strongest negative reactions in the sheep were recorded when a human with a leashed dog approached (MacArthur, Geist, and Johnston 1982). Furthermore, no reduction in heart-rate response was observed with repeated trials; instead, heart-rate response actually increased successively with each leashed-dog trial. In earlier studies, these same authors demonstrated that free-ranging dogs and coyotes evoked the maximum heart-rate responses (MacArthur, Geist, and Johnston 1979). In their later study, MacArthur, Geist, and Johnston (1982) concluded that, among all the stimuli they studied, “The presence of dogs on sheep range should be discouraged.”

The mere presence of dogs, which wild prey animals do not distinguish from other predators, can cause stress in prey species (Simes 1999). While the sight and sound of dogs are obvious direct cues, the scent of dogs and the wastes they leave behind have a much longer impact on prey species of an area, potentially preventing such species from approaching and using essential resources such as watering holes or cover for a period of time.

The presence of unleashed hunting dogs in the preserve is a component of all alternatives proposed for this GMP and would be a continuation of the current condition. What is being evaluated is the difference among the alternatives relative to leashed dogs in the preserve. If only leashed dogs were allowed in the preserve, the impacts attributable to their presence/absence would be larger. However, given that unleashed hunting dogs would be free

to roam the preserve within the limits established by their handlers and hunting regulations, the presence or absence of leashed dogs in the preserve is not anticipated to significantly increase or decrease dog-related stresses. As such, the restriction of leashed dogs to specific areas outside the preserve is not anticipated to contribute more than a negligible beneficial impact on bighorn sheep in the park.

**Cumulative Impacts.** Cumulative actions contributing to impacts on riparian-associated species as described above include growth of the human population in the area surrounding the park, oil and gas exploration on former Baca Ranch lands, and elk herd reduction. The first two of these would contribute adverse impacts, while elk herd reduction would contribute beneficial impacts, specifically to the riparian corridor habitats. In combination with these cumulative actions, the dunefield focus alternative is anticipated to contribute negligible to minor, adverse impacts.

Cumulative actions contributing to ungulate herd numbers and health include the enabling legislation for the expanded park and preserve (negative impacts from hunting of elk not being permitted in expansion areas of the national park), but also beneficial impacts from increased protection for habitats and species (from conservation-based NPS management). Also contributing to ungulate herd numbers and health would be the interagency fire management plan, which should provide beneficial impacts to ungulates through habitat management and enhancement. Finally, the elk herd reduction tentatively planned for the future, pending justification stemming from ongoing research and appropriate NEPA analysis, would most likely provide beneficial impacts to the elk by reducing the numbers to a level closer to the

predicted carrying capacity of the area, and reducing the risk of diseases often associated with high herd densities. Combined with past, present, and reasonably foreseeable future actions, the dunefield focus—maximize wildness alternative would be anticipated to contribute minor adverse impacts to ungulate herd numbers and health.

Cumulative actions contributing to impacts on bighorn sheep would include growth of the human population in the area surrounding the park, and elk herd reduction. The first of these would contribute adverse impacts, as it would be anticipated to increase the number of leashed (and potentially feral) dogs in the park, while elk herd reduction would contribute beneficial impacts by reducing competition from, habitat impacts due to, and the threat of diseases from, elk. In combination with these cumulative actions, the dunefield focus—maximize wildness alternative is anticipated to contribute negligible to minor beneficial impacts on bighorn sheep within the park.

**Conclusion.** The dunefield focus alternative would have minor to moderate, adverse impacts on species associated with riparian corridors due to increased recreational use; negligible to minor, adverse impacts on wetlands-associated species within the park due to removal of artificial water sources, and cessation of surface irrigation; and negligible to minor, beneficial impacts to the same species outside (downstream of) the park due to possible increase of downstream waters; minor adverse impacts on ungulate herd numbers and health due to continued limited access for elk hunting; and negligible beneficial impacts on bighorn sheep populations within the park due to the absence of leashed dogs in the national preserve. There would be *no impairment* of wildlife from this alternative (see specific

definition of impairment in the “Impairment of National Park Resources” section.

## SOILS AND GEOLOGIC RESOURCES

Under the dunefield focus—maximize wildness alternative, increased day-use hiking and equestrian use in the northern portion of the national park (the latter a result of a horse gate or gates) would result in social trails in that part of the park. Because this area would be zoned natural/wild in this alternative, installation of trails to mitigate this problem is not an option. The result would be long-term, mostly localized, minor to moderate, adverse impacts to soil resources.

In the frontcountry zone, expansion of parking and related support facilities such as restrooms could be expanded if demand warranted. Soils would be disturbed and destroyed in these localized areas, but the soils effects from visitor vehicles parking along road shoulders would be diminished compared to the no-action alternative. Adding a multiuse path (from the park boundary to the visitor center and dunes lot) would destroy and disturb soils in and immediately adjacent to the trail corridor. These actions would have long-term, localized, minor to moderate, adverse impacts and minor beneficial impacts.

In keeping with the concept of the dunefield focus—maximize wildness alternative, many roads and “two-tracks” would be abandoned. Medano Ranch headquarters area would be zoned and managed as natural/wild. Disturbed soils in these areas would very gradually revert to more natural conditions. This would be a long-term, localized, moderate, beneficial impact on soil resources.

**Cumulative Impacts.** Establishment of a water right to fulfill the purpose of the

national park and preserve would minimize further lowering of local groundwater levels or surface water flows, which could indirectly benefit sand recycling. Oil and gas exploration on lands that were formerly part of the Baca Ranch but are now within the national park has occurred and these activities could continue in the near future; however, any activities would be subject to 36 CFR 9B (*Nonfederal Oil and Gas Rights Regulations*), which require such activities be conducted in a manner consistent with park purposes and preventing or minimizing damage to the environment. Minor expansion and reconfiguration of the dunes parking area and relocation of the horse loading area and dump station would also cause localized soil disturbance and destruction. The dunefield focus—maximize wildness alternative would contribute both beneficial and adverse, localized impacts to soils and geologic resources. Combined with past, present, and reasonably foreseeable future actions, this alternative would have long-term, minor to moderate, mostly localized, beneficial, and adverse impacts on soils and geologic resources.

**Conclusion.** Increased day-use hiking and equestrian use in certain areas would cause localized soil disturbance, compaction, and social trailing. Expanded parking and restrooms, and a new multiuse path in the frontcountry zone would disturb and destroy soils in site-specific areas. However, expanded parking would mean reduced impacts (compared to the no-action alternative) from visitor vehicles parking along roadways. Some beneficial soils impacts would also be realized from restoration of the Medano Ranch headquarters site to more natural conditions. Overall, this alternative would have long-term, mostly localized, minor to moderate, adverse impacts, and long-term, mostly localized, minor to moderate, beneficial impacts. There would be *no*

*impairment* of soils and geological processes from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## WETLANDS

The frontcountry and dunes play management zones would be the focus of most visitor use in this alternative, and the number of visitors would increase over time (see “Visitor Use” section for projections). Medano Creek wetlands within these zones would experience more use, which would mean more potential for incidental trampling of wetland soils and vegetation. This would result in long-term, negligible to minor, adverse effects on creek-associated wetlands and riparian habitats.

Day use would increase in the vicinity of Deadman Creek near the northern park boundary. A gate or gates for horse access on the northern park boundary would encourage more off-trail equestrian use (natural/wild zone) in the northern portion of the national park. The mature narrow-leaf cottonwood groves along the Deadman Creek banks would likely attract hikers and horseback riders for resting, watering animals, and other passive pursuits. There would be no trails to direct use away from this area (same as for the no-action alternative), so the Deadman Creek corridor might become the preferred route of east-west hiking and horseback travel in this portion of the park. Adverse wetlands effects from incidental trampling, compaction of wetland soils and streambanks, and introduction of nonnative species might be concentrated along this corridor. Chemical and biological processes and wetlands species composition could be affected. Effects would be long term, minor to moderate, and adverse.

Assuming Medano Ranch is eventually transferred to NPS management, irrigation of hay meadows for bison forage in this area would be discontinued. Wetlands that are not supported by natural surface and groundwater flows (e.g., introduced or artificial wetlands) would be adversely affected by drying. Natural flows in Sand, Big Spring, and Little Spring creeks would increase, at least seasonally, when irrigation is discontinued, and other wetlands types (e.g., ephemeral ponds, playas, mudflats, etc.) would expand and/or become reestablished. Also, more water would likely be delivered to San Luis and Head lakes in San Luis Lakes State Park and Wildlife Area, stabilizing water levels and providing wetlands support in those areas. Overall, anticipated wetlands impacts would be long term, moderate to major, beneficial, and long term, moderate, adverse. A future study would examine expected impacts in more detail.

Eliminating bison grazing from Medano Ranch lands within the park would benefit some wetlands plant species, particularly the most palatable grasses. Some areas of channel and streambank erosion might gradually stabilize, improving wetlands structure and function. Livestock watering ponds and structures would be removed; some introduced wetlands would likely dry up, but other naturally occurring wetlands would be re-established or expand from restoration of natural flows. The park would identify and manage nonnative plant populations in new park areas, reducing their effects on native wetlands communities or possibly eliminating some nonnative stands from the landscape. Wetlands species composition and habitat quality would improve as a result. Overall, these actions would have long-term, minor to moderate, beneficial, and negligible to minor, adverse impacts on wetlands.

**Cumulative Impacts.** Livestock grazing typically adversely affects wetlands and riparian resources by causing shifts in species composition, erosion of stream-banks and bottoms, and browsing of wetland grasses, shrubs, and tree seedlings. Cattle grazing was discontinued on the former Baca Ranch lands in 2004, and some past adverse livestock impacts may gradually be reversed in the future. Under the dunefield focus—maximize wildness alternative, beneficial and adverse wetlands impacts would result from higher use levels (especially in certain areas), removal of livestock-related water control structures, control of nonnative noxious plant populations, and discontinuation of bison grazing and hay meadow irrigation. Combined with past, present, and reasonably foreseeable future actions, the no-action alternative would have long-term, moderate, beneficial impacts, and minor to moderate adverse impacts on wetlands resources.

**Conclusion.** Higher use levels in a few key areas would mean more potential for incidental trampling of wetland soils and vegetation; impacts on creek-associated wetlands and riparian habitats would be long term, adverse, and range from negligible to moderate. Discontinuing irrigation of wet meadows on Medano Ranch is expected to have long-term, moderate to major, beneficial, and long-term, moderate, adverse impacts on wetlands. Eliminating bison grazing, removing livestock water ponds and structures, and managing nonnative plants in new areas would have long-term, minor to moderate, beneficial, and negligible to minor adverse impacts on wetlands. There would be *no impairment* of wetlands from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## WATER RESOURCES

Under the dunefield focus—maximize wildness alternative, visitation would generally increase over time, and it would increase proportionally in certain areas (e.g., in the north portion of the park). Higher use levels over time would mean more potential for trash and human, horse, and dog waste to be washed into streams and lakes, thus degrading water quality. However, within the national park, dogs would be restricted to parking lots, campgrounds, and picnic areas, which would improve water quality in most of the national park (including the popular Medano Creek area within the dunes play zone). Backcountry toilets would be installed if/when visitor use levels become high enough that human waste disposal and sanitation is a concern. The natural/wild zone would cover most of the national park and preserve, so there would be no allowance for new trails that could otherwise direct use away from sensitive areas (e.g., Deadman Creek, lower Sand Creek, and Big Spring Creek). Thus, social trails (including those from horse use) could also be a problem, causing bank erosion that would contribute to stream sedimentation. The end result of these actions would be long-term, minor, adverse impacts, and long-term, minor, beneficial impacts to surface water and potentially to shallow groundwater quality.

If and when The Nature Conservancy transferred Medano Ranch lands to the National Park Service, surface irrigation of hay meadows for bison forage would be discontinued. Nondiverted creek flows would be allowed to remain within their natural drainages (e.g., Sand, Big Spring, and Little Spring creeks) rather than being redirected to meadow areas. Thus, discontinuation of meadow irrigation would affect surface water flow and

possibly groundwater levels, but additional research would be needed to determine the nature (scope, direction, intensity, etc.) of these impacts. Prior to discontinuing irrigation, a study would be conducted to provide more information about possible effects of this action.

**Cumulative Impacts.** Establishment of a water right to fulfill the purposes of the park would minimize additional lowering of local groundwater levels. Oil and gas exploration activities on lands that were formerly part of the Baca Ranch (but are now within the national park) are reasonably foreseeable in the near future; however, any such activities are subject to 36 CFR 9B, which requires that such activities be conducted in a manner that is consistent with protection of water resources (among other resources). The dunefield focus—maximize wildness alternative would have both beneficial and adverse effects on water resources, as discussed above. Combined with past, present, and reasonably foreseeable future actions, the impact of the no-action alternative on water resources would be long term, minor to moderate, and adverse.

**Conclusion.** Higher use levels would result in increased wastes and sediments in certain surface waters. Restricting dogs to limited areas within the national park and providing backcountry toilets would improve water quality. Social trails could cause bank erosion and stream sedimentation in the several stream corridors (e.g., Deadman Creek, Big Spring Creek, and lower Sand Creek). These actions would have long-term, minor, adverse impacts and long-term, minor beneficial impacts to surface water and potentially to shallow groundwater quality. Discontinuing surface irrigation of hay meadows on Medano Ranch would affect surface water hydrology and possibly groundwater levels, but research would be needed to determine

the nature of these impacts. There would be no impairment of water resources from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

**VISITOR USE AND EXPERIENCE**

**Visitor Use Projections**

Projected annual visitor use at Great Sand Dunes for the dunefield focus—maximize wildness alternative would be 397,100 by 2025, the lowest of the three draft GMP action alternatives. That level of use represents an increase of more than 106,000 annual visitors over the 2004 adjusted total and 22,300 (6%) more visitors than the no-action alternative (table 24). As for the no-action alternative, the principal factor that would drive increased visitor use is population growth in the San Luis Valley and Colorado. Annual use in 2025, under this alternative, would be about 30,000 fewer visitors than under the NPS preferred alternative.

Key elements of the dunefield focus—maximize wildness alternative that would influence future use include the following:

- management emphasis maintaining most of the Great Sand Dunes in primitive and undeveloped conditions, and recommendation of most eligible land for wilderness
- expansion of parking and related support facilities in the frontcountry zone as the frequency of filled lots and congestion increases
- restricting dogs to parking lots, campgrounds, and picnic areas
- the long-term return of Medano Ranch to natural and wild conditions, if the National Park Service acquires the property from The Nature Conservancy

**TABLE 24. CURRENT AND PROJECTED ANNUAL VISITORS IN 2025  
DUNEFIELD FOCUS—MAXIMIZE WILDNESS ALTERNATIVE**

2004 (recorded)	2004 (adjusted baseline)	No-Action Alternative	NPS Preferred Alternative	Dunefield Focus Alternative
268,400	291,000	374,800	427,100	397,100
Increases over 2004 (adjusted)				
Annual Visits (number)		+83,800	+136,100	+106,100
Annual Visits (percent)		+29%	+47%	+36%
Increases over the No-Action Alternative				
Annual Visits (number)		AA	+52,300	+22,300
Annual Visits (percent)		N/A	+14%	+6%

By 2025, projected visitation during the 3-month summer peak would reach nearly 235,000 visitors, about 13,000 higher than the 221,300 visitors projected under the no-action alternative for the summer months. Most of the increase would be focused in the frontcountry and dunes play zones, with an anticipated increase of about 5,000 visitors during July. Over time, the rise in visitation at peak periods could encourage visitors to arrive earlier or later in the year, that is, during the shoulder seasons.

Projected annual dispersed day and overnight use across the remainder of the park would reach 40,300 visitors under the dunefield focus—maximize wildness alternative, about 3,500 higher than under the no-action alternative, and about 12,000 fewer than with the NPS preferred alternative. Under this alternative, recreation use in much of the natural zone west of the dunefield, which would also be recommended for wilderness, would be very low.

### **Visitor Experience**

Most visitor use would remain focused in the eastern part of the dunefield. Parking and related support facilities in this area could be expanded to respond to higher demand as the frequency of filled parking lots and levels of congestion warrant. Visitor opportunities would be diversified by: (1) easier access to localized areas of the dunes and Medano Creek (from expanded parking), and (2) the new multiuse trail, which would allow visitors to see the park from a different perspective.

Backcountry use in the preserve is projected to grow over time, although the Mosca, Music, and Medano Pass access points would remain relatively isolated from substantial levels of nearby development and associated population

growth. Due to available access points, backcountry use would remain focused around upper Sand Creek, Medano Pass primitive road, the Mosca Pass corridor, and the northern-most portion of the national park. However, given this alternative's emphasis on wild conditions, there would likely be substantial interest in exploring backcountry areas on foot or horseback. People seeking wilderness experiences would probably visit specifically to explore the park's more remote areas.

A new horse gate on the park's northern boundary would encourage equestrian users to access and explore new park areas (i.e., former Baca Ranch lands) that are currently difficult to get to. The gate would also make it possible to reach the Sand Creek drainage from the west, which has terrain well-suited for horse use.

The frontcountry parking expansion, new multiuse trail and horse gate, and emphasis on wild conditions in most of the park, discussed in the preceding paragraphs, would have long-term, moderate, beneficial impacts on visitor experience.

Expansion of parking and related support facilities in the frontcountry zone means that frustrations related to vehicle and pedestrian circulation would be largely avoided, at least for the present time. However, visitors would encounter more people and congestion in the following areas: in the frontcountry zone, in the dunes play zone, on Medano Pass primitive road, and on trails in the national park and in the preserve. The campground would likely fill more often and earlier in the day. Rather than deal with crowded conditions on the Medano Pass primitive road, some visitors would undoubtedly seek out other options outside the park. Localized crowding and congestion in frontcountry and backcountry access zones would have

minor adverse impacts on visitor experience.

As in the no-action alternative, information, education, and interpretation activities would be concentrated in the area east of the dunefield; there would be little change with respect to these services and opportunities.

Visitors who like to travel and/or recreate with their dogs would have much less freedom to do so compared with the no-action alternative—dogs would be allowed only in parking areas, picnic areas, and car campgrounds. This would likely discourage some dog lovers from visiting the park. Other visitors would be pleased; this policy would virtually eliminate concerns and complaints related to aggressive dogs and dog waste in the dunes play zone, where considerable recreational activity occurs. The new policy regarding dogs in the park would have long-term, minor, adverse, and beneficial impacts on visitor experience.

The dunefield focus—maximize wildness alternative would offer ample opportunities to experience wilderness conditions within existing wilderness areas. The horse gate on the north end would be the only new access point, so remote areas would remain so. However, in less remote parts of the wilderness, increasing visitor numbers over time could affect wilderness values (opportunities for solitude, evidence of human use, etc.). The larger, busier frontcountry zone could have “spillover” effects, degrading wilderness conditions in adjacent wilderness areas. Eventually, day-use backcountry permits might be required to maintain desired conditions in the natural/wild zone. Diminished wilderness values in less remote portions of existing wilderness areas would have a long-term, minor, adverse impact on visitor experience. A wilderness recommendation for most new park lands means that new

wilderness experiences would be offered. The sand sheet and sabkha life zones present a different wilderness setting from that available in the dunes and forest. Like the NPS preferred alternative, this one would allow visitors to hike or ride horseback around the massive dunefield almost entirely within designated wilderness. New wilderness opportunities would result in long-term, major, beneficial impacts to visitor experience.

**Cumulative Impacts.** Rehabilitation of main park roads and parking areas, which includes increasing the capacity of the dunes lot by 5%, is planned for the near future and would modestly improve pedestrian and vehicle traffic flow in the immediate area. The dunefield focus—maximize wildness alternative provides for more substantial expansion of frontcountry parking, which would relieve frustrations from vehicle and pedestrian circulation in this area, at least temporarily. Ongoing wilderness restoration efforts in the South Colony Lakes basin area are improving wilderness values in the Sangre de Cristo Wilderness. This alternative would lead to diminished wilderness experiences in less remote areas, and maintain wilderness experiences in more remote areas of the Sangre de Cristo Wilderness within the park. It would also provide new, different wilderness opportunities, from a wilderness recommendation for most new park lands. Combined with past, present, and reasonably foreseeable future actions, the dunefield focus—maximize wildness alternative would have minor adverse and minor to major beneficial effects on visitor experience.

**Conclusion.** The frontcountry parking expansion, new multiuse trail and horse gate, and emphasis on wild conditions in most of the park would have long-term, moderate, beneficial impacts on visitor experience. Localized crowding and

congestion (frontcountry and backcountry access zones) would have minor adverse impacts on visitor experience. The new policy regarding dogs in the park would have long-term, minor, adverse, and beneficial impacts on visitor experience. Diminished wilderness values in less remote portions of existing wilderness areas would have a long-term, minor, adverse impact on visitor experience. New wilderness opportunities would result in long-term, major, beneficial impacts on visitor experience.

## SCENIC RESOURCES AND VISUAL QUALITY

Under the dunefield focus—maximize wildness alternative, there would be no new human-made structures or vehicle areas in the national preserve that would affect scenic quality. However, in the frontcountry and dunefield focus zone, additional parking and comfort stations would be provided if demand warranted, and a multiuse path from the park boundary to the visitor center would be constructed east of the main park road. These human-made features would be at least partially visible from some key vantage points (e.g., the high dunes and mountain slopes) and would have minor to moderate, long-term, localized, adverse impacts to scenery.

A horse gate (or gates) would be provided on the northern boundary, where the national park adjoins the Baca Grande subdivision. With nowhere to park in the north part of the national park, many hikers and equestrians would park their vehicles, including horse trailers, on county roads within the subdivision to gain access to the park. As in the no-action alternative, scenic views would be affected locally by vehicles parked near the edge of the subdivision. In this case, however, parked

vehicles would also include horse trailers due to the new horse gate or gates on the northern boundary. Impacts on scenic views would be short and long term, adverse, and minor to moderate in intensity.

Structures at Medano Ranch headquarters would be documented but not maintained, or they would be removed after documentation. Medano Ranch corrals, fences, and utilities would also eventually be removed. No new facilities such as structures, roads, or trailheads would be provided in the park expansion area. The natural landscape in the park expansion area would be maintained and would eventually appear even more natural and wild. Impacts on scenery from these actions would be long term, minor, and beneficial.

Outdoor lights and vehicle traffic in the vicinity of Medano Ranch headquarters would eventually be phased out. No new sources of vehicle-induced dust and no new sources of light would be introduced. Impacts on visibility and the night sky would be negligible to minor, long term, and beneficial.

**Cumulative Impacts.** Rehabilitation of main park roads and parking areas, which includes increasing the capacity of the dunes lot by 5%, would result in a negligible, long-term, localized, adverse impact on scenic resources. Prescribed burns (fire management) would have short-term, minor, adverse, localized impacts on scenery and visibility. Continued residential growth of the Baca Grande subdivision would mean that more homes, retreat centers, commercial structures, and vehicles would be visible in this area in the future. Expanded residential development could also increase dust and wood smoke levels. The private land parcel that is for sale near the park entrance could be

rezoned to commercial and developed. Overall, such new development would intrude upon the area's natural scenery (at least from some vantage points), affect visibility, and introduce new light sources into the night sky. Regional population growth and development would also continue to introduce additional light into the night sky. The dunefield focus—maximize wildness alternative would contribute minor to moderate adverse impacts and negligible to minor beneficial impacts on scenic resources and visual quality. Combined with other past, present, and reasonably foreseeable future impacts, this alternative would have short- and long-term, moderate, adverse effects and negligible beneficial effects on scenic resources and visual quality.

**Mitigation.** No mitigation is proposed for this alternative.

**Conclusion.** The dunefield focus—maximize wildness alternative would have short- and long-term, minor to moderate, adverse impacts on scenery. It would also have long-term, negligible to minor, beneficial impacts on scenery, visibility, and the night sky. There would be *no impairment* of scenic resources and visual quality from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## SOCIOECONOMICS

Implementing the dunefield focus—maximize wildness alternative would occur against the same backdrop of economic, demographic, and social changes across the San Luis Valley described under the no-action alternative. The economic and social effects of the dunefield focus—maximize wildness alternative would add to those

changes, but not fundamentally change the area's economic and demographic outlook.

### Visitor-Related Economic Impacts

By 2025, annual visitor use at the park is projected to reach 397,100 recreation visits, which is 106,100 visits or 36% higher than visitation in 2004, and 22,300 more than under the no-action alternative. As under the no-action alternative, visitor use under the dunefield focus—maximize wildness alternative is expected to increase over time, but with some periods of higher or slower growth, or even some year-to-year declines. Peak monthly visitation of 85,700 visitors is projected in July 2025, as compared to about 80,800 under the no-action alternative.

Visitors to the park from outside the valley are expected to account for the majority of future visits, though the number of visits by residents of the region would also increase.

Projected visitation under the dunefield focus—maximize wildness alternative would result in 204,810 party days of visitor use, an increase of 12,150 party-days over that estimated for the no-action alternative. Retail, lodging, and other tourism-type spending across the region would reach \$19.61 million per year in 2025, \$1.18 million higher than in 2004, and \$2.72 million per year higher than for the no-action alternative. The higher visitor spending would benefit private businesses, as well as increasing the sales tax receipts for local governments. The park would collect higher entry fees and sales of various passes, and the Western National Parks Association would see higher merchandise sales.

Economic spin-offs from the visitor spending include \$6.12 million per year in personal income and 503 jobs. Those levels

represent \$0.37 million more in annual income and 31 more jobs than would occur in 2025 under the no-action alternative. The visitor-related impacts would be long term, but minor relative to overall employment and personal income in the two directly affected counties.

The effects on state and local governments under this alternative would be comparable to those under the no-action alternative; higher sales tax receipts due to the increased visitor spending, property taxes on new development, and PILT receipts for Saguache and Alamosa counties due to population growth and increases in federal ownership.

The visitor-related economic impacts would be beneficial, but negligible in the short term and minor and beneficial over the long term.

### **Economic Impacts Related to GMP Implementation and Park Operations**

The economic stimulus associated with implementation of the dunefield focus—maximize wildness alternative would include \$10.6 million in future capital spending, \$7.4 million in non-annual recurring costs, and increased non-payroll operating and maintenance expenditures. Increased staff would be required at the park over time to maintain current service levels, although any such increases are contingent upon additional base funding. The incremental staff need is estimated at five FTEs, at an annual cost of approximately \$260,000 over the current budget, but equivalent to that for the no-action alternative.

Short-term economic impacts associated with future capital and non-annual recurring outlays would support the local construction trades and related industries.

As with the other alternatives, the timing of these infusions is uncertain because they are subject to congressional appropriations, allocations within the National Park Service, and future entry and camping fees collected at the park that are used to support maintenance and construction projects. Recurring operating expenditures for the park would yield long-term impacts on employment, business sales, income and other related measures. The economic effects tied to these economic stimuli include:

- capital construction (short term): 158 job-years of employment and \$4.62 million in personal income over time, between 2006 and 2025
- non-annual recurring (short term): 122 job-years of employment and \$3.39 million in personal income over time, between 2006 and 2025
- park operations (long term): 43 jobs, including 33 FTEs of direct NPS staffing, and \$1.95 million per year in annual income

The economic effects of the dunefield focus—maximize wildness alternative are almost the same as those under the no-action alternative. The one area of minor differences reflects the \$3.8 million in higher capital outlays for the dunefield focus.

With the dunefield focus—maximize wildness alternative, the long-term gains in economic benefits associated with park operations could be offset, in part, by losses in the economic benefits associated with The Nature Conservancy's operation of Medano Ranch. If and when that happens would depend on the timing of federal acquisition of the ranch and a decision by The Nature Conservancy to stop its bison operations on the ranch. At that time, full

implementation of the proposed management zoning would proceed.

The end of the bison operation on Medano Ranch would also mark a transition in land use from agriculture to a more natural setting. Fencing would be removed and other vestiges of active agricultural operations would be removed or become less noticeable as natural processes are allowed to re-establish themselves.

The economic effects associated with park operations would be beneficial, but negligible to minor in the short term and beneficial and minor over the long term.

### **Community Services**

Impacts on community services associated with the dunefield focus alternative would be comparable to those under the no-action alternative. The limited scale, seasonal nature, and spatial dispersion of such demands across the region are such that facility expansions and additional staffing would not be required.

Effects on community services under this alternative would be indeterminate and negligible over the short term and long term.

### **Traffic and Emergency Services**

Traffic impacts of the dunefield focus—maximize wildness alternative on highways and roads providing access to the park would be comparable to those under the no-action alternative. Most of the additional traffic would be concentrated on SH 150 and Alamosa County 6N, the primary access roads to the park's main entrance. Most travelers would notice little change in travel conditions under the dunefield focus alternative. Even with the

increases in traffic, future traffic levels would be well within the design capacity of the roads, and they would not substantially increase the need for highway maintenance.

As in the no-action alternative, traffic volume north of the park would increase, especially on Saguache County Road T between SH 17 and Crestone/Baca Grande, and on roads within the Baca Grande subdivision. This would occur because although this alternative does not provide for public vehicle access into the north part of the park, traveling through the subdivision would remain the easiest way to get to that portion of the park. Thus, visitors to the north part of the park would continue to travel and park on county roads that terminate near the park's northern boundary. From there, they would walk or ride a horse (through a new horse gate) into the park. While in the area, some visitors might drive around the subdivision to explore alternate routes of approach to the park or adjacent national forest, visit spiritual retreats, or consider properties for sale. Traffic on subdivision roads would increase, and there would be localized problems from vehicles parking near the terminus of certain roads. This localized congestion would be greater than in the no-action alternative because it would include vehicles pulling horse trailers. Effects would be greatest on summer weekends and holidays and would likely intensify as (1) the park visitor population grows over time, and (2) as word spreads about access points to public lands. Given expected traffic increases from residential and spiritual retreat growth in Crestone and the Baca Grande subdivision, the contribution of park visitor-related traffic would be minor. However, vehicle congestion from visitors parking (or trying to park) near the terminus of county roads could be

bothersome, especially for those who live nearby.

Impacts on the number of traffic accidents and demands on first responders would be similar to those under the no-action alternative. The demands associated with the dunefield focus—maximize wildness alternative would not require additional law enforcement or emergency response staffing, although the increases in the number of “call outs” would burden area first response agencies because they are staffed by volunteers.

More travelers would cause more traffic accidents and demands on local law enforcement, emergency medical, and fire protection agencies. The scale of changes associated with the no-action alternative would not require law enforcement agencies to hire more staff, though they could contribute to overall needs for additional staff. While the frequency of incidents would remain relatively low, the distances and response times involved and the fact that many emergency medical and fire protection agencies in the area are staffed by volunteers, would impose a burden on these providers.

The effects of the dunefield focus—maximize wildness alternative on traffic and emergency services would be long term, adverse, and minor to moderate in intensity.

### **Attitudes and Lifestyles**

The dunefield focus—maximize wildness alternative establishes future management direction for the park that also reflects public input, park fundamental resources and values, and the foundation established by management of the former national monument. However, its focus on maintaining the wild and undeveloped

character of much of the newly acquired lands would tend to polarize opinions and attitudes more so than either the no-action or NPS preferred alternatives. Those favoring solitude, wilderness, adventure characterized by self-reliance and limited access to the new areas may tend to support this alternative. Those who viewed the park expansion and its opportunities more from a potential economic development perspective may be disappointed.

Like the no-action alternative, the management direction for this alternative would result in relatively few direct lifestyle consequences, as the influences of the park would generally be consistent with those resulting from the no-action alternative. Compared to the other action alternatives, the dunefield focus—maximize wildness alternative may be the most desirable in terms of conditions that affect the Crestone/Baca Grande community and fundamental qualities that underlie their decisions to live and/or provide services in the community.

**Cumulative Effects.** Cumulative social and economics arising from the dunefield focus—maximize wildness alternative are of the same type and scale as those under the no-action alternative. The cumulative effects include slightly higher traffic on Saguache County Road T and in the Crestone/Baca Grande community, higher spending by visitors that would bolster tourism-oriented businesses across the valley, and additional tax revenues to fund public services and facilities. The incremental effects on traffic would be small in relationship to traffic created by area residents, commercial vehicles, and other travelers passing through the area. Increases in park visitation would enhance the commercial development potential for private lands near the park’s main entry. Any sales and subsequent development of

those lands would have economic implications, as well as changing the visitor experience. The incremental effects of the dunefield focus—maximize wildness alternative would be negligible to minor in the short-term and minor in the long term, and generally beneficial, as compared to other social or economic effects resulting from the cumulative actions.

**Conclusion.** The economic and social effects of the dunefield focus—maximum wildness include negligible to minor short-term and moderate long-term economic benefits comparable to those under the no-action alternative. Long-term social consequences include a negligible to minor contribution to long-term population growth and demands on community infrastructure and services. Short- and long-term lifestyles and attitudes are indeterminate.

## HEALTH AND SAFETY

In the dunefield focus—maximize wildness alternative, Medano Ranch headquarters structures would not be adaptively used if/when The Nature Conservancy transfers the property to the National Park Service. Instead, after documentation, these structures would be removed or left unmaintained. Visitors would have access to the Medano Ranch headquarters area, so there would be some risk of structural fire, either accidental or arson. If a structural fire started, windy conditions could fan the fire into adjacent park areas. Prevailing winds would be most likely to fan fires eastward into the park, in which case the dune mass would probably act as an eventual natural barrier. Thus, the risk of fire spreading to areas of focused visitor use or to residential areas outside the park would be low. In the dunefield focus—maximize wildness alternative, public vehicle access would remain the same as in

the no-action alternative. However, parking could be expanded in the frontcountry zone, which would locally reduce vehicle congestion and help keep the incidence of traffic accidents from rising as visitation increases over time. The proposed multi-use (hiking/biking) path from the main park entrance to the visitor center, dunes lot, and campground would separate pedestrian and bicycle traffic from vehicle traffic along the main park road. This would provide a measure of increased safety for cyclists and pedestrians, particularly as numbers of vehicles increase with time. Some pedestrian/bicycle accidents could result from mixing pedestrians and cyclists on the same path, however. Compared to the no-action alternative, the dunefield focus—maximize wildness alternative is expected to have a long-term, negligible to minor, beneficial impact on safety from these actions.

Park lands that were once part of Baca Ranch would remain remote. Due to limited access and the wilderness recommendation for this alternative, visitors would assume some additional risk in visiting this area. The same would be true for the Medano Ranch area. Emergency response times to these areas would be longer compared with the no-action alternative. Bison would no longer graze within the park, so this minimal risk to visitor safety would be eliminated. In sum, these actions would have long-term, minor, adverse impacts, and negligible to minor beneficial impacts.

**Cumulative Impacts.** Relocation of the horse loading area east of the dunes is planned for the near future. This would include providing a dirt surface, allowing surer footing for horses, and a reduced risk of accidents. The *Greater Sand Dunes Interagency Fire Management Plan* (2005) includes measures for safely and efficiently managing wildland fires within the park

and preserve, the Baca National Wildlife Refuge, and The Nature Conservancy's Medano Zapata Ranch. The dunes parking lot within the national park is planned for minor expansion (~5%) and reconfiguration to improve vehicle circulation and increase capacity. Although the incidence of traffic accidents in the dunes lot is very low, this action would probably provide some small measure of increased safety as visitor use increases with time. The dunefield focus—maximize wildness alternative would contribute minor adverse and negligible to minor beneficial impacts on visitor safety. Combined with other past, present, and reasonably foreseeable future actions, the dunefield focus—maximize wildness alternative would have a long-term, negligible to minor, beneficial effect on safety.

**Conclusion.** The dunefield focus—maximize wildness alternative would provide negligible to minor beneficial safety impacts from expanded frontcountry parking, a hiking/biking path, and elimination of bison from the park. Long-term, minor, negative impacts would accrue from reduced administrative access and from the wilderness recommendation.

## **NATIONAL PARK SERVICE OPERATIONS**

Under the dunefield focus—maximize wildness alternative, new facilities that would add to the National Park Service maintenance load would be very limited and would be focused in the frontcountry zone. Parking and restrooms there would be expanded if demand warranted, and a multiuse path would be provided from the park entrance to main visitor facilities. Assuming The Nature Conservancy eventually transfers Medano Ranch to the National Park Service, facilities there would become the responsibility of the

National Park Service; in keeping with this alternative's concept, these facilities would be documented but not maintained, or they would be removed. Limited new facilities would be an additional burden on maintenance staff. Maintenance of additional facilities would have a minor, long-term, adverse impact on park operations.

Activities that would require more staff time in this alternative include: patrolling the frontcountry multiuse path, patrolling remote backcountry areas, and providing emergency response services in remote areas. Compared to the no-action alternative, administrative access would be severely limited, so activities in the backcountry would require more time to plan and conduct. Most of the park expansion area would be recommended for wilderness. Thus, certain activities (including activities by the National Park Service, other resource management agencies, and researchers) would require a wilderness minimum requirements analysis, which would take staff time to conduct. If the minimum requirements analysis indicated that an activity should be conducted using nonmotorized/mechanized travel and techniques, the time required to conduct (or support) such an activity could be much greater than with no wilderness. Changes in management responsibilities, limited administrative access, and new wilderness stipulations would have long-term, moderate, adverse impacts on park operations.

**Cumulative Impacts.** Expansion of nearby communities, fire management responsibilities, elk herd reduction, pursuing a National Park Service water right, management of oil and gas exploration activities, and similar management needs would require time and attention by senior NPS staff. Cooperation and coordination with neighboring agencies and entities regarding planning, proposals near the park, etc., also

require substantial amounts of staff time. The dunefield focus—maximize wildness alternative would place an additional burden on NPS staff, but this burden would be lessened if the park were staffed appropriately. Combined with past, present, and reasonably foreseeable future impacts, the dunefield focus—maximize wildness alternative would have moderate, long-term, adverse impacts on NPS operations.

**Conclusion.** Maintenance of additional facilities (limited) in the frontcountry zone would have a minor, long-term, adverse impact on park operations. Changes in management responsibilities, limited administrative access, and new wilderness stipulations would have long-term, moderate, adverse impacts on park operations. If the park were to eventually achieve full staffing, the impact would be long term, minor, and beneficial.

## **OPERATIONS OF OTHER ENTITIES AND MANAGEMENT AGENCIES**

### **Public Vehicle Access To / Through North Portion of the Park**

Under the dunefield focus—maximize wildness alternative, park access points would remain as they currently exist, except that a formalized gate (or gates) for horse access would be provided on the north boundary of the national park. Access across the northern boundary of the national park would be limited to pedestrian and equestrian traffic. The dunefield focus alternative does not provide for possible future evaluation of public vehicle access routes to the mountain front. Administrative access via Liberty Road would be permitted under this alternative, as it is under all alternatives. Impacts of the dunefield focus

alternative on other management agencies would be similar to those for the no-action alternative associated with planning and remediation expense.

### **Designation of Additional Wilderness Areas Within the Park**

The dunefield focus—maximize wildness alternative would recommend additional wilderness, as in the NPS preferred alternative. The consequences of this additional wilderness for other agencies would equate to those anticipated under the NPS preferred alternative (short and long term, moderate, adverse).

**Cumulative Impacts.** Cumulative impacts of this alternative with past, present, and reasonably foreseeable future actions would be the same for other agencies and organizations as those anticipated under the NPS preferred alternative. The dunefield focus—maximize wildness alternative would be anticipated to combine with these other cumulative actions and potentials to result in a moderately adverse impact on other management agencies and organizations.

**Conclusion.** The dunefield focus—maximize alternative would be anticipated to have short- and long-term, minor to moderately adverse impacts on other management agencies and organizations. This impact would stem from lack of access to the mountain front (minor impact), and increased planning and documentation required to carry out management activities in wilderness areas (moderate impact).

## **UNAVOIDABLE ADVERSE EFFECTS**

Some impacts caused by human use (especially minor, inadvertent impacts to archeological sites, vegetation, soils, water

resources, etc.) are essentially unavoidable because not allowing people in the park would be inconsistent with the National Park Service mission.

### **IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES**

Irreversible impacts are permanent. An irretrievable commitment of resources refers to resources that, once removed, cannot be replaced. Archeological resources that are stolen or vandalized are irreversibly lost. Even moving or disturbing such resources constitutes an irreversible commitment of resources because information is lost if the context (location and condition) is changed, even

inadvertently. Removal or cessation of maintenance of historic structures results in the eventual irreversible loss of those structures, even though that loss can be partially mitigated (for example, through documentation). Thus, there would be some irreversible loss or commitment of archeological resources and historic structures (at Medano Ranch headquarters) from this alternative.

### **RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY**

There would be no adverse effects on biological or economic productivity from implementation of this alternative.

## **IMPACTS OF THE THREE PUBLIC NODES ALTERNATIVE**

### **ARCHEOLOGY**

Under the three public nodes alternative, visitors would access the park primarily through three areas or nodes: the existing main entrance southeast of the dunes, the backcountry zone in the north portion of the national park, and Medano Ranch. As in the no-action alternative, there would be potential for archeological impacts in frontcountry areas, creek corridors, and along established trails (all areas with concentrations of archeological resources) from trampling of sites, vandalism, and theft. Impacts would be adverse and minor to moderate in intensity.

The new backcountry access zone in the north of the park would include an access road, trailhead, and small primitive campground (all to be located on previously disturbed ground if possible). The new access route and the campground

would encourage visitor access into the north portion of the national park and to other core park areas. Much of the park expansion area has not yet been surveyed for archeological resources because it has until recently been privately owned. However, based on archeological information that is available from other areas of the park, archeological resources are likely present. Other trails would be added in as yet undetermined locations in the northern portion of the national park and national preserve (backcountry adventure zone), so impacts could also occur from trail construction. Impacts from increased visitor use in the north and in core park areas, and from trail construction, would be site specific, adverse, and range from minor to moderate.

Assuming The Nature Conservancy transferred management of Medano Ranch to the National Park Service, Medano Ranch headquarters would become a

public day-use (frontcountry) area and would also be used for NPS administrative purposes. The adjacent guided learning zone would help protect archeological resources; visitors would not be in this area without a guide, and use would be directed to prevent most inadvertent adverse effects. Also, guides would help monitor resources on a regular basis. Park staff would be regularly present in the general area of Medano Ranch, serving as a deterrent to those who might otherwise intentionally harm sensitive archeological resources. Closer monitoring and the guided learning management zone would provide long-term, minor, beneficial impacts to archeological resources.

**Cumulative Impacts.** Residential and spiritual retreat growth in the Crestone/Baca Grande area have undoubtedly adversely affected archeological resources. Additional, as yet undisturbed resources would likely be disturbed or destroyed in the future as this area continues to grow (from ground disturbance during construction and from looting and unintentional disturbance). The foreseeable development of private land near the park entrance could similarly affect archeological resources. Rehabilitation of main park roads and parking could have potential long-term, localized, minor to moderate, adverse impacts to a NRHP-eligible archeological site (5AL405) from construction activities and heavy equipment. The interagency fire management plan could have beneficial effects if areas identified for prescribed burns or fuel reduction are first surveyed for archeological resources. This would expand identification of and knowledge about regional archeological resources. The three public nodes would contribute both adverse and beneficial effects on archeological resources, and these impacts would be confined within the park. Combined with past, present, and

reasonably foreseeable future actions, the no-action alternative would have minor to moderate adverse impacts and minor beneficial effects on archeological resources.

**Mitigation.** In general, facilities would be located and designed to minimize direct and indirect adverse effects to archeological resources. If avoidance is not possible, mitigation measures would be developed in consultation with the Colorado SHPO and federally recognized American Indian tribes. Areas under consideration for new facilities (e.g., trails, primitive campground) would be surveyed for archeological resources before any ground-disturbing activities took place. If archeological sites were discovered during such project-specific surveys, they would be evaluated and, if necessary, new locations for facilities would be identified. There would be a regular National Park Service presence in the north part of the park due to the primitive campground and potential for increased use (including overnight use), in the area. Having NPS staff there on a regular basis would improve monitoring of sites and serve as a deterrent to intentional damage.

**Conclusion.** Impacts from visitor use in existing areas, new vehicle access, and new trails would be site specific, adverse, and would range from minor to moderate. Closer monitoring, the guided learning management zone, and NPS presence in more areas of the park would provide long-term, minor, beneficial impacts to archeological resources. There would be *no impairment* of archeology from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## HISTORIC STRUCTURES

Assuming management of Medano Ranch were transferred to the National Park Service, the headquarters complex would be used as a public day-use area (front-country zone) and also for administrative purposes. Such uses would require some initial restoration and renovation, as well as constant upkeep of the complex. This would prevent further deterioration of historic structures and constitute a minor, long-term, localized, beneficial impact.

Opening the Medano Ranch headquarters area to public day use would result in substantially more vehicle and pedestrian access and traffic. There would be more potential for vandalism, although such activity would be discouraged by the presence of NPS staff. Also, depending on the type and exact location of public use, there could be increased general wear and tear on historic structures. Impacts would be negligible to minor, long term, localized, and adverse.

Adaptive reuse of these buildings would require modifications to the buildings, which, if not properly designed and implemented, could change character-defining historic features. Some buildings could be removed. Removing any significant historic buildings would constitute a major, long-term, localized, adverse impact. Installation of new facilities (e.g., parking areas, restrooms, picnic areas) would also have to be conducted carefully or it could result in minor to moderate, long-term, localized, adverse impacts on historic structures.

**Cumulative Impacts.** No cumulative effects would be anticipated.

**Mitigation.** Mitigation measures are undertaken to reduce potential impacts to

cultural resources. Mitigation would include consultation with the Colorado SHPO regarding restoration, rehabilitation, or removal of any Medano Ranch structure, or construction of any new facilities. This would ensure that the historic character and integrity of the ranch is not affected.

**Conclusion.** Potential effects to Medano Ranch would include minor, long-term, localized, beneficial impacts (from rehabilitation associated with adaptive use) and minor to major, long-term, localized, adverse impacts (from potential modifications to structures, public use, and vandalism). Through compliance with section 106 of the National Historic Preservation Act, consultation with the Colorado SHPO, and mitigation, the severity of impacts can be reduced below the “major” threshold. There would be *no impairment* of historic structures from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## CULTURAL LANDSCAPES

Assuming management of Medano Ranch were transferred to the National Park Service, the headquarters complex would be used as a public day-use area (front-country zone) and also for administrative purposes. Such uses would require some initial restoration and renovation, as well as constant upkeep of the complex and surroundings. This would prevent deterioration of the potential cultural landscape and constitute a minor, long-term, localized, beneficial impact.

Opening the Medano Ranch headquarters area to public day use would result in substantially more vehicle and pedestrian access and traffic. There would be the potential for more vandalism, although

such activity would be discouraged by the presence of NPS staff. Impacts would be negligible to minor, long term, localized, and adverse.

Adaptive reuse of Medano Ranch buildings would require modifications to the buildings, which, if not properly designed and implemented, could change potentially contributing elements of the cultural landscape. Some buildings could be removed. Removing any significant historic buildings could affect the integrity of the potential cultural landscape and would result in major, long-term, adverse impacts. Similarly, installation of new facilities (e.g., parking areas, restrooms, picnic areas) could also affect the historic character of the ranch and result in minor to moderate, long-term, localized, adverse impacts.

**Cumulative Impacts.** No cumulative effects would be anticipated.

**Mitigation.** Mitigation measures are undertaken to reduce potential impacts to cultural resources. Mitigation would include consultation with the Colorado SHPO regarding restoration, rehabilitation, or removal of any Medano Ranch structure, or construction of any new facilities. This would ensure that the historic character and integrity of the ranch is not affected.

**Conclusion.** Effects in the Medano Ranch potential cultural landscape would include minor, long-term, localized, beneficial impacts (from rehabilitation associated with adaptive use) and moderate to major, long-term, localized, adverse impacts (from potential modifications to structures, public use, and vandalism). Through compliance with section 106 of the National Historic Preservation Act, consultation with the Colorado SHPO, and mitigation, the severity of impacts can be reduced below the “major” threshold.

There would be *no impairment* of cultural landscapes from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## VEGETATION

Visitation in the public area (“node”) near the east part of the dunes (frontcountry and dunes play management zones) would increase fairly substantially over time; see the “Visitor Use and Experience” section for projections. The sparse dunefield plant communities would experience adverse effects due to trampling, wind erosion, and landslide. Popular locales within the subalpine and tundra life zones could also experience increased use over time. Unspecified new trails in the backcountry adventure zone would result in adverse effects from construction, social trail establishment, and potential for nonnative plant species establishment. A second public node at Medano Ranch headquarters (frontcountry zone) would encourage visitor use in this area, and in the adjacent guided learning zone. New hiking and equestrian trails would originate at the Medano Ranch headquarters and extend into the guided learning management zone, where guided use only is permitted. Providing guided hiking and equestrian trails in the guided learning zone of Medano Ranch would direct visitor use around sensitive areas, benefiting plant communities. In general, impacts to vegetation from increased use and use in new park areas (including horse use) would be tempered by monitoring and management actions tied to a management zone-based carrying capacity approach (see chapter 2, “Management Zones” section for details). Overall, impacts to plant communities of the sabkha, sand sheet, and dunefield life zones would be short and

long term, minor to moderately adverse and short and long term, minor, beneficial.

A third public node would be provided in the northern part of the park. A new public vehicle access, a parking area for 15 to 20 vehicles, a primitive campground consisting of up to 10 sites, and a trailhead would encourage considerably more hiker and equestrian use in the northern backcountry portion of the park. Disturbed sites would be used as much as possible, but there still could be effects to plant communities from grading, drainage configuration and control structures, and gravel overlay. Effects could include removal of or disturbance to vegetation, burial of habitat, and increasing disturbed sites where nonnative plant species could become established. The mature narrowleaf cottonwood groves along the banks of Deadman Creek would likely attract some hikers and horseback riders for resting, watering animals, and other passive pursuits that could result in streambank and vegetation impacts. Most visitors would probably remain on designated trails (e.g., Cow Camp Road), which would avoid this riparian corridor for natural resource reasons. Improved hiking access to the mountain front might lead to increased use in the upper (USFS) portion of Deadman Creek, which includes a USFS-designated research natural area that currently receives little visitation. Overall, visitation increases and visitor use (including equestrian activities) in the north part of the park could result in incidental vegetation trampling and introduction of nonnative species. Impacts to sand sheet, dunefield, foothill, and montane plant communities would be short and long term, minor to moderate, and adverse.

If The Nature Conservancy were to transfer Medano Ranch lands to the National Park Service, managed bison

grazing would be discontinued. Over time, plant communities in this area would recover from impacts of managed bison grazing (e.g., streambank trampling, shifts in species composition from selective consumption of more palatable species, etc.). This would have short- and long-term, minor, beneficial impacts on sabkha and sand sheet plant communities.

The park would identify and manage nonnative plant populations, reducing their effect on native plant communities or possibly eliminating some stands from the landscape resulting in short- and long-term, minor to moderate, beneficial impacts on the species composition of plant communities and their habitat quality.

**Cumulative Impacts.** Generally, native plant communities of the San Luis Valley and of the park have been affected by over a century of livestock grazing and the effects are sometimes intensified by periods of drought. Depending on the local environment, grazing effects can range from minor shifts of plant and animal species composition to more serious wind and water erosion (e.g., blowouts and gullying) and nonnative plant introductions. Cattle grazing was discontinued on the former Baca Ranch lands in 2004, and some past adverse livestock impacts may gradually be reversed in the future. Rehabilitation of main park roads and parking areas, which includes increasing the capacity of the dunes lot by 5%, would result in minor, long-term, localized, adverse impacts on vegetation. Introduction of nonnative landscape plants from adjacent developed lands would result in adverse effects to native plant communities. Introduction of nonnative landscape plants from adjacent developed lands would result in adverse effects to native plant communities. Some native plant communities have undergone

historic disturbance during past land-use activities and are therefore subject to such nonnative plant species invasion. Under the three public nodes alternative, beneficial and adverse impacts to plant communities would result from higher use levels, new trails and trailheads, a primitive campground, establishment of the guided learning zone, removal of structures related to grazing livestock, discontinued of bison grazing, and control of nonnative plant populations. Combined with past, present, and reasonably foreseeable future actions, the three public nodes alternative would have long-term, minor to major, adverse, and moderate beneficial effects on plant communities.

**Conclusion.** Increased visitation, construction of limited new facilities (new trailhead, primitive campground, trails, and improvements to existing infrastructure) would have long-term, minor to moderate, adverse impacts on plant communities. Impacts would likely diminish with increasing distance from each “public node.” Cessation of managed bison grazing on Medano Ranch, carrying capacity monitoring and actions, and control of nonnative plant species would have long-term, minor to moderate, beneficial impacts on plant community species composition and habitat quality. There would be *no impairment* of vegetation from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## ECOLOGICALLY CRITICAL AREAS

Visitation in the public area (“node”) near the east part of the dunes (frontcountry and dunes play zones) would increase substantially over time. The dunefields in this management zone, which comprise a portion of the Great Sand Dunes ecologically critical area, would experience

more use and the seven rare sand sheet and dunefield plant communities, rare plant species (James cryptanth and slender spider-flower), and rare wildlife (insects and small mammals) would be subject to increased trampling, wind erosion, and landslide effects. A second public node at the Medano Ranch headquarters (frontcountry zone) would encourage visitor use in this area and in the adjacent guided learning zone within the San Luis Lakes / Sand Creek ecologically critical area. Although new trails would have adverse effects on this ecological critical area (from trail construction and potential for nonnative plant species establishment), impacts would be tempered by monitoring and management actions associated with a carrying capacity approach. Providing guided hiking and equestrian trails in the guided learning zone, located within the San Luis Lakes / Sand Creek ecologically critical area, would provide beneficial impacts to rare plant communities; rare wetlands and aquatic plant associations and the slender spider-flower areas could be avoided by directing and carefully monitoring use. Overall, impacts to the Great Sand Dunes and San Luis Lakes / Sand Creek ecologically critical areas from these actions would be short and long term, minor to moderate, adverse, and short and long term, minor, and beneficial.

A third public node would be provided in the northern part of the park. A new public vehicle access route, trailhead parking area for 15 to 20 vehicles, and a primitive campground would encourage considerably more hiker and equestrian use in the northern backcountry portion of the park. Disturbed sites would be used as much as possible, but there still could be effects to plant communities from grading, drainage configuration and control structures, and gravel overlay. Effects could include removal of or disturbance to vegetation, burial of habitat, and an increase of

disturbed sites where nonnative plant species could become established. The groves of mature, non-hybridized narrowleaf cottonwoods along the banks of Deadman Creek would likely attract some hikers and riders for resting, watering animals, and other passive pursuits. This activity could result in vegetation trampling (including habitat for the rare canyon bog orchid), grazing and browsing vegetation by horses, and potential introduction of nonnative plant species. However, most visitors would probably remain on designated trails (e.g., Cow Camp Road), which would avoid this reach of the riparian corridor for natural resource reasons; this would help moderate impacts. Further updrainage, adverse impacts could occur to the rare quaking aspen / Rocky mountain maple forest that has become established along Deadman Creek. Improved hiking access to the mountain front might lead to increased use in the upper (USFS) portion of Deadman Creek, which includes a USFS-designated research natural area that currently receives little visitation. Effects associated with the northern public node on sand sheet, dunefield, foothill, and montane plant communities of the Deadman Creek ecologic critical area would be short and long term, minor to moderate, and adverse.

If The Nature Conservancy were to transfer Medano Ranch lands to the National Park Service, managed bison grazing would be discontinued, and local plant communities would recover over time from associated streambank disturbance, impacts from selective consumption of more palatable plants, etc. The end result would be long term, minor beneficial impacts on Medano Ranch portions of the San Luis Lakes / Sand Creek ecologically critical area plant communities and wildlife habitat.

The park would identify and manage nonnative plant populations, reducing their effect on native plant communities or possibly eliminating some stands from the landscape resulting in short- and long-term, minor to moderate, beneficial impacts on the species composition of plant communities and their habitat quality.

**Cumulative Impacts.** Generally, ecologically critical areas within the park have been affected by over a century of livestock grazing and the effect is sometimes intensified by periods of drought. Depending on the local environment, grazing effects can range from minor shifts of plant and animal species composition to more serious wind and water erosion (e.g., blowouts and gullying) and nonnative plant introductions. Cattle grazing was discontinued on the former Baca Ranch lands in 2004, and some past adverse livestock impacts may gradually be reversed in the future. Some native plant communities have undergone historic disturbance during past land-use activities and are therefore subject to such nonnative plant species invasion. Under the three public nodes alternative, beneficial and adverse impacts to plant communities of the three ecologically critical areas would result from higher use levels, new trails and trailheads, a primitive campground, establishment of the guided learning zone, removal of structures related to grazing livestock, discontinuation of bison grazing, and control of nonnative plant populations. Combined with past, present, and reasonably foreseeable future actions, the three public nodes alternative would have long-term, minor to major, adverse, and moderate beneficial effects on ecologically critical areas.

**Conclusion.** Higher use levels over time, use in new areas, and limited new facilities

(access routes, trailheads, trails, and a new campground) would mean more potential for introduction of nonnative plant species, trampling of vegetation, and establishment of social trails. Plant communities throughout the park could be affected, but less so with increasing distance as achieved from each “public node.” The end result would be long-term, minor to moderate, adverse impacts on three ecologically critical areas. Cessation of bison grazing, control of nonnative plant species, and management zone-related carrying capacity actions would have long-term, minor to moderate, beneficial impacts on ecologically critical areas. There would be *no impairment* of ecologically critical areas from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## FEDERAL THREATENED AND ENDANGERED SPECIES

In the three public nodes alternative, one of the three public nodes would be in the northern part of the national park. A new parking area, trailhead, and primitive campground would encourage considerably more hiker and equestrian use in the northern backcountry portion of the national park. The backcountry adventure zone within the national preserve would still be confined to trail corridors, as in the dunefield focus alternative. Visitor-related impacts of this alternative on potential Canada lynx within the park would be the same as those for the dunefield focus alternative: no to negligible, short and long term, adverse.

Under this alternative, unleashed dogs used for hunting would still be allowed in the national preserve; however, leashed (nonhunting) dogs would not be permitted in areas where there is high potential for, or a history of, conflict with natural resources.

There is no history of conflict with Canada lynx as residency of lynx in the park has not been established. However, areas restricted to leashed dogs to protect bighorn sheep (see discussion below) and other natural resources could be anticipated to shield potential lynx within the park from additional presence of leashed dogs as well. This may be anticipated to result in no to negligible beneficial impacts on potential lynx in the preserve. The continued presence of unleashed hunting dogs in the national preserve is anticipated to continue to have no to negligible adverse effects in the short and long terms on lynx passing through or trying to establish ranges within the national preserve.

**Cumulative Impacts.** Past, present, and reasonably foreseeable actions which might interact with aspects of the three public nodes alternative to affect potential lynx or lynx habitat within the park include general growth of the human populations surrounding the park and preserve, wilderness restoration efforts in the South Colony Lakes basin area (just north of the national preserve), and a potential elk herd reduction in the future. Population growth is anticipated to be a contributor to modest increases in visitation within the preserve. Wilderness restoration efforts north of the preserve may increase the potential habitat for Canada lynx along the range, and reduction of elk would avoid or reduce the impacts overly large populations of this native ungulate can have on a range of habitats and the food chains based on those habitats. Taken in combination with these cumulative impacts, the three public nodes alternative is anticipated to have no to negligible, adverse and no to negligible beneficial impacts on potential lynx establishment within the park.

**Conclusion.** Impacts on potential lynx within the park due to increased visitation over time would be moderated by

restriction of the backcountry adventure zones within the preserve to narrow trail corridors, and would be anticipated to decrease with an increase in elevation and ruggedness of the terrain such that only no to negligible, short- and long-term, adverse impacts on potential lynx or their habitat in the park are anticipated. The continued presence of unleashed hunting dogs in the national preserve is anticipated to continue to have no to negligible, adverse effects, in the short and long terms, on lynx passing through or trying to establish ranges within the national preserve. This may be offset somewhat by the elimination of leashed (nonhunting) dogs in natural resource sensitive areas, which could be anticipated to have no to negligible beneficial effects over the short and long terms on potential lynx within the park. These impacts correlate to a determination of “*may affect—not likely to adversely affect*” for Canada lynx for the three public nodes alternative. There would be *no impairment* of federal threatened and endangered species from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## **WILDLIFE, INCLUDING COLORADO STATE-LISTED SPECIES**

### **Species Associated with Riparian Corridors**

Visitation in the public area (“node”) near the east part of the dunes (frontcountry and dunes play zones) would increase substantially over time. Use levels in the northern portion of the national preserve (backcountry adventure zone) would similarly increase due to population increases and improved access. Higher use levels over time could result in impacts to riparian corridors (e.g., Sand, Castle,

Medano, Little Medano, and Cold creeks), and could include decreased water quality due to increased sedimentation, introduction of pollutants, and introduction of nonnative species or diseases. This would result in minor to moderate adverse effects on species associated with these riparian habitats such as the Rio Grande sucker, Rio Grande chub, and the Rio Grande cutthroat trout.

New trails in backcountry adventure and guided learning zones have the potential to disturb or displace wildlife, or cause areas to be avoided by wildlife; some species are more sensitive than others. Adverse effects could be mitigated by considering potential impacts on wildlife when siting new trails (Trails and Wildlife Task Force 1998). Assuming trails were carefully sited with wildlife in mind, impacts would be short and long term, localized, minor to moderate, and adverse.

A third public node would be provided in the northern part of the national park. A new parking area, trailhead, and primitive campground would encourage considerably more hiker and equestrian use in the northern backcountry portion of the national park. The mature narrowleaf cottonwood groves along the banks of Deadman Creek would likely attract some hikers and horseback riders for resting, watering animals, and other passive pursuits. However, most visitors would probably keep to designated trails (e.g., Cow Camp Road), which would avoid this riparian corridor for natural resource reasons. Improved hiking access to the mountain front might lead to increased use in the upper (USFS) portion of Deadman Creek, which includes a designated research natural area. The wildlife issue for consideration in Deadman Creek is the potential impacts of increased use on Townsend’s big-eared bats. These bats often forage along riparian corridors in the

western United States and are moth specialists (Schmidt 2003). Degradation of the Deadman Creek corridor could potentially result in a decrease in the prey base for this species if the woody vegetation, some of which probably serves as host plants for moths, is affected. Assuming standard monitoring and remediation of habitat conditions, such impacts would be anticipated to be minor to moderate, and adverse.

### **Wetlands-Associated Species**

Under the three public nodes alternative, livestock watering ponds and structures would be removed, and irrigation on Medano ranch would be ceased, resulting in long-term, negligible to minor, adverse impacts (from drying) on species associated with introduced wetlands in the immediate area. When watering ponds and structures are removed and irrigation is ended, natural flows could be reintroduced to other areas. Expansion or reestablishment of wetlands plant communities in those areas may have long-term, negligible to minor, beneficial impacts on wetlands-associated species. The result of this scenario would be a combination of negligible to minor, adverse impacts on wetlands-associated species within the park, and negligible to minor, beneficial impacts to the same species inside and outside (downstream of) the park. A detailed study of the potential changes to the hydrologic regime of the park and surrounding area would be conducted before irrigation is discontinued within the park.

### **Ungulate Herd Numbers and Health**

The three public nodes alternative provides for future consideration of potential access routes to the park via the USFS, USFWS,

and county/local planning processes. Under this alternative, as under the other two action alternatives, a northern route or routes across NPS land would be designated (via the Superintendent's Compendium) for hunter access to the national preserve and USFS lands, where hunting is permitted. According to the *Code of Federal Regulations*, provision for such access may be provided when other access is impracticable; hunters must stay on the designated routes and firearms must be broken down or disassembled so as to prevent their ready use.

Eventual development of public vehicle access to and/or through the north portion of the park could help ameliorate adverse impacts to ungulates from continued limited hunting on USFS lands adjacent to the northern boundaries of the park and preserve. Continued limited hunting pressure on elk in this area may exacerbate rapid population increases that may be linked to declines of other native ungulate populations (bighorn sheep and mule deer), and to habitat degradation in the Sangre de Cristo Wilderness. Estimated numbers of hunters who might want to access the preserve and adjacent USFS lands to hunt elk range from 20 to 30 for each of the three 5-day seasons; equating to 60 to 90 hunters annually. The preserve and adjacent USFS lands are in CDOW game management unit 82. The success rate for elk hunters in game management unit 82 in 2004 was 34% total, with 66% of harvested elk being cows. Based on the 2004 harvest rates, and CDOW estimates for numbers of hunters, the potential number of elk not harvested from the preserve and adjacent USFS lands is estimated to range from 14 to 20 cows, and 6 to 9 bull elk. Given that, at an estimated herd size of nearly 6,000 elk, the San Luis Valley herd is approximately four times larger than the 1,500-animal goal established by CDOW, removal or non-removal of 14 to 20 cow elk and 6 to 9 bull

elk would not make a substantial difference in efforts to reduce the size of this herd. Therefore, while providing public vehicle access to the northern portion of the park might facilitate hunting of elk in the preserve and on adjacent USFS lands, this beneficial impact is expected to be only negligible to minor.

### **Bighorn Sheep**

Under the three public nodes alternative, unleashed dogs used for hunting would continue to be allowed in the preserve. Leashed dogs would not be allowed in areas where there is high potential for, or a history of, conflicts with natural resources such as bighorn sheep.

Bighorn sheep, as prey animals, are anticipated to react negatively to dogs, whether on-leash or off. In a study of bighorn sheep, which were already partially habituated to humans, MacArthur et al. (1982) conducted human-disturbance trials on bighorn sheep, which were already partially habituated to humans. In this study, a person approached a group of sheep from a road, from the road accompanied by a dog on-leash, and from a ridge away from the road. The strongest negative reactions in the sheep were recorded when a human with a leashed dog approached (MacArthur, Geist, and Johnston 1982). Furthermore, no reduction in heart-rate response was observed with repeated trials; instead, heart-rate response actually increased successively with each leashed-dog trial. In earlier studies, these same authors demonstrated that free-ranging dogs and coyotes evoked the maximum heart-rate responses (MacArthur, Geist, and Johnston 1979). In their later study, MacArthur, Geist, and Johnston (1982) concluded that, among all the stimuli they studied, “The presence of

dogs on sheep range should be discouraged.”

The mere presence of dogs, which wild prey animals do not distinguish from other predators, can cause stress in prey species (Simes 1999). While sight and sound of the dogs are obvious direct cues, the scent of dogs and the wastes they leave behind have a much longer impact on prey species of an area, potentially preventing such species from approaching and using essential resources such as watering holes or cover for a period of time.

The presence of unleashed hunting dogs in the preserve is a component of all alternatives proposed for this GMP and would be a continuation of the current condition. What is being evaluated is the difference among the alternatives relative to leashed dogs in the preserve. If only leashed dogs were allowed in the preserve, the impacts attributable to their presence/absence would be larger. However, given that unleashed hunting dogs would be free to roam the preserve within the limits established by their handlers and hunting regulations, the presence or absence of leashed dogs in the preserve is not anticipated to significantly increase or decrease dog-related stresses. As such, the restriction of leashed dogs from areas where bighorn sheep/dog conflicts might arise is not anticipated to contribute more than a negligible beneficial impact on bighorn sheep in the park.

**Cumulative Impacts.** Cumulative actions contributing to impacts on riparian-associated species as described above include growth of the human population in the area surrounding the park, oil and gas exploration on former Baca Ranch lands, and elk herd reduction. The first two of these would contribute adverse impacts, while elk herd reduction would contribute beneficial impacts, specifically to the

riparian corridor habitats. In combination with these cumulative actions, the three public nodes alternative is anticipated to contribute minor to moderate, adverse impacts.

Cumulative actions contributing to ungulate herd numbers and health include the enabling legislation for the expanded park and preserve, which has negative impacts due to hunting of elk not being permitted in the expanded areas of the national park, but beneficial impacts due to different levels of protection for habitats and species in the preserve. Also contributing to ungulate herd numbers and health would be the interagency fire management plan, which should provide beneficial impacts to ungulates through habitat management and enhancement. Finally, the elk herd reduction tentatively planned for the future, pending justification stemming from ongoing research and appropriate NEPA analysis, would most likely provide beneficial impacts to the elk by reducing the numbers to a level closer to the predicted carrying capacity of the area, and reducing the risk of diseases often associated with high herd densities. Beneficial impacts to other ungulates (mule deer and bighorn sheep) would stem from reduced elk impacts on shared habitats, and reduced likelihood of exposure to diseases. Combined with past, present, and reasonably foreseeable future actions, the three public nodes alternative would be anticipated to contribute negligible to minor beneficial impacts to ungulate herd numbers and health.

Cumulative actions contributing to impacts on bighorn sheep would include growth of the human population in the area surrounding the park and elk herd reduction. The former would contribute adverse impacts if the number of leashed and feral dogs in the park increased, and the latter would contribute beneficial

impacts by reducing competition from, habitat impacts due to, and the threat of diseases from, elk. In combination with these cumulative actions, the three public nodes alternative is anticipated to contribute negligible to minor beneficial impacts on bighorn sheep within the park.

**Conclusion.** The three public nodes alternative would have minor to moderate, adverse impacts on species associated with riparian corridors due to increased recreational use; negligible to minor, adverse impacts on wetlands-associated species within the park due to removal of artificial water sources, and cessation of surface irrigation; and negligible to minor, beneficial impacts to the same species outside (downstream of) the park due to possible increase of downstream waters; negligible to minor beneficial impacts on ungulate herd numbers and health due to facilitation of elk hunting; and negligible beneficial impacts on bighorn sheep populations within the park due to the restriction of leashed dogs from areas where these two species might interact. There would be *no impairment* of wildlife from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## SOILS AND GEOLOGIC RESOURCES

In the three public nodes alternative, construction of new trails in the backcountry adventure zone would cause localized soil disturbance and compaction. Nonetheless, provision of such trails would help direct visitor foot traffic, which would mean fewer social trails (and fewer associated soil effects) compared with the no-action alternative. The backcountry access zone in the north part of the park would eventually include a public vehicle access route, small trailhead, and a primitive campground. Disturbed sites

would be used as much as possible for these facilities, but where that is not possible there is potential for localized soil disturbance and compaction. In the frontcountry zone, visitors would be directed to alternate park nodes when the main dunes parking area becomes full. This would reduce the incidence of visitor vehicles parking along the roadside (and attendant soil damage). The end result of these actions would be long-term, minor to moderate, site-specific, adverse impacts, and localized, minor, beneficial impacts.

**Cumulative Impacts.** Establishment of a water right to fulfill the purpose of the national park and preserve would minimize further lowering of local groundwater levels or surface water flows, which could indirectly benefit sand recycling. Oil and gas exploration on lands that were formerly part of the Baca Ranch, but are now within the national park, has occurred and these activities could continue in the near future; however, any activities would be subject to 36 CFR 9B (*Nonfederal Oil and Gas Rights Regulations*), which require such activities be conducted in a manner consistent with park purposes and preventing or minimizing damage to the environment. Minor expansion and reconfiguration of the dunes parking area and relocation of the horse loading area and dump station would also cause localized soil disturbance and destruction. The three public nodes alternative would contribute both beneficial and adverse localized impacts to soils and geologic resources. Combined with past, present, and reasonably foreseeable future actions, the three public nodes alternative would have long-term, minor to moderate, mostly localized, beneficial, and adverse impacts on soils and geologic resources.

**Conclusion.** Construction of new trails would cause localized soil disturbance and compaction. Provision of such trails would

mean fewer social trails, and fewer associated soil effects. Limited proposed facilities (vehicle access route, trailhead, and primitive campground) in the north of the park could cause localized soil disturbance and compaction, especially where it is not possible to use already disturbed sites. In the frontcountry zone, there would be lower incidence of vehicles parking along the roadside (and attendant soil damage). Impacts would be long term, minor to moderate, site-specific, adverse, and localized minor beneficial. There would be *no impairment* of soils and geologic resources from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## WETLANDS

Visitation in the public area (“node”) near the east part of the dunes (frontcountry and dunes play management zones) would increase substantially over time, so Medano Creek wetlands in these zones would experience more use. A second public node at Medano Ranch headquarters (frontcountry zone) would encourage visitor use in this area, and in the adjacent guided learning zone. New hiking and equestrian trails would originate at the Medano Ranch headquarters and extend into the guided learning zone, where only escorted use is permitted. Providing guided hiking and equestrian trails in the guided learning management zone would direct use around sensitive wetlands areas and prevent or minimize most direct wetlands impacts in this area. In general, however, visitation increases and visitor use (including horse use) in new park areas could increase the incidence of trampling, introduce non-native plant species, and compact wetland soils and streambanks. Chemical and biological processes and wetlands species composition could be affected. Overall,

there would be long-term, minor to moderate, adverse impacts to wetlands resources.

A third public node would be provided in the northern part of the national park. A new parking area, trailhead, and primitive campground would encourage considerably more hiker and equestrian use in the northern backcountry portion of the national park. The mature narrowleaf cottonwood groves along the banks of Deadman Creek would likely attract some hikers and horseback riders for resting, watering animals, and other passive pursuits. However, most visitors would probably keep to designated trails (e.g., Cow Camp Road), which would avoid this riparian corridor for natural resource reasons. Improved hiking access to the mountain front might lead to increased use in the upper (USFS) portion of Deadman Creek, which includes a USFS designated research natural area; it includes high elevation wetlands and currently receives little visitation. Visitation increases and visitor use (including horse use) in many new areas of the park could result in incidental trampling, compaction of wetland soils and streambanks, and introduction of nonnative species. Chemical and biological processes and wetlands species composition could be affected. Effects would be long term, minor to moderate, and adverse.

Assuming Medano Ranch is eventually transferred to National Park Service management, irrigation of hay meadows for bison forage in this area would be discontinued. Wetlands that are not supported by natural surface and groundwater flows (e.g., introduced wetlands) would be adversely affected by drying. Natural flows in Sand, Big Spring, and Little Spring creeks would increase, at least seasonally, when irrigation is discontinued, and other wetlands types

(e.g., ephemeral ponds, playas, mudflats, etc.) would expand and/or become reestablished. Also, more water would likely be delivered to San Luis and Head lakes in San Luis Lakes State Park and Wildlife Area, stabilizing water levels and providing wetlands support in these areas. Overall, impacts on wetlands would be long term, moderate to major, beneficial, and long term, moderate, adverse. A future study would examine expected impacts in more detail.

Eliminating bison grazing from Medano Ranch lands within the park would benefit wetlands plant species, particularly the most palatable grasses. Areas of channel and streambank erosion would gradually stabilize and plants would become reestablished, improving wetlands structure and function. Livestock watering ponds and structures would be removed; some introduced wetlands would probably dry up, but other naturally occurring wetlands would be re-established or would expand from restoration of natural flows. The park would identify and manage nonnative plant populations in new park areas, reducing their effects on native wetlands communities or possibly eliminating some nonnative stands from the landscape. Wetlands species composition and habitat quality would improve as a result. Overall, these actions would have long-term, minor to moderate, beneficial, and negligible to minor adverse impacts on wetlands.

**Cumulative Impacts.** Livestock grazing typically adversely affects wetlands and riparian resources by causing shifts in species composition, erosion of streambanks and bottoms, and browsing of wetland grasses, shrubs, and tree seedlings. Cattle grazing was discontinued on the former Baca Ranch lands in 2004, and some past adverse livestock impacts may gradually be reversed over the long term. Under the three public nodes alternative,

beneficial and adverse wetlands impacts would result from higher use levels, new trails and trailheads (and a primitive campground), establishment of the guided learning zone, removal of livestock-related water control structures, control of nonnative noxious plant populations, and discontinuation of bison grazing and hay meadow irrigation. Combined with past, present, and reasonably foreseeable future actions, the three public nodes alternative would have long-term, moderate, beneficial impacts, and minor to moderate adverse effects on wetlands resources.

**Conclusion.** Visitation increases and visitor use (including horse use) in several new park areas could increase the incidence of trampling, introduce nonnative plant species, and compact wetland soils and streambanks. Chemical and biological processes and wetlands species composition could be affected. Overall, there would be long-term, minor to moderate, adverse impacts to wetlands resources. Discontinuing the practice of irrigating hay meadows on Medano Ranch would have long-term, moderate to major, beneficial, and long-term, moderate, adverse impacts. Other actions (eliminating bison from Medano Ranch, removing livestock ponds and structures, and managing native plants in new park areas) would have long-term, minor to moderate, beneficial, and negligible to minor adverse impacts on wetlands. There would be *no impairment* of wetlands from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## WATER RESOURCES

Under the three public nodes alternative, visitation would increase in general over time, and it would increase proportionally in certain areas (e.g., in the north portion of

the park and in the guided learning zone). Higher use levels over time would mean more potential for trash and human, dog, and horse waste to be washed into streams and lakes, thus degrading water quality. Also, providing designated trails in backcountry adventure zones and in the guided learning zone would serve to minimize social trails, direct use away from sensitive areas, and restrict impacts to localized areas. Backcountry toilets would be installed if/when visitor use levels become high enough that human waste disposal and sanitation is a concern. The end result of these actions would be long-term, negligible to minor, localized, adverse impacts, and long-term, minor, beneficial impacts to surface water and potentially to shallow groundwater quality.

If and when The Nature Conservancy transfers Medano Ranch lands to the National Park Service, surface irrigation of hay meadows for bison forage would be discontinued. Non-diverted creek flows would be allowed to remain within their natural drainages (e.g., Sand, Big Spring, and Little Spring creeks) rather than being redirected to meadow areas. Thus, discontinuation of meadow irrigation would affect surface water flow and possibly groundwater levels, but additional research would be needed to determine the nature (scope, direction, intensity, etc.) of these impacts. Prior to discontinuing irrigation, a study would be conducted to provide more information about possible effects of this action.

**Cumulative Impacts.** Establishment of a water right to fulfill the purposes of the park would minimize additional lowering of local groundwater levels. Oil and gas exploration activities on lands that were formerly part of the Baca Ranch (but are now within the national park) are reasonably foreseeable in the near future; however, any such activities are subject to

36 CFR 9B, which requires that such activities be conducted in a manner that is consistent with protection of water resources (among other resources). The three public nodes alternative would have both beneficial and adverse effects on water resources, as discussed above. Combined with past, present, and reasonably foreseeable future actions, the impact of the three public nodes alternative on water resources would be long term, minor to moderate, and adverse.

**Conclusion.** Higher use levels would result in increased wastes and sediments in certain surface waters. However, providing designated trails would help to limit social trails, direct use, and restrict impacts to local areas. Providing backcountry toilets would improve water quality. These actions would have long-term, negligible to minor, localized, adverse impacts, and long-term, minor, beneficial impacts to surface water and potentially to shallow groundwater quality. Discontinuing surface irrigation of hay meadows on Medano Ranch would affect surface water hydrology and possibly

groundwater levels, but research would be needed to determine the nature of these impacts. There would be no impairment of water resources from this alternative (see specific definition of impairment in the “Impairment of National Park Resources” section).

## VISITOR USE AND EXPERIENCE

### Visitor Use Projections

Projected annual visitor use under this alternative would reach 441,000 visitors by 2025, the highest of any GMP alternative. As in the no-action alternative, the principal factor driving increases in visitor use would be population growth in the San Luis Valley and Colorado. This represents an increase of 150,000 visitors per year over the 2004 adjusted total, and 66,200 (18%) more visitors than the no-action alternative (table 25). Annual use in 2025 is projected to be about 12,000 visitors higher than for the NPS preferred alternative.

**TABLE 25. CURRENT AND PROJECTED ANNUAL VISITORS IN 2025  
THREE PUBLIC NODES ALTERNATIVE**

2004 (recorded)	2004 (adjusted baseline)	No-Action Alternative	NPS Preferred Alternative	Three Public Nodes
268,400	291,000	374,800	427,100	441,000
Increases Over 2004 (adjusted)				
Annual Visits (number)		+85,320	+83,800	+150,000
Annual Visits (percent)		+29%	+29%	+52%
Increases Over the No-Action Alternative				
Annual Visits (number)		NA	NA	+66,200
Annual Visits (percent)		NA	NA	+18%

Key elements of the three public nodes alternative that would influence future use include:

- creation of new public use nodes—a frontcountry zone at Medano Ranch headquarters, and a backcountry access zone with trailhead and primitive campground in the northwest portion of the park
- no additional wilderness areas proposed
- expanded opportunities for new programs and experiences in the guided learning zone
- adaptive reuse of Medano Ranch headquarters structures

By 2025, projected visitation during the 3-month summer period would increase to about 259,000 visitors, only about 9,000 fewer than total annual visitation to Great Sand Dunes National Monument just prior to expansion and redesignation. Summertime visitation would be 38,000 and 7,600 visitors higher than the no-action and NPS preferred alternatives, respectively. The largest share of the increase would be focused in the new Medano Ranch frontcountry zone. Most use there and at the northern part of the backcountry access zone would occur during the traditional May to September high-use period. Projected dispersed backcountry day and overnight use across the Great Sand Dunes would approach 56,000 visitors per year.

### Visitor Experience

More and different opportunities in different park areas would allow a wider range of visitor experiences. The average length of time that visitors stay in the park

would likely increase. Visitor use would probably be spread throughout more of the park compared to the no-action alternative.

Medano Ranch headquarters (frontcountry zone) would serve as a public day-use area, which would attract many visitors to the southwestern portion of the park. This area would also serve as an entry point to the guided learning zone west of the dunefield. There would be new options for interpretive and educational programs, picnicking, and guided hiking and horseback tours.

The trailhead and primitive campground, located in the backcountry access zone at the national park's northern part, would provide much improved hiking and horseback access to new park lands, the mountain front, and the north part of the national preserve. The campground would serve both as a base for day use, and as a "launch point" for multiday trips into the backcountry. Examples include loop trips and "through trips" to one of the front-country zones. The Sand Creek and Sand Ramp trails would probably receive substantially more hiking and equestrian use with the northern trailhead and campground included in this alternative.

Opportunities to see and enjoy the wildlife of the park would be expanded due to expanded access to new areas of the park. More hunters might be drawn to the national preserve and adjacent USFS lands, where hunting is allowed, because the north-end trailhead would provide better hiking, horseback, and vehicle access to certain hunting grounds. This would also depend on how CDOW managed hunting seasons and opportunities, however.

Interpretation, information, and education activities would be concentrated east of the dunefield (visitor center, amphitheater, dunes area, day-use trails, etc.), and at the Medano Ranch headquarters public day-

use area. Having two bases for these activities might allow increased diversity of visitor programs and services, including environmental education for school groups.

Compared to the no-action alternative, more options for visitors with limited mobility would result from wheelchair-accessible public facilities at Medano Ranch and the new primitive campground.

Expanded access, and new recreational and interpretive opportunities, as discussed in the preceding paragraphs, would have long-term, major, beneficial impacts on visitor experience.

This alternative would offer positive wilderness experiences within existing wilderness areas, although with new points of access, some areas that were once remote would be less so. Also, increasing visitor numbers over time could affect wilderness values (opportunities for solitude, evidence of human use, etc.), especially in portions of the wilderness served by new visitor access points (e.g., Sand Creek drainage). Diminished wilderness values in portions of existing wilderness areas would have a long-term, moderate, adverse impact on visitor experience. There would be no new wilderness opportunities because no new wilderness areas are proposed in this alternative (same as the no-action alternative).

Visitors who like to travel and/or recreate with their dogs would have less freedom to do so compared to the no-action alternative—dogs would not be permitted in areas where there is high potential for or a history of problems. This might discourage some dog lovers from visiting the park. Other visitors would be pleased to see dogs allowed in fewer areas and relegated to a separate, downstream area of

the dunes play zone. There would likely be fewer visitor concerns and complaints about aggressive dogs and dog waste as a result. The new policy regarding dogs in the park would have long-term, minor, adverse, and beneficial impacts on visitor experience.

Visitors would be redirected at the fee booth to other areas of the park when the dunes parking lot fills, which typically occurs on six to eight weekends during the summer months. Assuming redirecting visitors could be successfully accomplished, this policy would have several consequences. First, areas accessible from the main park road (e.g., the frontcountry zone, dunes play zone, and Medano Pass primitive road) would not experience much more use (or crowding) in the future than they do now. Second, the Medano Ranch day-use area could become quite busy if visitors were redirected there instead. Third, visitors who came to the park specifically to enjoy the dunes play zone would undoubtedly be disappointed and frustrated if they were turned away. This could be mitigated somewhat by a comprehensive information campaign (e.g., Web information, variable messaging at key highway intersections, etc.) that warned of this possibility, especially around busy weekends and holidays. The policy of denying entry at the fee booth and redirecting visitors elsewhere would have long-term, moderate, beneficial, and major adverse impacts on visitor experience.

**Cumulative Impacts.** Rehabilitation of main park roads and parking areas, which includes increasing the capacity of the dunes lot by 5%, is planned for the near future and would modestly improve pedestrian and vehicle traffic flow in the immediate area. This alternative's proposal to deny entry and redirect visitors when the dunes parking lot fills addresses the larger issue of crowding and frustrations related

to vehicle and pedestrian circulation in the main frontcountry zone. On the other hand, visitors who were denied entry on the busiest weekends would be frustrated and disappointed. Ongoing wilderness restoration efforts in the South Colony Lakes basin area are improving wilderness values in the Sangre de Cristo Wilderness. The three public nodes alternative would result in some diminishment of wilderness values in some portions of the Sangre de Cristo Wilderness that lies within the Great Sand Dunes. Renovations to the Great Sand Dunes visitor center have improved the visitor experience by enlarging indoor space available for information, education, and interpretive services. In the three public nodes alternative, expanded services and programs (from a frontcountry day-use zone at Medano Ranch headquarters and the guided learning zone) would benefit visitors. Combined with past, present, and reasonably foreseeable future actions, the three public nodes alternative would have moderate adverse and major beneficial impacts on visitor experience.

**Conclusion.** Expanded visitor access, combined with new recreational and interpretive opportunities, would have long-term, major, beneficial impacts on visitor experience. Diminished wilderness values in portions of existing wilderness areas would have a long-term, moderate, adverse impact on visitor experience. The new policy regarding dogs in the park would have long-term, minor, adverse, and beneficial impacts on visitor experience. The policy of denying entry at the main fee booth and redirecting visitors elsewhere would have long-term, moderate, beneficial, and major adverse impacts on visitor experience.

## SCENIC RESOURCES AND VISUAL QUALITY

Under the three public nodes alternative, there would be no new human-made structures or vehicle use areas in the national preserve that would affect scenic quality. However, some human-made facilities and human activities would be added on park expansion lands and this would affect scenery and visual quality. A small trailhead parking area and primitive campground would be added in the northwest portion of the park to enhance backcountry access. Medano Ranch headquarters would become a frontcountry public day-use area. Because sunlight reflects off of vehicle windshields, vehicles in the northern backcountry access zone and at Medano Ranch may be visible from higher vantage points in and around the national park and preserve. Increased vehicle activity associated with these two areas would mean increased dust levels, at least during dry periods. Airborne dust can affect both scenic quality and visibility over the short term. Thus, new facilities and activities in park expansion areas would have short- and long-term, localized, minor to moderate impacts on scenery and visibility.

There would probably be some shielded outdoor lights at the new primitive campground in the north part of the park. At Medano Ranch, most public use would occur during the day, but operational support of such use could introduce some minimal outdoor lighting (shielded) in this area as well. Impacts on the night sky would be long term, minor, and adverse.

**Cumulative Impacts.** Rehabilitation of main park roads and parking areas, which includes increasing the capacity of the dunes lot by 5%, would result in a negligible, long-term, localized, adverse

impact on scenic resources. Prescribed burns (fire management plan) would have short-term, minor, adverse, localized impacts on scenery and visibility from smoke. Continued residential growth of the Baca Grande subdivision would mean that more homes, retreat centers, commercial structures, and vehicles would be visible in this area in the future. Expanded residential development could also bring more dust and wood smoke. The private land parcel that is for sale near the park entrance could be rezoned to commercial and developed. Overall, such new development would intrude upon the area's natural scenery (at least from some vantage points), affect visibility, and introduce new light sources into the night sky. Regional population growth and development would also continue to introduce additional light into the night sky. The three public nodes alternative would contribute short- and long-term, adverse impacts to scenery and visibility (negligible to moderate in intensity) and the night sky (minor in intensity). Combined with other past, present, and reasonably foreseeable future impacts, impacts would be long term, minor to moderate, and adverse.

**Mitigation.** Parking areas would be placed and designed to help mitigate or avoid impacts to visual and scenic resources. The natural and built landscape would be used to help shield reflections and glare from vehicles. Environmentally friendly dust binders would be used as needed to help control dust on park roads.

**Conclusion.** Effects of the three public nodes alternative on scenery and visibility would be long term and adverse, and would range from minor to moderate. Impacts on the night sky would be long term, minor, and adverse. There would be no impairment of scenic resources and visual quality from this alternative (see specific definition

of impairment in the "Impairment of National Park Resources" section).

## **SOCIOECONOMICS**

Implementation of the three public nodes alternative would occur against the same backdrop of economic, demographic and social changes across the San Luis Valley described under the no-action alternative. The economic and social effects of the three public nodes alternative would contribute to those changes, but not fundamentally alter the area's economic and demographic outlook.

### **Visitor-Related Economic Impacts**

Annual recreational use at the park with the three public nodes alternative would amount to 441,000 visits by 2025, an increase of more than 150,000 visits, or 52%, compared to 2004, and 66,200 visits higher than projected under the no-action alternative. Visitor use under the three public nodes alternative would vary from year to year, perhaps even falling in some years. Visitor use would increase more than usual when Medano Ranch is opened to the public for educational and recreational use purposes. Peak monthly use would reach 94,500 visitors in July 2025, as compared to about 80,800 under the no-action alternative. Park visitors from outside the valley are expected to account for the majority of future visits, though the number of visits by residents of the region would also increase.

Projected visitation under the dunefield focus alternative would result in 228,280 party-days of visitor use, an increase of 35,620 party-days, or 18% higher than for the no-action alternative. Retail, lodging, and other tourism-type spending across the region would reach \$21.91 million per year

in 2025, \$8.78 million higher than in 2004, and \$3.48 million per year more than for the no-action alternative. The higher visitor spending would benefit private businesses, as well as increasing the sales tax receipts for local governments.

The park would collect approximately \$496,000 in receipts from entry, annual pass, and camping fees, with estimated annual merchandise sales of about \$450,000 for the Western National Parks Association's operation at the visitor center, the highest among the alternatives. In part, the higher revenues would be due to the opening of Medano Ranch to public use.

Projected spin-offs of the visitor spending include personal income of \$6.83 million per year and 561 jobs by 2025. Those levels are \$1.08 million in annual income and 89 jobs higher than the economic benefits in 2025 under the no-action alternative. Of all the GMP alternatives, the three public nodes alternative would do the most to boost economic development in the region. The guided learning and recreation opportunities at Medano Ranch may create opportunities for private concession or incidental business activities and educational partnerships that would not exist under the other alternatives. This alternative would create a larger economic boost for stores, restaurants, overnight lodging, or trail and other recreational services in the Crestone/Baca Grande community than would the other alternatives. Some of this increase would be attributable to the primitive campground in the north part of the national park. For example, campers would purchase ice, supplies, or a meal. When the primitive campground in the northern part of the park fills, people may camp at other campgrounds in the area.

The visitor-related impacts would be long term, but minor relative to the overall employment and personal income in the two directly affected counties.

The state and local governments would collect more in sales tax from the increased visitor spending and property taxes on new development than under the alternatives. Impacts on property taxes and PILT receipts for Saguache and Alamosa counties would be slightly higher than under the preferred alternative due to indirect effects on population and economic growth.

The visitor-related economic impacts would be beneficial, but negligible in the short term and minor to moderate and beneficial over the long term.

### **Economic Impacts Related to GMP Implementation and Park Operations**

The economic benefits of the three public nodes alternative would include \$20.6 million in capital spending, \$7.7 million in other major maintenance projects, and increased operating and maintenance expenditures. Higher staffing levels would be needed to maintain current service levels over time, although any such increases would depend on future increases in the park's base funding. The staffing need is estimated at 10 FTEs, at an annual cost of approximately \$520,000 over the current budget, and \$260,000 over the no-action alternative.

Short-term economic impacts associated with future capital and major maintenance spending would support local construction and related industries. As with the other alternatives, the timing of the spending is uncertain. Recurrent operating expenditures for the park would yield long-term impacts on employment, business

sales, income, and other related measures. The economic effects tied to these economic stimuli include:

- capital construction (short term): 314 job-years of employment and \$9.02 million in personal income over time, between 2006 and 2025
- non-annual recurring (short term): 123 job-years of employment and \$3.41 million in personal income over time, between 2006 and 2025
- park operations (long term): 49 jobs, including 38 FTEs of direct NPS staffing, and \$2.25 million per year in annual income

The short-term economic impacts associated with the capital construction program, 314 job-years (three public nodes alternative) compared to 122 job-years (no-action), would be substantially larger than those under the no-action alternative. The differences reflect \$13.8 million more in capital spending for the three public nodes alternative. Long-term economic impacts include six additional jobs and \$300,000 in additional personal income as compared to the no-action alternative.

With the three public nodes, gains in long-term economic stimulus associated with park operations could be offset, in part, by reductions in economic stimulus associated with The Nature Conservancy's operation of Medano Ranch. The extent to which that would happen depends on when federal acquisition of the ranch occurs and a decision by The Nature Conservancy to cease its bison operations because that is when full implementation of the proposed management zoning would proceed.

The end of the bison operation on Medano Ranch would also mark a transition in land use from active agriculture to more passive

setting in which some of the buildings and outbuildings remained, but their use would shift to guided learning, and historical and environmental education. Some fencing would be removed and other vestiges of active agricultural operations would be removed or become less noticeable as natural processes are allowed to re-establish themselves.

The economic effects associated with the park's operations would be beneficial, but negligible to minor in the short term and beneficial and minor over the long term.

### **Community Services**

Over time, more visitors to the park would indirectly result in added demands on community services and facilities across the region. The limited scale, seasonal nature, and spatial dispersion of such demands across the region are such that facility expansion and additional staffing would not be required.

Effects on community services under this alternative would be indeterminate and negligible over the short term and long term.

### **Traffic and Emergency Services**

Traffic impacts of the three public nodes on the highways and roads providing access to the park would be about 13% higher than those under the no-action alternative. Even with the increases in traffic, estimated future traffic volumes would remain substantially below design capacity and not dramatically increase maintenance requirements.

As in the NPS preferred alternative, traffic would increase on Saguache County Road T because more visitor use would occur in

the northern areas of the park. If access to the new backcountry access zone in the northern portion of the park utilizes Saguache County roads within the Baca Grande subdivision, traffic would increase on those roads. Assuming there were signs directing visitors along the preferred route, the traffic increases would be limited primarily to that route; nonetheless, some park visitors might explore along other subdivision roads while they were in the area. In contrast to the no-action alternative, there would be little localized traffic congestion from park visitor vehicles parked on roads within the subdivision near the park boundary. Instead, visitors would travel along the designated route, enter the national park, and proceed to the backcountry access zone trailhead. If, on the other hand, access were to come through the Baca National Wildlife Refuge, there would be little, if any traffic increase on roads within the Baca Grande subdivision. Instead, eastbound visitor traffic on County Road T would divert southward through the refuge before it reached the subdivision. Traffic increases would be greatest on summer weekends and holidays, and would increase over time as the potential visitor population grows. The backcountry access zone would include both a small trailhead (space for 15 to 20 vehicles) and a primitive campground (10 or fewer sites) in this alternative, and campers might make more than one trip into the campground per stay. Even so, the contribution of park visitor-related traffic would be minor, especially when considered against the backdrop of expected traffic increases from residential and spiritual retreat growth in the Baca Grande subdivision.

Impacts on the number of traffic accidents and demands on first responders would be similar to those under the no-action alternative. Demands associated with this alternative would not require additional

law enforcement or emergency response staffing, although the increases in the number of “call outs” would burden area first response agencies because they are staffed by volunteers.

The effects of the three public nodes alternative on traffic and emergency services across most of the region would be adverse, but negligible over the short term and long term. Long-term traffic impacts would be adverse and minor in the Crestone/Baca Grande community.

### **Attitudes and Lifestyles**

This alternative establishes future management direction for the park that also reflects public input, the park’s fundamental resources and values, and the foundation established by management of the former national monument, but with more emphasis on providing supplemental recreational and educational opportunities. That focus, like the wild focus of the dunefield focus—maximize wildness alternative, would tend to polarize opinions and attitudes more so than either the no-action or preferred alternatives. Those favoring solitude, wilderness, adventure characterized by self-reliance, and limited access to the new areas, may have a sense of dismay with this alternative. Those who viewed the park expansion and its opportunities more from a potential economic development perspective may be inclined to favor this alternative.

This alternative would likely result in the most direct lifestyle consequences, as it recasts many park influences; for example, it might encourage limited commercial development adjacent to the park on the south and in the Crestone/Baca Grande community. Compared to the other action alternatives, the three public nodes alternative may be the least favorable in

terms of conditions that affect the Crestone/Baca Grande community and fundamental qualities that underlie their decisions to live and/or provide services in the community.

**Cumulative Effects.** Cumulative social and economics arising from the three public nodes alternative are of the same type, but somewhat higher than, those occurring under any of the other alternatives. Cumulative effects include increased traffic levels on Saguache County Road T and in the Crestone/Baca Grande community, higher spending by visitors that would bolster tourism-oriented businesses across the valley, and additional tax revenues to fund public services and facilities. The higher number of park visitors under this alternative would enhance the commercial development potential of private lands along the access routes to the park's main entry. Any sales and subsequent development of those lands would have economic implications, as well as changing the visitor experience.

Opening Medano Ranch for public use could also result in long-term changes in traffic patterns, shifting more of the traffic from SH 150 to Alamosa County Road 6N. Having more traffic follow the combined SH 150/6N route would help promote the Los Caminos Antiguos Scenic Byway, of which those two roads are part. The incremental effects on traffic on the highways and roads in the region, including county roads T and 6N, would be small in relationship to traffic created in the future by area residents, commercial vehicles, and other travelers through the region. The increases would result in minor increases in road maintenance requirements for the respective state and local entities.

The incremental effects of the three public nodes alternative would be negligible to minor in the short-term and minor to

moderate in the long term, and generally beneficial, as compared to other social or economic effects resulting from the cumulative actions.

**Conclusion.** The economic effects of the three public nodes alternative include negligible to minor short-term and minor to moderate long-term economic benefits, the latter due to increased visitation tied to this alternative. Among the alternatives, three public nodes offers the largest economic benefits for the region. Long-term social consequences include a negligible to minor contribution to long-term population growth and demands on community infrastructure and services. Short- and long-term effects on lifestyles and attitudes are indeterminate.

## **HEALTH AND SAFETY**

The three public nodes alternative includes a primitive campground proposed for the northern portion of the national park. Campfires would likely be allowed in the new campground, and this could increase the risk of wildfire in the area. Prevailing winds could quickly push a fire eastward into steep terrain, making such a fire difficult to fight. A fire starting in the northern portion of the national park could also spread via prevailing winds into the Baca Grande subdivision. The increased risk of fire danger would present a minor to moderate, long-term, localized, adverse impact to human health and safety.

At the main park entrance, visitors would be redirected to (encouraged to visit) other areas once the dunes parking lot fills. This would help keep vehicle numbers and traffic congestion down along the main park road and turnouts, and at the visitor center and dunes parking lots. This would aid in keeping the incidence of traffic accidents from rising in these busy visitor

areas as visitation increases over time. Compared to the no-action alternative, the impact on safety would be long term, localized, negligible, and beneficial.

Administrative access to the former Baca Ranch and to Medano Ranch would remain relatively good. Guides would accompany visitors in the guided learning zone, and there would be a NPS presence at Medano Ranch. Based on available routes of access and the lack of a wilderness recommendation in this alternative, emergency response to these areas would remain relatively efficient. Any additional risk to visitors in these areas would be minimal. Bison would no longer graze within the park, so this minimal risk to visitor safety would be eliminated. Impacts would be long term, negligible, and beneficial compared to the no-action alternative.

**Cumulative Impacts.** Relocation of the horse loading area east of the dunes is planned for the near future. This would include providing a dirt surface, allowing surer footing for horses. The *Greater Sand Dunes Interagency Fire Management Plan* (2005) includes measures for safely and efficiently managing wildland fires within the park and preserve, the Baca National Wildlife Refuge, and The Nature Conservancy's Medano Zapata Ranch. The dunes parking lot within the national park is planned for minor expansion (~5%) and reconfiguration to improve vehicle circulation and increase capacity. Although the incidence of traffic accidents in the dunes lot is very low, this action would likely provide some small measure of increased safety as visitor use increases over time. The three public nodes alternative would contribute minor to moderate adverse and negligible beneficial impacts on visitor safety. Combined with other past, present, and reasonably foreseeable future actions, the three public

nodes alternative would have a long-term, minor, adverse effect on safety.

**Conclusion.** The three public nodes alternative would provide negligible beneficial safety impacts from managing visitor use in the eastern-most frontcountry zone (by redirecting visitors to other areas), elimination of bison from the park, and from National Park Service and guide presence around Medano Ranch and the guided learning zone. Long-term, minor to moderate, adverse impacts would accrue from increased wildfire risk due to campfires at the proposed primitive campground.

## NATIONAL PARK SERVICE OPERATIONS

New or improved facilities that would add to the park's maintenance load are proposed in the three public nodes alternative. Examples include a new access road, trailhead, and primitive campground in the north part of the national park, and new trails in several areas. Assuming The Nature Conservancy eventually transfers Medano Ranch to the National Park Service, facilities there would be upgraded and minimally expanded for public day use, administrative, and possibly concession purposes, and maintenance would become the responsibility of the National Park Service. Due to the condition of facilities at Medano Ranch, the park's maintenance backlog would be increased. Maintenance of additional facilities would place an additional burden on maintenance staff. Overall, this would have a long-term, moderate, adverse impact on park operations.

Activities that would require more NPS planning, coordination, and management include: managing public day use at Medano Ranch and in the guided learning

zone, managing the northern access / trailhead / primitive campground, patrolling and maintaining new trails, and managing nonnative invasive species. The new campground would attract and keep more visitors in the northern portion of the park, so this area would require careful monitoring to ensure resource protection. Managing and staffing the busy Medano Ranch frontcountry area and associated guided learning zone would be the biggest burden. Interpretation and information services, visitor and resource protection, management of guided learning zone tours, etc., would be needed there during most daylight hours. Administrative access to different park areas would not be quite as extensive as in the no-action alternative, but it would still allow relatively quick access for operational activities. Overall, new or expanded management responsibilities for the National Park Service would have long-term, moderate, adverse impacts on park operations.

**Cumulative Impacts.** Expansion of nearby communities, fire management responsibilities, elk herd reduction, pursuing a National Park Service water right, management of oil and gas exploration activities, and similar management needs would require time and attention by senior NPS staff. Cooperation and coordination with neighboring agencies and entities regarding planning, proposals near the park, etc., also require substantial amounts of staff time. The three public nodes alternative would place an additional burden on NPS staff, but this burden would be lessened if the park were adequately staffed. Combined with past, present, and reasonably foreseeable future impacts, the NPS preferred alternative would have moderate, long-term, adverse impacts on NPS operations.

**Conclusion.** Maintenance of additional facilities (especially in the northern portion

of the park and at Medano Ranch) would have moderate, long-term, adverse impacts on park operations. New or expanded management responsibilities would also have long-term, moderate, adverse impacts on park operations.

## **OPERATIONS OF OTHER ENTITIES AND MANAGEMENT AGENCIES**

### **Public Vehicle Access To/Through North Portion of Park**

Two potential routes for public vehicle access to the backcountry access zone in the north part of the national park would be considered under this alternative. The first route to be considered would involve access to the national park via the Baca National Wildlife Refuge; this option would be studied by the USFWS. If the USFWS determined this option to be incompatible with the purposes of the refuge, a second option of entering the park via a public county road from the Baca Grande subdivision (e.g., Camino Real), would be studied by the National Park Service in cooperation with Saguache County and the Baca Grande Property Owners Association. Consideration by Baca Grande/Crestone and the USFWS of potential access routes to the northern portion of the park would unavoidably place an additional responsibility on these two agencies during their comprehensive planning processes. This additional responsibility would be anticipated to add to the duration, complexity, and cost of the planning process for both entities. As such, this component of the alternative would have a short- and long-term, moderately adverse impact on the management actions of other agencies or entities.

This alternative allows for two additional (subsequent) public vehicle access options

to be considered in a separate future joint NPS/USFS public planning and environmental analysis process if USFS planning indicated that such access was needed. First, if either of the above described access routes into the national park were implemented, Cow Camp Road could be extended to the mountain front to connect with Liberty Road. Second, if neither of the above described access routes were determined to be feasible, the 0.7-mile segment of Liberty Road within the national park could be converted to a backcountry access zone. Either option would permit public vehicle access to the new USFS lands, an option that the USFS would like to preserve. Environmental impacts of these options would be addressed by a future study; they are not addressed in this GMP.

Should an acceptable route through the northern portion of the park to USFS lands be identified, concerns of the USFS relative to public vehicle access closer to the mountain front for general recreation would be appeased. Such a route would also provide public vehicle access closer to private in-holdings in Liberty, Short Creek, and Pole Creek. Finally, public vehicle access into the northern portion of the park would partially address CDOW and USFS concerns about limited hunter harvest of elk in adjacent USFS lands due to lack of vehicle access. This specific concern is also addressed by this alternative in the form of hunter access provided through use of the Superintendent's Compendium. Therefore, this alternative would be anticipated to have minor, long-term, beneficial impacts on other agencies.

## **Designation of Additional Wilderness Areas within the Park**

No new areas would be recommended for wilderness designation under the three public nodes alternative. Therefore, this alternative would have no impacts relative to additional wilderness designations.

**Cumulative Impacts.** The most relevant past, present, and reasonably foreseeable future actions that may interact cumulatively with this alternative to affect other agencies are the Great Sand Dunes National Park and Preserve Act (2000), and expansion of communities near the park. Impacts of the act are exemplified by this GMP. Increased human habitation in the area would reduce options for wildlife and wildlife management activities, as well as complicating the logistics of mineral exploration, among other activities. Combined with past, present, and reasonably foreseeable future actions, the impact of the preferred alternative would be long-term, minor to moderately adverse impacts on other entities and agencies.

**Conclusion.** Provision for evaluation of potential access routes to and through the northern portion of the park places much of the onus of evaluating such routes on the USFWS and Baca Grande/Saguache County—a short- and long-term, moderately adverse impact, depending on the duration of their respective planning processes. However, should an acceptable route be identified and implemented, it would partially address USFS and CDOW concerns about public vehicle access to the mountain front and about hunter harvest of elk. As such, this alternative is anticipated to have short- and long-term, minor to moderately adverse impacts on these agencies, as well as minor, long-term beneficial impacts.

## **UNAVOIDABLE ADVERSE EFFECTS**

Some impacts caused by human use (especially minor, inadvertent impacts to archeological sites, vegetation, soils, water resources, etc.) are essentially unavoidable because not allowing people in the park would be inconsistent with the National Park Service mission.

## **IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES**

Irreversible impacts are permanent. An irretrievable commitment of resources refers to resources that, once removed, cannot be replaced. Archeological

resources that are stolen or or vandalized are irreversibly lost. Even moving or disturbing such resources constitutes and irreversible commitment of resources because information is lost if the context (location and condition) is changed, even inadvertently. Thus there would be some irreversible loss or commitment of archeological resources from this alternative.

## **RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY**

There would be no adverse effects on biological or economic productivity from implementation of this alternative.



**TABLE 26. SUMMARY OF IMPACTS OF THE ALTERNATIVES**

Impact Topic	No-Action Alternative	NPS Preferred Alternative	Dunefield Focus—Maximize Wildness Alternative	Three Public Nodes Alternative
<b>Archeology</b>	<p>In frontcountry, along creeks, and along established trails, damage to sites (trampling, vandalism, and theft) from increased visitor use (-)</p> <p>Little potential damage to sites in much of park expansion area, including Medano Ranch, due to lack of public access and private ownership (+)</p> <p><u>Conclusion:</u> adverse: long term, minor to moderate; beneficial: minor</p>	<p>In frontcountry, along creeks, and along established trails, damage to sites (trampling, vandalism, and theft) from increased visitor use (-)</p> <p>Potential damage to sites in north part of park and core park areas from increased visitor access, trailhead, and new trails (-)</p> <p>Increased protection of sites in certain park expansion areas from NPS presence, guided learning zone and recommended wilderness (+)</p> <p><u>Conclusion:</u> adverse: long term, minor to moderate; beneficial: minor</p>	<p>In frontcountry, along creeks, and along established trails, damage to sites (trampling, vandalism, and theft) from increased visitor use (-)</p> <p>Potential site-specific impacts from multiuse trail and possible frontcountry parking and restroom expansion (-)</p> <p>Little potential damage to sites in much of park expansion area due to general lack of public access and recommended wilderness (+)</p> <p>Vandalism and theft possible despite very low use levels in remote areas due to low NPS presence and monitoring (-)</p> <p><u>Conclusion:</u> adverse: long term, minor to moderate; beneficial: minor</p>	<p>In frontcountry, along creeks, and along established trails, damage to sites (trampling, vandalism, and theft) from increased visitor use (-)</p> <p>Potential damage to sites in north part of park and core park areas from increased visitor access, trailhead, campground, and new trails (-)</p> <p>Increased protection of sites in certain park expansion areas from NPS presence, guided learning zone (+)</p> <p><u>Conclusion:</u> adverse: long term, minor to moderate; beneficial, minor</p>
<b>Historic Structures</b>	<p>Maintenance of Medano Ranch headquarters structures' integrity by Nature Conservancy ownership and management (+)</p> <p><u>Conclusion:</u> beneficial: negligible</p>	<p>Increased maintenance and some stabilization of Medano Ranch structures from NPS adaptive use (+)</p> <p>Potential changes to Medano Ranch structures' character-defining features and possible removal of minor buildings due to NPS adaptive use; potential vandalism, wear and tear from scheduled public access (-)</p> <p>Possible disturbance to an unevaluated ditch segment from hike/bike path (-)</p> <p>Reduced maintenance of some elements (e.g., roads and ditches) due to recommended wilderness (-)</p> <p><u>Conclusion:</u> beneficial: minor, long term; adverse: minor to major. (Impact severity can be reduced below the "major" threshold).</p>	<p>Deterioration of structures, vandalism, and building removal possible due to management of Medano Ranch as "natural/wild zone" (-).</p> <p>Reduced maintenance of some elements (e.g., roads and ditches) due to recommended wilderness (-)</p> <p><u>Conclusion:</u> adverse: long term, minor to major. (Impact severity can be reduced below the "major" threshold).</p>	<p>Increased maintenance and some stabilization of Medano Ranch structures from NPS adaptive use (+)</p> <p>Potential changes to Medano Ranch structures' character-defining features, possible removal of minor buildings, and possible new facilities due to NPS adaptive use; potential vandalism, wear and tear from scheduled public access (-)</p> <p><u>Conclusion:</u> beneficial: minor, long term; adverse: minor to major. (Impact severity can be reduced below the "major" threshold).</p>
<b>Cultural Landscapes</b>	<p>No effects on potential cultural landscapes</p> <p><u>Conclusion:</u> no impacts</p>	<p>Changes to Medano Ranch potential cultural landscape from NPS adaptive reuse and rehabilitation of buildings (+ and -)</p> <p>Integrity of NPS administrative potential cultural landscape restored by removal of nonhistoric fee booth (+)</p> <p><u>Conclusion:</u> beneficial: minor to moderate; adverse: long term, negligible to minor</p>	<p>Loss of integrity (from deterioration, vandalism, possible building removal) of the Medano Ranch potential cultural landscape due to management of Medano Ranch as "natural/wild zone" and wilderness recommendation (-).</p> <p><u>Conclusion:</u> adverse: long term, moderate to major. (Impact severity can be reduced below the "major" threshold).</p>	<p>Changes to Medano Ranch potential cultural landscape from NPS adaptive reuse, rehabilitation, and possible addition or removal of buildings (+ and -)</p> <p><u>Conclusion:</u> beneficial: long term, minor; adverse: long term, moderate to major. (Impact severity can be reduced below the "major" threshold).</p>
<b>Vegetation</b>	<p>Potential for introduction of nonnative plant species, social trail establishment, and trampling of vegetation from increased use in certain areas (-)</p> <p>Streambank trampling, species composition shifts due to selective consumption of more palatable species, and introduction of nonnative plant species from continued managed bison grazing (-)</p> <p><u>Conclusion:</u> adverse: long term, minor to moderate; beneficial: long term, moderate</p>	<p>Potential for introduction of nonnative plant species and trampling from increased visitor use in certain areas (-)</p> <p>Social trails and trampling effects minimized in sensitive areas by providing designated trails, guided learning zone, and carrying capacity approach (+)</p> <p>Localized damage or destruction of vegetation from limited new facilities (access road, trailhead, trails, fee booth, bike lanes, hike/bike path, any cooperative / joint facilities) (-)</p> <p>Plant community recovery from discontinuation of managed bison grazing (+)</p> <p><u>Conclusion:</u> adverse: long term, negligible to moderate; beneficial: long term, minor to moderate</p>	<p>Potential for introduction of nonnative plant species, social trail establishment, and trampling from increased visitor use in certain areas; impacts tempered by carrying capacity-approach (-)</p> <p>Localized damage or destruction of vegetation from limited new facilities (multiuse path, possible frontcountry parking and restroom expansion) (-)</p> <p>Plant community recovery from discontinuation of managed bison grazing (+)</p> <p><u>Conclusion:</u> adverse: long term, negligible to moderate; beneficial: long term, minor to moderate</p>	<p>Potential for introduction of nonnative plant species and trampling from increased visitor use in certain areas (-)</p> <p>Social trails and trampling effects minimized in sensitive areas by providing designated trails, guided learning zone, and carrying capacity approach (+)</p> <p>Localized damage or destruction of vegetation from limited new facilities (access road, trailhead, primitive campground, trails)</p> <p>Plant community recovery from discontinuation of managed bison grazing (+)</p> <p><u>Conclusion:</u> Adverse: long term, negligible to moderate; beneficial: long term, minor to moderate</p>

**TABLE 26. SUMMARY OF IMPACTS OF THE ALTERNATIVES**

Impact Topic	No-Action Alternative	NPS Preferred Alternative	Dunefield Focus—Maximize Wildness Alternative	Three Public Nodes Alternative
<b>Ecologically Critical Areas</b>	<p>Potential for introduction of nonnative plant species, social trail establishment, and incidental trampling of vegetation and soils in the Great Sand Dunes and Deadman Creek ecologically critical areas (-)</p> <p>Streambank trampling, species composition shifts from consumption of more palatable species, and introduction of nonnative plant species from continued managed bison grazing in the San Luis Lakes / Sand Creek ecologically critical areas (-)</p> <p><u>Conclusion:</u> adverse: long term, minor to moderate; beneficial: long term, minor to moderate</p>	<p>Potential for introduction of nonnative plant species and trampling from increased visitor use in certain areas of the Great Sand Dunes and Deadman Creek ecologically critical areas (-)</p> <p>Social trails and trampling effects minimized in sensitive areas by providing designated trails, guided learning zone, and carrying capacity approach (+)</p> <p>Localized effects from limited new facilities (access road, trailhead, trails, fee booth, bike lanes, hike/bike path, any cooperative/ joint facilities) (-)</p> <p>Plant community recovery within Great Sand Dunes and San Luis Lakes / Sand Creek ecologically critical areas from discontinuation of managed bison grazing (+)</p> <p><u>Conclusion:</u> Adverse: long term, minor to moderate; beneficial: long term, minor to moderate</p>	<p>Potential for introduction of nonnative plant species, social trail establishment, and trampling from increased visitor use in the Great Sand Dunes and Deadman Creek ecologically critical areas; impacts tempered by carrying capacity-approach (-)</p> <p>Localized effects from limited new facilities (multi-use path, possible frontcountry parking and restroom expansion) (-)</p> <p>Plant community recovery within Great Sand Dunes and San Luis Lakes / Sand Creek ecologically critical areas from discontinuation of managed bison grazing (+)</p> <p><u>Conclusion:</u> Adverse: long term, minor to moderate; beneficial: long term, minor to moderate</p>	<p>Potential for introduction of nonnative plant species and trampling from increased visitor use in certain areas of the Great Sand Dunes and Deadman Creek ecologically critical areas (-)</p> <p>Social trails and trampling effects minimized in sensitive areas by providing designated trails, guided learning zone, and carrying capacity approach (+)</p> <p>Localized effects from limited new facilities (access road, trailhead, primitive campground, trails) (-)</p> <p>Plant community recovery within Great Sand Dunes and San Luis Lakes / Sand Creek ecologically critical areas from discontinuation of managed bison grazing (+)</p> <p><u>Conclusion:</u> Adverse: long term, minor to moderate; beneficial: long term, minor to moderate</p>
<b>Federal Threatened and Endangered Species</b>	<p>Increased visitor use not anticipated to have detectable/ measurable impacts on any Canada lynx moving through or attempting to take up residence (-)</p> <p>Presence of leashed dogs and unleashed hunting dogs in the preserve not anticipated to noticeably affect any lynx passing through or establishing territories in the preserve (-)</p> <p><u>Conclusion:</u> adverse: short and long term negligible on Canada lynx ("may affect—not likely to adversely affect" determination)</p>	<p>Increased visitor use not anticipated to have detectable / measurable impacts on any lynx moving through or attempting to take up residence (-)</p> <p>Presence of leashed dogs and unleashed hunting dogs in the preserve not anticipated to noticeably affect any lynx passing through or establishing territories in the preserve (-)</p> <p><u>Conclusion:</u> adverse: short and long term negligible on Canada lynx ("may affect—not likely to adversely affect" determination)</p>	<p>Increased visitor use not anticipated to have detectable / measurable impacts on any Canada lynx moving through or attempting to take up residence (-)</p> <p>Presence of unleashed hunting dogs in the preserve not anticipated to noticeably affect any lynx passing through or establishing territories in the preserve (-)</p> <p>Elimination of leashed dogs in the preserve not anticipated to noticeably affect any lynx passing through or establishing territories in the preserve (+)</p> <p><u>Conclusion:</u> adverse and beneficial: short and long term negligible on Canada lynx ("may affect—not likely to adversely affect" determination)</p>	<p>Increased visitor use not anticipated to have detectable / measurable impacts on any Canada lynx moving through or attempting to take up residence (-)</p> <p>Presence of unleashed hunting dogs in the preserve not anticipated to noticeably affect any lynx passing through or establishing territories in the preserve (-)</p> <p>Elimination of leashed dogs in natural-resource sensitive areas of the preserve not anticipated to noticeably affect any lynx passing through or establishing territories in the preserve (+)</p> <p><u>Conclusion:</u> adverse and beneficial, short and long term negligible on Canada lynx ("may affect—not likely to adversely affect" determination)</p>
<b>Wildlife, Including Colorado State-Listed Species</b>	<p>Impacts on riparian species from increased recreational use (-)</p> <p>Impacts on wetlands-associated species from removal of artificial water sources (- and +)</p> <p>Impacts on ungulate herd numbers and health due to continued limited access for elk hunting (-)</p> <p>Impacts on bighorn sheep populations from presence of leashed dogs in national preserve (-)</p> <p><u>Conclusion:</u> adverse: long term, negligible to moderate; beneficial: long term, negligible to minor</p>	<p>Impacts on riparian species from increased recreational use (-)</p> <p>Impacts on wetlands-associated species from removal of artificial water sources (- and +)</p> <p>Impacts on ungulate herd numbers and health from facilitation of elk hunting (+)</p> <p>Impacts on bighorn sheep populations from presence of leashed dogs in national preserve (-)</p> <p><u>Conclusion:</u> adverse: long term, negligible to moderate; beneficial: long term, negligible to minor</p>	<p>Impacts on riparian species from increased recreational use (-)</p> <p>Impacts on wetlands-associated species from removal of artificial water sources (- and +)</p> <p>Impacts on ungulate herd numbers and health due to continued limited access for elk hunting (-)</p> <p>Impacts on bighorn sheep populations from absence of leashed dogs in national preserve (+)</p> <p><u>Conclusion:</u> adverse: long term, negligible to moderate; beneficial: long term negligible to minor</p>	<p>Impacts on riparian species from increased recreational use (-)</p> <p>Impacts on wetlands-associated species from removal of artificial water sources (- and +)</p> <p>Impacts on ungulate herd numbers and health from facilitation of elk hunting (+)</p> <p>Impacts on bighorn sheep populations from restriction of leashed dogs in areas where the two species might interact (+)</p> <p><u>Conclusion:</u> adverse: long term, negligible to moderate; beneficial: long term, negligible to minor</p>
<b>Soils and Geologic Resources</b>	<p>Social trails in northern portion of the national park from increased day-use hiking (-)</p> <p>Localized disturbance and compaction from vehicles parking along road shoulders when the dunes parking lot fills (-)</p> <p><u>Conclusion:</u> adverse: long term, mostly localized, minor to moderate</p>	<p>Localized soil disturbance and compaction from construction of new trails in the backcountry adventure and guided learning zones; vehicle access route and new trailhead in the northern backcountry access zone; and bike lanes, hiking/biking path in frontcountry zone (-)</p> <p>Fewer social trails due to provision of trails to direct foot traffic (+)</p> <p>Less localized disturbance and compaction along road shoulders due to visitor modest shuttle (+)</p> <p><u>Conclusion:</u> adverse: long term, site-specific, minor to moderate; beneficial: long term, localized minor</p>	<p>Social trails in northern portion of the national park from increased day-use hiking and horse use (-)</p> <p>Localized soil disturbance and compaction from limited new facilities (multiuse path, possible frontcountry parking and restroom expansion) (-)</p> <p>Gradual recovery of disturbed soils in park expansion areas due to extensive natural / wild zone (+)</p> <p><u>Conclusion:</u> adverse: long term, mostly localized, minor to moderate; beneficial: long term, mostly localized, minor to moderate</p>	<p>Localized soil disturbance and compaction from construction of new trails in the backcountry adventure and guided learning zones; vehicle access route, new trailhead, and primitive campground in the northern backcountry access zone (-)</p> <p>Fewer social trails due to provision of trails to direct foot traffic (+)</p> <p>Reduced disturbance and soil compaction from vehicles parking along road shoulders due redirection of visitors (+)</p> <p><u>Conclusion:</u> adverse: long term, site-specific, minor to moderate; beneficial: localized minor beneficial.</p>

**TABLE 26. SUMMARY OF IMPACTS OF THE ALTERNATIVES**

Impact Topic	No-Action Alternative	NPS Preferred Alternative	Dunefield Focus—Maximize Wildness Alternative	Three Public Nodes Alternative
<b>Wetlands</b>	<p>Introduction of nonnative species, and trampling of wetland soil and vegetation from increased visitor use in certain areas (-)</p> <p>Drying of introduced wetlands from removal of livestock watering ponds (-)</p> <p>Continued streambank and bottom erosion from the Medano Ranch managed bison herd (-)</p> <p><u>Conclusion:</u> adverse: long term, negligible to minor; beneficial: long term, negligible to moderate</p>	<p>Introduction of nonnative species, and trampling of wetland soil and vegetation from increased visitor use in certain areas (-)</p> <p>Drying of introduced wetlands from removal of livestock watering ponds and discontinuation of Medano Ranch meadow irrigation (-)</p> <p>Reestablishment or expansion of former wetlands from discontinuation of Medano Ranch meadow irrigation (+)</p> <p>Improved wetlands structure and function due to elimination of managed bison herd (+)</p> <p><u>Conclusion:</u> adverse: long term, negligible to moderate; beneficial: long term minor to major</p>	<p>Introduction of nonnative species, and trampling of wetland soil and vegetation from increased visitor use in certain areas (-)</p> <p>Drying of introduced wetlands from removal of livestock watering ponds and discontinuation of Medano Ranch meadow irrigation (-)</p> <p>Reestablishment or expansion of former wetlands from discontinuation of Medano Ranch meadow irrigation (+)</p> <p>Improved wetlands structure and function due to elimination of managed bison herd (+)</p> <p><u>Conclusion:</u> adverse: long term, negligible to moderate; beneficial: long term minor to major</p>	<p>Introduction of nonnative species, and trampling of wetland soil and vegetation from increased visitor use in certain areas (-)</p> <p>Drying of introduced wetlands from removal of livestock watering ponds and discontinuation of Medano Ranch meadow irrigation (-)</p> <p>Reestablishment or expansion of former wetlands from discontinuation of Medano Ranch meadow irrigation (+)</p> <p>Improved wetlands structure and function due to elimination of managed bison herd (+)</p> <p><u>Conclusion:</u> adverse: long term, negligible to moderate; beneficial: long term, minor to major</p>
<b>Water Resources</b>	<p>Increased potential for water quality impacts associated with increased visitation (-)</p> <p>Continued stream channel impacts from managed bison herd (-)</p> <p>Continued effects on groundwater and surface quantity impacts from irrigation of hay meadows on Medano Ranch (nature of impacts unknown)</p> <p><u>Conclusion:</u> Adverse: short and long term, localized, negligible to minor</p>	<p>Increased potential for water quality impacts associated with increased visitation and visitation in new areas (-)</p> <p>Improved water quality from restricting leashed dogs to certain zones within the national park, from the guided learning zone and backcountry toilets (+)</p> <p>Effects on groundwater and surface water quantity from discontinuing irrigation of hay meadows on Medano Ranch (nature of impacts unknown)</p> <p><u>Conclusion:</u> Adverse: short and long term, localized, negligible; beneficial: long term, minor</p>	<p>Increased potential for water quality impacts associated with increased visitation and visitation in new areas (-)</p> <p>Improved water quality from restricting dogs to developed areas (+), and from backcountry toilets (+)</p> <p>Sedimentation from increased social trails (no new trails to direct use away from sensitive areas) (-)</p> <p>Effects on groundwater and surface water quantity from discontinuing irrigation of hay meadows on Medano Ranch (nature of impacts unknown)</p> <p><u>Conclusion:</u> Adverse: long term, minor; beneficial: long term, minor</p>	<p>Increased potential for water quality impacts associated with increased visitation and visitation in new areas (-)</p> <p>Improved water quality from the guided learning zone (+), and from backcountry toilets (+)</p> <p>Effects on groundwater and surface water quantity from discontinuing irrigation of hay meadows on Medano Ranch (nature of impacts unknown)</p> <p><u>Conclusion:</u> Adverse: long term, localized, negligible to minor; beneficial: long term, minor</p>
<b>Visitor Use and Experience</b>	<p>Projected annual visitation: nearly 375,000 by 2025</p> <p>Equestrian users frustrated by having no easy way to access the north part of the park (-)</p> <p>Dunes parking lot would fill often; visitors must park along road shoulders (-)</p> <p>Visitor dissatisfaction with crowded conditions at certain locations (-)</p> <p>Dogs allowed in all areas of the park, provided they are on a leash (- and +)</p> <p><u>Conclusion:</u> Adverse: long term, minor to moderate; beneficial: long term, minor to moderate</p>	<p>Projected annual visitation: 427,100 by 2025</p> <p>Improved hiking and horseback access to new park lands, mountain front, and north part of the national preserve (+)</p> <p>Increased diversity of visitor programs and experiences with more bases for interpretation (+)</p> <p>More recreation options with bike lanes and hiking/biking path; more opportunities to see wildlife from expanded access to new areas (+)</p> <p>Reduced parking/driving frustrations when visitor shuttle is running (+)</p> <p>Leashed dogs restricted to national preserve, plus dunes play and frontcountry zones in national park (- and +)</p> <p>More perceptions of crowding in frontcountry areas (-)</p> <p>New wilderness experiences from wilderness recommendation (+)</p> <p><u>Conclusion:</u> Adverse: long term, minor; beneficial: long term, minor to major</p>	<p>Projected annual visitation: 397,100 by 2025</p> <p>Visitor opportunities diversified by easier access to localized areas of the dunes and Medano Creek and multiuse trail (+)</p> <p>Improved horseback access to northern portion of national park (+)</p> <p>Reduced parking/driving frustrations from frontcountry parking expansion (+)</p> <p>More perceptions of crowding in frontcountry areas (-)</p> <p>Leashed dogs restricted to parking lots, car campgrounds, and picnic areas within the national park and not allowed in national preserve (- and +)</p> <p>New wilderness experiences from wilderness recommendation (+)</p> <p><u>Conclusion:</u> Adverse: long term, minor; beneficial: long term, minor to major</p>	<p>Projected annual visitation: 441,000 visitors by 2025</p> <p>Improved hiking and horseback access to new park lands, mountain front, and north part of the national preserve (+)</p> <p>Increased diversity of visitor experiences and programs with more bases for interpretation (+)</p> <p>More opportunities to see wildlife from expanded access to new areas (+)</p> <p>New wheelchair-accessible public facilities (Medano Ranch and new primitive campground) (+)</p> <p>Leashed dogs not permitted in areas with high potential for or a history of problems (- and +)</p> <p>Visitor frustration from being redirected to other areas when dunes lot fills (+)</p> <p><u>Conclusion:</u> Adverse: long term, minor to major; beneficial: long term, minor to major</p>

**TABLE 26. SUMMARY OF IMPACTS OF THE ALTERNATIVES**

Impact Topic	No-Action Alternative	NPS Preferred Alternative	Dunefield Focus—Maximize Wildness Alternative	Three Public Nodes Alternative
<b>Scenic Resources and Visual Quality</b>	<p>Localized scenic impacts from people parking vehicles within Baca Grande subdivision to visit north part of park (-)</p> <p>No effects on visibility or night skies</p> <p><u>Conclusion:</u> adverse scenic: long term, localized, minor to moderate; no impacts on visibility or night skies</p>	<p>Frontcountry zone scenic impacts from limited new facilities (bike lanes, hike/bike path) (-)</p> <p>Scenic and night sky effects in park expansion lands from backcountry access zone trailhead in the north, possible new structures at Medano Ranch, and vehicles at both locations (-)</p> <p>Visibility effects from vehicles and dust in park expansion areas (-)</p> <p><u>Conclusion:</u> adverse: short and long term, localized, negligible to minor on scenery, visibility, and night skies</p>	<p>Frontcountry zone scenic impacts from limited new facilities (expanded parking and restrooms, multiuse path) (-)</p> <p>Localized scenic effects from people parking vehicles and horse trailers within Baca Grande subdivision to visit north part of park (-)</p> <p>Scenic, visibility, and night sky effects from discontinuation of use and possible eventual removal of structures at Medano Ranch (+)</p> <p><u>Conclusion:</u> adverse: short and long term, minor to moderate, adverse on scenery and visibility; beneficial: long term, negligible to minor on scenery, visibility, and night skies</p>	<p>Scenic and night sky effects in park expansion lands from backcountry access zone trailhead and primitive campground in the north, possible new structures at Medano Ranch, and vehicles at both locations (-)</p> <p>Visibility effects from vehicles and dust in park expansion areas (-)</p> <p><u>Conclusion:</u> adverse: long term, minor to moderate on scenery and visibility; long term, minor on night skies</p>
<b>Socio-economics</b>	<p>Projected annual visitor spending: \$18.43 million by 2025; 472 jobs supported (+)</p> <p>Projected NPS operations spending: \$6.8 million for future construction; \$7.4 million in other major maintenance spending (+)</p> <p>Vehicle congestion from visitors parking (or trying to park) near the terminus of county roads (-)</p> <p>This alternative fails to establish clear management direction for the expanded park (-)</p> <p>This alternative avoids certain outcomes or impacts that Great Sand Dunes community members might find objectionable; may be perceived to leave open management options for further consideration (+)</p> <p><u>Conclusion:</u> economic impacts: short term, negligible to minor, beneficial and long-term minor beneficial; community services impacts: indeterminate and negligible; traffic and emergency services impacts: long term, minor adverse; attitudes and lifestyles impacts: indeterminate—more likely adverse than beneficial</p>	<p>Projected annual visitor spending: \$21.18 million by 2025; 543 jobs supported (+)</p> <p>Projected NPS operations spending: \$21.2 million for future construction; \$7.7 million in other major maintenance spending (+)</p> <p>Traffic increase (from park visitors) on some local roads, including Saguache County Road T (-)</p> <p>This alternative establishes future management direction for the park reflecting public input and fundamental park values (+)</p> <p>This alternatives offers something for many to appreciate and something for many to disfavor (+ and -)</p> <p>Direct and indirect lifestyle consequences most apparent to neighbors and visitors to the park (+ and -)</p> <p><u>Conclusion:</u> economic impacts: short term, negligible to minor beneficial and long-term, minor, beneficial community services impacts: indeterminate and negligible; traffic and emergency services impacts: negligible adverse over the short and long term across most of the region, and long term minor adverse north of the park (Crestone / Baca Grande area); attitudes and lifestyles impacts: indeterminate</p>	<p>Projected annual visitor spending: \$19.61 million by 2025; 503 jobs supported (+)</p> <p>Projected NPS operations spending: \$10.6 million for future construction; \$7.4 million in other major maintenance spending (+)</p> <p>Vehicle congestion from visitors parking (or trying to park) near the terminus of county roads (-)</p> <p>This alternative establishes future management direction for the park reflecting public input and fundamental park values (+)</p> <p>This alternative would tend to polarize opinions and attitudes (+ and -)</p> <p>Relatively few direct lifestyle consequences (+ and -)</p> <p><u>Conclusion:</u> economic impacts: short term, negligible to minor beneficial and long term minor beneficial; community services impacts: indeterminate and negligible; traffic and emergency services: long term, minor to moderate adverse; attitudes and lifestyles impacts: indeterminate</p>	<p>Projected annual visitor spending: \$21.91 million by 2025; 561 jobs supported (+)</p> <p>Projected NPS operations spending: \$20.6 million for future construction; \$7.7 million in other major maintenance spending (+)</p> <p>Traffic increase (from park visitors) on some local roads, including Saguache County Road T (-)</p> <p>This alternative establishes future management direction for the park reflecting public input and fundamental park values (+)</p> <p>This alternative would tend to polarize opinions and attitudes (+ and -)</p> <p>Direct and indirect lifestyle consequences most apparent to neighbors and visitors to the park (+ and -)</p> <p><u>Conclusion:</u> economic impacts: short term, negligible to minor beneficial and long-term minor to moderate beneficial; community services impacts: indeterminate and negligible; traffic and emergency services: negligible adverse over the short and long term over most of the region, and long term minor adverse north of the park (Crestone/Baca Grande area); attitudes and lifestyles impacts: indeterminate</p>
<b>Health and Safety</b>	<p>No new risks from wildfire</p> <p>Some increased risk of traffic accidents with increased visitation over time (-)</p> <p>Continued safety risk (negligible) associated with a managed bison herd in the park (-)</p> <p><u>Conclusion:</u> adverse, long term, negligible</p>	<p>No new risks from wildfire</p> <p>Reduced risk of traffic accidents due to visitor shuttle system, bike lanes, and hike/bike path (+)</p> <p>Longer emergency response times to former Baca Ranch due to limited access and wilderness recommendation (-), and shorter emergency response times to Medano Ranch and guided learning zone due to NPS presence (+)</p> <p><u>Conclusion:</u> beneficial: long term, negligible to minor; adverse: long term, minor</p>	<p>Possible increased risk of wildfire from Medano Ranch structures being left unmaintained (-)</p> <p>Some increased risk of traffic accidents with increased visitation over time, and busier frontcountry (-)</p> <p>Reduced risk of traffic accidents from multi-use path (+)</p> <p>Longer emergency response times to former Baca Ranch and Medano Ranch areas due to limited access and wilderness recommendation (-)</p> <p><u>Conclusion:</u> beneficial: long term, negligible to minor; adverse: Long term, minor</p>	<p>Increased risk of wildfire in the north due to new primitive campground (-)</p> <p>Reduced risk of traffic accidents due to redirection of visitor vehicles when dunes lot fills (+)</p> <p>Shorter emergency response times to former Baca Ranch, Medano Ranch and guided learning zone due to NPS presence and lack of wilderness recommendation (+)</p> <p><u>Conclusion:</u> beneficial: long term, negligible; adverse: long term, minor to moderate</p>

**TABLE 26. SUMMARY OF IMPACTS OF THE ALTERNATIVES**

Impact Topic	No-Action Alternative	NPS Preferred Alternative	Dunefield Focus—Maximize Wildness Alternative	Three Public Nodes Alternative
<p><b>National Park Service Operations</b></p>	<p>No to negligible impacts on NPS operations</p> <p><u>Conclusion:</u> no to negligible impacts</p>	<p>Increased operational burden from maintenance of additional facilities (trails, trailhead, bike lanes, Medano Ranch headquarters)(-)</p> <p>Increased operational burden from administering scheduled public activities at Medano Ranch, managing public use of the guided learning zone, managing a visitor shuttle system, patrolling the northern access/trailhead and new trails, and managing expanded wilderness (-)</p> <p><u>Conclusion:</u> adverse: long term, moderate</p>	<p>Increased operational burden from maintenance of additional facilities (expanded parking, restrooms, and multiuse path in frontcountry zone) (-)</p> <p>Increased operational burden from patrolling the frontcountry multiuse path, patrolling remote backcountry areas, providing emergency response services in remote areas, and managing expanded wilderness (-)</p> <p><u>Conclusion:</u> adverse: long term, minor to moderate</p>	<p>Increased operational burden from maintenance of additional facilities (trails, trailhead, primitive campground, Medano Ranch headquarters) (-)</p> <p>Increased operational burden from managing public day use at Medano Ranch and in the guided learning zone, managing the northern access / trailhead / primitive campground, and patrolling and maintaining new trails (-)</p> <p><u>Conclusion:</u> adverse: long term, moderate</p>
<p><b>Operations of Other Entities and Management Agencies</b></p>	<p>Doesn't provide for possible future evaluation of public vehicle access routes to the mountain front—a USFS and CDOW goal (-)</p> <p>Doesn't provide for a northern route or routes for hunting access to USFS lands (-)</p> <p>No burden placed on USFWS and the Baca Grande subdivision/ Saguache County to consider potential access routes across their respective lands in their planning processes</p> <p>Remediation expenses for possible degradation of near-pristine conditions on adjacent USFS lands not expected to increase beyond those projected from visitation trends</p> <p>No new wilderness-related effects on activities of other agencies and organizations</p> <p><u>Conclusion:</u> adverse: short and long term, minor</p>	<p>Provides for possible future evaluation of public vehicle access routes to the mountain front—a USFS and CDOW goal (+)</p> <p>Provides for a northern route or routes for hunting access to USFS lands (+)</p> <p>Burden placed on USFWS and the Baca Grande subdivision / Saguache County to consider potential access routes across their respective lands in their planning processes (-)</p> <p>Possible increased remediation expenses for degradation of near-pristine conditions on adjacent USFS lands (-)</p> <p>Burden on other agencies to ensure that their activities on NPS lands are conducted in a way that protects wilderness values (-)</p> <p><u>Conclusion:</u> beneficial: long term, minor; adverse: short and long term minor to moderate</p>	<p>Doesn't provide for possible future evaluation of public vehicle access routes to the mountain front—a USFS and CDOW goal (-)</p> <p>Provides for a northern route or routes for hunting access to USFS lands (+)</p> <p>No burden placed on USFWS and the Baca Grande subdivision/ Saguache County to consider potential access routes across their respective lands in their planning processes</p> <p>Remediation expenses for possible degradation of near-pristine conditions on adjacent USFS lands not expected to increase beyond those projected from visitation trends</p> <p>Burden on other agencies to ensure that their activities on NPS lands are conducted in a way that protects wilderness values (-)</p> <p><u>Conclusion:</u> adverse: short and long term, minor to moderate</p>	<p>Provides for possible future evaluation of public vehicle access routes to the mountain front—a USFS and CDOW goal (+)</p> <p>Provides for a northern route or routes for hunting access to USFS lands (+)</p> <p>Burden placed on USFWS and the Baca Grande subdivision/ Saguache County to consider potential access routes across their respective lands in their planning processes (-)</p> <p>Possible increased remediation expenses for degradation of near-pristine conditions on adjacent USFS lands (-)</p> <p>No new wilderness-related effects on activities of other agencies and organizations</p> <p><u>Conclusion:</u> beneficial: long term, minor; adverse: short and long term, minor to moderate</p>

