

**DRAFT**

**General Management Plan / Wilderness Study / Environmental Impact Statement  
Great Sand Dunes National Park and Preserve**

Alamosa and Saguache Counties, Colorado

April 2006

---

This document is a draft General Management Plan / Wilderness Study / Environmental Impact Statement for Great Sand Dunes National Park and Preserve. General management plans describe the general path the National Park Service intends to follow in managing a park over the next 15 to 20 years. The general management plan (GMP) portion of this document (chapters 1 and 2) presents four alternative ways to manage natural and cultural resources, visitor use and opportunities, and facilities at Great Sand Dunes National Park and Preserve. One of the four GMP alternatives is a “no-action alternative” that provides a baseline against which to consider the other alternatives; it describes continuation of current management practices into the future. Issues addressed by the GMP relate to protection of fundamental park resources and values, management of new park lands, public access, crowding/overuse, wilderness, wild and scenic rivers, and development and uses in and around the park.

The wilderness study portion of this document provides a public forum for evaluating new lands within the expanded Great Sand Dunes park boundary for possible recommendation to Congress for inclusion in the National Wilderness Preservation System. This document provides a formal evaluation of those lands by studying wilderness eligibility, wilderness alternatives, and impacts of those alternatives. The wilderness alternatives are matched to the four GMP alternatives.

The environmental impact statement portion of this document (chapters 3, 4, and 5) provides background information about conditions in and around Great Sand Dunes National Park and Preserve (e.g., for natural and cultural resources, the socioeconomic environment, and agency operations); and it describes the environmental consequences that would be expected from implementing each of the four GMP/wilderness alternatives.

**Notes to reviewers:** Please send comments on this Draft General Management Plan / Wilderness Study / Environmental Impact Statement to the address or e-mail address below by June 19, 2006. It is the practice of the National Park Service to make all comments, including names and addresses of respondents who provide that information, available for public review following the conclusion of the National Environmental Policy Act compliance process. Individuals may request that the National Park Service withhold their name and/or address from public disclosure. If you wish to do this, you must state this prominently at the beginning of your comment. Commentators using the Web site can make this request by checking the box “keep my contact information private.” The National Park Service will honor such requests to the extent allowable by law, but you should be aware that the National Park Service may still be required to disclose your name and address pursuant to the Freedom of Information Act.

**Please address comments to:** Superintendent Steve Chaney; Great Sand Dunes National Park and Preserve; 11500 Highway 150; Mosca, Colorado 81146. E-mail: [grsa\\_superintendent@nps.gov](mailto:grsa_superintendent@nps.gov)



## SUMMARY

The purpose of this conceptual plan is to describe the general path the National Park Service (NPS) intends to follow in managing Great Sand Dunes National Park and Preserve over the next 15 to 20 years. The approved plan will provide a framework for proactive decision making on visitor use, natural and cultural resource management, and park facilities. Although a general management plan (GMP) provides the analysis and justification for future funding, the plan in no way guarantees that money will be forthcoming. Requirements for additional data for legal compliance and competing national park priorities can delay implementation of actions. Full implementation of a plan could lie many years in the future.

## ALTERNATIVES

Four alternatives have been developed for managing visitor use and resources at Great Sand Dunes National Park and Preserve. Each alternative provides a different management approach. The alternatives were based on the park's purpose and significance, fundamental resources and values, legal mandates, public views, and information on visitor use and park resources.

The **no-action alternative** was developed to provide a baseline for evaluating the changes and impacts of the three action alternatives. This baseline is characterized primarily by conditions in December 2004, roughly 2 months after ownership and management of the Baca Ranch was transferred to the U.S. government, and by continuation of current management practices into the future. (There are funded projects planned for very near term; these

are included in the no-action alternative). Most visitor use would continue to be focused in or near the eastern part of the dunefield. The developed area east of the dunes (main park road, visitor center, and campground) would remain essentially the same. Some visitors would continue to explore backcountry areas of the park and preserve via designated trails and roads, and cross-country horse and hiking use would also continue. Some people would enter the north part of the park on foot from the Baca Grande subdivision, via the two county roads that end at the park boundary.

No new areas would be recommended for wilderness. New park lands that were not open to public use before December 2004 would be managed in a very conservative manner. That is, there would be no new development, and visitor use would be managed so as to not establish new practices for camping, types and routes of access, etc.

New park areas would be inventoried for natural and cultural resources and managed according to NPS policies that emphasize natural processes (for example, nonnative species, interior pasture fences, and artificial water holes and sources would be removed). Existing trails and trailheads in the park and preserve would be maintained, but there would be no new trails or trailheads. The Nature Conservancy would continue to manage Medano Ranch, including the Medano Ranch headquarters. There would be no public use of Medano Ranch. Bison grazing would continue within the park on lands leased or owned by The Nature Conservancy. Leashed dogs would

generally be allowed within the park and preserve.

The **NPS preferred alternative** was developed with substantial public, interagency, and NPS staff participation between 2003 and 2005. This is the plan the National Park Service proposes to implement over the next 15 to 20 years. Options would be created for dispersed hiking and horseback riding; a few new trails would be provided. Cooperative or joint facilities (such as access routes, trailheads, and ranger stations) with neighboring management agencies or private partners would be emphasized.

A large portion of the park expansion lands would be recommended for future designation as wilderness. To address existing and growing congestion in parking areas near the high dunes and visitor center, the park would pursue managing traffic and possible transportation solutions, rather than building additional parking or limiting use. The park's fee booth would be removed and a new one would be located closer to the park boundary. Bike lanes would be added to the main entrance road from the park boundary to the dunes parking lot. A biking/walking path would connect the Pinyon Flats campground to the dunes parking lot and visitor center.

The National Park Service would seek to acquire Medano Ranch and adaptively use the ranch headquarters for administrative purposes (offices, housing, storage, research support), and scheduled, guided public activities (interpretive programs, environmental education, a base for guided hiking or horseback tours, special events). Most historic Medano Ranch structures would be maintained. Leashed dogs would be allowed within the national park within the frontcountry and dunes play zones

only, and they would be allowed within the national preserve.

A trailhead would be provided in the north part of the park to provide a closer access point for backcountry recreation on the nearby national forest, the preserve, and new lands within the national park. Assuming neighboring entities find a way to provide vehicle access, the trailhead would be accessed via the Baca National Wildlife Refuge or Baca Grande subdivision, and then via Cow Camp Road within the national park. Also, the U.S. Forest Service (USFS), in consultation with the National Park Service, may study the need for (and impacts of) providing public vehicle access to USFS lands via Liberty Road or via an extension of Cow Camp Road; these options would be studied in a separate NPS/USFS environmental analysis study.

In the **dunefield focus—maximize wildness alternative**, most visitor use and visitor activities would be focused in or near the eastern edge of the dunefield. Most of the rest of the park and preserve would remain wild and undeveloped, allowing natural processes to continue with minimal human influence. Backcountry areas would be primitive and rugged, providing outstanding opportunities for solitude and adventure. A large portion of the park expansion lands would be recommended for future designation as wilderness.

Existing trails and trailheads would be maintained. Most visitors would continue to visit the main dunefield area (main park road, visitor center, dunes parking lot, and picnic area). Parking and related support facilities, such as restrooms, could be expanded in the frontcountry zone if dunes parking lots filled too often. A new multiuse trail for bicyclists and pedestrians would extend from near the park's main entrance to the visitor center, dunes

parking lot / picnic area, and to Pinyon Flats campground. A gate for horse access would be provided on the north boundary of the national park, and pedestrian access from the Baca Grande subdivision would continue.

The National Park Service would seek acquisition of Medano Ranch and would manage it as a natural/wild area. Ranch structures would not be maintained (or would be removed after documentation). Leashed dogs would be restricted to parking areas, picnic areas, and car campgrounds within the national park—they would not be permitted in the national preserve.

In the **three public nodes alternative**, most visitors would gain access to the park and preserve via three areas or “nodes.” Visitor facilities and trails would be concentrated in or near the three nodes, and the rest of the park and preserve would remain largely undeveloped. This alternative would provide diverse options for visitors to experience different portions of the dunes system.

The first node, located at the existing developed area east of the dunes, would remain essentially the same. The second node would be located at the Medano Ranch headquarters. The National Park Service would seek acquisition of Medano Ranch and would manage the ranch headquarters as a public day-use area, most historic ranch structures would be maintained, and guided hiking and horseback tours to nearby high interest areas could be provided. The third node, located in the north part of the park, would include a backcountry trailhead and a primitive campground if an appropriate public vehicle access route could be identified via the Baca National Wildlife Refuge or Baca Grande subdivision.

Dogs would not be permitted in areas where there is increased potential for or a history of conflicts with visitors or with wildlife; otherwise leashed dogs would be allowed. No new wilderness would be recommended in this alternative. The USFS, in consultation with the National Park Service, may study the need for (and impacts of) providing public vehicle access to USFS lands via Liberty Road or via an extension of Cow Camp Road to the mountain front; these options would be studied in a separate NPS/USFS environmental analysis study.

## BOUNDARY ADJUSTMENTS

Due to the Great Sand Dunes Act of 2000 and the major park boundary expansion that followed, the *General Management Plan / Wilderness Study / Environmental Impact Statement* addresses only minor, technical boundary adjustments. The National Park Service would pursue, through legislation or administrative action, minor boundary corrections, including one to address boundary discrepancies near San Luis Lakes State Park.

## ENVIRONMENTAL CONSEQUENCES

For all alternatives, most impacts on natural resources (vegetation, wildlife, wetlands, etc.) and cultural resources (e.g., archeological sites) would result from visitor use in new park areas and growth in visitor use over the life of the plan. The action alternatives would also have direct and indirect natural resource impacts from limited new facilities such as trails, trailheads, and (in one alternative) a primitive campground. Some such facilities would affect scenery and traffic in and around the park. In the NPS preferred and three public nodes alternatives, NPS

## Summary

adaptive use of the Medano Ranch headquarters would help protect historic structures, and the guided learning zone would allow visitors to learn about and enjoy sensitive resources while protecting those resources. Under the three action alternatives, the managed bison herd and hay meadow irrigation would be eliminated and more natural conditions restored. Wilderness recommendations in the NPS preferred and dunefield focus-maximize wildness alternatives would affect park resources, visitor experiences, and

operations of the National Park Service and other agencies. Providing a trailhead in the north end of the national park (NPS preferred and three public nodes alternatives) would improve access to new NPS and USFS lands and have other beneficial and adverse impacts on neighboring communities and agencies.

For a detailed summary table of environmental consequences (including type, intensity, and duration), see chapter 4, table 26.

# CONTENTS

## SUMMARY iii

## CHAPTER ONE: PURPOSE AND NEED FOR THE PLAN 1

PURPOSE AND NEED FOR THE PLAN	3
Overview of the Park and Preserve and the Region	3
General Management Planning	6
Purpose and Need for the General Management Plan	7
PURPOSE AND NEED FOR THE WILDERNESS STUDY	8
FOUNDATION FOR PLANNING AND MANAGEMENT	9
Part I: Purpose, Significance, Mission, Primary Interpretive Themes, and Special Mandates	9
Part II: Fundamental Resources and Values	13
RESOURCE OPPORTUNITY AREAS	15
DESIRED CONDITIONS AND STRATEGIES	16
Desired Conditions for the Dunes and for Biological Diversity	16
Desired Conditions for Human Connections	22
Desired Conditions for Visitor Opportunities	25
Other Desired Conditions	29
PLANNING ISSUES AND CONCERNS	32
Protection of Fundamental Resources and Values	32
Management of New Park Lands	33
Access to National Park Service and Other Federal Lands	33
Crowding and Overuse	33
Wilderness	33
Wild and Scenic Rivers	33
Development and Uses in and Near the Park	34
PLANNING CONSIDERATIONS AND CONSTRAINTS	34
Medano Ranch	34
Public Vehicle Access to the Backcountry Access Zone in Northern Portion of National Park	34
Cow Camp Road	34
RELATIONSHIP OF THE GENERAL MANAGEMENT PLAN TO OTHER PLANNING EFFORTS	35
Resource Management Strategy, Great Sand Dunes National Monument	35
Conceptual Management Plan, Comprehensive Conservation Plan, Baca National Wildlife Refuge	35
Planning for Lands Added to Rio Grande National Forest in the Year 2000	36
Interagency Land Exchange, Great Sand Dunes National Park and Preserve, Baca National Wildlife Refuge, Bureau of Land Management, and Colorado State Land Board	36
Greater Sand Dunes Interagency Fire Management Plan	37

**CHAPTER TWO: ALTERNATIVES 39**

- INTRODUCTION 41
  - Introduction to the Alternatives 41
- CARRYING CAPACITY 42
- MANAGEMENT ZONES 43
  - Frontcountry Zone 43
  - Dunes Play Zone 45
  - Backcountry Access Zone 46
  - Guided Learning Zone 48
  - Backcountry Adventure Zone 49
  - Natural / Wild Zone 51
  - Administrative Zone 52
- NO-ACTION ALTERNATIVE 54
  - Application of Management Zones 56
  - Wilderness 56
  - Staffing and Costs 56
  - Boundary Adjustments 56
- ELEMENTS COMMON TO THE THREE ACTION ALTERNATIVES 57
- NATIONAL PARK SERVICE PREFERRED ALTERNATIVE 58
  - Public Vehicle Access to Federal Lands in the North— Ongoing Collaboration 61
  - Application of Management Zones 62
  - Wilderness 62
  - Staffing and Costs 62
- DUNEFIELD FOCUS—MAXIMIZE WILDNESS ALTERNATIVE 64
  - Application of Management Zones 65
  - Wilderness 65
  - Staffing and Costs 65
- THREE PUBLIC NODES ALTERNATIVE 67
  - Application of Management Zones 70
  - Wilderness 70
  - Staffing and Costs 70
- ACTIONS CONSIDERED BUT ELIMINATED FROM DETAILED CONSIDERATION 70
  - Allowing Off-Highway Vehicles on Medano Pass Primitive Road (Within the National Preserve Only) 70
  - Reintroduction of a Native, NPS-Managed Bison Herd Within the Park and Adjacent Lands Under Federal Management 71
- MITIGATION MEASURES FOR THE ACTION ALTERNATIVES 72
  - General 72
  - Natural Resources 73
  - Cultural Resources 74
- ENVIRONMENTALLY PREFERRED ALTERNATIVE 76

**CHAPTER THREE: AFFECTED ENVIRONMENT 83**

INTRODUCTION 85

IMPACT TOPICS CONSIDERED IN THIS GENERAL MANAGEMENT PLAN 86

- Cultural Resources 86
- Vegetation 90
- Ecologically Critical Areas 99
- Federal Threatened and Endangered Species 102
- Colorado State-Listed Wildlife Species 110
- Wildlife 112
- Soils and Geologic Resources 114
- Wetlands 119
- Water Resources 123
- Visitor Use and Experience 128
- Scenic Resources and Visual Quality 137
- Socioeconomics 140
- Health and Safety 151
- National Park Service Operations 155
- Other Entities and Management Agencies’ Operations 160

IMPACT TOPICS CONSIDERED BUT NOT ANALYZED IN DETAIL 163

- Museum Collection 163
- Ethnographic Resources 163
- Floodplains 163
- Prime and Unique Farmlands 164
- Air Quality 165
- Natural Soundscape 165
- Wild and Scenic Rivers 166
- Energy Requirements and Conservation Potential 166
- Indian Trust Resources 166
- Environmental Justice 166

**CHAPTER FOUR: ENVIRONMENTAL CONSEQUENCES 167**

INTRODUCTION 169

TERMS AND ASSUMPTIONS 169

CUMULATIVE IMPACTS 170

- Great Sand Dunes National Park and Preserve Act (2000) 170
- National Park Service Visitor Center Renovation (2004) 170
- Discontinuation of Cattle Grazing on the Former Baca Ranch (2004) 170
- Greater Sand Dunes Interagency Fire Management Plan (2005) 171
- Development/Expansion of Retreat Centers in the Baca Grande Area (past, ongoing) 171
- Growth of the Crestone / Baca Grande Area (past, ongoing) 171
- Wilderness Restoration in the South Colony Lakes Basin Area (ongoing) 171
- Oil and Gas Exploration Activities on Former Baca Ranch Lands (past, future) 171
- Rehabilitate Main Park Roads and Parking (future) 172

## CONTENTS

Establishment of Water Right to Fulfill the Purposes of the National Park and Preserve	172
Relocate Horse Loading Area and Dump Station from Amphitheater Parking Lot (future)	172
Sale/Development of Private Land Parcels Near the Entrance to the Park (future)	172
Elk Herd Reduction (future)	172
IMPAIRMENT OF NATIONAL PARK RESOURCES	173
IMPACTS TO CULTURAL RESOURCES AND SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT	173
METHODS AND ASSUMPTIONS FOR ANALYZING IMPACTS	175
Archeology	175
Historic Structures	175
Cultural Landscapes	176
Vegetation	177
Ecologically Critical Areas	178
Federal Threatened and Endangered Species	179
Wildlife, Including Colorado State-Listed Species	180
Soils and Geologic Resources	182
Wetlands	182
Water Resources	183
Visitor Use and Experience	184
Scenic Resources and Visual Quality	184
Socioeconomics	185
Health and Safety	188
National Park Service Operations	188
Operations of Other Entities and Management Agencies	189
IMPACTS OF THE NO-ACTION ALTERNATIVE	189
Archeology	189
Historic Structures	190
Cultural Landscapes	190
Vegetation	191
Ecologically Critical Areas	192
Federal Threatened and Endangered Species	193
Wildlife, Including Colorado State-Listed Species	194
Soils and Geologic Resources	198
Wetlands	198
Water Resources	200
Visitor Use and Experience	201
Scenic Resources and Visual Quality	203
Socioeconomics	204
Health and Safety	208
National Park Service Operations	208
Operations of Other Entities and Resource Management Agencies	209
Unavoidable Adverse Effects	210
Irreversible and Irrecoverable Commitments of Resources	210

Relationship of Short-Term Uses and Long-Term Productivity 210

IMPACTS OF THE NATIONAL PARK SERVICE PREFERRED ALTERNATIVE 211

- Archeology 211
- Historic Structures 212
- Cultural Landscapes 213
- Vegetation 214
- Ecologically Critical Areas 216
- Federal Threatened and Endangered Species 218
- Wildlife, Including Colorado State-Listed Species 219
- Soils and Geologic Resources 222
- Wetlands 223
- Water Resources 224
- Visitor Use and Experience 225
- Scenic Resources and Visual Quality 229
- Socioeconomics 230
- Health and Safety 234
- National Park Service Operations 235
- Operations of Other Entities and Management Agencies 236
- Unavoidable Adverse Effects 239
- Irreversible and Irrecoverable Commitments of Resources 239
- Relationship of Short-Term Uses and Long-Term Productivity 239

IMPACTS OF THE DUNEFIELD FOCUS—MAXIMIZE WILDNESS ALTERNATIVE 239

- Archeology 239
- Historic Structures 241
- Cultural Landscapes 241
- Vegetation 242
- Ecologically Critical Areas 243
- Federal Threatened and Endangered Species 245
- Wildlife, Including Colorado State-Listed Species 246
- Soils and Geologic Resources 249
- Wetlands 250
- Water Resources 252
- Visitor Use and Experience 253
- Scenic Resources and Visual Quality 256
- Socioeconomics 257
- Health and Safety 261
- National Park Service Operations 262
- Operations of Other Entities and Management Agencies 263
- Unavoidable Adverse Effects 263
- Irreversible and Irrecoverable Commitments of Resources 264
- Relationship of Short-Term Uses and Long-Term Productivity 264

IMPACTS OF THE THREE PUBLIC NODES ALTERNATIVE 264

- Archeology 264

## CONTENTS

Historic Structures	266
Cultural Landscapes	266
Vegetation	267
Ecologically Critical Areas	269
Federal Threatened and Endangered Species	271
Wildlife, Including Colorado State-Listed Species	272
Soils and Geologic Resources	275
Wetlands	276
Water Resources	278
Visitor Use and Experience	279
Scenic Resources and Visual Quality	282
Socioeconomics	283
Health and Safety	287
National Park Service Operations	288
Operations of Other Entities and Management Agencies	289
Unavoidable Adverse Effects	291
Irreversible and Irrecoverable Commitments of Resources	291
Relationship of Short-Term Uses and Long-Term Productivity	291

## **CHAPTER FIVE: CONSULTATION AND COORDINATION 299**

SUMMARY OF PUBLIC INVOLVEMENT, INCLUDING SCOPING	301
--	-----

CONSULTATION	303
--------------	-----

LIST OF AGENCIES CONTACTED FOR INFORMATION OR SENT A COPY OF THE PLAN	304
---	-----

SELECTED BIBLIOGRAPHY	307
-----------------------	-----

PREPARERS AND CONSULTANTS	322
---------------------------	-----

Document Preparers	322
--------------------	-----

Great Sand Dunes National Park Advisory Council	323
---	-----

Consultants	324
-------------	-----

INDEX	453
-------	-----

Appendix A: Legislation	325
-------------------------	-----

Appendix B: Information Regarding Potential Conservation Sites, Colorado Natural Heritage Program	345
---	-----

Appendix C: Resource Opportunity Areas	349
--	-----

Appendix D: Carrying Capacity Steps	363
-------------------------------------	-----

Appendix E: Development of the General Management Plan	367
--	-----

Appendix F: Cost Estimates for the GMP Alternatives	377
---	-----

Appendix G: Wilderness Study and Recommendation	381
---	-----

Appendix H: Wild and Scenic River Evaluation	393
--	-----

Appendix I: Consultation Letters	403
----------------------------------	-----

Appendix J: Wetlands Statement of Findings	439
--	-----

## MAPS

Region	4
Vicinity	5
Resource Opportunity Areas	17
No-Action Alternative	55
National Park Service Preferred Alternative	59
Dunefield Focus—Maximum Wildness Alternative	66
Three Public Nodes Alternative	68
Selected Potential Conservation Sites	100
Great Sand Dunes System	118
Wilderness Status and Recommendations	391
National Wetlands Inventory	445

## TABLES

Table 1. Summary of Key Differences Among the Alternatives	78
Table 2. Impact Topics	85
Table 3. NPS-Managed Historic Structures and Districts (NRHP-eligible) and Potential Impacts	88
Table 4. Special-Status Plant and Animal Species	104
Table 5. Specific Soil Types Present on or in the Vicinity of the Great Sand Dunes	115
Table 6. Estimated Current Annual Use	136
Table 7. Population Growth Trends, 1990 to 2004	141
Table 8. Employment By Major Category, 2003 (percent of total)	141
Table 9. Overview of Agricultural Operations in the Region, 2002	142
Table 10. Per Capita Personal Income, 2000 to 2003	144
Table 11. Unemployment Rates, 2000 to 2005	144
Table 12. Selected Demographic Characteristics, 2000	144
Table 13. Selected Housing Characteristics	144
Table 14. Traffic Characteristics Near the Great Sand Dunes, 2004	146
Table 15. Land Ownership	148
Table 16. Federal Payment In Lieu of Taxes, Fiscal Year 2005	148
Table 17. Annual Spending in San Luis Valley By Visitors to the Great Sand Dunes	150
Table 18. Great Sand Dunes Accidents by Location 2000–2004	153
Table 19. Great Sand Dunes Accidents by Year	153
Table 20. National Park Service Buildings and Structures	157
Table 21. Medano Ranch Buildings and Structures	159
Table 22. Current and Projected Annual Visitors in 2025 No-action Alternative	201
Table 23. Current and Projected Annual Visitors in 2005 NPS Preferred Alternative	226
Table 24. Current and Projected Annual Visitors 2025 Dunefield Focus—Maximize Wildness Alternative	253
Table 25. Current and Projected Annual Visitors in 2025 Three Public Nodes Alternative	279
Table 26. Summary of Impacts of the Alternatives	293
Table 27. Compliance with Section 106 of the National Historic Preservation Act	304

**FIGURES**

- Figure 1. Frontcountry Zone 43
- Figure 2. Dunes Play Zone 45
- Figure 3. Backcountry Access Zone 46
- Figure 4. Guided Learning Zone 48
- Figure 5. Backcountry Adventure Zone 49
- Figure 6. Natural / Wild Zone 51
- Figure 7. Administrative Zone 52
- Figure 8. Cross-Section Showing Great Sand Dunes Life Zones 91
- Figure 9. Total Annual Visits to the Great Sand Dunes, 1932 to 2004 134
- Figure 10. Total Annual Visits to Great Sand Dunes, 1992 to 2004 134
- Figure 11. Cumulative Visitation at Great Sand Dunes, Selected Years and Average 1992 to 2004 135
- Figure 12. Monthly Visitation at Great Sand Dunes, Selected Years 135



## Chapter One: Purpose and Need for the Plan

---



## PURPOSE AND NEED FOR THE PLAN

### OVERVIEW OF THE PARK AND PRESERVE AND THE REGION

Great Sand Dunes National Monument was established in 1932 by presidential proclamation “for the preservation of the Great Sand Dunes and additional features of scenic, scientific, and educational interest.” The Great Sand Dunes Wilderness Area, established in 1976, includes most of the original monument. In November 2000, the Great Sand Dunes National Park and Preserve Act authorized expansion of the national monument into a national park and preserve almost four times the size of the original monument. Some of the land within the expanded national park boundaries is in private or state ownership. The national preserve includes some 40,000 acres of wilderness formerly managed by the U.S. Forest Service (USFS).

In this document, Great Sand Dunes National Park and Preserve is referred to collectively as “the park” or “the Great Sand Dunes.” Great Sand Dunes National Preserve (only) is referred to as “the preserve” or “the national preserve.” Great Sand Dunes National Park (only) is referred to as “the national park.”

The park is located in the high San Luis Valley of south-central Colorado at an elevation of 8,175 feet (~2500 meters) (see “Region” and “Vicinity” maps). The San Luis Valley (“Valley”) is bordered by Poncha Pass on the north, the San Juan Mountains on the west, and the Sangre de Cristo Mountains on the east. To the south, the San Luis Valley extends into New Mexico along the Rio Grande. The Valley

is a discrete cultural region rich in Hispanic culture and place names. Cattle ranching and irrigated agriculture (especially potatoes and alfalfa) are two main land uses in the Valley. Blanca Peak, the fourth-highest mountain in Colorado and sacred to some native peoples, towers over the Valley, just southeast of the park.

The park straddles the line dividing Saguache and Alamosa counties. The nearest good-sized town is Alamosa, population 8,545, located about 25 miles southwest of the park as the crow flies. Several smaller settlements (Moffat, Hooper, Mosca, and Crestone) lie closer to the park.

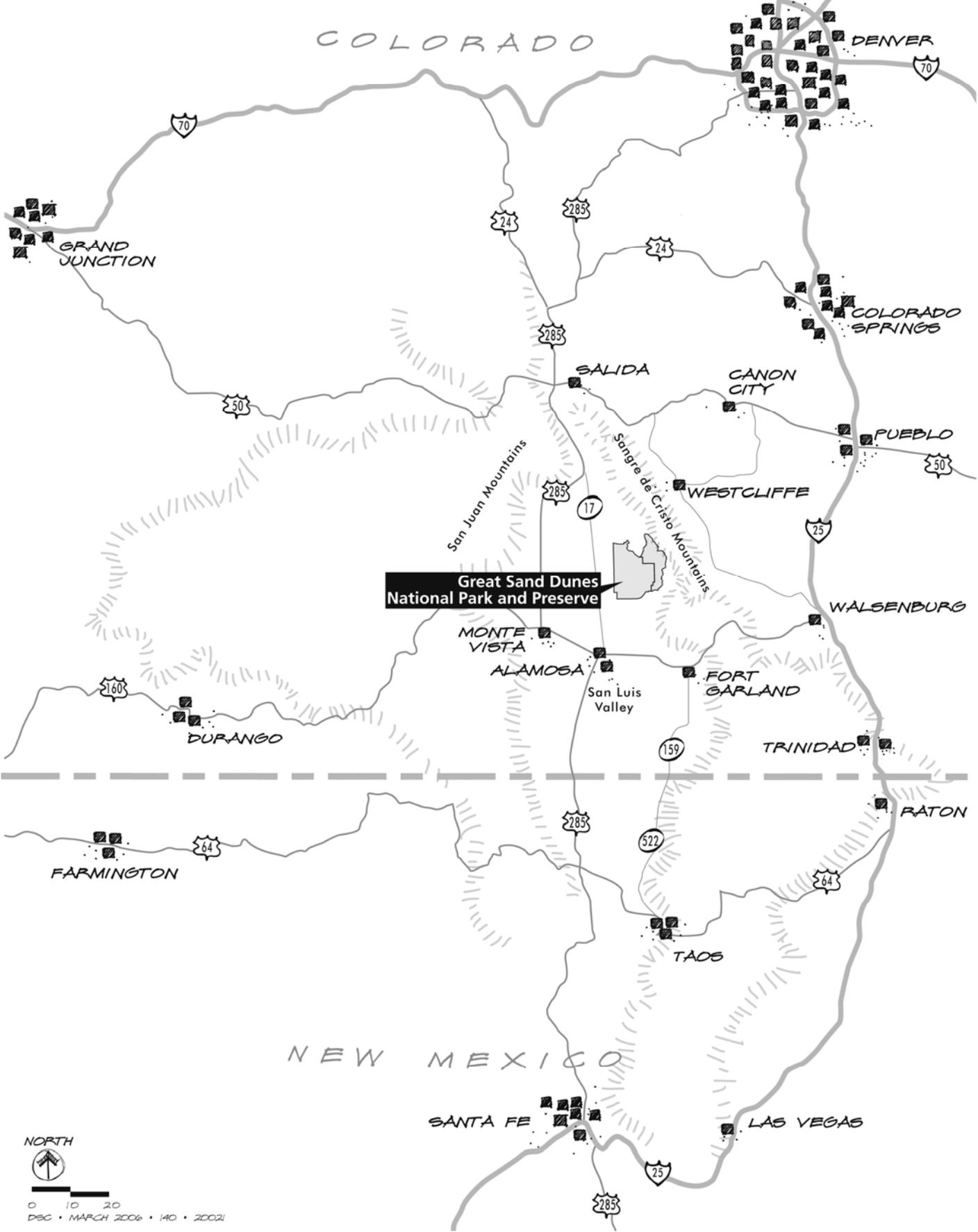
Sand, sun, wind, and water provide a land of elemental contrasts at the dunes. Early and late in the day, shadows lengthen and muted colors melt into one another. Sand ridge shadows paint striking patterns across the dune mass. At midday, intense solar radiation unimpeded by the thin atmosphere can heat sand to scorching temperatures. At the foot of the dunes, Medano Creek’s surging waters provide a delightful contrast to the barren sand surface in the spring and early summer. In the springtime, strong winds can blow for days; countless sand grains scour everything in their path.

The park is part of a fragile, dynamic system that influences and sustains the dunes. The dune mass is a huge deposit of pure sand nestled against the Sangre de Cristo Mountains. The sand sheet surrounds the dune mass and is stabilized by grasses and other low-growing plant life.



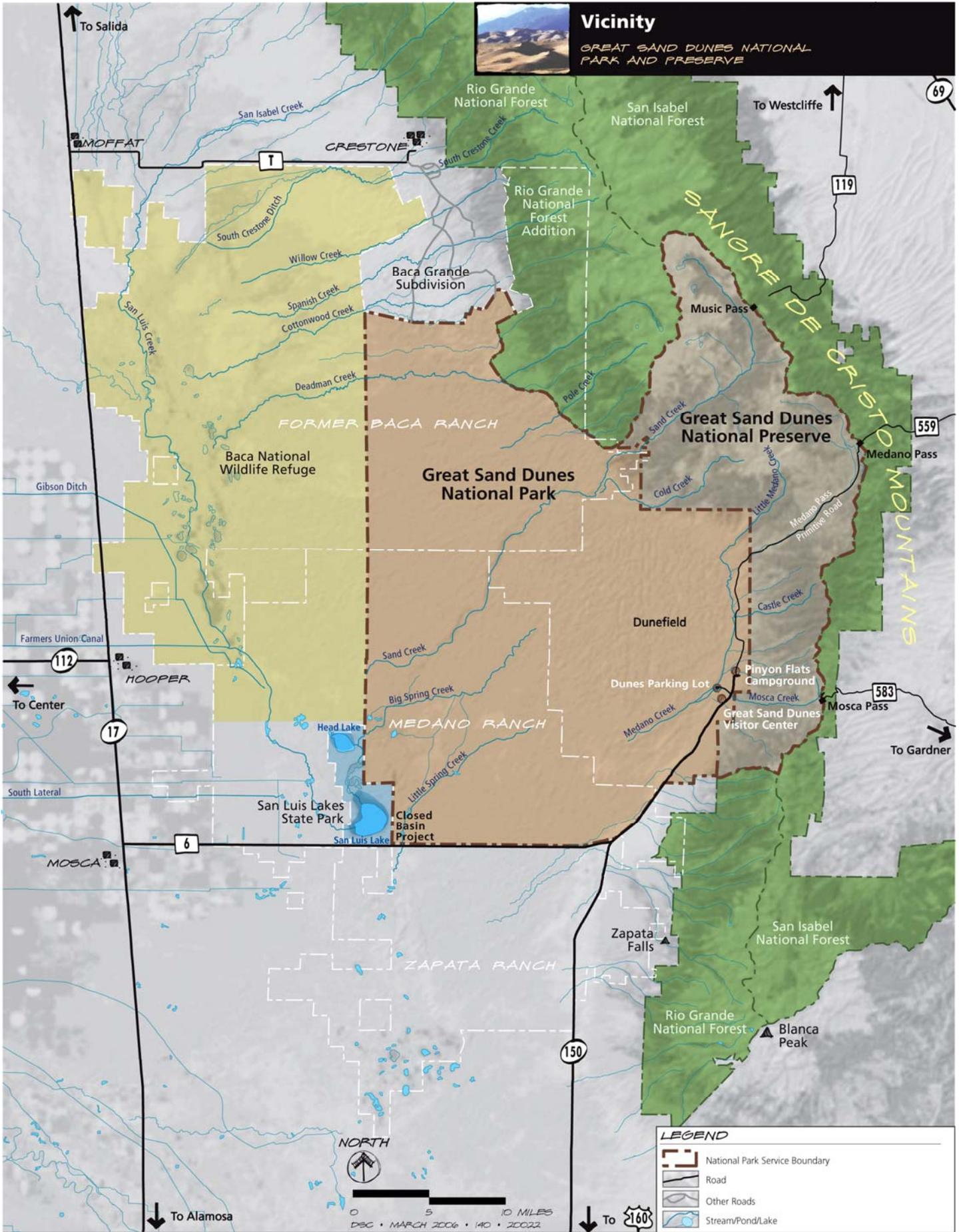
### Region

GREAT SAND DUNES NATIONAL PARK AND PRESERVE



0 10 20

DSC • MARCH 2006 • 140 • 20021



The sabkha (a sand deposit hardened by minerals) is located west of the sand sheet, and is cemented by minerals deposited by seasonal wetlands. Streams born high in the Sangre de Cristo Mountains recycle wind-blown sand back to and around the dunes. Over time, sand, wind, and water combine and join forces to shape the ever-changing dunefield.

From valley floor to the crest of the Sangre de Cristos, a dramatic variety of life zones provides distinct communities of plant and animal life. Just above the dunefield, at the base of the mountains, short shrubs give way to sparse piñon-juniper woodland. With rising elevation, the piñon-juniper forest transitions into denser montane forests of fir, pine, and aspen. Higher still is the subalpine life zone, where hardy stands of spruce and fir mingle with rocky talus slopes. Near the crest of the mountains is the rocky, snowy alpine zone. Each life zone supports specially adapted plant, animal, and insect life.

The Ancestral Puebloans hunted and camped near the Great Sand Dunes as early as 10,000 to 12,000 years ago. Beginning around AD 1400, several Indian groups, including the Apache, Arapaho, Cheyenne, Comanche, Kiowa, Navajo, and Ute, migrated to the San Luis Valley and other areas of the Southwest. The Spanish arrived in the San Luis Valley in the late 1500s—their cultural influence remains today. In 1807, Zebulon Pike and his men climbed over the crest of the Sangre de Cristo Mountains and into the Valley. Pike documented the expedition's first glimpse of the Great Sand Dunes. Today the park bears evidence of past human use and occupation in many forms: archeological sites and artifacts, historic homesteads and trails, "culturally peeled" trees, and wickiups (temporary shelters made from tree saplings).

## GENERAL MANAGEMENT PLANNING

Park planning is a decision-making process, and general management planning is the broadest level of decision making for parks. General management plans are required for all units of the national park system and are intended to establish the future management direction of a park. General management planning is the first phase of tiered planning and decision making for national park units. It focuses on why the park was established (purpose), why it is special (significance and fundamental resources and values), and what resource conditions and visitor experiences should be achieved and maintained (desired future conditions). General management plans look years into the future and consider the park holistically, in its full ecological and cultural context and as part of a surrounding region.

Although a GMP provides the analysis and justification for future funding, the plan in no way guarantees that money will be forthcoming. Requirements for additional data or legal compliance and competing national park system priorities can delay implementation of actions. Full implementation of a plan could lie many years in the future.

This *General Management Plan / Wilderness Study / Environmental Impact Statement* (GMP) was developed by an interdisciplinary team in consultation with relevant National Park Service (NPS) offices; the Great Sand Dunes National Park Advisory Council; tribal, federal, state, and local agencies; other interested parties; and the general public. Establishment of the advisory council was mandated by the Great Sand Dunes National Park and Preserve Act of 2000, which authorized the expansion of the national park. The role of the advisory council is to advise the

Secretary of the Interior (generally via the Great Sand Dunes superintendent) regarding development of the Great Sand Dunes GMP. The backgrounds and experience of the advisory council members reflect the purposes of the park and the interests of persons who will be affected by the planning and management of the Great Sand Dunes. More information about the advisory council and its contributions to this general management plan effort can be found in appendix E.

## **PURPOSE AND NEED FOR THE GENERAL MANAGEMENT PLAN**

This GMP provides comprehensive guidance for perpetuating natural systems, preserving cultural resources, and providing opportunities for quality visitor experiences at Great Sand Dunes National Park and Preserve. Its purpose is to ensure that park managers and the public share the same vision of how best to achieve the park's purpose and protect its resources unimpaired for future generations.

The GMP describes the general path the National Park Service intends to follow in managing the Great Sand Dunes over the next 15 to 20 years. The GMP does not provide specific and detailed answers to every issue facing the park and preserve, but rather, is a framework to assist NPS managers in making decisions in today's and future contexts. The GMP:

- Provides general guidance for how to manage resources and provide for visitor use.
- Presents a general approach for facilities and access.
- Supports the park's purpose and significance and protects its fundamental resources and values.

- Clearly defines the resource conditions and visitor experience opportunities to be achieved.
- Ensures that the foundation for decision making has been developed in consultation with an interested public and adopted by NPS leadership after sufficient analysis of the benefits, impacts, and economic costs of alternative courses of action.

The park is currently operating under a master plan approved in 1977. The National Park Service initiated development of a new GMP in the mid-1990s, but this effort was halted in 1999, when it appeared that Congress would greatly expand the national monument. In the year 2000, the Great Sand Dunes National Park and Preserve Act enlarged the national monument almost four-fold, authorized conversion of the national monument to a national park, and established the Great Sand Dunes National Preserve (also managed by the National Park Service). The 1977 master plan is outdated and does not provide background information, a foundation for planning, or management guidance for the expanded national park and preserve.

The park is located adjacent to the newly established Baca National Wildlife Refuge (managed by the U.S. Fish and Wildlife Service [USFWS]), Rio Grande and San Isabel National Forests (managed by the USFS), San Luis Lakes State Park (managed by Colorado State Parks), San Luis Lakes State Wildlife Area, (managed by Colorado Division of Wildlife [CDOW]), and land owned by private entities and individuals. This situation creates remarkable opportunities for the National Park Service to work cooperatively with others toward long-term stewardship of the dunes and the San Luis Valley.

## PURPOSE AND NEED FOR THE WILDERNESS STUDY

This wilderness study provides a public forum for evaluating new land within the expanded park boundary for possible recommendation to Congress for inclusion in the National Wilderness Preservation System. Wilderness, which can be designated only by Congress, provides for permanent protection of lands in their natural condition.

Lands within Great Sand Dunes have been part of the National Wilderness Preservation System since 1976. The 35,955-acre Great Sand Dunes Wilderness Area is located within the former Great Sand Dunes National Monument. About 40,000 acres of wilderness located within the national preserve (part of the Sangre de Cristo Wilderness Area established in 1993) were added by the Great Sand Dunes National Park and Preserve Act of 2000. Most remaining lands within the expanded national park boundary, including former Baca Ranch and Medano Ranch lands, have not previously been evaluated for wilderness.

The wilderness study is included as part of this GMP because of legislation, public interest, and timeliness. The Great Sand Dunes Act (2000) cites wilderness as one of several important resources for which the park was expanded. The wilderness review process for the park expansion lands began with a *Federal Register* notice and a wilderness suitability/eligibility assessment

conducted during the early phases of GMP planning. Since initial scoping of this plan, the public has been interested in protecting natural systems and wilderness values. A wilderness study may be a separate document accompanied by an environmental impact statement, or it may be part of a general management plan / environmental impact statement. Including the wilderness study with the general management plan and environmental impact statement provides efficiencies of time and money, as the two processes have similar environmental compliance and public involvement needs.

The first step of this wilderness study was to conduct a wilderness suitability/eligibility assessment, which determined that some areas within the expanded park boundary possess wilderness characteristics. The next step was to conduct a formal evaluation of those lands by studying alternatives and impacts to see if the lands should be recommended for wilderness. With a general management plan, the wilderness alternatives are matched to various general management alternatives. A wilderness study results in a recommendation to Congress to designate all, some, or none of the lands possessing wilderness character as part of the National Wilderness Preservation System. Based on the wilderness study, the National Park Service may prepare a wilderness proposal to forward to the Department of the Interior.

## FOUNDATION FOR PLANNING AND MANAGEMENT

The foundation for planning and management identifies what is most important about the park. It consists of two parts. Part I outlines the intentions of Congress or the president in creating the park as a unit of the national park system. These intentions, which take precedence over all other considerations, include the park's purpose, significance, mission, primary interpretive themes, and special mandates. Part II documents the fundamental resources and values that deserve primary consideration during planning and management.

### **PART I: PURPOSE, SIGNIFICANCE, MISSION, PRIMARY INTERPRETIVE THEMES, AND SPECIAL MANDATES**

#### **Park Purpose**

Park purpose statements convey the reasons for which the park was set aside as part of the national park system. They are grounded in a thorough analysis of park legislation and legislative history, and provide fundamental criteria against which the appropriateness of plan recommendations, operational decisions, and actions are tested. The purpose of Great Sand Dunes National Park and Preserve is to:

- Preserve spectacular and unique sand dunes and their high elevation watersheds, and perpetuate the entire system for the benefit and enjoyment of present and future generations. Protect the sand deposits associated with the dune mass and the groundwater system on which the sand dune and wetlands systems depend.

- Provide long-term protection of the geological, hydrological, ecological, scenic, scientific, cultural, wilderness, educational, wildlife, and recreational resources of the area. Preserve the remarkable biodiversity evident in the landscape from the valley floor to the mountain crest.
- Provide opportunities for visitors to experience, understand, enjoy, and gain a sense of stewardship of the park's natural and cultural resources.
- Facilitate research to support park management, and to promote scientific knowledge and education.

#### **Park Significance**

Park significance statements capture the essence of the park's importance to the nation's natural and cultural heritage. They describe the park's distinctiveness and describe why an area is important within regional, national, and global contexts. This helps park managers focus their efforts and limited funding on protection and enjoyment of attributes that are directly related to the purpose of the park.

Great Sand Dunes National Park and Preserve:

- Contains the tallest dunes in North America and one of the most fragile and complex dune systems in the world.

- Protects a globally significant water- and wind-driven system, which includes creeks that demonstrate surge flow, a rare hydrologic phenomenon.
- Provides tremendous scenic settings that, for many, provoke strong emotional responses. These settings (including massive dunes surrounded by alpine peaks, a desert valley, creeks flowing on the surface of the sand, pristine mountains, and rural rangeland) offer spacious relief from urban America, exceptional opportunities for solitude and quiet, and a remarkably unspoiled day and night sky.
- Hosts a great diversity of plants and animals, including insect species found nowhere else on earth. The system, which spans high desert to alpine life zones, supports rare biological communities that are mostly intact and functional.
- Contains some of the oldest (9,000+ years before present) known archeological sites in America. The dunes have been identified as having special importance by people of various cultures, and the area is recognized for the culturally diverse nature of human use.
- Provides special opportunities for recreation, exploration, and education in the highly resilient dune mass and adjoining creek environments.

## **Mission**

The mission statement is a visionary summary that conveys the essence of park

qualities to be protected and understood, forging an intellectual and emotional connection between people and their national heritage.

Majestic and austere, the Great Sand Dunes rise from a high mountain valley flanked by some of the tallest peaks in the Rocky Mountains. Great Sand Dunes National Park and Preserve celebrates the entire natural system of the Great Sand Dunes, as well as a rich and living connection with ancient and modern peoples. Our mission is to offer visitors opportunities for enjoyment, learning, solitude, and a growing sense of stewardship in an accessible and undeniably enticing natural setting. The National Park Service works with park partners, neighbors, and the American public to protect this treasure forever.

## **Primary Interpretive Themes**

Primary interpretive themes are the most important ideas and concepts communicated to the public about the park. They are the core of all interpretive programs and media provided to park visitors.

- The unexpected combination of massive dunes surrounded by alpine peaks, a desert valley, and creeks flowing on the surface of the sand makes Great Sand Dunes National Park and Preserve a unique landscape that inspires awe, mystery, and wonder.
- Although the active dunefield appears stark, in reality Great Sand Dunes National Park and Preserve is a rich and complex environment ranging from desert valley floor to snow-capped mountain peaks where many different plants and

animals live in a variety of distinct natural communities.

- The tall dunes and the life they support are the most visible indicators of the health of the natural system that extends beyond park boundaries. To protect the ecological health of the park, the National Park Service must partner with the larger community.
- Just as human survival is dependent upon water, this complex, dynamic dune system, with its distinctive geological and biological character, is dependent on the area's unusual, fragile, and near-pristine water system for its continued existence.
- The same physical characteristics that influenced the formation of the sand dunes created a cultural crossroads, resulting in a landscape of special significance to many people over thousands of years.
- The wilderness areas within Great Sand Dunes National Park and Preserve offer spacious relief from urban America, exceptional solitude and quiet, and a remarkably unspoiled day and night sky.

### **Special Mandates**

Special mandates are legal requirements and administrative commitments that apply to a specific unit of the national park system. They are mandated by Congress or by signed agreements with other entities. Special mandates for Great Sand Dunes National Park and Preserve are listed below. The Great Sand Dunes National Park and Preserve Act of 2000 is referred to herein as the "Great Sand Dunes Act of 2000" for brevity.

### **Advisory Council**

The Secretary of the Interior has responsibility for establishing a "Great Sand Dunes Advisory Council." The council is to advise the secretary with respect to preparation and implementation of a management plan for the national park and preserve. The advisory council is to dissolve upon completion of the GMP (Great Sand Dunes Act of 2000, Public Law 106-530).

### **Water Resources**

The Secretary of the Interior is to obtain and exercise water rights required to fulfill the purposes of the national park and preserve, provided:

1. Such water rights are appropriated and administered pursuant to the procedural requirements of Colorado state law.
2. The purposes and other substantive characteristics of water rights are established according to state law, except that the Secretary of the Interior is specifically authorized to appropriate water exclusively 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.
3. Water rights are established without interfering with: (a) any exercise of a water right for a nonfederal purpose in the San Luis Valley that existed when the Great Sand Dunes Act of 2000 was

passed, and (b) the Closed Basin Project.

4. Except for those rights already established for the national monument and for the Rio Grande National Forest, no federal reservation of water may be claimed or established for the national park or preserve.

Two irrigation ditches in the headwaters of Medano Creek are associated with water rights senior to those of the park. The Hudson Ditch was constructed in 1886, and the Medano Ditch in 1892. Since no easement was issued for these ditches by the USFS prior to passage of the Great Sand Dunes Act of 2000, the legislative authority for issuing easements and establishing terms and conditions for such easements on these ditches now falls to the National Park Service. However, since the USFS was in the process of issuing easements for these ditches prior to the passage of the 2000 Act, the National Park Service may be required to issue an easement pursuant to the Colorado Ditch Bill (Public Law 99-545, October 27, 1986) despite the fact that this legislation would not normally pertain to an NPS area.

### **Wilderness**

The Great Sand Dunes Wilderness Area, comprised primarily of the main dunes within Great Sand Dunes National Park, was established in 1976 by Public Law 94-567 and amended in 1978 by Public Law 95-625. It is 35,955 acres in size. The Sangre de Cristo Wilderness Area was established by the Colorado Wilderness Act of 1993 (Public Law 103-77). It is 226,420 acres in size. In 2000, 39,686 acres of the Sangre de Cristo Wilderness Area was administratively transferred from the USFS to the National Park Service (Great Sand Dunes

Act of 2000). Total designated wilderness in Great Sand Dunes National Park and Preserve amounts to 75,641 acres. Nothing in the Great Sand Dunes Act of 2000 alters the wilderness designation of any lands within the national park or preserve.

### **Hunting, Fishing, and Trapping**

Hunting, fishing, and trapping<sup>1</sup> shall generally be permitted on land and water within the preserve, in accordance with applicable federal and state laws. Areas may be designated where, and limited periods established when, no hunting, fishing, or trapping are permitted for reasons of public safety, administration, or compliance with applicable law (Great Sand Dunes Act of 2000). Fishing is allowed in the national park, but hunting and trapping are not.

### **Domestic Livestock**

On former state or private land where grazing was permitted when the Great Sand Dunes Act of 2000 was passed, and which is acquired for the national park or preserve, the Secretary of the Interior, in consultation with the lessee, may permit continued grazing by the lessee at the time of acquisition. Where grazing was permitted on federal land when the 2000 Act was passed, the secretary may permit continued grazing unless it would harm the resources or values of the national park or preserve. Permits for grazing are subject to applicable law and regulations. The secretary may accept voluntary termination of leases or permits for grazing within the national park or preserve (Great Sand Dunes Act of 2000).

---

<sup>1</sup> A state constitutional amendment was passed in 1996 that made it generally unlawful to take wildlife with any leghold trap, any instant kill body-gripping design trap, or by poison or snare in the state of Colorado (*Colorado Revised Statutes* 33-6-203).

## **Closed Basin Project**

The Closed Basin Division, San Luis Valley project (Closed Basin Project) is located in a topographic depression (the Closed Basin) in the San Luis Valley. The purpose of the project is to pump and deliver unconfined groundwater and available surface flows in the Closed Basin to the Rio Grande River via a 42-mile conveyance channel. The project helps Colorado meet its water delivery commitment to New Mexico and Texas under the Rio Grande Compact of 1939, and helps the United States meet its water delivery commitment to Mexico under a treaty dated May 21, 1906. The project also delivers water to the Alamosa National Wildlife Refuge.

Features of the Closed Basin Project within the national park are not to be affected by the park expansion. Management responsibility for the Closed Basin Project features within the national park is to remain with the U.S. Bureau of Reclamation (Great Sand Dunes Act of 2000).

## **PART II: FUNDAMENTAL RESOURCES AND VALUES**

Fundamental resources and values are systems, processes, features, visitor experiences, stories, and scenes that deserve primary consideration in planning and management because they are critical to maintaining the park's purpose and significance. Fundamental resources and values are subject to periodic review and updates based on new information or changing conditions. The planning team, with assistance from the Great Sand Dunes National Park Advisory Council and the public, has identified the following fundamental resources and values for

Great Sand Dunes National Park and Preserve.

## **Dunes System**

The dunes system is complex, fragile, and dynamic due to the interactions of sand, wind, streams, groundwater, vegetation, and mountains. The main components of the dunes system must be protected to ensure that the system remains intact. The main components that can be feasibly managed are listed below. Sand particles, wind, and the geologic setting are important components, but were not included in the list because they cannot be feasibly managed.

- **dunefield (complex, tall, inland dunes)**  
-natural transport of sand by streams must be protected
- **sand sheet (relatively flat sand sheet stabilized by vegetation)**  
-natural vegetation patterns must be protected
- **sabkha (sand deposit hardened by minerals)**  
-groundwater aquifer must be protected
- **Sand Creek (transports and recirculates sand)**  
-watershed and groundwater aquifer must be protected
- **Medano Creek and its surge flow (transports and recirculates sand)**  
-watershed and groundwater aquifer must be protected

- **groundwater aquifers (integral to sabkha, vegetation on sand sheet, surface water flows)**  
-natural water table levels must be maintained

## Natural Diversity

Great Sand Dunes National Park and Preserve contains remarkable natural biological diversity, which is due largely to its range of elevation zones and mix of wet and desert habitats. The following key resources help contribute to the dunes' unusual species diversity:

- **insects that are endemic to the Great Sand Dunes**  
- (there are at least seven known endemic species)
- **Medano Creek's outstanding water quality and closed system**  
-serves as a genetic refuge/breeding area for native fish such as the state-endangered Rio Grande sucker and the Rio Grande cutthroat trout, a state species of special concern
- **un-hybridized narrowleaf cottonwoods**  
-located along creeks (e.g., Sand Creek)—up to 340 years old, oldest cored, which conserve a native plant gene pool
- **sand sheet wetlands**  
- (e.g., interdunal ponds, Big Spring Creek, Little Spring Creek)  
-increases the variety of flora and fauna
- **balanced and sustainable populations of native wildlife and plants**  
-important habitat and natural

processes, including fire, must be protected

- **tundra**  
-highly erosive, fragile (highly vulnerable to damage from visitor use)

## Human Connections

The Great Sand Dunes have served as a prominent visual and cultural marker, drawing people physically and spiritually for thousands of years. Cultural resources and values that are key to maintaining the park's purpose and significance include the following:

- **early archeological sites**  
-associated with Folsom Early Man, ~9,000 years before present
- **dunes area—important to American Indians and other people**  
-e.g., traditional hunting and gathering place, sacred and spiritual place
- **scarred ponderosa pines**  
-inner bark of scarred trees used by native peoples for food (mid-1800s)  
-one cluster of trees (Indian Grove) is listed in the National Register of Historic Places (NRHP)
- **contemporary community ties to the dunes**  
-emotional connection, support for park expansion

## Visitor Opportunities

The Great Sand Dunes are attractive, inviting, and approachable. These qualities and certain inspirational, recreational, and

educational opportunities must be managed and protected to maintain the park's purpose and significance:

- **climbing and descending the high dunes**
- **experiencing surge flow, playing in Medano Creek near the foot of the dunes**
- **seeing the heavens (Milky Way, stars, planets, comets, etc.) at night**
  - dark night sky must be protected
- **viewing the dune mass with backdrop of the high peaks and from the mountains**
  - key elements: views from west and south, viewing the dunes from the mountains, changing light conditions
  - shadow and contrast especially
- **impressive in early morning and evening**
  - air quality and undeveloped mountain slopes must be protected
- **seeing wildlife in its natural setting (e.g., elk, pronghorn, deer)**
  - important habitat must be protected
- **learning about the dunes system—its components and dynamic nature**
  - includes research, education, and stewardship opportunities
- **experiencing quiet, solitude, isolation in a wilderness environment**
  - driving in sand on Medano Pass primitive road (high clearance four-wheel drive required)

## RESOURCE OPPORTUNITY AREAS

Differences in resource values and visitor opportunities generally exist within different areas of a park. Resource opportunity areas are a way of organizing and describing these differences—especially fundamental resources and values—so they can be considered during management planning. Resource opportunity areas are often documented with a map that shows where in the park they occur and a table that lists the characteristics or qualities of each resource opportunity area (appendix C).

The resources and values of Great Sand Dunes National Park and Preserve have

been organized into the following resource opportunity areas: Sangre de Cristo Mountains and Foothills; Mountain Lakes and Streams; Lower Medano and Sand Creeks; Dunefield; Sand Sheet and Sabkha; Spring Creeks and Wetlands. The map on the following page shows where the resource opportunity areas occur in the park and preserve. Appendix C characterizes the different resource opportunity areas, focusing primarily on fundamental resources and values because these are a primary consideration in general management planning.

## DESIRED CONDITIONS AND STRATEGIES

This section focuses on parkwide desired conditions and strategies that guide management of the Great Sand Dunes in all alternatives, including the no-action alternative. They guide actions taken by park staff on such topics as natural and cultural resource management, wilderness management, park facilities, and visitor use management. Each topic discussed below has two parts: (1) desired conditions for that topic, and (2) strategies that may be applied to achieve those desired conditions.

Desired conditions describe the ideal conditions that the National Park Service is striving to attain. “Desired conditions” is used interchangeably with “goals.” Desired conditions provide guidance for fulfilling the park’s purpose and for protecting the park’s fundamental resources and values. To emphasize this, the desired conditions listed below (in italics) are organized by fundamental resource and value type (dunes and biological diversity, human connections, visitor opportunities, and other).

The strategies describe actions that may be taken by park staff to achieve the desired conditions. Most of these strategies are already being implemented. Those that are not already being implemented are consistent with NPS policy, are not believed to be controversial, and require no additional analysis and documentation under the National Environmental Policy Act of 1969 (NEPA).

The alternatives in this GMP include additional desired conditions and strategies besides the ongoing ones described below. The parkwide desired conditions and strategies in this section, combined with others that are specific to the alternative selected for implementation (see chapter 2) will form the complete GMP for the Great Sand Dunes.

### DESIRED CONDITIONS FOR THE DUNES AND FOR BIOLOGICAL DIVERSITY

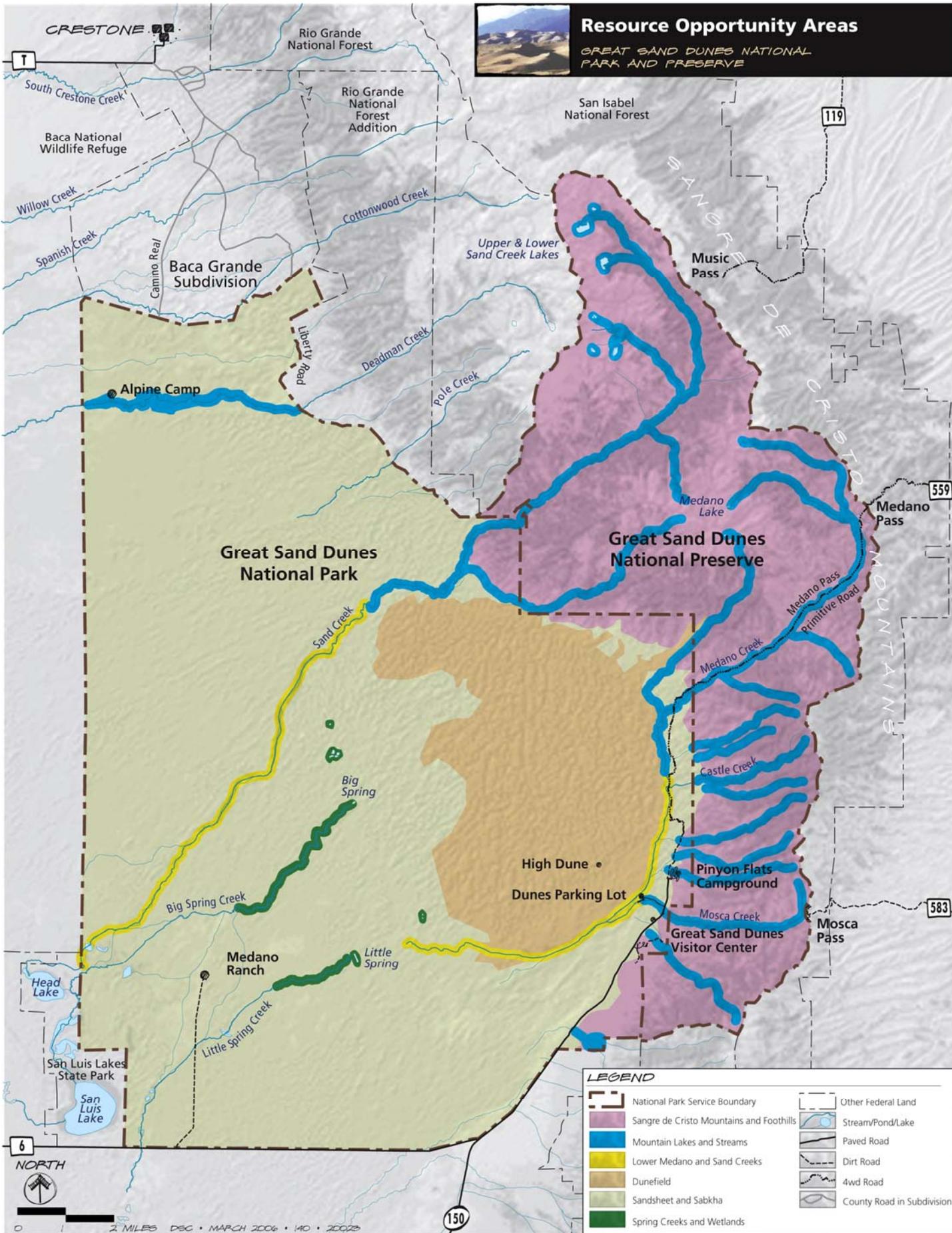
#### Ecosystem Management

*The National Park Service is a leader in resource stewardship and conservation of ecosystem values within and outside the park. The dunes system is managed from an ecosystem perspective, considering both internal and external factors affecting visitor use, environmental quality, and resource stewardship. Management decisions about ecosystems are based on ongoing scholarly and scientific information. Resources and visitation are managed in view of the ecological and social conditions of the park and surrounding area. Park managers adapt to changing ecological and social conditions and are partners in regional land planning and management. The dunes system shows no lasting physical damage caused by humans.*



# Resource Opportunity Areas

GREAT SAND DUNES NATIONAL PARK AND PRESERVE



0 1 2 MILES DSC • MARCH 2006 • 140 • 20028

150

583

559

119

6

T

### *Strategies*

- Park staff will continue to participate in and encourage ongoing partnerships with local, state, and federal agencies and organizations in programs that have importance within and beyond park boundaries. Partnerships important to the long-term viability of critical natural resources include:
  - reintroduction of native fish species
  - valleywide groundwater monitoring and trends
  - management of wildlife across human-created boundaries
  - combating nonnative invasive plants
  - wildland fire management
- Central to ecosystem management is long-term monitoring of changes in condition of cultural and natural resources and related human influences. Improvement or degradation of resources and visitor experience cannot be determined with any certainty without a monitoring program. To protect, restore, and enhance park resources and to sustain visitor use and enjoyment within and around the park, park managers will:
  - Initiate or continue long-term monitoring of resources and visitor use, including use of the visitor experience and resource protection (VERP) framework or other carrying capacity process, as appropriate.
  - Promote research to increase understanding of park resources, natural processes, and human interactions with the environment, with emphasis on fundamental park resources and values.
  - Practice science-based decision making and adaptive management, incorporating the results of resource monitoring and research into all aspects of park operations.
  - Identify lands outside the park where ecological processes, natural and cultural resources, and human use affect park resources or are closely related to park resource management considerations; initiate joint research, monitoring, management actions, agreements, or partnerships to promote resource conservation.
  - Provide education and outreach programs to highlight conservation and management issues facing the park and related lands, and to develop partners who assist with ecosystem stewardship.
  - Continue to participate in the Rocky Mountain Inventory and Monitoring Network and integrate the information that results into management decisions and identification and monitoring of vital signs.

## Natural Resources and Diversity

*The resources and processes of Great Sand Dunes National Park and Preserve retain their ecological integrity. Natural wind, sand, and water processes are understood and allowed to function. Management decisions about natural resources are based on ongoing scholarly and scientific information. Park resources and values are protected through collaborative efforts with neighbors and partners. Human impacts on resources are monitored and harmful effects are minimized or eliminated.*

*Biologically diverse native communities are protected and restored when possible. Particularly sensitive communities such as sand sheet wetlands and tundra are closely monitored and protected. Endemic species and habitats are fully protected, nonnative species are controlled or eliminated, and native species are re-introduced when conditions allow. Genetic integrity of native species is protected. Threatened and endangered species recovery is successful. Natural fire regimes are understood and supported. Grazing by domestic and wildlife species is managed so that natural plant and animal communities and cultural values are protected. Research natural areas may be designated to provide representative areas for long-term ecological baseline studies.*

### **Strategies**

Park staff and other scientists will:

- Continue to inventory park resources to quantify, locate, and document biotic and abiotic resources in the park and to assess their status and trends.

- Continue long-term systematic monitoring of resources and processes to detect natural and human-caused trends, document changes in species or communities, evaluate the effectiveness of management actions taken to protect and restore resources, and to mitigate impacts on resources.
- Continue research that furthers understanding of the geology, sand, wind, and water processes that underlie the dunes system.
- Conduct or support natural history studies of endemic insects to support management and protection of these species.
- Identify ecological disturbance regimes (e.g., wildland fires and sand blowouts) and their extent, and determine the relative impact of human actions on them.
- Implement and keep current a cooperative wildlands fire management plan that maintains, to the extent possible, condition class I vegetative communities (i.e., within the natural range). This plan is developed with the input and cooperation of park neighbors and federal, state, and local agencies.
- Establish cooperative agreements and develop weed management area plans for prevention and control of nonnative plants.
- Inventory and map cottonwoods in new areas of the park to determine whether they are un-hybridized narrowleaf cottonwoods. Identify and implement management actions aimed at minimizing the likelihood of introduction of and

hybridization with broadleaf cottonwoods.

- Continue to map and monitor sand sheet wetlands areas (springs, stream corridors, and interdunal ponds) to expand understanding of long-term water trends, surface water-groundwater relationships, sensitive species, and human impacts. Persistent problems may trigger restoration activities or management of visitor access.
- Inventory, map, and monitor vegetation, fauna, and soils in tundra areas, particularly adjacent to popular trails and alpine lakeshores. If resources are threatened, actions could include stronger delineation of trails, trail relocation, and/or site restoration. Persistent problems could trigger additional management actions such as use limits or closures, education, and mandatory permits.
- Inventory human-made structures and modifications, and remove structures or restore modifications that do not contribute to the purposes or management of the park, or have been determined not to have cultural significance, or are judged to be unsafe.
- Provide information to adjacent homeowners and private landowners on living with the park's natural processes, wildlife, critical habitats, and threats to its resources. Information will include wildlife, wildfire, nonnative plants, etc.
- Conserve and restore habitats for threatened and endangered species

such as the Rio Grande cutthroat trout.

- Continue to expand the park's data management systems (e.g., geographic information system (GIS), research database, and literature database) for analyzing, modeling, predicting, and testing trends in resource conditions.
- Continue to regularly update the park's resource stewardship plan and prioritize actions needed to protect, manage, and study park resources.
- Apply mitigation techniques to minimize impacts of construction and other activities on park resources.

## **Air Quality**

*Great Sand Dunes' Class I air quality is maintained or enhanced. Naturally dark night skies and scenic views are substantially unimpaired.*

### ***Strategies***

- The National Park Service will continue to work with appropriate state and federal agencies, industries, nearby communities, land managers, and the Western Regional Air Partnership to maintain park and regional air quality.
- Park staff and other scientists will continue to inventory and monitor the park's air quality and expand this program to detect and measure changes (improvement or deterioration) to the expanded park's airshed.

- Consistent with provisions of the Clean Air Act, the National Park Service will review, comment on, and recommend actions to minimize or reduce emissions from sources being proposed within 64 miles (103 kilometers) of Great Sand Dunes.
- Park managers will attempt to minimize the effects of in-park pollution sources on air quality. For example, if warranted by data demonstrating degradation, emissions from burning wood in campgrounds and employee residences may be reduced by establishing non-burn days or by banning wood burning altogether.

## **Water Quality and Quantity**

*Great Sand Dunes water quality and quantity reflect natural conditions and support natural, recreational, and administrative uses. Outstanding water quality is protected and preserved. Water rights are managed to protect natural systems. Existing water rights are used, maintained, and respected.*

### ***Strategies***

- The National Park Service will continue to work to identify and obtain water rights required to fulfill the purposes of the national park and preserve, as authorized by Congress and the Secretary of the Interior.
- Park managers will continue to expand water quality monitoring associated with outstanding waters with the aim of understanding trends and possible management actions aimed at protecting water

quality. They will also seek outstanding waters designations for other worthy streams within the park and preserve.

- Park staff will seek to bring water diversions on watercourses and wells within newly acquired park lands into compliance with state water law.
- The National Park Service will expand ongoing water quality and groundwater and stream flow monitoring programs into new park lands to more fully understand the status and trends of surface water and groundwater throughout the area.
- Park staff will develop a program to manage human waste in backcountry areas, particularly near stream corridors and lakes.
- Park staff will educate visitors about techniques to prevent water pollution and to safely collect and treat drinking water from natural sources.
- Park managers will work with adjacent landowners and managers and the Colorado Division of Water Resources to prevent water pollution and minimize the risk of water-borne diseases stemming from livestock and other sources.
- Park managers will participate in state and national water quality remediation and watershed planning programs.
- The National Park Service will work with partners and neighbors throughout the valley to better understand groundwater systems,

trends, and human influences. The National Park Service will also work with partners and neighbors throughout the valley to protect groundwater resources.

- The National Park Service will attempt to acquire the transbasin water rights to the Hudson and Medano ditches if the owners are willing.
- The National Park Service will update its water resource management plan to reflect resources and management issues of the expanded park.

## Wildlife Management

*Natural wildlife populations and systems are understood and perpetuated. Natural fluctuations in populations are permitted to occur. Natural influences are mimicked if necessary. The National Park Service works with neighbors and partners to achieve mutually beneficial goals.*

### *Strategies*

- The National Park Service will continue its elk/bison management study to determine the status and health of the elk and bison populations that use park lands.
- The National Park Service will continue to work with partners, including CDOW, USFWS, USFS, The Nature Conservancy, and park neighbors to develop management strategies for elk and bison. Of particular interest is understanding and perpetuating the dynamic interaction of grazing animals, vegetation, sand sheet conditions, and dune migration in the greater

ongoing natural processes of the Great Sand Dunes.

- The National Park Service will strive to identify species that have occupied the park and preserve in the past, and evaluate the feasibility and advisability of reintroducing extirpated species.
- The National Park Service will continue to cooperate with CDOW to learn more about population dynamics and determine appropriate management actions for game species.
- Park managers will work with CDOW to address conflicts between hunters and other recreational users of the preserve.
- The park will investigate the feasibility of expanding the native fish reintroduction program into other streams in the park or preserve.

## DESIRED CONDITIONS FOR HUMAN CONNECTIONS

### Cultural Resources

*Great Sand Dunes' cultural resources, especially archeological and ethnographic resources, are identified, evaluated, managed, and protected within their broader context. Visitors and employees recognize and understand the value of the park's cultural resources. Management decisions about cultural resources are based on ongoing scholarly and scientific information in consultation with native peoples and the Colorado state historic preservation office (SHPO). Culturally scarred trees are managed to preserve their*

*vitality. The historic integrity of properties listed on (or eligible for listing on) the NRHP is protected. Human impacts on cultural resources are monitored and harmful effects are minimized or eliminated.*

### **Strategies**

- Park staff, researchers, and partners will continue to collect information to fill gaps in the knowledge and understanding of Great Sand Dunes cultural resources, to assess status and trends, and effectively protect and manage cultural resources.
- In accordance with the National Historic Preservation Act, as amended, park managers will continue to locate, identify, and evaluate cultural resources throughout the park and preserve to determine if they are eligible for listing in the NRHP. In particular, the National Park Service will continue work to identify cultural landscapes and archeological sites within the expanded park and preserve.
- The National Park Service will continue to work closely with and consult with the Colorado SHPO and other interested parties to identify, evaluate, and determine appropriate treatment for historic structures, sites, and cultural landscapes throughout the park and preserve.
- The National Park Service will use the best available scientific information and technology for making decisions about management of the park's cultural resources. Park managers will continue to use and expand its data management systems, including GIS and electronic databases, to analyze, model, predict, and test trends in resource conditions.
- The National Park Service will continue long-term monitoring of archeological sites to measure deterioration from natural and human sources and to evaluate the effectiveness of management actions to protect resources and mitigate impacts. Park managers will rely on a variety of actions to minimize these impacts, including visitor education and interpretation, and use of patrols to enforce the Archeological Resource Protection Act. The park's archeological site disclosure policy will continue to be followed. Appropriate preservation actions for all cultural resources that are threatened or in danger of being lost will be developed. This could include measures such as removing the threat, stabilizing the resource, data recovery, documenting and researching, increasing ranger patrol and visitor education, or closure.
- To provide the public and park staff with optimum interpretive and resource management opportunities, park personnel will continue to research, document, and catalogue the museum collection. Museum objects and archival materials will be conserved to National Park Service and professional standards. The park's museum conservation program will continue to provide the proper preservation and protection of the museum collection.

- Resource and maintenance staff will receive historic preservation training and will be made aware of and apply the most recent preservation technology and applications.
- Park managers will continue to regularly update the park's Resource Stewardship Plan and prioritize actions needed to protect park resources.

### **Relations with Private and Public Organizations, Adjacent Landowners, and Governmental Agencies**

*Great Sand Dunes National Park and Preserve is managed holistically as part of a greater ecological, social, economic, and cultural system. Positive relations are maintained with adjacent landowners, surrounding communities, academia, and private and public groups that affect, and are affected by, the park. Great Sand Dunes is managed proactively to resolve external issues and concerns, to provide opportunities for appropriate independent research, and to ensure that park values are not compromised.*

#### ***Strategies***

- Park staff will continue to establish and foster partnerships with public and private organizations to achieve the purposes and mission of the park. Partnerships will be sought for resource protection, research, education, and visitor enjoyment purposes.
- To foster a spirit of cooperation with neighbors and encourage compatible adjacent land uses, park staff will keep landowners, land managers, local governments,

and the public informed of park goals, management activities, and resource threats. Park staff will respond promptly to concerns that arise on adjacent lands over park management practices, visitor access, and proposed activities and development. Park managers will seek agreements with landowners to encourage that their lands be managed in a manner compatible with park purposes. Park staff will seek ways to provide landowners with technical and management assistance to address issues of mutual interest or concern.

- The National Park Service will work closely with local, state, and federal agencies, and tribal governments whose programs affect, or are affected by, activities at Great Sand Dunes. Park managers will continue to work closely with the USFS, USFWS, Colorado State Parks, CDOW, and The Nature Conservancy to achieve mutual management goals. Park managers will also pursue cooperative regional planning whenever possible to involve the park in issues of regional concern.
- The National Park Service will seek to resolve minor boundary discrepancies near San Luis Lakes State Park and at other locations through administrative action or legislation.

### **Relations between American Indian Tribes and Great Sand Dunes National Park**

*The National Park Service and tribes culturally affiliated with Great Sand Dunes maintain positive, productive, government-*

*to-government relationships. Park managers and staff respect the viewpoints and needs of the tribes, promptly address any conflicts that occur, and consider American Indian values in park management and operation. Traditional ethnographic needs and uses are understood, and those uses that are consistent with protection of park resources and values are allowed to occur.*

### **Strategies**

- The National Park Service will continue to cooperate with tribes in conducting ethnographic studies to better understand which tribes are culturally affiliated with the park and to identify culturally significant resources. Regular consultations will occur with affiliated tribes to continue to improve communications and understand mutual concerns.
- Values and stories of affiliated tribes will be considered (in consultation with the tribes) in development of park interpretive programs and management decisions.

### **Contemporary Community Ties**

*Strong personal ties to the Great Sand Dunes and appropriate uses are recognized, fostered, and maintained. National Park Service staff, volunteers, and concession employees reflect the cultural diversity of the San Luis Valley and the region.*

### **Strategies**

- Park managers will recruit employees who reflect the cultural

diversity of the San Luis Valley and region.

- The park will continue to partner with Friends of the Dunes to meet mutual goals related to park research, interpretation, and education, and to strengthen community ties.
- Park managers will continue to support and encourage volunteers who contribute to park programs.

## **DESIRED CONDITIONS FOR VISITOR OPPORTUNITIES**

### **Visitor Use and Experience**

*Visitors from diverse backgrounds can experience a range of opportunities consistent with the purpose, significance, and fundamental resources and values of the park. Most visitors understand and appreciate the purpose and significance of the park and value their stewardship role in preserving natural and cultural features. They actively contribute to the park's preservation through appropriate use and behavior. Park programs and services are accessible to all audiences. All visitors understand park policies for use. Conflicts between different user groups are minimized.*

*Visitor use levels and activities are consistent with preserving park purpose, significance, and fundamental resources and values, and with providing opportunities for primitive recreation and/or solitude. Visitor use is also managed to minimize impacts on neighboring private and public lands. Management decisions are based on scholarly and scientific information. When such information is lacking, managers make decisions based on*

*the best available information, adapting as new information becomes available. Regional recreation opportunities are coordinated among agencies for public benefit and ease of use.*

### **Strategies**

- By evaluating existing services and seeking opportunities for improvement, the park will attempt to provide programs and facilities that are effective in reaching and serving diverse communities.
- The park will seek to collect data over time to monitor visitor experiences, as part of an overall carrying capacity effort to protect desired resource conditions and visitor experiences. Methods will be designed to minimize the burden to staff and visitors.
- The National Park Service will strive to address threats to resources and the visitor experience by means other than placing limits or restrictions on use (e.g., by expanding or redirecting visitor education programs). If necessary, however, more restrictive methods may include requiring permits for certain uses or areas, placing limits on use, and closing areas, including trails or campsites. Restrictions on visitor use will be based on a determination by the park superintendent that such measures are consistent with the park's enabling legislation and NPS policies, and are necessary to prevent degradation of the purposes and values for which the park was established, to minimize visitor use conflicts, or to provide opportunities for quality visitor experiences.

## **Visitor Information, Interpretation, and Education**

*Interpretation and education services at Great Sand Dunes facilitate intellectual and emotional connections between visitors and park resources. Interpretive programs foster understanding of park resources, resource stewardship, and build a local and national constituency. Outreach programs through schools, organizations, and partnerships build connections to the park. Curriculum-based education inspires student understanding and resource stewardship. Information about public use opportunities is coordinated among neighboring agencies for public benefit and ease of use. Visitors receive adequate information to orient themselves to visitor opportunities and have a safe, enjoyable visit.*

### **Strategies**

- Park managers will continue to update and implement the park's long-range interpretive plan, with emphasis on providing information, orientation, and interpretive services in the most effective manner possible. Staff will use state-of-the-art technologies, including Internet Web-based programs, where appropriate.
- Park staff will stay informed of changing visitor demographics and preferences to effectively tailor programs for visitors. They will develop interpretive media supportive of park purposes, interpretive themes, and fundamental resources and values.
- Working with other federal agencies, the state of Colorado, and local communities, park staff will

continue to improve pre-trip planning and provide en route information and orientation for park visitors. Park staff will work with local communities and other entities to provide information/ orientation and interpretive services outside park boundaries, where appropriate. Park staff will seek partnerships with other state and national parks, educational institutions, and other organizations to enrich interpretation and educational opportunities regionally and nationally.

- Staff will implement the park's education strategy plan, which outlines goals and actions for expanding the park's curriculum-based education program.

## Viewsheds

*Key scenic vistas are identified and protected. Park managers work with neighbors, local communities, and land managers to preserve scenic values.*

### **Strategies**

- The National Park Service will work with visitors, neighbors, and others to identify and preserve key viewpoints and vistas in and near the park. Managers will share viewpoint and vista preservation goals and concerns with neighboring management agencies, communities, and landowners so that these entities may share in stewardship of these fundamental park and regional values.
- Park managers will also work with neighbors, partners, and others to preserve the rural, scenic character of park "gateway" (entrance) areas

and corridors so that they complement the park's key viewpoints and vistas.

## Night Sky

*The naturally dark night sky is preserved. Artificial light sources within and outside of the park do not impair opportunities to see the moon, stars, planets, and other celestial features.*

### **Strategies**

- Baseline data for the dark night sky is established through servicewide NPS programs.
- The National Park Service will continue to work with local communities to encourage protection of the night sky and will evaluate impacts on the night sky caused by facilities within Great Sand Dunes National Park and Preserve. To the extent possible, the staff will work within a regional context to protect night sky quality.
- If park staff determine that light sources within the park affect views of the night sky, they will study ways to further minimize light sources and eliminate any unnecessary ones.

## Natural Sounds

*The natural soundscape is preserved. Visitors have opportunities throughout most of the park to experience natural sounds. The sounds of civilization are generally confined to developed areas.*

**Strategies**

- Park managers will continue to work with the Federal Aviation Administration, commercial businesses, and general aviation entities to minimize noise and visual impacts of aviation to the park. Pilots will be discouraged from overflying the park. Actions taken to minimize aviation impacts could include identifying the park on aviation maps as a noise-sensitive area, educating pilots about park values, and encouraging pilots to fly in compliance with Federal Aviation Administration regulations and advisory guidance, in a manner that minimizes noise and other impacts. If demand for commercial air tours develops, the National Park Service will develop a commercial air tour management plan to address tours and their effects on the park.
- The National Park Service will continue to work with Department of Defense entities (e.g., Colorado Air National Guard) to minimize impacts from military flights in the vicinity of the park.
- Park managers will follow several strategies to control existing and potential land-based noise sources:
  - Continue to require bus tour companies to comply with regulations that reduce noise levels (e.g., turning off engines when buses are parked).
  - Encourage visitors to avoid the use of noisy generators.
  - Maintain existing quiet hours in campgrounds.

- Continue to enforce existing noise policies in the backcountry.
- Park managers will minimize noise generated by their own management activities by regulating National Park Service and concession use of noise-producing machinery such as aircraft and motorized equipment. Noise will be a consideration when procuring and using park equipment. In wilderness areas, the use of motorized equipment will conform to the requirements of the Wilderness Act “minimum requirements procedures” and related NPS policies (NPS Director’s Order 41).
- The National Park Service will continue to collect baseline data on park soundscapes to understand characteristics and trends in natural soundscapes and to assist in management.

**Wilderness**

*Wilderness areas retain their wilderness characteristics and values. Visitors find ample opportunities for primitive recreation and solitude. Wilderness areas are affected primarily by the forces of nature, and signs of people remain substantially unnoticeable. Visitors value and support wilderness preservation.*

**Strategies**

- Within 5 years after approval of the GMP, park staff will complete a wilderness management plan, which will include establishing specific carrying capacities for areas of concern. Managers will

plan in coordination with the adjacent USFS wilderness area, seeking common goals, information sharing, joint planning, efficient and consistent management, and good visitor service. In the meantime, and in keeping with established NPS policies and Director's Order – 41: *Wilderness Preservation and Management*, the park staff will continue to manage wilderness areas and recommended wilderness areas as wilderness.

- The park's wilderness plan will also provide guidance for minimum requirement assessments, as defined in Director's Order – 41, to all activities affecting wilderness resources and character. A minimum requirement assessment will be used to determine whether or not a proposed management action is appropriate or necessary for the administration of the area as wilderness. If the project is deemed appropriate or necessary, the management method selected will be that which causes the least amount of impact to the physical resources and experiential characteristics of the wilderness. The park staff will also continue to take appropriate action to preserve wilderness character and limit visitor impacts on resources.

### **Park Accessibility**

*Buildings, facilities, programs, and services of Great Sand Dunes are accessible to and usable by all people, including those with disabilities. New and renovated facilities are designed and constructed to be universally accessible. Visitors with limited mobility have opportunities to experience*

*the dunes, surrounding sands and waters, and enjoy representative portions of the backcountry.*

### **Strategies**

- The National Park Service will identify and modify existing facilities to meet accessibility standards as funding allows or as facilities are replaced or rehabilitated. New facilities will meet accessibility standards.
- Park managers will periodically consult with disabled persons or their representatives to increase awareness of the needs of the disabled and to determine how to make the park more accessible. Human-powered over-sand wheelchairs will continue to be available for visitors with special accessibility needs.

## **OTHER DESIRED CONDITIONS**

### **Land Protection**

*Impacts from rights-of-way, inholdings, private mineral interests, agricultural uses, and other valid existing rights within the park are minimized to protect park resources and values.*

### **Strategies**

- Private property and water rights within the park will continue to be recognized; however, such rights will be acquired or modified, where possible, to minimize impacts on park resources and values. Park staff will continue to communicate with private right owners to understand each others'

values and concerns and to address any potential impacts from each others' activities. Meetings will be held, as necessary, to address any concerns.

- Various techniques will be used to protect park values, including cooperative management agreements, acquisition of conservation and access easements, land exchanges, donations, and purchase of fee title. Inholdings will be acquired, as possible, assuming conditions for transfer are acceptable and compatible with the purposes of the park. Management of such lands will revert to the zoning and wilderness status proposed in this GMP once land or water rights are acquired or relinquished, and nonconforming uses are removed.
- Federal regulations and laws will be applied to oil, gas, and mineral exploration and extraction activities to ensure protection of park resources.

## Research

*The National Park Service works with partners to learn about natural and cultural resources and associated values. Research priorities for the park and preserve are aligned with its purpose, significance, and fundamental resources and values.*

### **Strategies**

- Park managers will encourage and support basic and applied research through various partnerships and agreements to enhance understanding of park resources and

processes, or to answer specific management questions.

## Facilities and Services

*Great Sand Dunes facilities and development are the minimum necessary to serve visitor needs and protect park resources for the long term. Visitor and management facilities are compatible with natural processes and surrounding landscapes, aesthetically pleasing, and functional. Commercial services in the park are only those that are necessary and based on park purposes. In general, commercial services will be provided outside the park rather than inside the park, if possible. Housing is managed to ensure an adequate level of protection for park resources, visitors, employees, and government property, and to provide necessary services. Adequate response (equipment and people) for visitor and facility protection, search and rescue, fire management, and safety is available. All decisions regarding park operations, facilities management, and development at Great Sand Dunes—from initial concept through design and construction—reflect principles of resource conservation and sustainability.*

### **Strategies**

- Facilities will be located, built, and/or modified according to the *Guiding Principles of Sustainable Design* (NPS 1993) or similar guidelines. Architectural character guidelines will be established and followed to ensure sustainability and compatibility with the natural and cultural environment. Park staff will properly maintain and upgrade existing facilities using sustainability principles where

necessary to serve the park mission.

- Park managers will consider the availability of existing or planned facilities in nearby communities and adjacent lands, as well as the possibility of joint facilities with other agencies, when deciding whether to construct new developments in the park. This will ensure that any additional facilities in the park are necessary, appropriate, and cost-effective.
- The National Park Service will continue to strive to make affordable housing available within the park for emergency response staff, seasonal and entry-level employees, and support other park needs (housing support for researchers, etc.).
- Any new telecommunication structures will be carefully sited so as to not jeopardize the park's purpose, significance, and fundamental resources and values (including viewsheds), and in consideration of the park's management zones. New rights-of-

way will be permitted only with specific statutory authority and approval by NPS managers, and only if there is no practicable alternative to such use of National Park Service lands.

- To support visitor opportunities, "The National Park Service will provide, through the use of concession contracts and incidental business permits, commercial visitor services within parks that are necessary and appropriate for visitor use and enjoyment. Concession operations will be consistent with the protection of park resources and values and demonstrate sound environmental management and stewardship" (NPS 2001). The following criteria were derived from NPS Management Policies to guide management of commercial services at Great Sand Dunes National Park and Preserve. Necessary and appropriate commercial services are generally identified under the management zones and alternatives sections of this GMP.

### **Criteria for Commercial Services**

Commercial services are managed at Great Sand Dunes National Park and Preserve in accordance with NPS policies and to meet the following criteria for “necessary and appropriate”:

1. Necessary (meets one or more)
  - a. Enhances visitor understanding and appreciation of park mission and values.
  - b. Facilitates or complements the fundamental experiences of park visitors.
  - c. Assists the park in managing visitor use and educating park visitors in appropriate, safe, and minimum-impact techniques.
  - d. Is an essential visitor service or facility not available within a reasonable distance from the park.
2. Appropriate (meets all)
  - a. Services are consistent with the purposes and values for which the park was established, as well as applicable laws, regulations, and policies.
  - b. Services do not compromise public health, safety, or well-being.
  - c. Services do not significantly impact important park resources and values.
  - d. Services do not unduly conflict with other authorized park uses and activities or services outside the park.
  - e. Services do not monopolize limited recreational opportunities at the expense of the general public.

## **PLANNING ISSUES AND CONCERNS**

Early in the planning process, the planning team identified the primary issues and concerns facing Great Sand Dunes National Park and Preserve with assistance from the public, the Great Sand Dunes National Park Advisory Council, park staff, and neighboring agencies and organizations. Many issues relate to protection of natural and cultural resource values or providing for quality experiences. This section summarizes the main issues or concerns to be addressed by the GMP / wilderness study.

### **PROTECTION OF FUNDAMENTAL RESOURCES AND VALUES**

The National Park Service must identify fundamental resources and values that deserve primary consideration in planning and management for the national park and preserve, and strategies to protect those

values. Similarly, the National Park Service must identify what visitor opportunities or experiences fit with the purposes and maintain the significance of the park and preserve, and develop strategies for enhancing those opportunities. [Note: these determinations are now documented in the “Fundamental Resources and Values” section above.] The National Park Service must also decide how to manage specific areas of the park (through management zoning) to protect and provide for these different natural, cultural, and visitor experience values. The National Park Service must resolve whether certain kinds of recreational activities (e.g., dogs, pack animal, and off-highway vehicle use) and commercial services are consistent with protecting these resources and values, and where they should occur within the park (if they should occur at all).

## **MANAGEMENT OF NEW PARK LANDS**

The Great Sand Dunes Act of 2000 expanded the size of Great Sand Dunes National Monument by nearly four times. Some of the new land is now Great Sand Dunes National Park, and some is now Great Sand Dunes National Preserve. The National Park Service must decide how to manage natural resources, cultural resources, and visitor use on the park expansion lands. Of particular concern is management of former Baca and Medano Ranch lands that are now within the boundaries of the national park. Examples include: determining the fate of ranch infrastructure such as buildings and roads, deciding whether to continue to allow bison on park lands, and resolving how to protect sensitive resources and manage visitor use on new lands.

## **ACCESS TO NATIONAL PARK SERVICE AND OTHER FEDERAL LANDS**

Comments provided by the public and neighboring agencies indicate that access to new NPS lands and adjacent federal lands is of great interest and concern. People are concerned about whether there will be new road or trail access to the dunes from the north. Hunters are concerned about how to get to the national preserve and to USFS lands, where hunting is allowed. There is also interest in whether the National Park Service or other land managers will provide new trails or trailheads to stream drainages north of the former national monument. Neighbors in the Crestone / Baca Grande community are concerned that potential new routes of access could affect their quality of life. The National Park Service must decide what routes and means of access are appropriate in different areas of the park and preserve, given resource protection and visitor experience needs.

## **CROWDING AND OVERUSE**

Some visitor facilities and frontcountry and backcountry areas within the park and preserve are crowded or congested, even at times other than peak visitor weekends. The GMP must deal with issues of crowding and give general management direction for addressing visitor carrying capacity in the park and preserve.

## **WILDERNESS**

Great Sand Dunes National Park includes the Great Sand Dunes Wilderness Area, and the national preserve includes a portion of the Sangre de Cristo Wilderness Area. Lands added to the national park when the park was expanded in 2000 have not previously been considered for wilderness designation by the National Park Service. The National Park Service needs to determine the general direction of wilderness management for existing National Park Service wilderness areas, and determine whether any additional lands should be proposed for inclusion in the National Wilderness Preservation System.

## **WILD AND SCENIC RIVERS**

The Wild and Scenic Rivers Act of 1968, and NPS management policies require park managers to assess whether watercourses within national park units are suitable for inclusion in the national wild and scenic river system. The streams of the park and preserve have not previously been considered for wild and scenic river status. The National Park Service must determine whether to recommend streams within the park as part of the wild and scenic rivers system (appendix H).

## **DEVELOPMENT AND USES IN AND NEAR THE PARK**

Some areas of the San Luis Valley are gradually becoming more developed by residential, commercial, and other uses. Agricultural and domestic demand for additional water has the potential to draw down the groundwater aquifer that underlies the dunes system. Oil and gas exploration activities are being conducted

on lands within the national park. These and other activities could degrade park resources and values such as scenic views, the night sky, ambient sound levels, opportunities for solitude, and native plant and animal communities. Park managers must determine how to work with park neighbors to protect park resources in light of changes and activities that are occurring in the valley.

## **PLANNING CONSIDERATIONS AND CONSTRAINTS**

This section explains planning considerations and constraints related to implementation of some actions in the GMP alternatives.

### **MEDANO RANCH**

The Nature Conservancy owns all private lands within Medano Ranch, and may eventually transfer the ranch portion within the national park boundary to the federal government. This could happen in phases or all at once, but this transfer is generally expected to be completed within the life of this GMP. Until the transfer takes place, implementation of some alternative actions, especially those related to Medano Ranch facilities and access onto or through Medano Ranch lands, will be contingent on agreement and cooperation with The Nature Conservancy.

### **PUBLIC VEHICLE ACCESS TO THE BACKCOUNTRY ACCESS ZONE IN NORTHERN PORTION OF NATIONAL PARK**

Some alternatives in this GMP propose a backcountry access zone in the northern

portion of the national park for purposes of public vehicle access to a small trailhead (and a campground in one alternative). Due to surrounding land ownership and public road patterns, topography, and designated wilderness, there is presently no way to access this backcountry access zone by vehicle. There are two potential future ways to drive into this zone located within the national park: (1) via Saguache County public roads through the Baca Grande subdivision, or (2) via road(s) through the Baca National Wildlife Refuge. Both options have drawbacks. Because public vehicle access to this backcountry access zone is outside the control and jurisdiction of the National Park Service, this GMP does not resolve the question of which option, if either, might ultimately be used. It instead leaves flexibility for either option, should future conditions allow. This issue and management zones are discussed in more detail in chapter 2 of this document.

### **COW CAMP ROAD**

Cow Camp Road (sometimes referred to locally as Lexam Road) is an improved gravel road located within the Baca National Wildlife Refuge and the northern

portion of Great Sand Dunes National Park. Some alternatives in this GMP propose that segments of Cow Camp Road within the national park be designated a backcountry access zone to allow public vehicle access to a small trailhead (and a campground in one alternative). Lexam Explorations, Inc., has a surface-use agreement permitting the company to use Cow Camp Road to exercise its subsurface mineral rights within the former Baca Ranch. Lexam's surface-use agreement will expire in the year 2011, unless Lexam begins producing oil or gas on the former

Baca Ranch. In that case, the surface-use agreement could be extended beyond the life of this GMP. The surface-use agreement contains language relieving Lexam of liability for others' use of Cow Camp Road. To allow acquisition of Baca Ranch by the federal government, The Nature Conservancy assumed liability for the federal government's use of the road. The Nature Conservancy does not wish to assume liability for public vehicle use, so such use would not be allowed until expiration of the Lexam surface-use agreement.

## **RELATIONSHIP OF THE GENERAL MANAGEMENT PLAN TO OTHER PLANNING EFFORTS**

### **RESOURCE MANAGEMENT STRATEGY, GREAT SAND DUNES NATIONAL MONUMENT**

The 1994 "Resource Management Strategy for Great Sand Dunes National Monument" formulated a strategy that prompted park managers to move from a reactive to a proactive method of resource management. The strategy consists of five parts or steps: (1) define the Great Sand Dunes ecosystem, (2) understand the system, (3) monitor the system, (4) manage the system, and (5) evaluate actions.

Since the strategy was developed, park managers have made great strides in implementing it. First, progress toward defining and understanding the system provided scientific background and support for the 2000 park expansion legislation. Second, resource managers have answered certain key questions about physical, biological, and cultural components of the Great Sand Dunes system that were identified in the 1994 strategy, and are still working proactively to answer others. Third, managers are using

the information gained to make informed management decisions. Increased understanding of the dunes system and its components has supported and guided the GMP in important ways, including helping to define fundamental resources and values; identifying resource threats and sensitive area locations within the park; and underscoring the need to involve neighbors, partners, and the interested public in planning for the expanded park.

### **CONCEPTUAL MANAGEMENT PLAN, COMPREHENSIVE CONSERVATION PLAN, BACA NATIONAL WILDLIFE REFUGE**

The USFWS administers the recently established Baca National Wildlife Refuge, located just west of Great Sand Dunes National Park. The USFWS published a conceptual management plan for the Baca refuge in May 2005. This plan provides a broad overview of that agency's proposed management approach to wildlife and relative habitats, public uses, facilities, interagency coordination, and other

operational needs. The plan acknowledges that a big issue for the National Park Service and the public is vehicle access to the northern portion of the expanded national park.

The conceptual management plan of the USFWS does not provide detailed information about where new facilities (if any) would be located or how visitor services would be implemented. However, it outlines requirements for any public uses on a national wildlife refuge as follows: (1) the use must be determined compatible with the purpose of the refuge; and (2) sufficient resources must be available for the development, operation, and maintenance of the permitted public use. The conceptual management plan indicates that the USFWS intends to develop a visitor services plan to address issues related to public access and wildlife-dependent activities on the refuge. Also, a comprehensive conservation plan for the refuge will provide a detailed analysis of current and future refuge management activities—this effort is scheduled to begin in 2008 (USFWS 2005). The USFWS has been cooperating extensively in planning for the Great Sand Dunes, and the National Park Service expects to be closely involved in planning for its refuge neighbor.

### **PLANNING FOR LANDS ADDED TO RIO GRANDE NATIONAL FOREST IN THE YEAR 2000**

The Great Sand Dunes Act of 2000 added a new area to the Rio Grande National Forest. This area, referred to as “Zone B” in the 2000 legislation, is located immediately east of the Baca Grande subdivision, and north of the national park. The U.S. Forest Service will be amending their forest plan to designate the newly acquired USFS system lands into management prescriptions. This planning process is

expected to begin in 2006 and will include public and other agency involvement. The Rio Grande National Forest has preliminarily identified the need to provide the public with vehicle access (to provide for the use and enjoyment of the national forest) along the existing U.S. Forest Service portion of Liberty Road that lies within the Rio Grande National Forest boundary.

### **INTERAGENCY LAND EXCHANGE, GREAT SAND DUNES NATIONAL PARK AND PRESERVE, BACA NATIONAL WILDLIFE REFUGE, BUREAU OF LAND MANAGEMENT, AND COLORADO STATE LAND BOARD**

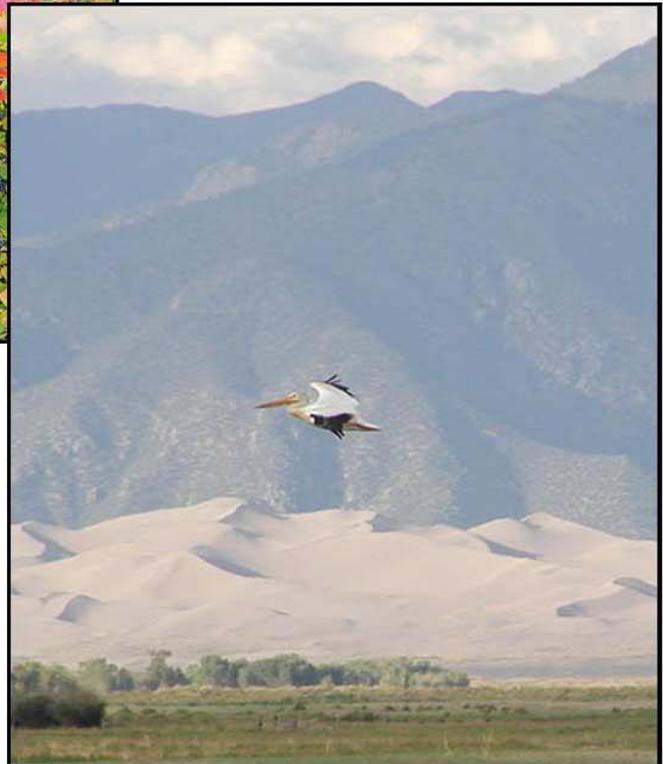
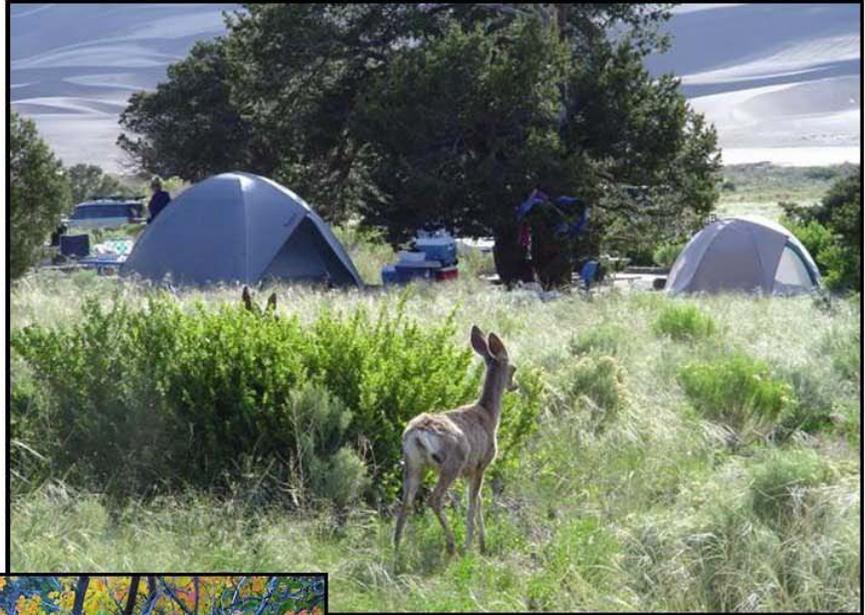
A land exchange involving the National Park Service, the State Land Board of Colorado, the Bureau of Land Management (BLM), and the USFWS is being pursued. With expansion of the national park and creation of the Baca National Wildlife Refuge (Great Sand Dunes Act of 2000) came the authority to acquire private lands within the boundary through purchase, donation, or exchange. The legislation specifically authorizes that lands or interests therein owned by the state of Colorado may only be acquired by donation or exchange. The interagency land exchange involves exchanging a number of state-owned land parcels within the expanded boundaries of the national park and the Baca National Wildlife Refuge for BLM land parcels lying outside the park/refuge boundaries. The proposed exchange meets state and federal goals of consolidating dispersed parcels to achieve better and more efficient management. All agencies are actively involved in working out the complexities of the exchange. The GMP for the Great Sand Dunes considers how lands within the park (acquired via the land exchange) should be managed.

## **GREATER SAND DUNES INTERAGENCY FIRE MANAGEMENT PLAN**

The *Greater Sand Dunes Interagency Fire Management Plan* was prepared cooperatively by and for Great Sand Dunes National Park and Preserve, Baca National Wildlife Refuge, and The Nature Conservancy's Medano-Zapata Ranch in 2005. The plan describes a cross-boundary, interagency fire management program for the Greater Sand Dunes landscape that aims to conserve ecological systems,

biodiversity, and wildlife, while protecting human life, property, and other resources. The plan provides direction for fire management across the study area, while still allowing each agency to meet its own protection and resource management objectives. The agencies plan to update the plan regularly; thus, there will be opportunities to adjust the interagency fire management plan, as needed, to incorporate elements of the Great Sand Dunes National Park and Preserve GMP, once the latter is approved.





## Chapter Two: Alternatives

---



## INTRODUCTION

This chapter presents four alternatives, including the National Park Service preferred alternative, for future management of Great Sand Dunes National Park and Preserve. The four alternatives are labeled: no-action, NPS preferred, dunefield focus—maximize wildness, and three public nodes.

The alternatives, each of which is consistent with the park’s purpose, significance, and fundamental resources and values, present different ways to manage resources, visitor use, and facilities within the park. The no-action alternative is included as a baseline for comparing the environmental consequences of implementing each “action” alternative.

This chapter also includes a table that summarizes key differences between the alternatives. Key differences in the expected impacts of implementing the alternatives are summarized in table 26, chapter 4. The summary of the impacts table is based on the analysis in Chapter 4: Environmental Consequences.

### INTRODUCTION TO THE ALTERNATIVES

As noted in chapter 1, “Foundation for Planning and Management,” the National Park Service would continue to follow special park mandates and servicewide laws and policies, regardless of the alternative considered in this GMP. These special mandates, laws, and policies are not repeated here.

Similarly, the parkwide desired conditions (and management strategies to achieve those conditions) for the Great Sand Dunes discussed in chapter 1 apply regardless of

the alternative considered in this GMP. Those desired conditions cover four main topic areas: *Dunes and Biological Diversity* (includes ecosystem management, natural resources and diversity, air quality, water quality and quantity, and wildlife management); *Human Connections* (cultural resources; relations with private and public organizations, adjacent landowners, and governmental agencies; relations between American Indian tribes and Great Sand Dunes National Park; and contemporary community ties); *Visitor Opportunities* (visitor use and experience; visitor information, interpretation, and education; viewsheds; night sky; natural sounds; wilderness; and park accessibility); and *Other* (land protection, research, and facilities and services). The desired conditions and management strategies are not repeated in this chapter.

The primary focus of this chapter, and of the environmental impact statement, is actions that would differ among the GMP alternatives. The GMP alternatives are intended to be specific enough to provide clear management direction for park staff, while still allowing flexibility to adapt to changing future conditions and situations. They outline alternate visions of the future that would guide day-to-day and year-to-year management of the park. Implementation of the GMP alternative that is ultimately selected will depend on future funding, resource protection priorities, and environmental and cultural compliance. Full implementation could take many years.

To develop the GMP alternatives in this chapter, the National Park Service planning team and the Great Sand Dunes National Park Advisory Council first gathered

information about existing visitor use and the condition of park facilities, areas, and resources. They considered which areas of the park attract visitors and which have sensitive resources. They then developed seven management zones for guiding the preservation, appreciation, and use of the Great Sand Dunes. The management zones

are applied in varying combinations and locations in the GMP alternatives (except for the no-action alternative). Thus, the management zones form the main basis for the GMP alternatives. These zones are discussed in detail after the following section, which introduces the concept of carrying capacity.

## CARRYING CAPACITY

General management plans are required to address visitor carrying capacity for national park units. The National Park Service defines visitor carrying capacity as “the type and level of visitor use that can be accommodated while sustaining desired resource conditions and visitor experiences in the park.” Carrying capacity does not necessarily involve identifying a “magic number” for visitor use, nor does it necessarily imply closures or use limits.

The carrying capacity process for national parks typically involves the following steps (more detail on these steps is provided in appendix D):

1. Identify desired conditions (goals) for resources and visitors.
2. Identify indicators (things to monitor to determine whether desired conditions are being met).
3. Identify standards (limits of acceptable change) for the indicators.
4. Monitor indicators.
5. Take management action, as necessary, to ensure that standards are met.

6. Regularly evaluate and make adjustments based on new information and lessons learned.

This GMP addresses carrying capacity in the following ways:

- It identifies desired resource and visitor experience conditions for each management zone.
- It identifies the principal resource and visitor experience concerns for each management zone (and related indicators) so that park managers can collect baseline data that will assist with setting preliminary standards.
- For each resource concern, it lists potential management actions that might be used to address deteriorating trends or unacceptable conditions.
- It identifies specific geographic areas for special monitoring attention.
- It evaluates the tradeoffs of having different proportions and distributions of management zones, via the GMP alternatives.

- It explores different scenarios (solutions) for what to do when frontcountry parking areas become full, via the GMP alternatives.

A wilderness management plan, tiered off this GMP, will provide more specific direction for addressing carrying capacity.

With limited NPS personnel and budgets, park managers must focus carrying capacity efforts on areas where there are definite concerns and/or clear evidence of problems. This means that monitoring should concentrate on areas where:

conditions violate standards (or threaten to), conditions are changing rapidly, specific and important values are threatened by visitation, or effects of management actions or visitation are unknown. At the Great Sand Dunes, the following areas deserve special carrying capacity attention: the Upper and Lower Sand Creek Lakes areas, portions of Deadman, Sand Creek, and Castle Creek corridors located within the national park, Big and Little Springs, the area north of Cow Camp Road, and the area around the dunes parking lot.

## MANAGEMENT ZONES

Management zones define specific resource conditions, visitor opportunities, and management approaches to be achieved and maintained in each area of the park. Similar to city or county zoning, management zones provide predictable expectations for the condition of areas of the park. Seven management zones have been developed for Great Sand Dunes National Park and Preserve, and these zones are applied to different areas of the park in each action alternative:

- frontcountry
- dunes play
- backcountry access
- guided learning
- backcountry adventure
- natural/wild
- administrative

The management zones are described in more detail in the following sections.

In addition to the management zones, park managers would continue to use the Superintendent's Compendium to effect limitations or closures, as necessary, to

protect resources and wilderness values. The Superintendent's Compendium is a list of designations, closures, request requirements, and other restrictions imposed under the discretionary authority of the park superintendent as provided for in Title 36 of the *Code of Federal Regulations* (CFR).

## FRONTCOUNTRY ZONE



FIGURE 1. FRONTCOUNTRY ZONE

### Overview

Primary features, facilities, and programs provide opportunities for large numbers of

people to enjoy and learn about the park. This zone does not occur in wilderness.

### Resource Condition

Natural processes and landscapes are unaltered, except within or directly adjacent to the limited number of developed sites or areas. In frontcountry zone developed areas, natural processes and landscapes may be altered or manipulated to restore damaged areas, to preserve or maintain cultural resources, or to direct visitor use to avoid resource impacts. Alterations are designed to blend with the natural landscape as much as possible.

### Visitor Opportunities

These easily accessible, high-use areas focus on a connection with and appreciation of special park resources. Visitors are offered a variety of opportunities for onsite interpretation and education; understanding park themes is a priority. Sights and sounds of people and/or vehicles are expected. Encounters with others, including park staff, are likely, especially around developed facilities. Basic necessities and conveniences are provided, so visitors don't need a high degree of self-reliance or outdoor skills. This zone is popular and well-suited for family recreation.

### Facilities and Activities

Common visitor activities include scenic driving, viewing scenic vistas, taking short walks on designated trails, and picnicking. Interpretive and educational programs may be provided. Horse or pack animal use is not permitted. Culturally significant resources, including historic structures,

may be used for visitor or administrative purposes. Appropriate kinds of facilities include visitor centers, visitor contact stations, slow-speed paved or gravel roads, parking areas, formal campgrounds, picnic areas, amphitheaters, surfaced trails, and operational facilities (offices, NPS housing, horse corrals, etc.). Appropriate commercial services include limited convenience concessions, modest shuttle services, horse tours, and dog boarding.

### Carrying Capacity

Principal resource concerns and indicators for the frontcountry zone:

- When the dunes parking lot fills, visitors park along the shoulders of the dunes lot access road and portions of the main park road. Parking on road shoulders and other undesignated areas compacts soils and damages vegetation. Possible indicator: vegetation damage along road shoulders; number of vehicles parking along roadside may be an easy-to-monitor surrogate indicator. Possible management actions to address this concern: parking lot reconfiguration (underway), continue to publicize park busy times so visitors can avoid them, provide modest shuttle service, redirect visitors to other areas of the park.
- There is a proliferation of social trails along the east side of Medano Creek, between the north dunes lot and the campground. Possible indicator: linear feet of social trails. Possible management actions to address this concern: install hiking/biking path from campground to dunes lot.

Principal visitor experience concerns and indicators for the frontcountry zone:

- When the dunes parking lot fills, visitors park along the shoulders of the dunes lot access road and portions of the main park road. Visitors then walk on the road to reach dunes access points. This is a visitor experience and safety concern. Possible indicator: proportion of visitors who encountered people walking along the road and perceived it to be a problem (exit survey), number of vehicles parking along roadside may be an easy-to-monitor surrogate indicator. Possible management actions to address this concern: same as for resource conditions concerns (see above).

## DUNES PLAY ZONE



FIGURE 2. DUNES PLAY ZONE

### Overview

These are natural areas for visitor enjoyment of the dunes and Medano Creek, two of the park's prime resources. This zone occurs primarily in wilderness.

### Resource Condition

Natural processes are unaltered. Lasting evidence of recreational use is not apparent (evidence is temporary).

### Visitor Opportunities

Experiencing Medano Creek and the high dunes are a focus of this zone. Visitors have opportunities for primitive and unconfined recreation and a sense of freedom in a natural landscape. There is a low expectation for solitude because this is a key area for park visitors, but it's possible to find solitude within 0.25 mile of the dunes parking lot. This zone is popular and well-suited for family recreation.

### Facilities and Activities

Common visitor activities include wading, climbing and sliding on the high dunes, sand and water play (the latter when the creek is flowing), and guided interpretive and educational programs. No facilities except small signs. No trails, camping, horseback riding, or motorized vehicles. In designated wilderness, management is consistent with NPS wilderness management policies. No commercial services would be appropriate in this zone.

### Carrying Capacity

Principal resource concerns and indicators for the dunes play zone:

- Medano Creek water quality—waste from horses upstream, humans (from babies and discarded diapers), and dogs in the creek is a concern. (Note: this is also a visitor experience concern). Possible indicator (underway):

fecal coliform counts in/near the dunes play area. Possible management actions to address this concern: establish limits on numbers (or duration of stay) of horses upstream, close area temporarily to dogs and/or visitors if public health standards are exceeded, prohibit dogs in the creek area altogether, establish special area downstream where dogs are allowed, require special swim diapers for babies.

Principal visitor experience concerns and indicators for the dunes play zone:

- Some visitors indicate that they are bothered by crowding. Possible indicator: proportion of visitors who say they feel crowded in the dunes play area. Possible management actions to address this concern: provide information about where to go in this zone to find solitude, continue to publicize park busy times so visitors can avoid them, install a Web camera in the dunes parking lot so potential visitors can tell when the area tends to be busy.
- Park staff occasionally receive complaints about dogs who are aggressive and/or off-leash. Possible indicator: number of complaints received per week, proportion of visitors who encountered problem dogs (exit survey). Possible management actions to address this concern: prohibit dogs in this area.

## BACKCOUNTRY ACCESS ZONE

### Overview

This zone provides access to backcountry adventure or natural/wild zones by providing vehicle travel routes and/or trailheads. This zone does not occur in wilderness.



FIGURE 3. BACKCOUNTRY ACCESS ZONE

### Resource Condition

These are unpaved vehicle travel routes or trailheads from which backcountry adventure or natural/wild areas can be accessed. Parts of the natural landscape may be altered to protect resources from impacts (e.g., installing culverts under roads). Alterations are designed to blend with the natural landscape. There is little to no roadside damage to vegetation and soils from vehicles passing each other. Resources may be manipulated when necessary to restore damaged areas, to preserve or maintain cultural resources, or to direct visitor use to avoid resource impacts.

### Visitor Opportunities

Travel is generally by passenger vehicle, horseback, or bicycle. Visitors have opportunities to view or access some of the

park's prime resources from roads or trailheads. There is a sense of being in a natural landscape. There are some opportunities for adventure and discovery. The expectation for solitude is low during peak visitor periods, but congestion due to numbers of vehicles occurs only on summer holiday weekends. Visitors are somewhat self-reliant and need basic outdoor skills. There may be limits on numbers of people or vehicles to protect resources or visitor experiences.

### Facilities and Activities

Common visitor activities include scenic driving, horseback riding, and bicycling. Appropriate kinds of facilities include unpaved roads, trailheads, primitive campgrounds, vault or composting toilets, and information kiosks. Appropriate commercial services include guided activities: hunting (preserve only), fishing, hiking, horseback riding, and backcountry four-wheel-drive tours (originating outside the park) on designated routes.

### Carrying Capacity

Principal resource concerns and indicators for the backcountry access zone:

- Most drivers keep to road corridors, but a few drive off illegally, damaging soils and plant life outside the road corridor. Possible indicator: amount of vegetation damage outside the road corridor. Possible management actions to address this concern (some underway): install special fabric in areas of deeper sand to provide a stable base and improve traction, install posts along the road to better delineate road corridor, install signs encouraging

drivers to stay on the road, increase visitor contacts, work with user groups to enhance understanding of impacts and how to avoid them, alternate traffic flow during busy times to reduce/eliminate the need for cars to pass, inform drivers at fee booth about dry sand conditions, require permits for road use (excluding Medano Pass Road).

Principal visitor experience concerns and indicators for the backcountry access zone:

- crowding and congestion in certain areas. Possible indicators: proportion of road users who say they felt crowded (exit survey); number of times parking areas fill (parking lot use is closely correlated with road use, and parking lots are simpler to monitor). Possible management actions to address this concern: continue to publicize busy times so visitors can avoid them.
- Crowding at backcountry campsites in the national preserve (some individual sites get crowded when people try to park as many as seven or eight cars at one site). Possible indicators: proportion of campers who say they felt crowded (exit survey), number of vehicles counted during patrols (easy to count surrogate). Possible management actions to address this concern (underway): use barriers or better delineate sites to prevent extra vehicles, create regulatory limit on number of vehicles that can park at each site.

## GUIDED LEARNING ZONE



FIGURE 4. GUIDED LEARNING ZONE

### Overview

Protecting sensitive resources is the focus of this zone. Learning about these resources is important and protection is provided by guiding or escorting visitors. This zone occurs in wilderness or nonwilderness.

### Resource Condition

These are areas where visitor use is permitted only with a guide or escort to protect particularly sensitive resources. Travel is via horse or foot (or vehicle in nonwilderness areas). Parts of the natural landscape may be altered (e.g., designated trails and backcountry toilets installed) to protect resources from negative impacts. Resources may be manipulated when necessary to restore damaged areas, to preserve or maintain cultural resources, or to direct visitor use to avoid resource impacts. Alterations are designed to blend with the natural landscape.

### Visitor Opportunities

Opportunities to learn about these special resources while protecting them are provided by guiding or escorting visitors.

Travel is by horse or foot (or vehicle in nonwilderness areas). Parts of the natural landscape may be altered (e.g., designated trails and backcountry toilets installed) to protect resources from negative impacts. Resources may be manipulated when necessary to restore damaged areas, to preserve or maintain cultural resources, or to direct visitor use to avoid resource impacts. Alterations are designed to blend with the natural landscape.

### Facilities and Activities

Visitor activities include guided interpretive and educational tours on horseback, by foot, or (in nonwilderness areas) by vehicle. Appropriate kinds of facilities include unpaved roads, trails, wayside exhibits, vault or composting toilets, and information kiosks. Appropriate commercial services include concession-operated guided vehicle, horseback, and hiking tours. In designated wilderness, management is consistent with NPS wilderness management policies.

### Carrying Capacity

Principal resource concerns and indicators for the guided learning zone:

- Potential damage to archeological sites and sensitive wetlands areas. (Note: the intent is to minimize this concern by using guided tours.)  
Possible indicators: amount of soil disturbance, erosion, loss of artifacts, etc., as measured by photo comparisons and/or survey plots. Possible management actions to address this concern: limit visitor use in terms of group size, tour frequency, time (daily or seasonally), and space as needed to protect sensitive resources.

Principal visitor experience concerns and indicators for the guided learning zone:

- The National Park Service desires that visitors enjoy and are satisfied with guided tours. Possible indicator: proportion of visitors satisfied with their guided tour (end-of-tour survey). Possible management actions to address this concern: alter tour details, within limits, to correct deficiencies (ongoing problems would not be expected).

## BACKCOUNTRY ADVENTURE ZONE



FIGURE 5. BACKCOUNTRY ADVENTURE ZONE

### Overview

These are natural landscapes with a few facilities such as designated trails, backcountry campsites, and backcountry patrol cabins. This zone occurs in wilderness or nonwilderness.

### Resource Condition

Natural systems and processes prevail, with minimal human alteration. Segments of the natural landscape may be altered (e.g., campsites defined, water bars and privies installed) to protect resources from negative impacts. Resources may be

manipulated when necessary to restore damaged areas, to preserve or maintain cultural resources, or to direct visitor use to avoid resource impacts. Alterations are designed to blend with the natural landscape.

### Visitor Opportunities

Travel is by foot or horseback on designated trails. Visitors have a sense of being in the natural landscape and opportunities to view, access, and experience some of the park's prime resources. Encounters with other visitors are common on trails during park busy periods, but solitude can always be found in off-trail areas. Visitors are somewhat self-reliant and need basic outdoor skills. There are some opportunities for adventure and discovery. Visitors have opportunities to experience natural soundscapes and lightscapes. There may be limits on numbers of visitors, length of stay, group size, and overnight use to protect resources or visitor experience. A visitor permit system may be implemented if needed to protect resources.

### Facilities and Activities

Common visitor activities include hiking, backpacking, hunting (in the preserve only), fishing, backcountry camping, and horseback riding (bicycles are not permitted). Visitor access is by foot or horseback. Appropriate kinds of facilities include primitive or maintained trails, trails marked by cairns or markers, backcountry campsites, backcountry privies, and patrol cabins. In designated wilderness, management is consistent with NPS wilderness management policies. Appropriate commercial services include guided activities: hunting and fishing,

hiking, horseback riding, pack animal trips, and mountaineering/climbing.

## Carrying Capacity

Principal resource concerns and indicators for the backcountry adventure zone:

- There is concern about invasive nonnative plants becoming established, especially in more accessible areas of the expanded national park that are newly open to public use (e.g., the northern-most portion of the national park, and Deadman and Sand Creek corridors). Possible indicators: incidence of such plants in new areas. Possible management actions to address this concern: require use of weed-free hay, increased education, and other visitor-oriented measures to limit spread of weed seeds.
- There is concern about soil compaction, social trails, erosion, vegetation trampling and loss, and tree damage in areas of heavy visitor/horse use (e.g., around Upper Sand Creek Lake) and in areas of new visitor use (e.g., northern-most portion of the national park). This is also a visitor experience concern. Possible indicators: linear feet of social trails, number and size of problem sites (e.g., denuded areas, wide muddy spots on trails), number of damaged trees. Possible management actions to address this concern: rehabilitate disturbed areas, create designated campsites, install planking across wet areas, require “leave-no-trace” practices, allow stoves only (no wood fires), require backcountry permits, limit

number (or duration of stay) of horses.

- There is a human waste problem—a health, water quality, and visitor experience concern—from visitors who do not adhere to the park’s sanitary regulations, particularly in the Upper and Lower Sand Creek Lakes area. Possible indicators: fecal coliform counts in nearby lakes and streams, toilet tissue “counts” or surveys. Possible management actions to address this concern: provide primitive toilets in problem areas, require visitors to pack waste out, expand education efforts.
- Wildlife concerns include bears becoming habituated to humans, declining bighorn sheep numbers (unknown cause), and fishing impacts on reestablished native fish populations. Possible indicators: fish surveys, number of human/bear encounters, bighorn sheep population size/health. Possible management actions to address these concerns: require use of bear canisters/lockers for food (underway); fishing restrictions designed, in consultation with CDOW, to protect native fishes, bighorn sheep research conducted jointly by the National Park Service and CDOW.

Principal visitor experience concerns and indicators for the backcountry adventure zone:

- In this zone, solitude is a desired condition in off-trail areas, but the zone allows for frequent encounters along trails during busy visitor periods. The Upper and Lower Sand Creek Lakes areas are of

particular concern; use is increasing so that it's difficult at times to find solitude and good camping locations. Possible indicator: proportion of visitors who saw or heard too many other visitors in off-trail areas (exit survey). Possible management actions to address this concern: tighter restrictions on camping around lakes, create designated campsites, require visitor permits, work cooperatively with the USFS regarding capacity and management of the upper Music Pass parking lot (east side of the Crestone divide).

## NATURAL / WILD ZONE



FIGURE 6. NATURAL / WILD ZONE

### Overview

This is the wildest zone. It protects natural resources and provides opportunities for physical challenge, adventure, and solitude. This zone occurs in wilderness or nonwilderness.

### Resource Condition

Natural systems and processes prevail, and natural and cultural resources are generally

unaltered and unaffected by human influences. Evidence of recreational use is not readily apparent. Resource inventory and monitoring activities help to identify and protect resources. Rare or special plant communities receive management emphasis for preservation and protection. Archeological sites are protected in place. Natural soundscapes and the dark night sky predominate.

### Visitor Opportunities

Visitors explore and enjoy relatively remote areas in a natural setting by foot or horseback. Opportunities for solitude, independence, closeness to nature, and adventure are readily available. Expectation for solitude is high and it can be found in most areas of this zone; there are few encounters with other people. Visitors are self-reliant and require good outdoor skills as these areas are without comforts or conveniences. Visitors have opportunities to experience natural soundscapes and lightsapes. There may be limits on numbers of visitors, length of stay, and overnight use. A visitor permit system may be implemented if needed to protect resources or visitor experience.

### Facilities and Activities

Common visitor activities include off-trail hiking, backcountry camping, horseback riding, guided or unguided hunting (within the national preserve only), and fishing. Visitor access is by foot or horseback (bicycling is not permitted). Overnight use may be limited in certain areas. Management activities include research and monitoring, and stabilization and restoration of natural and cultural resources. There are generally no facilities (examples of exceptions: unmaintained historic structures, research plots, and

monitoring wells). In designated wilderness, management is consistent with NPS wilderness management policies. Occasional administrative use of mechanized tools or transport may be used, as necessary, outside of wilderness. Appropriate commercial services include guided activities: hunting and fishing, hiking, horseback riding, pack animal trips, and mountaineering/climbing.

### Carrying Capacity

Principal resource concerns and indicators for the natural/wild zone:

- same as for the backcountry adventure zone

Principal visitor experience concerns and indicators for the natural/wild zone:

- In this zone, a desired condition is that solitude can be found and there are few encounters with other people. The Upper and Lower Sand Creek lakes areas are of particular concern; use is increasing so that it's difficult at times to find solitude and good camping locations. Possible indicator: proportion of visitors who saw or heard too many other visitors in off-trail areas (exit survey). Possible management actions to address this concern: tighter restrictions on camping around lakes, require visitor permits, work cooperatively with the USFS regarding capacity and management of the upper Music Pass parking lot (east side of the Crestone divide).

### ADMINISTRATIVE ZONE



FIGURE 7. ADMINISTRATIVE ZONE

### Overview

This zone is primarily to support management and administration of the park or other mandated activities such as the Closed Basin Project. This zone does not occur in wilderness.

### Resource Condition

Natural processes and resources are in good condition, but may be altered to support park operations (or other mandated activities such as the Closed Basin Project); the degree of alteration is dependent on need. Resources may also be altered or manipulated to preserve/maintain cultural resources, restore damaged areas, or to direct use to prevent additional resource impacts. Alterations blend in visually with the surrounding landscape or facilities to the extent possible.

### Visitor Opportunities

This zone is intended primarily to serve National Park Service operational and administrative needs, but in certain specific cases (e.g., at Medano Ranch headquarters)

may also accommodate scheduled visitor activities. It may be used as a hiking or horseback travel route for visitors with or without guides, and as a vehicle travel route for visitors traveling with NPS-approved guides. Hunters may use this zone as a vehicle travel route if they have special permission and/or are accompanied by land management agency staff.

### Facilities and Activities

Visitor activities include environmental education programs, guided interpretive and educational tours on horseback, by foot, or (in nonwilderness areas) by vehicle. Appropriate kinds of facilities include visitor information signs; structures serving as a base for management or maintenance activities (offices, shops, storage buildings, patrol cabins); housing; outdoor storage areas; environmental education, interpretation, and research facilities; unpaved roads, fences, and ditches. Management activities include maintenance, planning, and overseeing operations, research, monitoring resources and visitor activities, and vehicle travel to remote park areas. Appropriate commercial services include guided activities: hiking, horseback riding, and vehicle tours on designated routes (in nonwilderness), including backcountry four-wheel drive tours originating outside the park.

### Carrying Capacity

Principal resource concerns and indicators for the administrative zone:

- This zone is located in disturbed areas (established roads and trails, Medano Ranch headquarters, etc.), so the main resource concern is use-related impacts to historic structures at Medano Ranch. Possible indicators: damage or wear and tear on adaptively used historic structures. Possible management actions to address this concern: limit visitor use (group size, tour frequency, area, etc.), reinforce or protect structures to protect historic integrity.

Principal visitor experience concerns and indicators for the administrative zone:

- The National Park Service desires that visitors enjoy and are satisfied with interpretive and educational activities (at Medano Ranch). Possible indicator: proportion of visitors satisfied with such activities. Possible management actions to address this concern: alter interpretive and educational activities and services to correct deficiencies.

## NO-ACTION ALTERNATIVE

The no-action alternative was developed to provide a baseline for evaluating changes and impacts of the three action alternatives. This baseline is characterized primarily by conditions in December 2004, roughly two months after ownership and management of the Baca Ranch was transferred to the U.S. government, and by continuation of current management practices into the future. There are funded projects planned for the very near future; these are included in the no-action alternative.

In the no-action alternative, management and use at the Great Sand Dunes would be similar to that existing in December 2004. Most visitor use would continue to be focused in or near the eastern edge of the dunefield. The developed area east of the dunes (main park road, visitor center, and campground) would remain essentially the same. However, the dunes parking lot would undergo minor expansion (~5% additional paved surface) and reconfiguration to improve circulation and increase capacity.

Some visitors would continue to explore backcountry areas of the park and preserve via designated trails and roads, and cross-country horse and hiking use would also continue. Some people would enter the north part of the park on foot from the Baca Grande subdivision via the two county roads that end at the park boundary, but this route of access would not be shown on NPS maps. Alpine Camp would serve as a backcountry patrol cabin for administrative use.

New park lands that were not open to public use before December 2004 would be managed in a very conservative manner. That is, visitor use would be managed so as to not establish new practices for camping, types and routes of access, etc. New park areas would be inventoried for natural and cultural resources and managed according to NPS policies that emphasize natural processes (for example, nonnative species, interior pasture fences, and artificial water holes and sources would be removed).

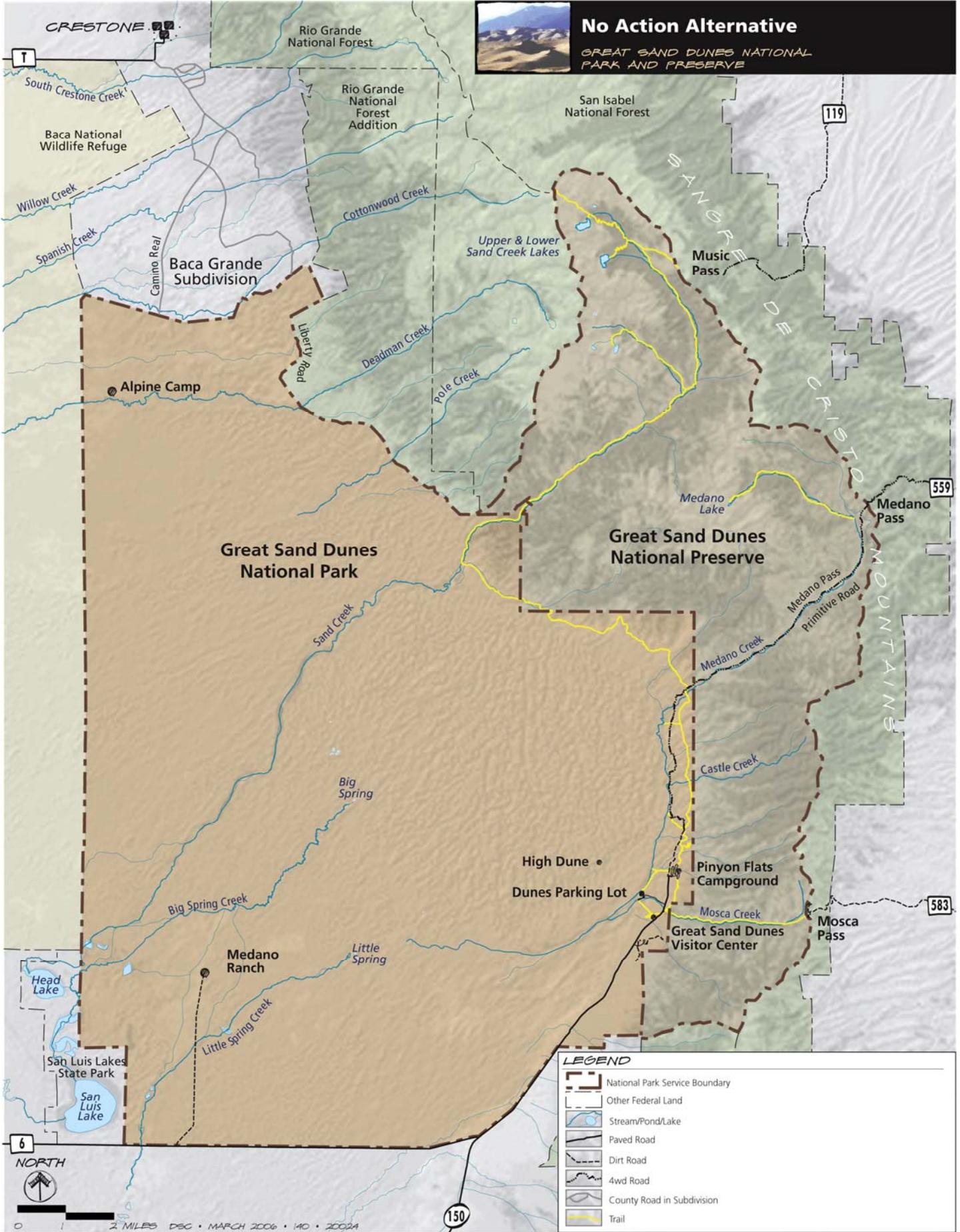
Existing trails and trailheads in the park and preserve would be maintained. There would be no new trails or trailheads. Visitors would be able to enjoy most portions of the park via foot or horseback (select areas would remain off-limits to horses).

The Nature Conservancy would continue to manage Medano Ranch, including the Medano Ranch headquarters. There would be no public use of Medano Ranch. Bison grazing would continue within the park on lands leased or owned by The Nature Conservancy.

Historic structures within new park lands (that is, lands added by the Great Sand Dunes National Park Act of 2000), would be evaluated for their historic significance, but not actively maintained. If acquired by the National Park Service, the Sand Creek Stamp Mill complex would be evaluated for its historic significance, and decisions

# No Action Alternative

GREAT SAND DUNES NATIONAL PARK AND PRESERVE



**LEGEND**

- National Park Service Boundary
- Other Federal Land
- Stream/Pond/Lake
- Paved Road
- Dirt Road
- 4wd Road
- County Road in Subdivision
- Trail



0 1 2 MILES DSG • MARCH 2006 • 140 • 2002A

became a health or safety hazard, they would be individually assessed to determine whether they should be removed.

Leashed dogs would generally be allowed within the park and preserve. Off-leash dogs would continue to be allowed for hunting, which is permitted only within the national preserve. A route or routes for hunter access across NPS land would not be provided from the north. Use of off-highway vehicles that do not conform to requirements for use on Colorado state roads would not be allowed in the park or preserve. There would be no limit on numbers of visitors entering the park, preserve, or any particular area, but existing group size limits, backcountry permit requirements, pack stock regulations, etc., would remain.

Necessary and appropriate commercial services would continue to include providing firewood and incidental camper supplies in the vicinity of the campground through a concession contract. Horseback riding, pack trips, guided hunting, guided hiking, photography workshops, and four-wheel drive tours would continue to be provided in appropriate zones through commercial use authorizations (formerly known as incidental business permits), with the base of operations located outside the park.

## **APPLICATION OF MANAGEMENT ZONES**

Management zones, which are *prescriptive* (that is, they describe desired conditions for the future) have not been applied for the no-action alternative.

## **WILDERNESS**

No new areas would be proposed for wilderness designation in the no-action alternative.

## **STAFFING AND COSTS**

Under the no-action alternative, the park staffing level would be 28 full-time equivalents (FTEs); this number, which was used to develop the cost estimate and impacts of the no-action alternative, is equal to the December 2004 staffing level. (If the park were fully staffed under this alternative, there would be 33 FTEs.) Volunteers would continue to be a key component of park operations.

The cost estimates provided here are for alternatives comparison purposes only—they are not to be used for budgeting purposes. Capital costs for the no-action alternative, which include planned improvements to parking areas and roads, utilities, exhibits, etc., are estimated at \$5.4 to \$6.8 million. Life-cycle costs over 20 years, which include staff, maintenance, and operations costs (as well as capital costs), are estimated at \$28.1 to 29.5 million. More information on costs is provided in appendix F.

## **BOUNDARY ADJUSTMENTS**

Due to the Great Sand Dunes Act of 2000 and the major park boundary expansion that followed, this GMP addresses only minor, technical boundary adjustments. The National Park Service would pursue, through legislation or administrative action, minor boundary corrections, including one to address boundary discrepancies near San Luis Lakes State Park.

## ELEMENTS COMMON TO THE THREE ACTION ALTERNATIVES

- Park staff would continue to work with park neighbors, public and private, to achieve the purposes of the park and to protect fundamental resources and values (see “Desired Conditions and Strategies” section of this document for more information).
- If and when The Nature Conservancy ceased agricultural uses (e.g., bison grazing and forage production) on their owned and leased lands, and transferred the lands to the National Park Service, surface irrigation of meadows would be discontinued and the bison fence would be removed. Before surface irrigation was discontinued, a study would be conducted to better understand how this action might affect wetlands, groundwater supplies, downstream water users, federal water rights, the Closed Basin Project, etc.
- Use of off-highway vehicles that do not conform to requirements for use on Colorado state roads would not be allowed in the park or preserve.
- A 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* [36 CFR 24], 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). Such routes would be identified cooperatively with CDOW and the USFS.
- Roads that the National Park Service does not intend to use for public or administrative purposes would be abandoned and not maintained, but there would be no active obliteration and revegetation of roads. Depending on the alternative, abandoned roads would include Cow Camp Road, Medano Ranch roads, and/or other minor roads and “two-tracks.”
- Historic structures in backcountry areas would be documented, but not maintained. If the structures became a health or safety hazard, they would be individually assessed to decide whether they should be removed.
- Toilets would be installed if/when visitor use levels are high enough that human waste disposal and sanitation is a concern, and if a more suitable solution does not exist.
- Alpine Camp would serve as a backcountry patrol cabin.
- Due to the Great Sand Dunes Act of 2000 and the major park boundary expansion that followed, this GMP addresses only minor, technical boundary adjustments. The National Park Service would pursue, through legislation or administrative action, minor boundary corrections, including one to address boundary discrepancies near San Luis Lakes State Park.

## NATIONAL PARK SERVICE PREFERRED ALTERNATIVE

In the NPS preferred alternative (NPS “Preferred Alternative” map), options would be created for dispersed hiking and horseback riding in the park and preserve. Longer day-use options and overnight linking or loop options would be emphasized. A few new trails would be provided, and links to trails on adjacent lands would be a priority. Carefully located access routes near the park’s perimeter would provide new visitor opportunities with minimal new facilities, keeping most new lands free for natural processes to continue. Cooperative or joint facilities (such as access routes, trailheads, and ranger stations) with neighboring management agencies or private partners would be emphasized. A large portion of the park expansion lands that are not already designated as wilderness would be recommended for future designation as wilderness. (See the appendix E section titled “Rationale for the Preferred Alternative” for more information about why this alternative was selected as the NPS preferred.)

Examples of potential cooperative opportunities include the following:

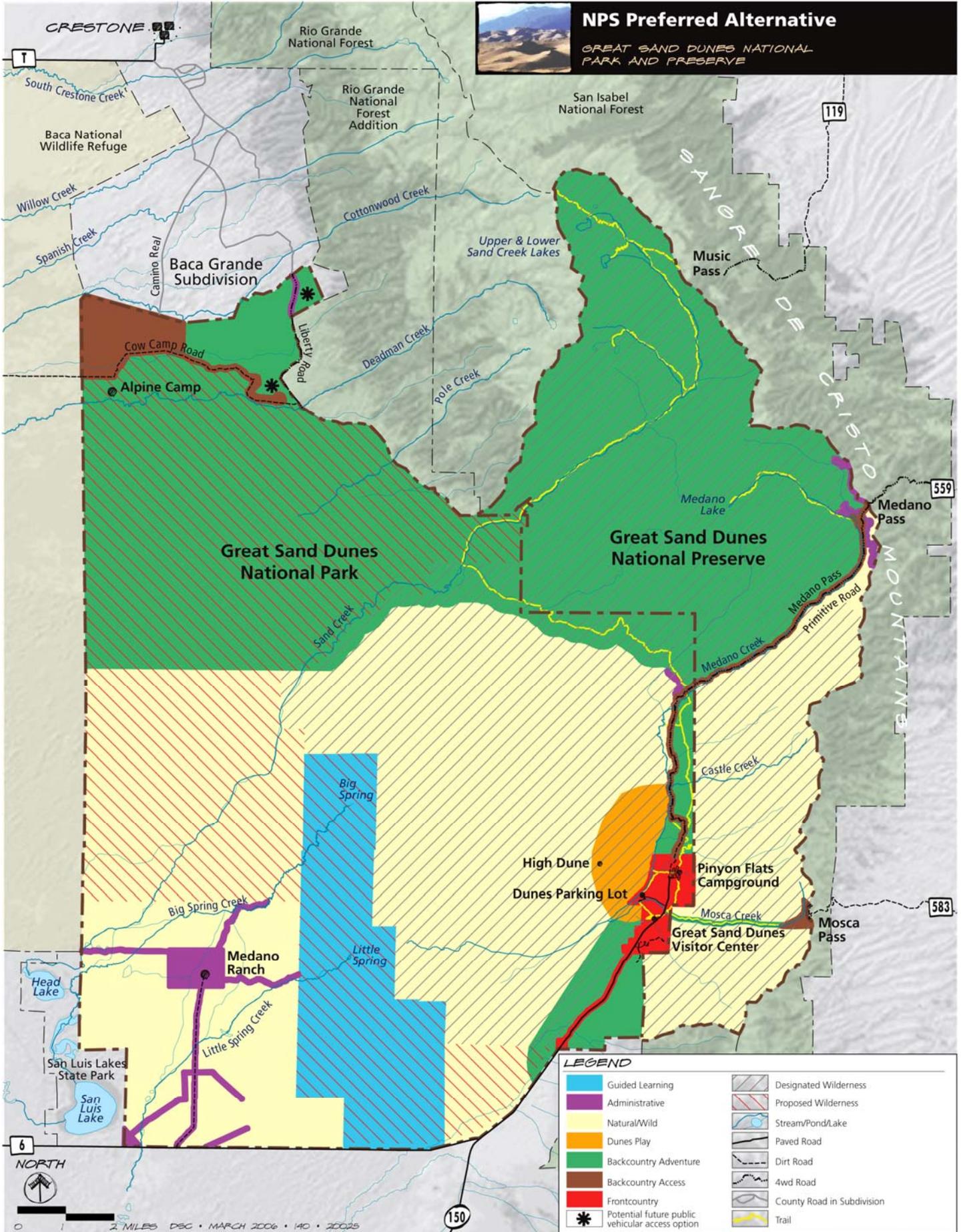
- The Oasis area (private lodge, store, and campground near the main park entrance) could serve as a trailhead base for guided or unguided horse or hiking trips, and as a shuttle staging area.
- San Luis Lakes State Park and/or Wildlife Area could serve as a base for hiking and horseback visits to the national park.
- The National Park Service and USFWS could operate a joint visitor contact station (e.g., on the refuge at the former Baca Ranch headquarters or along SH 17).

The existing developed area east of the dunes (main park road, visitor center, dunes parking area, and campground) would remain essentially the same, providing a base for most park visitation. To address existing and growing vehicle congestion in parking areas on peak summer weekends, the park would pursue managing traffic and possible transportation solutions, rather than building additional parking or limiting use. On peak summer weekends, the park may operate a temporary shuttle service, such as the modest shuttle system operated on a trial basis in the summer of 2005. If congestion becomes a more persistent problem, transportation studies would be undertaken to determine the need, configuration, and feasibility of a more formal transportation system.

The park’s fee booth would be removed and a new one would be located closer to the park boundary, near the Oasis. The new location would better accommodate a modest shuttle system and overflow parking, and reduce congestion near park headquarters. Bike lanes would be added to the main entrance road from the park boundary to the dunes parking lot. A walking/biking path would connect the Pinyon Flats campground to the dunes parking lot and visitor center.

# NPS Preferred Alternative

GREAT SAND DUNES NATIONAL PARK AND PRESERVE



LEGEND	
	Guided Learning
	Administrative
	Natural/Wild
	Dunes Play
	Backcountry Adventure
	Backcountry Access
	Frontcountry
	Potential future public vehicular access option
	Designated Wilderness
	Proposed Wilderness
	Stream/Pond/Lake
	Paved Road
	Dirt Road
	4wd Road
	County Road in Subdivision
	Trail

The National Park Service would seek acquisition of Medano Ranch, and upon acquisition, would use the ranch headquarters area for the following:

- Administrative use such as offices, housing, storage, and research support.
- Scheduled, guided public activities such as interpretive programs, environmental education, a base for guided hiking or horseback tours, and special events. Visitor activities may be guided by the National Park Service, concessioners, or other partners under direction of the National Park Service. Because of concerns about sensitive resources, staffing costs, and visitor safety, the Medano Ranch area and adjacent guided learning zone would not be open to general public visitation and use.

The National Park Service would adaptively use and maintain Medano Ranch historic structures for the above uses. The agency would not necessarily keep all historic structures, but would maintain certain ones based on adaptive use potential, efficiency, and historic significance. Partnership support would be needed to bring these facilities up to NPS standards, to maintain them over time, and to provide opportunities for visitors.

Leashed dogs would be allowed within the national park within the frontcountry and dunes play zones, and within the national preserve. Within the national preserve, unleashed dogs would continue to be allowed for hunting (see chapter 3, “Health and Safety—Dogs” section for details). Within the national park, no dogs would be permitted within the backcountry access, backcountry adventure, administrative, or guided learning zones. If dogs became

more of a problem over time, adjustments to the latter policy would be addressed in the Superintendent’s Compendium. To assist visitors with complying with dog regulations, a commercial service to provide dog boarding in the vicinity of the main dunes area would be sought.

Necessary and appropriate commercial services would continue to include providing firewood and incidental camper supplies in the vicinity of the campground through a concession contract. Pending a study of financial feasibility, a determination may be made to seek the following new commercial services: (1) dog boarding within the main dunes area frontcountry zone, (2) guided tours by horse, jeep, or hiking from Medano Ranch (provided primarily from outside the park with a minimal base of operations at the ranch), and (3) modest shuttle services. Horseback riding, pack trips, guided hunting, guided hiking, photography workshops, and four-wheel drive tours would continue to be provided in appropriate zones through commercial use authorizations (formerly known as incidental business permits), with the base of operations located outside the park.

A backcountry access zone would be located in the north end of the park (see NPS preferred alternative map). A public trailhead with parking would be included in this zone to satisfy the general public’s desire for a new and closer access point for backcountry recreation on the nearby national forest, the preserve, and new public lands within the national park. A road would enter the park from the Baca National Wildlife Refuge or from the Baca Grande subdivision (see “Public Vehicle Access to Federal Lands in the North—Ongoing Collaboration” below), follow Cow Camp Road eastward toward the mountains to the point where the improvement of Cow Camp Road ends,

and terminate in a trailhead. Use of Cow Camp Road would help protect an ecologically sensitive area by encouraging public access outside the Deadman Creek riparian corridor. A trail or trails from the trailhead to the mountain front would be provided within the backcountry adventure zone.

The trailhead would include a small parking area with a capacity of 10 to 15 vehicles and would accommodate horse use, or a partner would be sought to provide a horse trailhead facility outside the park. This trailhead would be designed to discourage parking outside of designated spaces. The capacity of the trailhead would not be increased during the life of this GMP. If demand for use of this trailhead routinely exceeded capacity, the National Park Service would manage trailhead use (e.g., require permits) rather than expand the trailhead. A previously disturbed site, such as an existing drill pad, would be sought for the trailhead location to minimize natural resource impacts.

The size of the backcountry zone in the northwest corner of the park would allow maximum flexibility for siting a public vehicle access route, either from the refuge or from the Baca Grande subdivision. Within this zone, no new facilities beyond the access road and trailhead mentioned above are proposed.

In consultation with the National Park Service, the USFS may study the need for (and impacts of) providing public vehicle access to USFS lands via Liberty Road or via an extension of Cow Camp Road eastward to connect with Liberty Road. These options—see asterisks on NPS preferred alternative map—are not evaluated in this document and would require a separate public joint (USFS / NPS) environmental analysis study. (See the chapter 1 section, “Relationship of the

General Management Plan to Other Planning Efforts: Planning for Lands Added to Rio Grande National Forest in the Year 2000” for more information about USFS planning efforts).

## **PUBLIC VEHICLE ACCESS TO FEDERAL LANDS IN THE NORTH— ONGOING COLLABORATION**

There is general public desire for backcountry access to the northern part of the expanded park and preserve, as well as to new USFS lands. The National Park Service has determined that it is desirable to have a small backcountry trailhead parking area for 10 to 15 vehicles to provide access for hikers, backpackers, horseback riders, and hunters within the backcountry access zone. The USFS has not completed planning for the new national forest lands and wants to preserve the option for vehicle access to the mountain front. Nor has the USFWS completed planning for the new Baca National Wildlife Refuge. There are no simple long-term solutions to provide vehicle access to NPS or USFS lands. There are strong community concerns regarding any public vehicle access through the Baca Grande subdivision. Similarly, there are concerns that an access route through the adjacent Baca National Wildlife Refuge may not be compatible with its wildlife purposes. It may take several years after the completion of the GMP to collaboratively determine a solution to the issue of public access to new federal lands that finds a balance between demand for backcountry access, protection of ecological values, and values of park neighbors.

Upon completion of this plan, no road or parking area would be constructed in the backcountry access zone unless a collaborative decision of the community, county, and agencies was reached regarding an

acceptable point of access. Ongoing planning efforts will continue for the agencies and the community for several years (including a joint NPS / USFS public planning process to study access to the mountain front, comprehensive planning for the Baca refuge, and community planning in the Baca Grande subdivision) giving all parties the opportunity to learn more about actual use and issues over time. It is important to note that while the NPS boundary and backcountry access zone joins a public right-of-way at Camino Real, allowing public pedestrian access, this county road stops 0.2-mile short of the NPS boundary. The National Park Service cannot provide vehicle access to the backcountry access zone through the subdivision unless the county chooses to extend Camino Real or create another public route.

If no public vehicle access to the north part of the park could be found over the long term so that trailering horses into the north part of the park was not possible, the National Park Service would provide gates for horses at the north park boundary at Camino Real and Liberty Road.

## **APPLICATION OF MANAGEMENT ZONES**

Most of the northern half of the park would be zoned backcountry adventure, as would existing trails. Much of the southern half would be zoned natural/wild. The frontcountry zone, east of the dunefield, would allow relocation of the fee booth, bike lanes, and a new hiking/ biking path from the campground to the dunes lot. The Medano Pass primitive road would be zoned backcountry access. There would be a guided learning zone southwest of the dunefield for guided visitor use of sensitive areas. The dunes play zone would cover a portion of the dunefield closest to the

dunes parking lot. Administrative zones would be located in various places around the park and preserve, primarily for NPS operational access. Medano Ranch headquarters, also zoned administrative, would be open for scheduled public activities.

## **WILDERNESS**

Almost all of the lands identified as suitable/eligible for wilderness would be recommended for wilderness designation in this alternative. The only exclusion would be a setback (200 feet in width from the road center line) along County Lane 6 and State Highway (SH) 150 to allow for any underground and future utility, drainage, fence, or roadway improvements. The area recommended for wilderness would be contiguous with the existing Great Sand Dunes Wilderness, extend west to the National Park Service boundary, north to Cow Camp Road, and reach south toward Medano Ranch, but exclude the ranch headquarters area and structures associated with the Closed Basin Project. A total of 50,951 acres would be recommended for wilderness designation (see appendix G).

## **STAFFING AND COSTS**

Full staffing level under the NPS preferred alternative would be 36 FTEs. Volunteers would continue to be a key component of park operations. If funding and staffing for some elements of the preferred alternative were unavailable from federal sources, park managers would consider other options such as expanding the park volunteer program or developing partnerships with other agencies, organizations, or businesses to accomplish these elements.

The cost estimates provided here are for alternatives comparison purposes only—they are not to be used for budgeting purposes. Capital costs for the NPS preferred alternative are estimated at \$16.2 to \$21.2 million. In addition to items mentioned for the no-action alternative, this includes costs for a new trailhead, trails, access road, improvements at

Medano Ranch, cooperative contact station, fee booth, associated utilities, and bison fence removal. Life cycle costs over the 15- to 20-year life of the plan, which include staff, maintenance, and operations costs (as well as capital costs), are estimated at \$44.6 to \$49.6 million. More information on costs is provided in appendix F.

## DUNEFIELD FOCUS—MAXIMIZE WILDNESS ALTERNATIVE

In this alternative, most visitor use and visitor activities would be focused in or near the eastern edge of the dunefield. Most of the rest of the park and preserve would remain wild and undeveloped, allowing natural processes to continue with minimal human influence. Backcountry areas would be primitive and rugged, providing outstanding opportunities for solitude and adventure. As in the preferred alternative, a large proportion of newly added lands not already designated as wilderness would be recommended for future designation as wilderness.

Existing trails and trailheads would be maintained. Most visitors would continue to visit the main dunefield area (main park road, visitor center, dunes parking lot, and picnic area). Parking and related support facilities, such as restrooms, could be expanded in the frontcountry zone if dunes parking lots filled too often. A new multiuse trail for bicyclists and pedestrians would extend from near the park's main entrance (near the Oasis) to the visitor center, dunes parking lot / picnic area, and to the Pinyon Flats campground.

A gate for horse access would be provided on the north boundary of the park, where Camino Real (a Saguache County public road) intersects the park boundary. Alpine Camp, located in the northwest portion of the park, would serve as a backcountry patrol cabin for NPS administrative purposes; there would be a couple of options for administrative access to this site.

The National Park Service would encourage the USFS to not expand 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 Cristo Mountains. This would help keep visitor numbers from increasing in the Upper Sand Creek drainage (zoned natural/wild in this alternative).

The National Park Service would seek acquisition of Medano Ranch. In the interim, The Nature Conservancy would continue to graze bison on lands they lease or own, and they would continue to use ranch structures. After National Park Service acquisition, Medano Ranch structures would be documented, but not maintained (or they would be removed after documentation). Surrounding lands would be managed as part of the natural/wild zone, allowing visitors to explore by foot or by horse.

Leashed dogs would be restricted to parking areas, picnic areas, and car campgrounds within the national park; they would not be permitted in the national preserve. Unleashed dogs would still be allowed for hunting, which is permitted only within the national preserve. To assist visitors with complying with dog regulations, a commercial service to provide dog boarding in the vicinity of the main dunes area would be sought.

Necessary and appropriate commercial services would continue to include providing firewood and incidental camper supplies in the vicinity of the campground through a concession contract. Pending a study of financial feasibility, a determination may be made to seek a commercial service to provide dog boarding within the main dunes area frontcountry zone. Horseback riding, pack trips, guided hunting, guided hiking, photography

workshops, and four-wheel drive tours would continue to be provided in appropriate zones through commercial use authorizations, with the base of operations located outside the park.

## **APPLICATION OF MANAGEMENT ZONES**

Most of the park and preserve, including Medano Ranch, would be zoned natural/wild (natural conditions prevail and trails disallowed). The frontcountry zone east of the dunes would be fairly large, which would provide for potential future expansion of parking and a new hiking/biking path. The Medano Pass primitive road would be zoned backcountry access. Existing trails would be zoned backcountry adventure. There would be no guided learning zone in this alternative. Administrative zones would be located in various places around the park and preserve, primarily for NPS operational access.

## **WILDERNESS**

As in the NPS preferred alternative, almost all of the lands identified as suitable/eligible for wilderness would be recommended for wilderness designation. The only exclusion

would be a setback (200 feet from the road centerline) along County Lane 6 and SH 150 to allow for any future underground utility, fence, or roadway improvements. A total of 50,951 acres would be recommended for wilderness designation (see appendix G).

## **STAFFING AND COSTS**

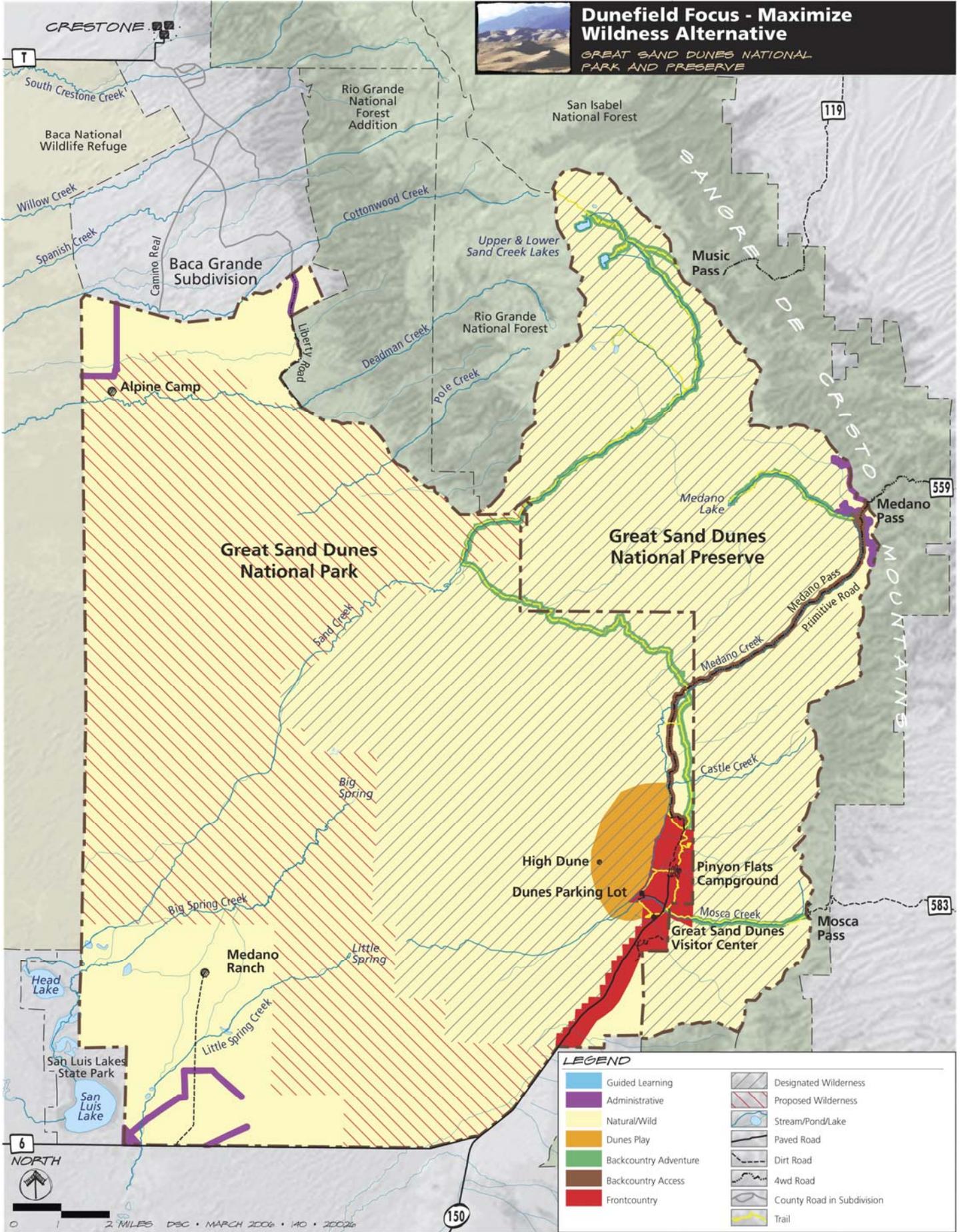
Full staffing level under the dunefield focus—maximize wildness alternative would be 33 FTEs. Volunteers would continue to be a key component of park operations.

The cost estimates provided here are for alternatives comparison purposes only—they are not to be used for budgeting purposes. Capital costs for the dunefield focus—maximize wildness alternative are estimated at \$8.2 to \$10.6 million. In addition to items mentioned for the no-action alternative, this includes costs for new paths and trails, expansion of frontcountry zone parking and restrooms, and bison fence removal. Life-cycle costs over 20 years, which include staff, maintenance, and operations costs (as well as capital costs), are estimated at \$35.6 to \$36.7 million. More information on costs is provided in appendix F.



# Dunefield Focus - Maximize Wildness Alternative

GREAT SAND DUNES NATIONAL PARK AND PRESERVE



150

559

583

6

NORTH

0

CRESTONE

South Crestone Creek

Baca National Wildlife Refuge

Willow Creek

Spanish Creek

Baca Grande Subdivision

Camino Real

Alpine Camp

Liberty Road

Cottonwood Creek

Deadman Creek

Pole Creek

Sand Creek

Big Spring

Big Spring Creek

Medano Ranch

Little Spring Creek

Little Spring

Head Lake

San Luis Lakes State Park

San Luis Lake

Upper & Lower Sand Creek Lakes

Rio Grande National Forest

San Isabel National Forest

SANGRE DE CRISTO MOUNTAINS

Music Pass

Great Sand Dunes National Park

Great Sand Dunes National Preserve

Medano Lake

Medano Creek

Medano Pass

Primitive Road

Castle Creek

High Dune

Dunes Parking Lot

Pinyon Flats Campground

Great Sand Dunes Visitor Center

Mosca Creek

Mosca Pass

119

SANGRE DE CRISTO MOUNTAINS

### THREE PUBLIC NODES ALTERNATIVE

In this alternative, most visitors would gain access to the park and preserve via three areas or “nodes.” The first node, located at the existing developed area east of the dunes, would remain essentially the same. The second node would be located at Medano Ranch headquarters. The third node would be a backcountry access zone in the north part of the park. Visitor facilities and trails would be concentrated in or near the three nodes, and the rest of the park and preserve would remain largely undeveloped, allowing natural processes to occur. This alternative would provide fairly diverse options for visitors to experience different portions of the dunes system. No new wilderness would be recommended.

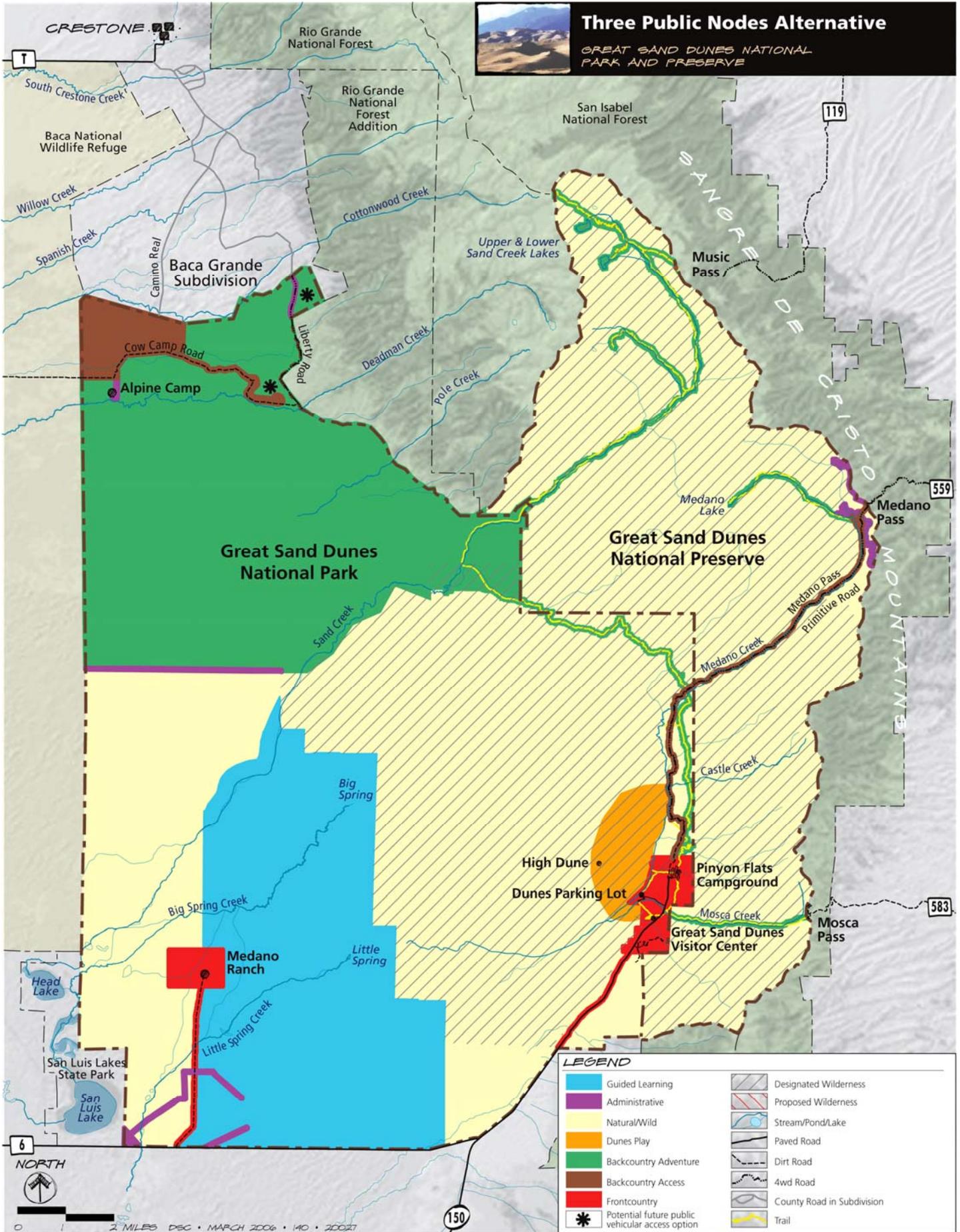
The backcountry zone at the third node would include a backcountry trailhead and a primitive campground if an appropriate public vehicle access route into the national park could be identified. The zone would follow Cow Camp Road from a public access point eastward toward the mountain front to the point where the improvement of Cow Camp Road ends. The intent of this zone would be to provide public vehicle access to the north part of the park while discouraging visitor use in the adjacent Deadman Creek riparian corridor (an ecologically special and sensitive area). The trailhead would have a capacity of about 15 to 20 vehicles and would accommodate horse use. The primitive campground would be small (10 or fewer campsites). The trailhead and campground would be located at the eastern-most “tail” of the backcountry zone, at the point where the improved road ends.

This backcountry zone would be reached by one of two potential routes for public vehicle access. 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. (This option would require no new road construction or improvements within the national park.) 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. This second option, if determined feasible, would require construction of a 1-mile connector road (two-wheel drive, high clearance, all-weather gravel) within the national park—from the subdivision boundary to Cow Camp Road.

The size of this backcountry zone in the north part of the park would allow maximum flexibility for siting either of the two potential access routes. No new facilities or roads, beyond the primitive campground and trailhead mentioned above, are proposed. A trail or trails to the mountain front from the trailhead/campground area would be provided within the backcountry adventure zone. Alpine Camp would serve limited visitor purposes such as a ranger station or backcountry permit station.

# Three Public Nodes Alternative

GREAT SAND DUNES NATIONAL PARK AND PRESERVE



6 NORTH

150

Additional (subsequent) public vehicle access options could be considered in a separate future joint NPS / USFS public planning and environmental analysis process if USFS planning indicated that such access was needed. Two options for such access have been defined to date: (1) 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, or (2) 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.

The National Park Service would seek acquisition of Medano Ranch and would utilize the ranch headquarters as a public day-use area. In the interim, The Nature Conservancy would continue to graze bison on lands they lease or own, and they would continue to utilize ranch structures. After National Park Service acquisition, Medano Ranch structures would be adaptively used for public purposes (such as an interpretive area, contact station, concessions support, picnicking, and/or an environmental education facility); most historic structures would be maintained. Guided hiking and horseback tours to nearby high interest areas could be provided. Another possibility would be a cooperative situation at Medano Ranch: the National Park Service could use some ranch structures for public purposes while The Nature Conservancy continued management of bison grazing on their leased and owned lands, in conjunction with public use and education.

When the main dunes parking area fills, visitors would be directed to one of the other park nodes. Within the guided learning zone, some existing unpaved roads

would be used for administrative purposes and guided visitor use, while others would be closed and use discontinued.

The National Park Service would consider requiring permits for backcountry use in certain areas. It would also encourage the USFS to not expand the capacity of Music Pass trailhead parking or the standard of the four-wheel drive access road located east of the Sangre de Cristo divide. These measures would help maintain desired visitor and resource conditions for the natural/wild zone in the Upper Sand Creek drainage (see natural/wild management zone description for more information on desired conditions).

Dogs would not be permitted in areas where there is high potential for, or a history of problems with, conflicts with visitors (e.g., the area of concentrated visitor use at Medano Creek near the dunes parking area) or with wildlife, (e.g., bighorn sheep); otherwise leashed dogs would be allowed. Within the dunes play zone, there would be an alternative downstream area where leashed dogs would be allowed. Unleashed dogs would still be allowed for hunting, which is permitted only within the national preserve. To assist visitors with complying with dog regulations, a commercial service to provide dog boarding in the vicinity of the main dunes area would be sought.

Necessary and appropriate commercial services would continue to include providing firewood and incidental camper supplies in the vicinity of the campground through a concession contract. Pending a study of financial feasibility, a determination may be made to seek the following new commercial services: (1) dog boarding within the main dunes area frontcountry zone, (2) guided tours by horse, jeep, or hiking from Medano Ranch (with possible stable and other base facilities at the ranch).

Horseback riding, pack trips, guided hunting, guided hiking, photography workshops, and four-wheel drive tours would continue to be provided in appropriate zones through commercial use authorizations, with the base of operations located outside the park.

### **APPLICATION OF MANAGEMENT ZONES**

Most of the preserve and about half of the national park would be zoned natural/wild (natural conditions prevail and trails disallowed). Existing trails, zoned backcountry adventure, would remain. The northwest portion of the national park would also be zoned backcountry adventure to provide for future new trails. The frontcountry zone east of the dunes would be fairly small—no new facilities or development are anticipated. The Medano Ranch headquarters would be zoned frontcountry to permit public use. East of Medano Ranch headquarters, a guided learning zone for guided visitor use of sensitive areas would be located. The Medano Pass primitive road would be zoned backcountry access. The dunes play zone would cover a portion of the dunefield closest to the dunes parking lot. Administrative zones would be located in various places around the park and

preserve, primarily for NPS operational access.

### **WILDERNESS**

No new areas would be proposed for wilderness designation.

### **STAFFING AND COSTS**

Full staffing levels under the three public nodes alternative would be 38 FTEs. Volunteers would continue to be a key component of park operations.

The cost estimates provided here are for alternatives comparison purposes only—they are not to be used for budgeting purposes. Capital costs for the three public nodes alternative are estimated at \$15.8 to \$20.6 million. In addition to items mentioned for the no-action alternative, this includes costs for a new trailhead, trails, primitive campground, access road, improvements for public use at Medano Ranch, associated utilities, and bison fence removal. Life-cycle costs over 20 years, which include staff, maintenance, and operations costs (as well as capital costs), are estimated at \$46.7 to \$50.3 million. More information on costs is provided in appendix F.

### **ACTIONS CONSIDERED BUT ELIMINATED FROM DETAILED CONSIDERATION**

During the planning process, some additional actions were considered, but later dismissed from further consideration. These actions and the reasons for dismissing them are described below.

#### **ALLOWING OFF-HIGHWAY VEHICLES ON MEDANO PASS PRIMITIVE ROAD**

#### **(WITHIN THE NATIONAL PRESERVE ONLY)**

The Medano Pass primitive road has a narrow corridor that is bordered by wilderness. Allowing off-highway vehicles on Medano Pass primitive road (within the national preserve only) was originally considered because: (1) the USFS currently

allows off-highway vehicle use on the Medano Pass Road east of the pass, and (2) off-highway vehicle use on Medano Pass Road west of the pass was formerly allowed, before the area became part of the national preserve. This action was dropped from detailed consideration for the following reasons: (1) there are concerns about resource damage resulting from illegal use on NPS lands outside the road corridor, (2) allowing off-highway vehicle use on NPS lands would require a special regulation (exception), (3) off-highway vehicle users coming from the pass must turn around at the national park boundary anyway (off-highway vehicles are not allowed in national parks), and (4) many other areas outside the national preserve are available for off-highway vehicle use.

#### **REINTRODUCTION OF A NATIVE, NPS-MANAGED BISON HERD WITHIN THE PARK AND ADJACENT LANDS UNDER FEDERAL MANAGEMENT**

This action was considered because bison are native to the San Luis Valley, and because NPS policy supports the reintroduction of native species if: (1) adequate habitat exists to support the species, (2) the species may be managed so as to not pose a serious threat to the public, (3) the species' genetic make-up closely matches that of the original, and (4) the species disappeared as a direct result of human-induced change. Such restorations are supported only when they can be done in a way that promotes the restoration of natural resources and processes.

From the available literature, it is difficult to ascertain whether or not the modern species of bison (*Bison bison*) had continuous presence in the San Luis Valley. We must rely on documentation from oral histories, field notes and journals, and

ethnographic and archeological studies. Documentation for the presence of bison in the Valley is scant at best. Bean (1975) asserts that bison herds never consisted of large numbers of animals, and that those reportedly in the San Luis Valley were "strays" that had come over the passes of the Sangre de Cristo mountain range during the summer. It is more likely that people living in the San Luis Valley made forays during the fall to the eastern Plains to secure meat, which was dried or jerked before it was brought back to the Valley for the winter. Wilson (1975) reports that a western route out of the San Luis Valley, one favored by the Utes to reach their winter homes, was named "Cochetopa" or "Buffalo Pass"; she emphasizes that although there were never extensive herds in the San Luis Valley, they must have used this migration route, based on the Utes' name for the pass.

Jodry (1999) discusses historic and recent land use in the San Luis Valley by native people. In her interview with the Southern Ute tribal leader, Everett Burch, it was understood that "since buffalo were abundant in many areas of southern Colorado and northern New Mexico, Ute people moved primarily to obtain other resources that they needed, meanwhile hunting bison in those areas." However, the areas of bison abundance did not specifically include the San Luis Valley. She also cites the earliest known written record of bison in the San Luis Valley. The journal of Spanish explorer Don Diego de Vargas in July 1694, relates Spanish efforts to "secure fresh meat from a herd of 500 animals in the southern valley" (de Vargas 1694 in Jodry 1999). Likewise, White (2005) cites Zebulon Pike's reports of bison in the "mountain valleys north of the Great Sand Dunes" in 1807. Although his party killed deer and reported on wild horses and elk in the San Luis Valley, bison were not mentioned (Pike 1810 in White 2005).

The Great Sand Dunes has four records of bison remains in its curatorial collection database. Of the four records, only one (a skull) has been positively identified as *Bison bison* (modern bison), and this record was deaccessioned (removed from the collection) in 1981, because its provenience is unknown. The other three specimens (one phalange and two horns) have been identified to genus (*Bison* sp.). The phalange was found within the former monument boundaries in 1958, and identified by Dennis Stanford of the Smithsonian in 1978. The two horns were found on a property east of the dunes (area around Liberty, George White Ranch).

Today, available bison habitat within the park is very limited compared to that needed by a wild (unconfined) bison herd on a year-round and year-to-year basis. Also, the abundance of bison forage is quite variable in this area due to limited precipitation and high elevation. Bison

confined to the national park and adjacent Nature Conservancy lands (bison are not an option on the refuge for the foreseeable future) would have to be intensively managed to maintain herd size and mimic natural grazing impacts. Such management would require a significant amount of time and energy that would divert resources from other park needs and projects. For these and other reasons, this option is not realistic for the life of the GMP. If additional bison habitat becomes available at some point in the future, this option may be reconsidered by the National Park Service. In the meantime, The Nature Conservancy may continue its ranching operations within the park (on its private inholdings and on lands it leases from the state and the National Park Service), thus preserving some desirable aspects of bison on the land, creating opportunities for natural systems study, and providing opportunities for visitors to see bison.

## MITIGATION MEASURES FOR THE ACTION ALTERNATIVES

In the legislation that created the National Park Service, Congress charged the agency with managing lands under its stewardship “in such manner and by such means as will leave them unimpaired for the enjoyment of future generations” (National Park Service Organic Act (16 *United States Code* [USC] 1 2 3, and 4). As a result, the National Park Service routinely considers and implements mitigation measures whenever activities that could adversely affect the resources or systems are anticipated. Mitigation means to take action to avoid, reduce, or compensate for the effects of environmental damage.

A common set of mitigation measures would be applied to the action alternatives in this GMP. The National Park Service

would avoid, minimize, and mitigate adverse impacts whenever practicable.

### GENERAL

New facilities such as trailheads and trails would be sited in disturbed areas whenever feasible to avoid causing new impacts to resources.

Construction zones would be identified with temporary fencing prior to any construction activity to confine activity to the minimum area required. All protection measures would be clearly stated in construction specifications and workers would be instructed to avoid areas beyond the fencing.

Outdoor lighting for new or rehabilitated facilities would be the minimum amount required to provide for personal safety. Lights would also be shielded and/or directed downward to minimize impacts to the night sky.

## NATURAL RESOURCES

New trails would be sited with potential wildlife impacts in mind. Specific measures used to avoid impacts on wildlife would include the following (Trails and Wildlife Task Force et al. 1998):

- Considering not only the narrow width of the trail, but also the wider area it may influence; different species respond differently to the presence of humans (and dogs) along trails.
- Seeking out degraded areas that have the potential to be used or restored when aligning a trail, rather than creating another disturbed area.
- Aligning trails along or near human-created ecological edges rather than bisecting undisturbed areas.
- Keeping trails (and their zones of influence) away from known sensitive species, populations, or communities.
- Locating trails where they can be screened and separated by vegetation or topography from sensitive wildlife.
- Providing trail experiences that are diverse and interesting enough that recreationists are less inclined to create their own trails

Measures to control dust and erosion during construction would be implemented and could include the following: water sprinkling dry soils; using silt fences and sedimentation basins; stabilizing soils during and after construction with specially designed fabrics, certified straw, or other materials; covering haul trucks; employing speed limits on unpaved roads; and revegetating disturbed areas where practicable.

Wetlands and riparian habitats would be delineated by qualified specialists, as appropriate, clearly marked, and avoided during construction. To protect water quality and wetlands/riparian areas, best management practices would be employed and could include all or some of the following actions, depending on site-specific requirements:

- Work would be scheduled to avoid the wet season.
- Barriers would be provided between stream channels and trails or paved areas to reduce erosion potential.
- Disturbed areas would be kept as small as possible to minimize exposed soil and erosion potential.
- Silt fences, temporary earthen berms and water bars, sediment traps, stone check dams, or other equivalent measures would be installed prior to construction.
- Regular site inspections would be conducted during construction to ensure that erosion control measures were properly installed and functioning effectively.

- Chemicals, fuels, and other toxic materials would be stored, used, and disposed in a proper manner.

Undesirable species would be controlled in high-priority areas. Other undesirable species would be monitored and control strategies initiated if these species occur. To prevent the introduction of and to minimize the spread of nonnative vegetation and noxious weeds, the following measures would be implemented:

- Minimize soil disturbance.
- Pressure wash all construction equipment to ensure that it is clean and weed-free before entering the park.
- Limit vehicle parking to road shoulders, parking lots, or previously disturbed areas.
- Obtain fill, rock, or additional topsoil from the project area. If this is not possible, obtaining weed-free sources from NPS-approved sources outside the park would be required.
- Monitor disturbed areas for 2 to 3 years following construction to identify noxious weeds or nonnative vegetation. Treatment of nonnative vegetation would be completed in accordance with NPS Director's Order – 77: *Natural Resource Management Reference Manual* (NPS 2004).

Mitigation measures would occur prior to construction to minimize immediate and long-term impacts to rare, threatened, and endangered species. Surveys would be conducted for such species as warranted. Facilities would be sited and designed so as to avoid adverse effects on rare, threatened,

and endangered species whenever possible. If avoidance is not feasible, adverse effects would be minimized and compensated for, as appropriate, and in consultation with appropriate resource agencies.

Before surface irrigation of meadows was discontinued on Medano Ranch, a study would be conducted to better understand how this action might affect wetlands, groundwater supplies, federal water rights, the Closed Basin Project, etc.

Standard noise abatement measures would be implemented, as appropriate, during park operations and construction activities. Examples include: scheduling activities so that impacts are minimized, use of the best available noise control technique, use of hydraulically or electrically powered tools, and situating noise-producing machinery as far as possible from sensitive uses or resources.

## CULTURAL RESOURCES

Efforts would be made to avoid adverse impacts through use of the *Secretary of the Interior's Standards for Archeology and Historic Preservation* (Federal Register, 36 CFR Part 61).

Ground-disturbing activities would be monitored by a NPS-qualified archeologist for unanticipated discovery of archeological resources. Workers would be informed of penalties for illegally collecting artifacts or intentionally damaging archeological or historic property. Workers would be informed of proper notification procedures in the event that previously unknown resources were uncovered during construction. If during construction, any archeological resources are discovered, work in the immediate vicinity of the discovery would be halted, the site secured until the resources could be identified and

documented, and an appropriate mitigation strategy developed in consultation with the Colorado SHPO and other consulting parties.

In the event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) (25 USC 3001), would be followed.

Great Sand Dunes National Park and Preserve would consult with associated American Indian tribes to develop and accomplish the programs in a way that respects the beliefs, traditions, and other cultural values of the American Indian tribes who have ancestral ties to park lands. The park will maintain government-to-

government relations with associated tribes to ensure a collaborative working relationship, and it will consult regularly with them before taking actions that would affect natural and cultural resources that are of interest and concern to them. The park would accommodate access to, and ceremonial use of, American Indian sacred sites by American Indian religious practitioners in a manner that is consistent with park purposes and applicable law, regulation, and policy.

All proposed documentation, recordation, and mitigation measures for archeological, historical, and ethnographic resources would be stipulated in a memorandum of agreement between the National Park Service and the Colorado SHPO (and/or, as necessary, the Advisory Council on Historic Preservation).

## ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is the alternative that promotes the national environmental policy expressed in NEPA (Sec. 101(b)). This includes alternatives that: (1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations; (2) ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings; (3) attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences; (4) preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice; (5) achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and (6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources" (NPS DO-12 Handbook, § 2.7D).

"Generally this means the alternative that causes the least damage to the biological and physical environment. It also means the alternative that best protects, preserves, and enhances historic, cultural, and natural resources." (Council on Environmental Quality, "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations" [40 CFR 1500–1508], *Federal Register* Vol. 46, No. 55, 18026–18038, March 23, 1981: Question 6a).

The NPS preferred alternative has the most advantages compared to the other alternatives (see appendix E for a detailed discussion). It also meets the purpose and need for the GMP. By managing the park in

a conservative manner, protecting certain sensitive resource areas via the guided learning zone, limiting new facilities, recommending wilderness, and protecting key historic resources and cultural landscapes, the NPS preferred alternative realizes criteria 1 through 5. The alternatives do not differ much with respect to criterion 6.

The no-action alternative is meant to represent how the park was managed soon after ownership and management of the Baca Ranch was transferred to the U.S. government. It was included to provide a baseline against which to compare the effects of the other (action) alternatives. It only minimally meets the six criteria outlined above. Furthermore, it does not address the GMP's purpose and need, nor does it address key planning issues outlined in chapter 1.

The dunefield focus—maximize wildness alternative realizes criteria 1 and 2 and some aspects of criterion 4 by managing the park in a conservative manner, limiting new facilities, and recommending wilderness. Because it does not protect sensitive resources or historic structures/cultural landscapes to the same degree as the NPS preferred and three public nodes alternatives, it does not realize criteria 3 and 5 to the same extent as these alternatives.

The three public nodes alternative realizes criteria 3, 4, and 5 by managing the park in a conservative manner, protecting certain sensitive resource areas via the guided learning zone, limiting new facilities, and protecting key historic resources and cultural landscapes. Because it does not recommend wilderness and has undesired/unintended impacts related to

increased visitor access, it does not meet criteria 1 and 2 as well as the NPS preferred and dunefield focus—maximize wildness alternatives.

After a review of the alternatives' environmental consequences, it was

determined that the NPS preferred alternative is also the environmentally preferred alternative. This alternative best realizes the full range of national environmental policy goals as stated in section 101 of NEPA.

**TABLE 1. SUMMARY OF KEY DIFFERENCES AMONG THE ALTERNATIVES**

	<b>No-Action Alternative</b>	<b>NPS Preferred Alternative</b>	<b>Dunefield Focus—Maximize Wildness Alternative</b>	<b>Three Public Nodes Alternative</b>
<b>General Emphasis</b>	<ul style="list-style-type: none"> <li>▪ Existing management extended to new lands.</li> <li>▪ Most visitors continue to go to the main dunes area. Some visitors explore the backcountry on horse and foot.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Dunes area remains the main focus of visitor activity.</li> <li>▪ New access in the north and at Medano Ranch (limited).</li> <li>▪ New horseback and trail options, including overnight linking or loop options.</li> <li>▪ Emphasis on cooperative or joint facilities (e.g., access routes, trailheads, ranger stations).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Most visitors go to the main dunes area.</li> <li>▪ Most of the rest of the park and preserve remains wild and undeveloped.</li> <li>▪ Few new trails.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Most visitors go to the main dunes area.</li> <li>▪ Additional visitor activities available near the main dunes, Medano Ranch / guided learning zone, and north portion of new lands.</li> <li>▪ New trail options in certain areas.</li> </ul>
<b>Management Zones</b>	<ul style="list-style-type: none"> <li>▪ Not zoned.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Moderate amount of backcountry adventure zone.</li> <li>▪ Moderate amount of natural/wild zone.</li> <li>▪ Small amount of guided learning zone.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Most of the park and preserve zoned natural/wild.</li> <li>▪ Frontcountry zone east of main dunes larger than in other action alternatives.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Lots of natural/wild zone.</li> <li>▪ Moderate amounts of backcountry adventure and guided learning zones.</li> </ul>
<b>Wilderness</b>	<ul style="list-style-type: none"> <li>▪ No new wilderness recommended.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Most undeveloped areas of new park land recommended for wilderness.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Most undeveloped areas of new park land recommended for wilderness.</li> </ul>	<ul style="list-style-type: none"> <li>▪ No new wilderness recommended.</li> </ul>
<b>Medano Ranch Headquarters</b>	<ul style="list-style-type: none"> <li>▪ Continued use by The Nature Conservancy as Medano Ranch headquarters. Most historic structures maintained by The Nature Conservancy.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Adaptively used for NPS administrative purposes and open to the public on a limited basis for scheduled activities. Most historic structures maintained by the National Park Service.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Use discontinued and area managed as natural/wild zone. Structures not maintained and possibly removed.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Adaptively used as a public day-use area (e.g., interpretive area, contact station, concessions support). Most historic structures maintained by the National Park Service.</li> </ul>

**TABLE 1. SUMMARY OF KEY DIFFERENCES AMONG THE ALTERNATIVES**

	<b>No-Action Alternative</b>	<b>NPS Preferred Alternative</b>	<b>Dunefield Focus—Maximize Wildness Alternative</b>	<b>Three Public Nodes Alternative</b>
<b>New Trails and Trailheads</b>	<ul style="list-style-type: none"> <li>▪ Existing trails and trailheads maintained.</li> <li>▪ Otherwise, no new trails or trailheads, but visitors could enjoy most portions of park and preserve via foot or horseback (select areas remain off-limits to horses).</li> </ul>	<ul style="list-style-type: none"> <li>▪ New trailhead in northern part of the national park and new trails in backcountry adventure zone areas.</li> <li>▪ Link park trails to outside trails where possible.</li> <li>▪ New trails in guided learning zone.</li> <li>▪ Cooperative trailheads around park if possible (e.g., Oasis, Baca National Wildlife Refuge, San Luis Lakes State Park).</li> </ul>	<ul style="list-style-type: none"> <li>▪ New multiuse trail from the park boundary (near the Oasis) to the visitor center, dunes parking lot / picnic area, and Pinyon Flats campground.</li> <li>▪ New trails or trailheads only in frontcountry zone east of main dunes.</li> </ul>	<ul style="list-style-type: none"> <li>▪ New trailhead in northern part of park and new trails in backcountry adventure zone areas.</li> <li>▪ Trailhead at Medano Ranch for new trails in guided learning zone.</li> <li>▪ Possible concession opportunities for guided hiking and horseback tours to high interest areas on or near Medano Ranch.</li> </ul>
<b>Public Access to North Part of Park</b>	<ul style="list-style-type: none"> <li>▪ Foot-only access facilitated; no horse gates, trailhead, or campground.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Small backcountry trailhead (10–15 vehicles) within backcountry access zone improves foot, horse, and vehicle access.</li> <li>▪ No campground in this area.</li> <li>▪ Access route to trailhead to be determined in the future.</li> <li>▪ Public vehicle access options to new USFS lands, i.e., Liberty Road or extension of Cow Camp Road could be considered in a separate future NEPA process.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Foot and horseback access only facilitated (gate or gates provided at northern boundary); no trailhead or campground in this area.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Backcountry trailhead (15–20 vehicles) and primitive campground within backcountry access zone improves foot, horse, and vehicle access.</li> <li>▪ Access route to trailhead and campground to be determined in the future.</li> <li>▪ Two public vehicle access options to new USFS lands could be considered in a separate future NEPA process (Liberty Road or extension of Cow Camp Road to Liberty Road).</li> </ul>

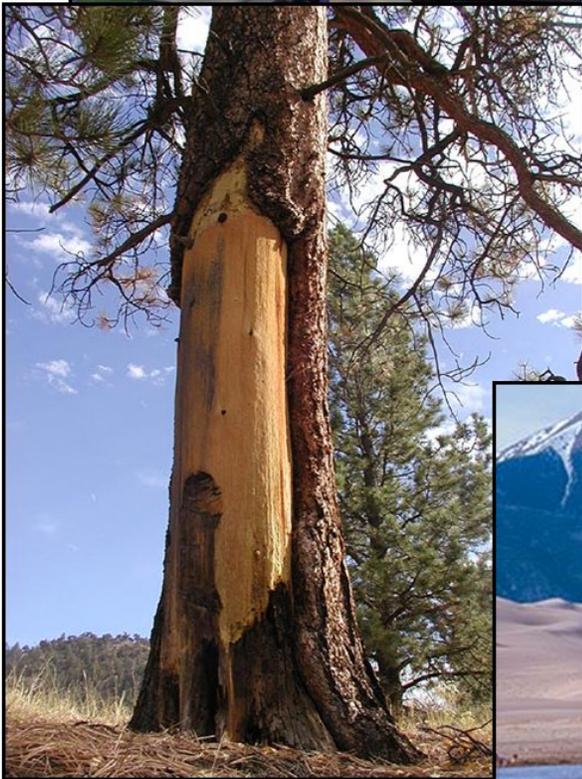
**TABLE 1. SUMMARY OF KEY DIFFERENCES AMONG THE ALTERNATIVES**

	<b>No-Action Alternative</b>	<b>NPS Preferred Alternative</b>	<b>Dunefield Focus—Maximize Wilderness Alternative</b>	<b>Three Public Nodes Alternative</b>
<b>Main Dunes Area Carrying Capacity</b>	<ul style="list-style-type: none"> <li>Minor expansion (~5% additional paved surface) and reconfiguration of the dunes parking lot to improve circulation and increase capacity.</li> </ul>	<ul style="list-style-type: none"> <li>Possible modest shuttle system to transport visitors from remote parking into the dunes area during peak summer weekends.</li> </ul>	<ul style="list-style-type: none"> <li>Parking and related support facilities (e.g., restrooms) could be expanded within the frontcountry zone if the parking lot fills too often.</li> </ul>	<ul style="list-style-type: none"> <li>No parking or facility expansion; when the dunes parking area is full, visitors arriving at the main entry would be directed to alternate park nodes (e.g., Medano Ranch).</li> </ul>
<b>Backcountry Carrying Capacity</b>	<ul style="list-style-type: none"> <li>Manage according to existing backcountry management plan (addresses former national monument only).</li> </ul>	<ul style="list-style-type: none"> <li>New trails in backcountry adventure zone direct use to areas that can accommodate it.</li> <li>Guided learning zone protects Big Spring and Little Spring.</li> <li>Sensitive areas (Upper and Lower Sand Creek lakes, Deadman Creek, Big Spring and Little Spring) managed closely according to new wilderness management plan.</li> </ul>	<ul style="list-style-type: none"> <li>Few new trails or access points; keep use light and dispersed.</li> <li>Sensitive areas (Upper and Lower Sand Creek lakes, Deadman Creek, Big Spring and Little Spring) managed closely according to new wilderness management plan.</li> </ul>	<ul style="list-style-type: none"> <li>New trails in backcountry adventure zone direct use to areas that can accommodate it.</li> <li>Guided learning zone protects Big Spring and Little Spring.</li> <li>Sensitive areas (Upper and Lower Sand Creek Lakes, Deadman Creek, Big Spring and Little Spring) managed closely according to new wilderness management plan.</li> </ul>
<b>Dogs</b>	<ul style="list-style-type: none"> <li>Leashed dogs generally allowed in the national park.</li> <li>Leashed dogs generally allowed in the national preserve.</li> <li>Unleashed dogs allowed for hunting (permitted only within the national preserve).</li> </ul>	<ul style="list-style-type: none"> <li>Within the national park, leashed dogs allowed only within the frontcountry and dunes play zones.</li> <li>Leashed dogs generally allowed in the national preserve.</li> <li>Unleashed dogs allowed for hunting (permitted only within the national preserve).</li> </ul>	<ul style="list-style-type: none"> <li>Within the national park, leashed dogs permitted only in parking areas, picnic areas, and car campgrounds.</li> <li>Leashed dogs not allowed in the national preserve.</li> <li>Dogs allowed for hunting (permitted only within the national preserve).</li> </ul>	<ul style="list-style-type: none"> <li>No dogs in areas with high potential for (or a history of problems with) conflicts with visitors or wildlife; otherwise leashed dogs allowed.</li> <li>Within the dunes play zone, leashed dogs allowed in an alternative downstream area.</li> <li>Unleashed dogs allowed for hunting (permitted only within the national preserve).</li> </ul>

**TABLE 1. SUMMARY OF KEY DIFFERENCES AMONG THE ALTERNATIVES**

	<b>No-Action Alternative</b>	<b>NPS Preferred Alternative</b>	<b>Dunefield Focus—Maximize Wildness Alternative</b>	<b>Three Public Nodes Alternative</b>
<b>Bison</b>	<ul style="list-style-type: none"> <li>▪ Continued bison grazing within the park on lands owned or leased by The Nature Conservancy.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Bison grazing phased out if/when The Nature Conservancy decides to discontinue agricultural operations or if land is transferred to National Park Service.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Bison grazing phased out if/when The Nature Conservancy decides to discontinue agricultural operations or if land is transferred to National Park Service.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Bison grazing phased out if/when The Nature Conservancy decides to discontinue agricultural operations or if land is transferred to National Park Service.</li> </ul>
<b>Total Life Cycle Costs Over the Life of the Plan</b>	\$28.1 to \$29.5 million	\$44.6 to \$49.6 million	\$35.6 to \$36.7 million	\$46.7 to \$50.3 million





## Chapter Three: Affected Environment

---



## INTRODUCTION

This chapter describes the existing environment of Great Sand Dunes National Park and Preserve. The focus is on key park resources, visitor use and experience, socioeconomic characteristics, and park operations that would be affected by the alternatives should they be implemented. These topics were selected on the basis of federal law, regulations, executive orders, National Park Service expertise, and concerns expressed by other

agencies or members of the public during project scoping. The conditions described in this chapter establish the baseline for Chapter 4: Environmental Consequences.

The first section in this chapter discusses impact topics that are analyzed in detail in this GMP. The next section describes impact topics that are not analyzed in detail and explains the rationale for this decision.

**TABLE 2. IMPACT TOPICS**

<b>Impact Topics Considered in this GMP</b>	<b>Impacts Topics Considered But Not Analyzed in Detail</b>
<i>Proposals in this plan have potential to affect these resources/topics</i>	<i>These resources/topics are important, but proposals in this plan would have only positive impacts on these resources, and/or any adverse impacts would be negligible to minor</i>
Archeology	Museum Collections
Historic Structures	Ethnographic Resources
Cultural Landscapes	Floodplains
Vegetation	Prime and Unique Farmlands
Ecologically Critical Areas	Air Quality
Federal Threatened and Endangered Species	Natural Soundscapes
Wildlife, Including Colorado State-Listed Species	Wild and Scenic Rivers
Soils and Geologic Resources	Energy Requirements and Conservation Potential
Wetlands	Indian Trust Resources
Water Resources	Environmental Justice
Visitor Use and Experience	
Scenic Resources and Visual Quality	
Socioeconomics	
Health and Safety	
National Park Service Operations	
Operations of Other Entities and Management Agencies	

## IMPACT TOPICS CONSIDERED IN THIS GENERAL MANAGEMENT PLAN

### CULTURAL RESOURCES

#### Historic Property Definitions

Historic properties are defined under 36 CFR Part 800. They are defined as, “any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in, the National Register of Historic Places.” The National Park Service provides the following definitions for buildings, sites, structures, objects, districts, and landscapes:

- **Building:** created principally to shelter any form of human activity such as a barn, house, church, or hotel.
- **Site:** the location of a significant event; a prehistoric or historic occupation or activity; or a building or structure, whether standing or ruined, or vanished, where the location itself possesses historic, cultural, or archeological value, regardless of the value of the existing structure.
- **Structure:** a functional construction usually made for purposes other than creating human shelter such as tunnels, bridges, oil wells, or dams.
- **Object:** primarily artistic in nature or is relatively small in scale and simply constructed. Although an object may be moveable by nature or design, it is associated with a specific setting or environment, including sculptures, boundary markers, or statues.
- **District:** possesses as significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development such as a college campus, central business district, fort, or spread out ranch.
- **Landscape:** associated with events, persons, design styles, or ways of life that are significant in American history, landscape architecture, archeology, engineering, or culture.

Cultural resources associated with the Great Sand Dunes Park and Preserve include archeological sites, historic buildings and structures, ethnographic resources, and cultural landscapes. Cultural resources and values that are fundamental to the park (that is, key to maintaining the park’s purpose and significance) are archeological sites associated with Folsom Early Man (9,000 years before present), culturally scarred ponderosa pines, the dunes themselves, and contemporary community connections to the park. These resources are described below. Location of archeological sites is not included in these descriptions due to vandalism concerns.

#### Archeological Resources

The Great Sand Dunes is rich in prehistoric resources. Over 4,500 acres have been inventoried, although this represents just a small fraction of the park. Surveyed areas in general include most of the frontcountry, Mosca, Medano, Music, and Sand Creek mountain corridors, the lower Sand Creek corridor, and various localities around springs. Archeological site distribution

tends to be high around lakes and streams, near ponderosa tree stands, in the woodlands, and along established trails and passes. Surveys have not been conducted in the majority of the Baca and Medano Ranch lands, most of the dunefield, and various wetlands located within the park. Exposure of archeological resources in the dunes and sand sheet is dynamic, as shifting dunes uncover some resources and bury others over time.

An area of approximately 10 miles by 4 miles within the sand sheet contains a dense concentration of documented and undocumented archeological resources, as well as ethnographic resources important to American Indian groups. Many undocumented sites may also exist throughout the park (Marilyn Martorano, pers. comm., 2005). Over 200 sites have been recorded and 18 have been tested. Over 70 isolated artifact finds were recorded (Martorano 2001, 2002, 2004; Martorano and Mrzlack 2003). All four stages of prehistory (Paleo-Indian, Archaic, Late Prehistoric / Ceramic, and Protohistoric stages) are represented within the park. Open campsites, stone tools, hearth features, ceramics, wickiups, and culturally peeled trees are some of the prehistoric resources found within the surveyed areas.

There are many archeological sites in the park that are eligible for or listed on the NRHP, and many more are likely to be identified in the future. Sites that may be affected by the alternatives include one site that is eligible for the NRHP and one that requires an eligibility determination. The NRHP-eligible site is in the vicinity of the visitor center and associated parking lot. The second site, which needs an eligibility determination, is located approximately 200 feet from the east side of SH 150, and is in the vicinity of the area proposed for a

multiuse trail in the dunefield focus—maximize wildness alternative.

Site distribution in the sand dunes and sheet is difficult to document. As dunes migrate and sand blow-outs appear over time, sites may be repeatedly exposed and covered (Marilyn Martorano, pers. comm., 2005). Buried cultural features may be considered significant and sensitive by archeologists and American Indians. Artifacts from these sites and features have been illegally collected and vandalized (Martorano 2004). Adverse and beneficial impacts related to visitor use are possible from the proposed alternatives within this unstable area. This generalized area will also be addressed and considered for all alternatives.

### **Historic Structures and Districts**

Although numerous buildings and structures are found throughout the park, only certain buildings qualify as historic resources because they have been listed or found eligible for listing on the NRHP (table 3). At park headquarters, two structures qualify: (1) the superintendent's residence (includes rock walls and is now used for administrative headquarters offices), and (2) the entrance station. These structures will not be discussed further in this document because no impacts to them would occur from the GMP alternatives.

Other buildings and structures, such as the visitor center and amphitheater, were built during the Mission 66 era but have lost integrity due to extensive renovations and rebuilding. (Mission 66 was a federal program to improve or replace deteriorated facilities during 1956–1966; many structures built during this era have been recognized as historically significant). The visitor center has been remodeled and

enlarged. The Mission 66 amphitheater burned down in 2000 and was rebuilt.

One unevaluated ditch segment is present between the visitor center and Pinyon Flats campground. Other unevaluated historic buildings or structures include a pipeline segment and the Garden Creek flume, the latter located immediately east of Pinyon Flats campground. Only the ditch segment will be discussed further; no impacts would occur to the remainder from the GMP alternatives.

**Medano Ranch**

In the southwest portion of the park, the Medano Ranch complex, which is owned and managed by The Nature Conservancy, is listed on the NRHP as a historic district. It consists of the main ranch house, various

outbuildings/structures, a silo, and an extensive corral. The Medano Ranch was established in 1875, when the first homestead was erected. Early log buildings were eventually replaced or incorporated into more substantial log buildings. Contributing buildings include the main ranch house, bunkhouse, harness shed, meat house, cookhouse, privy, draft horse barn, cottonseed cake house, and corral. Noncontributing elements include two machine sheds, a storage shed, and a metal silo. The ranch complex is architecturally significant for its joining of smaller buildings to create larger ones. The main ranch house, bunkhouse, and cookhouse all represent the combination of smaller buildings into one larger building. The corral is also significant due to its complexity of design (Simmons and Simmons 2004).

**TABLE 3. NPS-MANAGED HISTORIC STRUCTURES AND DISTRICTS (NRHP-ELIGIBLE) AND POTENTIAL IMPACTS**

Resource No.	Name	Type	Comments
5AL301	Medano Ranch headquarters	Historic district – 9 contributing buildings/structures, 4 noncontributing buildings/structures	Listed, numerous buildings in district; impacts possible
5AL414	GRSA superintendent’s residence and rock walls	Territorial Revival – building	Listed, classified structure; no impacts anticipated
5AL414	GRSA entrance station	Territorial Revival – structure	Listed, classified structure; no impacts anticipated
<b>Unevaluated Resources</b>			
5AL406	Water conveyance feature	Pipeline	No impacts anticipated
5AL408	Garden Creek flume	Water flume	No impacts anticipated
5AL411	Great Sand Dunes canal segment	Ditch segment	Impacts possible

### **Canal (ditch) Segment**

This canal segment is actually more of a ditch remnant than a canal, in that it lacks formal features (Marilyn Martorano, pers. comm., 2005). It is of unknown age, but is likely associated with Euro-American ranching. It is possible that the segment was part of the 11 miles of ditches and canals located on Medano Ranch (Colorado SHPO 2005).

### **Cultural Landscapes**

The National Park Service identifies a cultural landscape as, “. . . a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined, both by physical materials such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions.”

Cultural landscapes are the imprint on the natural landscape of physical human activity combined with unconscious schemes of spatial organization and patterns of living and working. This alteration and manipulation of the natural landscape provides a look at the long interaction between humans and their environment. Technology, politics, land-use management, economic, and environmental factors all influence how humans interact with the landscape and order their world. Upon closer inspection of the interplay between these factors that form a cultural landscape and between the cultural landscapes themselves, an overall understanding of the history of an area begins to emerge. This provides a broad, dynamic look at human history.

No listed or eligible cultural landscapes have been identified within the park. However, two potential cultural landscapes that could be affected by the GMP alternatives have been identified and are described in the following sections.

### **Medano Ranch Landscape**

This potential cultural landscape centers around the Medano Ranch complex, but includes other ranches and ranching features in the area such as roads, ditches, fences, and ranch buildings from other ranches. The Medano Ranch was the largest and most important in the San Luis Valley and had enveloped the Zapata, Oliver, and Taylor ranches, as well as the Trujillo homestead and lands (Simmons and Simmons 2004). The Medano ranch buildings, structures, and objects would all be included in the landscape, in addition to features from the other ranches subsumed by the Medano Ranch. Fence lines reinforce use and management patterns on the landscape. Roads help us understand transportation systems within Medano Ranch and between the ranch and its surroundings. At one time, there were 10 miles of ditches used by the ranch for irrigation. The ditches help us to understand irrigation systems and the arrangement of agricultural field types on the landscape (Simmons and Simmons 2004). The buildings and homesteads provide insight into settlement patterns and land use.

### **National Park Service Administrative Landscape**

This potential cultural landscape is centered around the superintendent's residence (currently park headquarters), its rock walls, and the entrance station. At one

time, the visitor center would have been part of the landscape, but it has lost its integrity through extensive renovations. It is not considered further as part of the potential cultural landscape. The superintendent's residence and entrance station are representative of a particular era and type of design, but they are only two remaining elements of what was once a more intact and larger landscape. As a result, the residence and entrance station may not be able to adequately evoke an image of the landscape as a whole.

## VEGETATION

Great Sand Dunes National Park and Preserve includes a diverse cross-section of vegetation representative of the San Luis Valley and the Sangre de Cristo mountain range. From the valley floor on the western boundary of the park, to the mountain crest in the national preserve, a dramatic variety of life zones (habitats) support distinct plant communities that have been classified into broader ecological systems. Over 620 vascular plant species are known for the park and an additional 400 taxa could reasonably be expected to occur within its boundaries (Spackman et al. 2004). The park supports rare plant taxa that are discussed in the "Ecologically Critical Areas" section. For this GMP, vegetation is described in terms of broad life zones, associated ecological systems, and nonnative plant species. Plant communities at the association level are being determined by the Colorado Natural Heritage Program (CNHP) and NatureServe under the National Park Vegetation Mapping Program. This information should be available during

fiscal year (FY) 2007. There are seven plant associations known within the park that are considered critically imperiled; these are discussed in detail in the "Ecologically Critical Areas" section of this chapter.

## Life Zones and Ecological Systems

Great Sand Dunes, best known for impressive sand dunes, also supports other distinct life zones ranging from sabkha flats to steep alpine tundra. Intervening landscapes support short-shrubs; open piñon-juniper woodlands; montane woodlands; and forests of fir, pine, and quaking aspen, as well as extensive stands of spruce and subalpine fir. From the lowest to highest elevations are seven life zones, including sabkha, sand sheet, dunefield, piñon-juniper woodland, montane forest, subalpine vegetation, and alpine tundra.

NatureServe, a nonprofit conservation organization that provides scientific information and tools to guide conservation, has defined ecological systems to represent biological communities that are found in similar physical environments and are influenced by similar dynamic ecological processes, such as fire or flooding. Ecological systems represent classification units that are readily identifiable by conservation and resource managers in the field. Ecological systems that occur in the park are described under the seven life zones below (NatureServe 2005). A brief description of each life zone and its component ecological systems follows:

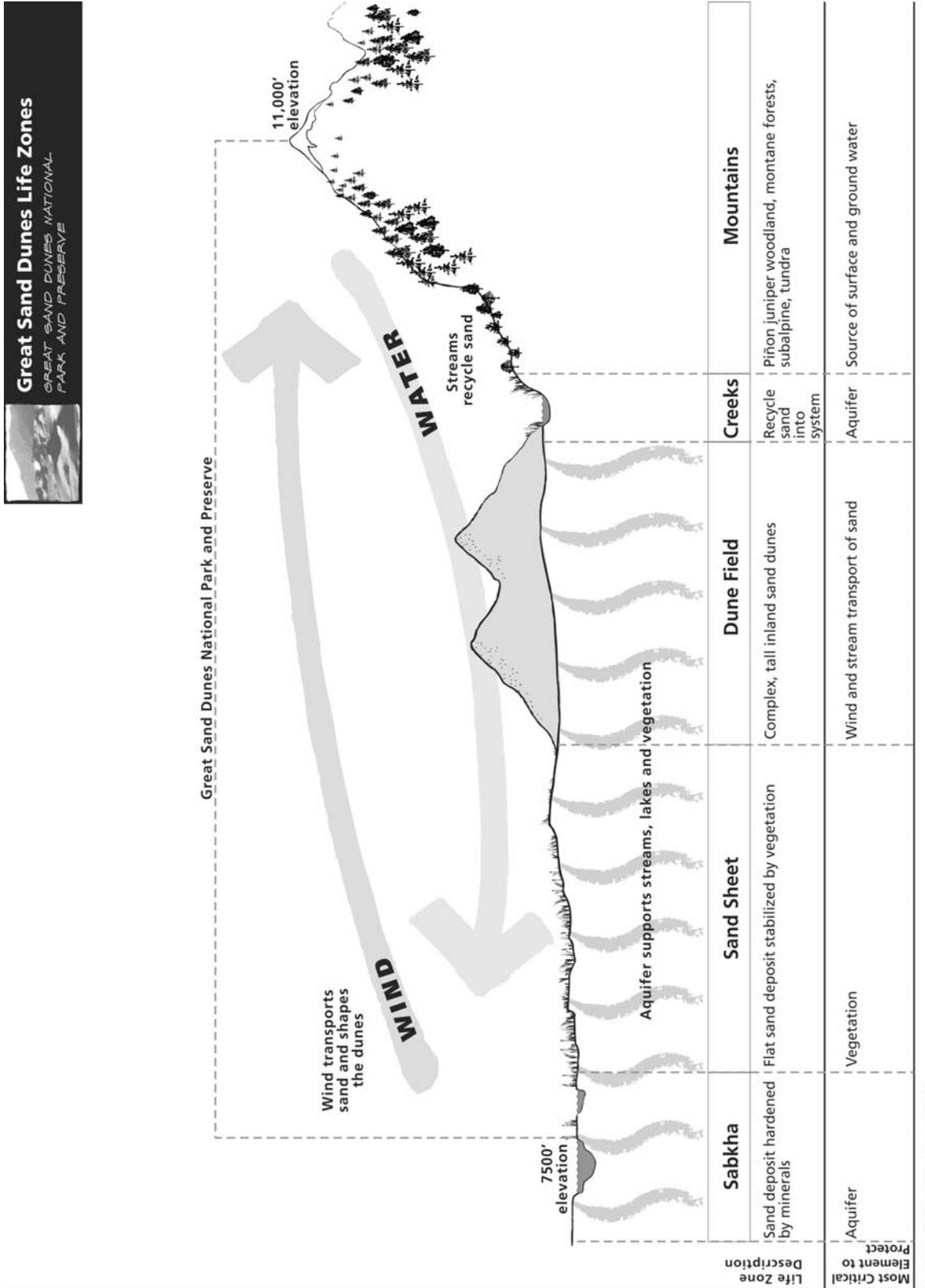


FIGURE 8. CROSS-SECTION SHOWING GREAT SAND DUNES LIFE ZONES

### **Sabkha Life Zone**

The sabkha encompasses part of the valley floor and is characterized by an alkali-hardened sand crust. Leaching of minerals from the near-to-surface water table has resulted in high soil alkalinity tolerated only by a small number of plant species including four-wing saltbush (*Atriplex canescens*) and saltgrass (*Distichlis spicata*). The sabkha is one of the park's fundamental resources and values (see chapter 1).

**Inter-Mountain Basins Playa.** Composed of barren and sparsely vegetated playas (generally <10% canopy cover). Salt crusts are common throughout, with small saltgrass beds in depressions and sparse shrubs around the margins. These systems are intermittently flooded. Characteristic species typically include greasewood or chico (*Sarcobatus vermiculatus*), and four-wing saltbush.

**Inter-Mountain Basins Greasewood Flats.** Occupies basins and occurs near drainages on stream terraces and flats or forms rings around more sparsely vegetated playas. Typically have saline soils, a shallow water table, and flood intermittently, but remain dry for most growing seasons. This system usually occurs as a mosaic of multiple communities, with open to moderately dense shrublands dominated or codominated by greasewood and four-wing saltbush with alkali sacaton (*Sporobolus airoides*), saltgrass, or spike-rush (*Eleocharis palustris*) in the understory.

### **Sand Sheet Life Zone**

The sand sheet occurs on the valley floor at a slightly higher elevation than the sabkha. Soil alkalinity is reduced in this landscape where sandy soils are anchored by deep-rooted shrubs and forbs including rabbitbrush (*Chrysothamnus* spp., *Ericameria* spp.), winterfat (*Krascheninnikovia lanata*), prickly-pear cactus (*Opuntia polyacantha*), sand verbena (*Tripterocalyx micranthus*), prairie sunflower (*Helianthus petiolaris*), and yucca (*Yucca glauca*). The sand sheet is one of the park's fundamental resources and values (see chapter 1).

**Inter-Mountain Basins Semi-Desert Shrub-Steppe.** Typically occurs on alluvial fans and flats with moderate to deep soils. This semi-arid shrub-steppe is typically dominated by graminoids (>25% canopy cover) with an open shrub layer. Characteristic species include Indian ricegrass (*Achnatherum hymenoides*), blue grama (*Bouteloua gracilis*), needle-and-thread (*Hesperostipa comata*), alkali sacaton, four-wing saltbush, rabbitbrush species, and winterfat.

**Inter-Mountain Basins Semi-Desert Grasslands.** Occurs on dry plains and mesas between 4,800 to 7,600 feet. These grasslands occupy lowland and upland areas on swales, playas, mesa tops, plateau parks, alluvial flats, and plains, but sites are typically xeric. When they occur near foothills, grasslands are on flatter land at lower elevations and are characterized by Indian ricegrass, blue grama, and needle-and-thread.

**North American Arid West Emergent Marsh.** Occurs in ponds, as fringes around lakes, and along slow-flowing streams and rivers. Marshes are frequently or continually inundated, with water at depths

up to 6.5 feet. Characterized by emergent and aquatic herbaceous plants including bulrush (*Scirpus* spp.), cattail (*Typha latifolia*), rush (*Juncus* spp.), pondweed (*Potamogeton* spp.), and water smartweed (*Persicaria amphibia*). This system may also include areas of relatively deep water with floating-leaved plants such as duckweed (*Lemna* spp.), water smartweed, hornwort (*Ceratophyllum* spp.), and the mostly submerged water milfoil (*Myriophyllum sibiricum*).

### **Dunefield Life Zone**

Highly mobile sand dunes rise from the sand sheets, creating the distinctive dunefield life zone. Although mostly barren, the sand dunes support a range of plants uniquely suited for this habitat, including some rare plants described in the “Ecologically Critical Areas” section of this chapter. Common plant species found on active dunes include blowout grass (*Redfieldia flexuosa*) and scurfpea (*Psoralidium lanceolatum*). The dunefield is also one of the park’s fundamental resources and values (see chapter 1).

**Inter-Mountain Basins Active and Stabilized Dunes.** Composed of unvegetated to moderately vegetated (<10-30% canopy cover), active and stabilized dunes and sand sheets. Species occupying these environments are often adapted to shifting, coarse-textured substrates (usually quartz sand), and form patchy or open grasslands, shrublands, or steppe characterized by Indian ricegrass, four-wing saltbush, rubber rabbitbrush (*Ericameria nauseosa*), and alkali sacaton.

### **Piñon-Juniper Woodland Life Zone**

**Piñon-Juniper Woodland.** Occurs as a distinct band on south- and west-facing slopes at the base of the mountains, directly above the sand sheet and sand dune formations. Regularly spaced piñon pine and juniper trees characterize this life zone with a mix of understory species including blue grama, Colorado’s state grass.

**Southern Rocky Mountain Piñon-Juniper Woodland.** Occurs on dry mountains and on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. The woodland is characterized by an open canopy of two-needle piñon pine (*Pinus edulis*) and Rocky Mountain juniper (*Juniperus scopulorum*) with understories characterized by mountain mahogany (*Cercocarpus montanus*), currant (*Ribes* spp.), rabbitbrush, or blue grama.

### **Montane Forests Life Zone**

At higher elevations than piñon-juniper woodlands and grasslands occupying cooler and wetter slopes are more dense woodlands and montane forests. Common trees in this zone include Douglas-fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), ponderosa pine, and quaking aspen (*Populus tremuloides*). The mesic conditions support a diverse understory, particularly where there are breaks in tree canopies that allow light to penetrate. Club moss (*Selaginella* spp.), penstemon (*Penstemon* spp.), columbine (*Aquilegia* spp.), and wax currant (*Ribes cereum*) are common species.

**Rocky Mountain Aspen Forest and Woodland.** Found in the montane and subalpine zones where the elevation ranges from 8,300 to 10,000 feet (but occurrences can be found at lower elevations). Characteristic upland forest and woodland

species include quaking aspen without a significant conifer component (<25% relative tree cover). The understory structure may be complex with multiple shrub and herbaceous layers, or simple with herbaceous ground cover characterized by snowberry (*Symphoricarpos* spp.), raspberry (*Rubus* spp.), serviceberry (*Amelanchier* spp.), and kinnikinnick (*Arctostaphylos uva-ursi*). Occurrences originate and are maintained by stand-replacing disturbances such as avalanches, crown fire, insect outbreak, disease, and windthrow, or clearcutting by beaver, within the matrix of conifer forests.

**Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland.**

Highly variable ecological system of the montane zone, occurring on all aspects at elevations ranging from 8,300 to 10,800 feet. Douglas-fir forests occupy drier sites where ponderosa pine is a common codominant. White fir stands occupy cooler sites such as upper slopes at higher elevations, canyon side slopes, ridgetops, and north- and east-facing slopes that burn somewhat infrequently. Blue spruce (*Picea pungens*) is found in cool, moist locations, often occurring as smaller patches within a matrix of other associations. As many as seven conifer species can be found growing in the same occurrence, and there are a number of common cold-deciduous shrub and grass species, including kinnikinnick, Oregon-grape (*Mahonia repens*), mountain lover (*Paxistima myrsinites*), snowberry, and fescue (*Festuca* sp.).

**Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodlands.** Occur in cool ravines and on north-facing slopes at elevations ranging from 9,000 to 10,800 feet. Common canopy trees include Douglas-fir and white fir and Englemann spruce (*Picea engelmannii*), blue spruce, or ponderosa pine may be present. This system includes mixed conifer/quaking

aspen stands and is characterized in the understory by Rocky Mountain maple (*Acer glabrum*), thinleaf alder (*Alnus incana*), western birch (*Betula occidentalis*), red-osier dogwood (*Cornus sericea*), fleabane (*Erigeron* spp.), strawberry (*Fragaria* spp.), and meadow rue (*Thalictrum* spp.).

**Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland.** Occurs on montane slopes and plateaus from 9,000 to 9,800 feet in elevation. The tree canopy is composed of a mix of deciduous and coniferous species characterized by quaking aspen, Douglas-fir, white fir, subalpine fir (*Abies lasiocarpa*), blue spruce, and limber pine (*Pinus flexilis*). As the stands age, quaking aspen is slowly reduced in cover until the conifers dominate. Commonly associated shrubs and herbs include serviceberry, chokecherry (*Prunus virginiana*), western snowberry (*Symphoricarpos occidentalis*), common juniper (*Juniperus communis*), rose (*Rosa* spp.), Oregon-grape, yarrow (*Achillea millefolium*), bedstraw (*Galium* spp.), meadow-rue, and/or false Solomon's-seal (*Maianthemum stellatum*).

**Southern Rocky Mountain Ponderosa Pine Woodland.** Occurs in small stands or patches at the lower tree line/ecotone between grassland or shrubland and more mesic coniferous forests typically in warm, dry, exposed sites. Elevations range from 8,200 to 9,100 feet and stands occupy all slopes and aspects with moderately steep to very steep slopes or ridgetops the most common habitat. Stands are characterized by ponderosa pine, in addition to Douglas-fir, two-needle piñon pine, and Rocky Mountain juniper. Understories are usually shrubby, with species of rabbitbrush common. Common grasses include needle-and-thread, ricegrass (*Achnatherum* spp.), fescue (*Festuca* spp.), muhly

(*Muhlenbergia* spp.), and grama (*Bouteloua* spp.).

**Rocky Mountain Lower Montane-Foothill Shrubland.** Occurs between 9,000 to 9,500 feet elevation and are usually associated with exposed sites, rocky substrates, and dry conditions that limit tree growth. Scattered trees or inclusions of grassland patches or steppe may be present, but the vegetation is typically characterized by a variety of shrubs including service-berry (*Amelanchier* spp.), mountain mahogany, western snowberry, or yucca. Characteristic grasses include muhlys, grammas, and needle-and-thread.

**Southern Rocky Mountain Montane-Subalpine Grasslands.** Typically occur between 9,000 to 9,800 feet on flat to rolling plains or on lower side slopes that are dry, but may extend up to 11,000 feet on warm aspects. A stand usually consists of a mosaic of two or three plant associations characterized by oatgrass (*Danthonia* spp.) and fescue. These large-patch grasslands are intermixed with matrix stands of spruce, fir, lodgepole pine, ponderosa pine, and quaking aspen forests.

**Rocky Mountain Lower Montane Riparian Woodland and Shrubland.** Occurs up to 9,200 feet in elevation, as a mosaic of multiple communities that are tree dominated with a diverse shrub component. This system is dependent on a natural hydrologic regime, especially annual to episodic flooding. Stands are found within the flood zone of rivers, on islands, sand or cobble bars, and immediate streambanks. Characterized by boxelder (*Acer negundo*), narrowleaf cottonwood (*Populus angustifolia*), Douglas-fir, blue spruce, Rocky Mountain juniper, thinleaf alder, western birch, red-osier dogwood, hawthorn (*Crataegus* spp.), chokecherry, and willows, e.g., mountain, Drummond,

and coyote (*Salix monticola*, *S. drummondiana*, *S. exigua*).

**Wet Meadow Vegetation.** Typically forb-rich, with forbs contributing more to overall herbaceous cover than graminoids. Important characteristic species include fleabane, bluebell (*Mertensia* spp.), lupine (*Lupinus* spp.), goldenrod (*Solidago* spp.), lovage (*Ligusticum* spp.), tufted hairgrass (*Deschampsia caespitosa*), Junegrass (*Koeleria micrantha*), and shrubby cinquefoil (*Dasiphora floribunda*).

### **Subalpine Life Zone**

The subalpine life zone is located higher in elevation, above the montane forest stands and below the treeless tundra. Harsh conditions result from the cold temperatures and heavier snow accumulation that occur at high elevations. Engelmann spruce, blue spruce, subalpine fir, and quaking aspen are the common tree species.

**Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland.** Support Engelmann spruce and subalpine fir forests that comprise the matrix forests of the subalpine zone, occur up to 11,000 feet elevation, and are usually the highest elevation forests. Sites are cold year-round and precipitation is predominantly snow, which may persist until late summer. Tree canopy characteristics are remarkably similar across its distribution, with Engelmann spruce and subalpine fir characterizing mixed stands or occurring individually as stands. Douglas-fir may persist for long periods without regeneration. Stands of mixed conifer and quaking aspen also regularly occur. Understory species common to stands on dry sites include common juniper and Oregon-grape. Disturbance includes

occasional blow-down, insect outbreaks, and stand-replacing fire.

**Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland.** Occurs at high elevations and is characterized by Engelmann spruce and subalpine fir. It typically occurs in locations with cold air drainage or ponding, or where snow pack lingers into late summer such as north-facing slopes and high-elevation ravines. Typical mesic understory shrubs include serviceberry and species of willows, and herbaceous plants include baneberry (*Actaea rubra*), false Solomon's-seal, flowering dogwood, fleabane, lupine, and bluejoint reedgrass (*Calamagrostis canadensis*). Disturbances include occasional blow-down, insect outbreaks, and stand-replacing fire.

**Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodlands.** These zones occur on dry, rocky ridges and slopes near upper tree line above the matrix spruce-fir forest. These stands are characterized by limber pine and bristlecone pine (*Pinus aristata*), Rocky Mountain juniper, and/or Douglas-fir. Understory species can include kinnikinick, common juniper, Oregon-grape, currant, reedgrass (*Calamagrostis* spp.), and fescue.

**Rocky Mountain Subalpine Mesic Meadows.** Restricted to sites in the subalpine zone where finely textured soils, snow deposition, or wind-swept dry conditions limit tree establishment, typically above 9,800 feet in elevation. These upland communities occur on gentle to moderate gradient slopes. These sites are not as wet as those found in the Rocky Mountain alpine-montane ecological system.

**Rocky Mountain Subalpine-Montane Riparian Shrublands.** Montane to

subalpine riparian shrublands occurring as narrow bands lining streambanks and alluvial terraces in narrow to wide, low-gradient valley bottoms and floodplains with sinuous stream channels. Generally, it is found at higher elevations, but can be found anywhere from 8,000 to 11,400 feet. Can also be found around seeps, fens, and isolated springs on hill slopes away from valley bottoms. Characteristic shrubs include thinleaf alder, birch, red-osier dogwood, and a number of willow species, e.g., Bebb, plane-leaf, Drummond, and mountain (*Salix bebbiana*, *S. brachycarpa*, *S. drummondiana*, *S. monticola*), among others. Generally, the vegetation surrounding these riparian systems is either conifer or quaking aspen forests.

**Rocky Mountain Subalpine-Montane Riparian Woodlands.** Comprised of seasonally flooded forests and woodlands found at montane to subalpine elevations and containing the conifer and quaking aspen woodlands that line montane streams. Tolerant of periodic flooding and high water tables. Typically occur at elevations between 9,800 and 10,800 feet and are confined to specific riparian environments on floodplains or terraces of rivers and streams, in V-shaped narrow valleys, and canyons (where there is cold-air drainage). Characteristic trees include subalpine fir, Engelmann spruce, Douglas-fir, blue spruce, quaking aspen, narrowleaf cottonwood, and/or Rocky Mountain juniper.

**Rocky Mountain Alpine-Montane Wet Meadows.** High-elevation communities characterized by herbaceous species found on saturated sites with very low-velocity surface and subsurface flows. They range in elevation from montane to alpine (9,000–11,000 feet) and occur as large meadows in montane or subalpine valleys, as narrow strips bordering ponds, lakes, and streams, and along toeslope seeps. Often occurs as a

mosaic of several plant associations characterized by graminoids and forbs, including species of sedge (*Carex* spp.), tufted hairgrass, spike-rush, rush, and marsh marigold (*Caltha leptosepala*). Often alpine dwarf-shrublands, especially those supporting willows, are immediately adjacent to the wet meadows.

**Rocky Mountain Alpine Bedrock and Scree.** Composed of barren and sparsely vegetated alpine substrates, typically including both bedrock outcrop and scree slopes, with nonvascular-dominated (lichen) communities. Desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit plant growth. These exposed sites support sparse cover of forbs, grasses, lichens, and low shrubs.

**Rocky Mountain Cliffs and Canyons.** Consist of barren and sparsely vegetated landscapes (generally <10% plant cover) and are found from foothill to subalpine elevations on steep cliff faces, narrow canyons, and smaller rock outcrops. Also included are unstable scree and talus slopes that typically occur below cliff faces. There may be small patches of dense vegetation, but they typically include scattered trees and/or shrubs. Characteristic trees and shrubs include Douglas-fir, ponderosa pine, limber pine, quaking aspen, white fir, subalpine fir, two-needle piñon pine, juniper, rock-spiraea (*Holodiscus dumosus*), currant, rose, and serviceberry.

### **Tundra Life Zone**

Tundra in the Sangre de Cristo Mountains occurs on thin soils interspersed among bare rock outcrops and rock-strewn talus slopes. Devoid of trees, this zone supports low-growing, mat-forming cushion plants and stunted shrubs. Moss campion (*Silene acaulis*) and purplefringe (*Phacelia* spp.)

are common tundra cushion plants. The tundra is one of the park's fundamental resources and values (see chapter 1).

**Rocky Mountain Alpine Fell-Fields.** Wind-scoured, rock-strewn sites that are free of snow in the winter, such as ridgetops and exposed saddles, exposing the plants to severe environmental stress. Most fell-field plants are cushioned or matted, frequently succulent, flat to the ground in rosettes and often densely haired and thickly cutinized. Usually found within or adjacent to alpine tundra dry meadows and are characterized by species of cushion plants and graminoids including sedge, alpine avens (*Geum* spp.), phlox (*Phlox* spp.), and moss campion.

**Rocky Mountain Dry Tundra.** Occurs above upper tree line on gentle to moderate slopes, flat ridges, valleys, and basins. Vegetation is controlled by snow retention, wind desiccation, permafrost, and a short growing season, and is characterized by a dense cover of low-growing, perennial graminoids and forbs. Although alpine tundra dry meadow is the matrix of the alpine zone, it typically intermingles with alpine bedrock and scree, ice field, fell-field, alpine dwarf-shrubland, and alpine/subalpine wet meadow systems. Rhizomatous, sod-forming sedges are the dominant graminoids, and prostrate- and mat-forming plants with thick rootstocks or taproots characterize the forbs, including tufted hairgrass, fescue, and alpine avens.

### **Nonnative Invasive Plant Species**

During vascular plant inventories, the CNHP documented 47 nonnative plant species within the park (Spackman et al. 2004, Whitson et al. 2000). The most important invasive weeds, due to their difficulty to control, were determined to be

Canada thistle (*Cirsium arvense*), field bindweed (*Convolvulus arvensis*), leafy spurge (*Euphorbia esula*), whitetop (*Cardaria pubescens*), yellow and white sweetclovers (*Melilotus officinalis* and *M. alba*), smooth brome (*Bromus inermis*), crested wheatgrass (*Agropyron cristatum*), and cheatgrass (*Bromus tectorum*). Of particular concern is leafy spurge, which is listed on the Colorado list of noxious weeds (Colorado Department of Agriculture 2003). Other perennial, nonnative species that have become established in and along wetlands include Russian-knapweed (*Acroptilon repens*), spike bentgrass and redtop (*Agrostis exarata* and *A. stolonifera*), meadow foxtail (*Alopecurus pratensis*), timothy (*Phleum pratense*), Kentucky bluegrass (*Poa pratensis*), orchardgrass (*Dactylis glomerata*), watercress (*Nasturtium officinale*), and red clover and white Dutch clover (*Trifolium pratense* and *T. repens*) (Spackman et al. 2004).

Canada thistle, leafy spurge, and whitetop are perennial species with extensive underground rhizomes that become established on moist sites and wetlands, often forming patches or stands to the exclusion of native species. They are commonly observed in the borrow areas and ditches of roads, along canals and natural drainages, around ponds, in sloughs, in irrigated hayfields, and in emergent wetlands. Smooth brome and yellow and white sweetclovers occupy mesic to dry sites and wetlands margins, usually at slightly higher elevations than the preceding species. Introduced as a pasture and erosion-control grass, smooth brome forms extensive patches and stands via underground rhizomes. Yellow and white sweetclovers, introduced primarily for erosion control on highway cut-and-fill slopes, are biennials that form a rosette the first year and flower the second, are often scattered in distribution, but can also form

extensive stands. They occupy dry to mesic sites, including the margins of wetlands.

Field bindweed is a vining forb that becomes established in and persists on disturbed land, particularly roadsides, homesteads, and agricultural fields (both active and abandoned). Crested wheatgrass is a perennial bunchgrass that was introduced to enhance forage production on rangeland and also for erosion control along highways. It more commonly occurs on lands that were disturbed mechanically and re-seeded. Cheatgrass is an annual that was introduced primarily to enhance forage production for livestock. It has spread abundantly on both disturbed and undisturbed landscapes and can occur as pure stands on sites that have burned or sites that have experienced intensive use such as homesteads, corrals, agricultural fields, etc.

Methods commonly used to control these nonnative species include mechanical (mowing, disking, flooding, etc.), chemical (herbicide application), and biological (introduction of host-specific insects, etc.). These methods are also used in combination to increase their efficacy and to maximize stress on the nonnative plant populations. Control is expensive and requires perseverance because stands are not or are very rarely eliminated by using only one treatment or by treating for only one season. Control is important as part of a good neighbor policy because seeds generated in or plants spreading by rhizomes from the park can blow to or grow onto adjacent private or nonpark public lands. Of course, the reverse is also true, further establishing the need for communication and cooperation among landowners.

## ECOLOGICALLY CRITICAL AREAS

When evaluating the intensity of environmental impacts according to NEPA, certain unique characteristics of the geographic area must be considered, including ecologically critical areas (40 CFR 1508.27). Ecologically critical areas can be defined as “special ecosystems that serve unique functions and are small in area or are unusually fragile relative to others” (Conservation Foundation 1984). To identify ecological critical areas for the purposes of this GMP, the National Park Service used a CNHP designation called “potential conservation sites.” The CNHP delineates potential conservation sites to identify areas and ecological processes that are necessary to support elements of natural heritage significance in Colorado. The potential conservation sites, once identified, are given a rank (score) between 1 and 5 that reflects their overall biodiversity significance. For the purposes of this GMP, the planning team defined ecological critical areas as CNHP potential conservation sites ranked as B1 (outstanding significance) or B2 (very high significance). They are shown on the “Selected Potential Conservation Sites” map and are discussed briefly below. More detailed information about the CNHP potential conservation site program (definitions, ranks, etc.) is provided in appendix B.

### Great Sand Dunes Potential Conservation Site

The Great Sand Dunes potential conservation site, estimated at 103,640 acres, encompasses the massive active sand dunes, the sand sheet with its grass and shrub communities, interdunal wetlands, and Sand and Medano creeks (“Selected

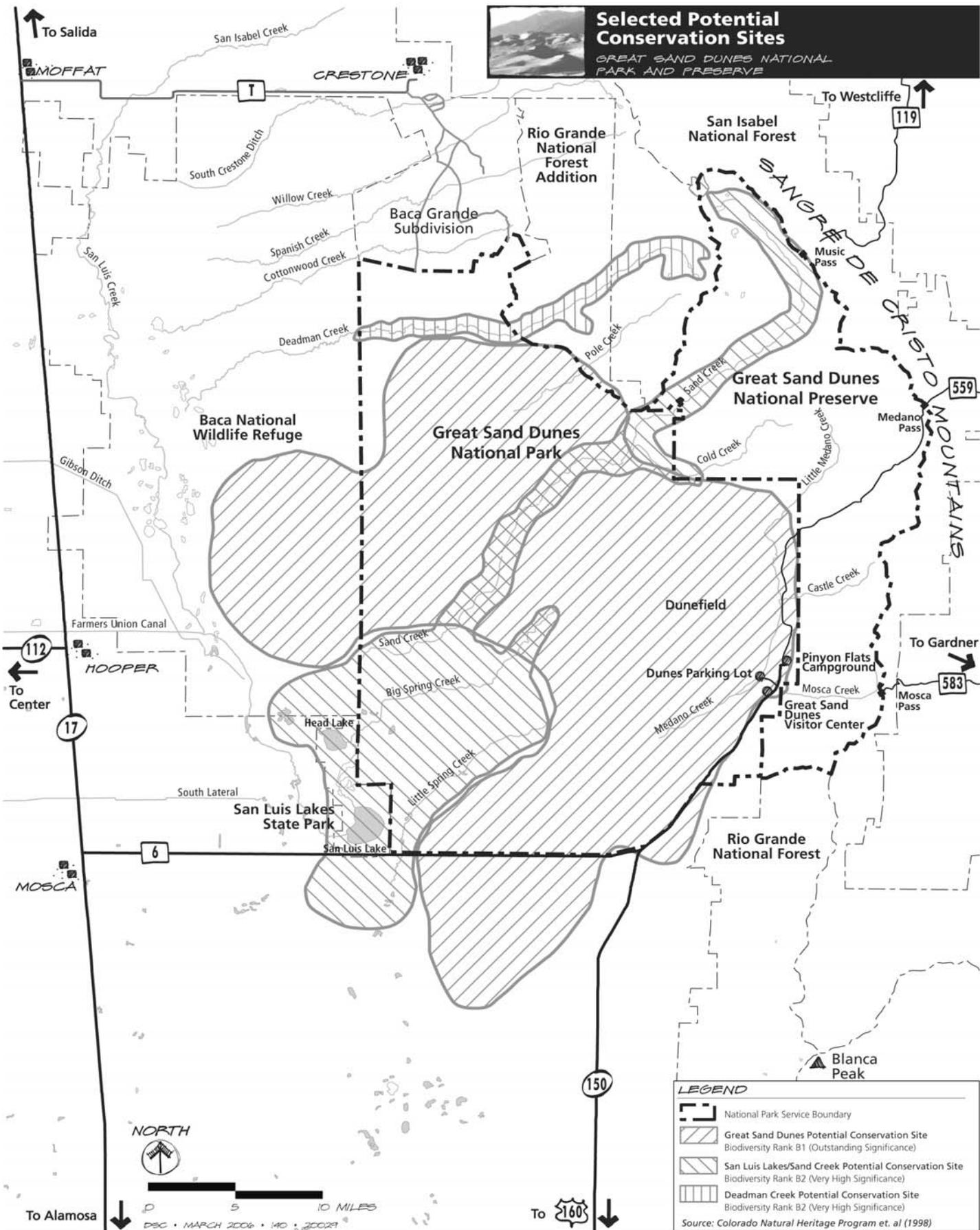
Potential Conservation Sites” map). It has been assigned a biodiversity rank of B1—outstanding significance (CNHP 1998). This site contains many species that are restricted in range and endemic (native to a certain limited area) to the Great Sand Dunes system or to the San Luis Valley (CNHP 1999).

Seven rare plant associations occupy the nearly barren active dunes, the associated sand sheet, and creek banks. These include *Redfieldia flexuosa* – (*Psoralidium lanceolatum*) (blowout grass – (dune scurfpea)) Herbaceous Vegetation, *Achnatherum hymenoides* – *Psoralidium lanceolatum* (Indian ricegrass – dune scurfpea) Herbaceous Vegetation, and *Hesperostipa comata* – *Achnatherum hymenoides* (needle-and-thread – Indian ricegrass) Herbaceous Vegetation (CNHP 1998). The *Schoenoplectus pungens* (three-square bulrush) Herbaceous Vegetation association is an emergent wetlands that is rare in the park. Two riparian shrubland associations occupy creek bank habitat: *Alnus incana* – *Salix* (*monticola*, *lucida*, *ligulifolia*) (thinleaf alder – (mountain willow, whiplash willow, strapleaf willow)) Shrubland, and *Salix exigua* (coyote willow) Barren Shrubland (CNHP 1998). One montane riparian woodland type is also present: *Populus angustifolia* / *Alnus incana* (narrowleaf cottonwood / thinleaf alder) Woodland. The narrowleaf cottonwood trees growing on the banks of Medano Creek and Sand Creek are thought to represent a pure strain that has not hybridized with other stands; these are some of the oldest narrowleaf cottonwood trees known in the western U.S. and have been identified as among the fundamental resources and values of the park (see chapter 1).



### Selected Potential Conservation Sites

GREAT SAND DUNES NATIONAL PARK AND PRESERVE



**LEGEND**

- National Park Service Boundary
- Great Sand Dunes Potential Conservation Site  
Biodiversity Rank B1 (Outstanding Significance)
- San Luis Lakes/Sand Creek Potential Conservation Site  
Biodiversity Rank B2 (Very High Significance)
- Deadman Creek Potential Conservation Site  
Biodiversity Rank B2 (Very High Significance)

Source: Colorado Natural Heritage Program et. al (1998)

Rare plant species include *Cleome multicaulis* (slender spider-flower), associated with emergent wetlands and wetlands margins, and *Cryptantha cinerea* var. *pustulosa* (James' catseye), found on sand sheet and rocky slope habitats (CNHP 1998). The active dunes and surrounding sand sheet represent important habitat for arthropods, including six endemic insect species (Pineda 2002, CNHP 1998). As many as 2,000 insect species may be present (CNHP 1998). Endemic species include: Great Sand Dunes tiger beetle (*Cicindela theatina*), circus beetle (*Eleodes hirtipennis*), anthicid beetles (*Amblyderus triplehorni* and *A. wernerii*), a noctuid moth (*Copablepheron* undescribed), and a robber fly (*Proctacanthus* n.sp.) (Pineda, 2002). A local subspecies of the rare silky pocket mouse (*Perognathus flavus sanluisi*) and the Rio Grande cutthroat (*Oncorhynchus clarki virginalis*) are also associated with this potential conservation site.

### Deadman Creek Potential Conservation Site

The Deadman Creek potential conservation site, estimated at 3,500 acres, encompasses nearly the entire Deadman Creek watershed from the Sangre de Cristo Range (12,300 feet) to the floor of the San Luis Valley (7,600 feet). It has been assigned a biodiversity rank of B2—very high significance (CNHP 1998). Rare plant associations include *Populus tremuloides* / *Acer glabrum* (Quaking aspen / Rocky Mountain maple), *Populus angustifolia* – *Juniperus scopulorum* / *Sporobolus cryptandrus* (Narrowleaf cottonwood – Rocky Mountain juniper / Sand dropseed) Woodland, and *Populus angustifolia* / *Salix* (*monticola*, *drummondiana*, *lucida*) (Narrowleaf cottonwood / (Mountain willow, Drummond's willow, Whiplash willow)) Woodland (CNHP 1998,

NatureServe 2005). Rare plant species include the canyon bog orchid (*Platanthera sparsiflora* var. *ensiflora*) and Smith whitlow-grass (*Draba smithii*) (CNHP 1998). The former occupies emergent wetlands and the latter occupies steep mountain slopes with mountain mahogany and mountain muhly (*Muhlenbergia montana*). Rare wildlife observations in the Deadman Creek corridor include a nursery for Townsend's big-eared bat (*Corynorhinus townsendii pallescens*) in an abandoned mine adit and Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*) (CNHP 1998).

### San Luis Lakes / Sand Creek Potential Conservation Site

The San Luis Lakes / Sand Creek potential conservation site, estimated at 35,000 acres, includes the Big Spring area, which has been designated a Colorado Natural Area (named Indian Spring Natural Area) by the Colorado Natural Areas Program (CNAP 2005). It includes San Luis Lakes State Park and the watershed of Sand Creek and Big Spring Creek, which flow into San Luis Lake. The site ranges in elevation from 7,500 to 12,050 feet, extending to the summit of the Sangre de Cristo range within the Sand Creek watershed. It has been assigned a biodiversity rank of B2—very high significance (CNHP 1998).

Emergent wetlands associations on the potential conservation site include *Eleocharis palustris* (creeping spikerush) Herbaceous Vegetation, *Carex simulata* (analogue sedge) Herbaceous Vegetation, *Hippuris vulgaris* (mare's-tail) Herbaceous Vegetation, and *Polygonum amphibium* (water smartweed) Permanently Flooded Herbaceous Vegetation (CNHP 1998), and brookgrass – monkeyflower (*Catabrosa aquatica* – *Mimulus glabratus*); for the latter there is no corresponding plant association

within NatureServe Explorer (2005). A riparian forest type occupies sand dune habitats: *Populus angustifolia* (narrowleaf cottonwood) / Sand Dune Forest. Two riparian forest and woodland types are present in the montane floodplain of Sand Creek: *Abies concolor*–*Picea pungens*–*Populus angustifolia* / *Acer glabrum* (white fir–blue spruce–narrowleaf cottonwood / Rocky Mountain maple) Forest and *Populus angustifolia* / *Salix drummondiana*–*Acer glabrum* (narrowleaf cottonwood / Drummond’s willow–Rocky Mountain maple) Woodland. Rare plant species observed within this potential conservation site include *Cleome multicaulis* (slender spiderflower) and *Platanthera sparsiflora* var. *ensiflora* (canyon bog orchid); both occupy emergent wetlands.

A rare insect species, the San Luis sandhill skipper (*Polites sabuleti ministigma*), and two rare small mammal subspecies (the plains pocket mouse, *Perognathus flavescens relictus*, and the silky pocket mouse) have been recorded on sand sheet habitats (CNHP 1998). Pineda (2002) reported 1,034 arthropod species, mostly insects, from the Indian Spring locale. Six of these species were considered endemic. Migrant bird species, mostly aquatic birds and shorebirds, are supported by this potential conservation site. Rare bird species include the short-eared owl (*Asio flammeus*) of montane habitats, western snowy plover (*Charadrius alexandrinus nivosus*), long-billed curlew (*Numenius americanus*), black-crowned night-heron (*Nycticorax nycticorax*), white-faced ibis (*Plegadis chihi*), eared grebe (*Podiceps nigricollis*), and Forster’s tern (*Sterna forsteri*) (CNHP 1998).

## FEDERAL THREATENED AND ENDANGERED SPECIES

The Endangered Species Act of 1973, as amended, requires that federal agencies consult with the USFWS before taking any action that could jeopardize the continued existence of any federally listed threatened or endangered plant or animal species, or critical habitat. Agencies must consider potential effects the proposed action could have on listed species and critical habitats. National Park Service policy also requires the examination of impacts on federal candidate species.

Consultation was initiated on January 5, 2005, with a letter to the USFWS. In a facsimile dated February 15, 2005, the USFWS provided an inventory list of threatened or endangered species and candidate species that are potentially present in Alamosa and Saguache counties (appendix I). There was no designated critical habitat listed in the inventory. Table 4 identifies the federally listed threatened or endangered species and candidate species potentially found in Alamosa and Saguache counties and the park. The table indicates for each species whether it was retained for or dismissed from detailed analysis in this GMP / environmental impact statement (and why).

The listed fish species identified by the USFWS as occurring in these two counties (bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker) are actually located in the Colorado River system. Based on the complete geographic separation of these species from the Rio Grande River basin and Great Sand Dunes, these species are dismissed as impact topics. In addition, on September 29, 2005, the USFWS announced its finding that the southern Rocky Mountain population of the boreal toad (*Bufo boreas*) population

did not meet the criteria for listing as a distinct population and is no longer a candidate for federal listing. Therefore, the boreal toad is dismissed as an impact topic.

Wildlife species listed as threatened, endangered, or of special concern by CDOW are also presented in table 4, and discussed below after the federally listed species. The state of Colorado does not list or protect plant species. However, the CNHP has identified several plants that occur within the park that are deserving of special attention and protection (CNHP 1998). These plants are also included in table 4 and are discussed in an ecosystem context in the “Ecologically Critical Areas” sections of this document (chapters 3 and 4).

### **Canada Lynx**

The Canada lynx (*Lynx canadensis*), listed as threatened under the Endangered Species Act on March 24, 2000, and as endangered by the state of Colorado, is a species of the northern coniferous forest. The preferred habitat of the Canada lynx is uneven-aged stands with relatively open canopies and well-developed understories, within the elevational range between 9,000 and 14,500 feet (Quinn and Parker 1987, NDIS 2005e). While the snowshoe hare comprises 80% of the lynx diet (Brand et al. 1976), this carnivore will also take squirrels, beaver, muskrats, and even large ungulates such as deer (NDIS 2005e). Before recent reintroductions of Canada lynx to

Colorado, the lynx appeared to be restricted to extremely isolated areas of the mountains of the central portion of the state (NDIS 2005e). Beginning in 1999, 166 lynx were released in southwestern Colorado, the vast majority in the Rio Grande National Forest. Released animals were tracked by satellite or VHF transmitters. Cumulative data from 1999 through January 2005 indicate three position records occurred within the park; two in the southwestern portion of the national park, and one on the extreme northern part of the preserve. The two records in the southwestern portion of the park likely represent one or two individuals dispersing from the release sites on the western side of the San Luis Valley to suitable habitat at higher elevations on the eastern side. In light of these records, continued reintroduction efforts, and the presence of potential lynx habitat in the upper reaches of the national preserve (not in the national park), the Canada lynx is retained as an impact topic and will be discussed under “Federal Threatened and Endangered Species” in chapter 4.

### **Summary and Determination— Federal Threatened and Endangered Species**

The federally listed threatened and endangered species and federal candidate species that have the potential to occur within the park have been analyzed relative to the anticipated impacts of the four

TABLE 4. SPECIAL-STATUS PLANT AND ANIMAL SPECIES

MAJOR GROUP	SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS <sup>1</sup>	COLORADO STATUS <sup>2</sup>	HABITAT COMMENTS AND OTHER NOTES	REASONS FOR DISMISSING FROM DETAILED ANALYSIS, IF DISMISSED
<b>Insects</b>						
d	<i>Boloria improba acrocnema</i>	Uncompahgre fritillary	LE	—	Occurs around moist alpine slopes above 12,000 feet with extensive snow willow ( <i>Salix nivalis</i> ).	Not found in the park; snow willow habitat in the park differs markedly from that known to support this species; no differences among the GMP alternatives that would differentially affect this species.
<b>Fish</b>						
✓	<i>Catostomus plebeius</i>	Rio Grande sucker	—	E	Present in the park (introduced to Medano Creek). Occurs in areas near rapidly flowing water. Backwaters or banks adjacent to fast waters provide holding areas during the day.	—
d	<i>Gila cypha</i>	Humpback chub	E		A “big river” fish. Found in Colorado in the Yampa, Gunnison, Green, and Colorado rivers.	Historical and current occurrence limited to the Colorado River system; does not occur in the park or the Rio Grande River system. The park is not a suitable area for potential reintroduction.
d	<i>Gila elegans</i>	Bonytail chub	E	E	Found historically throughout the Colorado River drainage—in recent years bonytail have only been taken from the Green River in Utah and lakes Havasu and Mohave.	Historical and current occurrence limited to the Colorado River system; does not occur in the park or the Rio Grande River system. The park is not a suitable area for potential reintroduction.

TABLE 4. SPECIAL-STATUS PLANT AND ANIMAL SPECIES

MAJOR GROUP	SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS <sup>1</sup>	COLORADO STATUS <sup>2</sup>	HABITAT COMMENTS AND OTHER NOTES	REASONS FOR DISMISSING FROM DETAILED ANALYSIS, IF DISMISSED
✓	<i>Gila pandora</i>	Rio Grande chub	—	SC	Extirpated from the park, but under consideration for reintroduction. Found in pools of small to moderate streams near areas of current, in association with undercut banks, overhanging bank vegetation, and aquatic plants. Has been collected in small impoundments in the San Luis Valley.	—
✓	<i>Oncorhynchus clarki virginalis</i>	Rio Grande cutthroat trout	—	SC	Present in the park (introduced to Medano Creek). Found in small headwater streams; spawns in clean gravel; nursery habitat along stream margins in slower water; winter habitat includes deep pools (may be limiting in headwaters).	—
<b>d</b>	<i>Ptychocheilus lucius</i>	Colorado pikeminnow	E	T	Occurs in medium to large rivers.	Historical and current occurrence limited to the Colorado River system; does not occur in the park or the Rio Grande River system. The park is not a suitable area for potential reintroduction.
<b>d</b>	<i>Xyrauchen texanus</i>	Razorback sucker	E	E	Large river species not found in smaller tributaries and headwater streams.	Historical and current occurrence limited to the Colorado River system; does not occur in the park or the Rio Grande River system. The park is not a suitable area for potential reintroduction.

TABLE 4. SPECIAL-STATUS PLANT AND ANIMAL SPECIES

MAJOR GROUP	SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS <sup>1</sup>	COLORADO STATUS <sup>2</sup>	HABITAT COMMENTS AND OTHER NOTES	REASONS FOR DISMISSING FROM DETAILED ANALYSIS, IF DISMISSED
<b>Amphibians</b>						
d	<i>Bufo boreas pop.</i>	Boreal toad	C	E	Southern Rocky Mountain population. Elevational range of 7,000–12,000 ft. Found in wetlands and riparian areas in montane forest, subalpine, and alpine life zones.	Historic and current observations of this species are well north and west of the park; the park may provide suitable habitat for reintroduction if historic occurrence within the park is established; GMP alternatives would not differentially or adversely affect such efforts.
d	<i>Rana pipiens</i>	Northern leopard frog	—	SC	Elevational range of 3,500–11,000 ft. Found in wet meadows and banks and shallows of just about any type of water body.	A single individual has been found in the park in recent decades; potential for reintroduction to the park would not be affected by the GMP alternatives.
<b>Birds</b>						
d	<i>Buteo regalis</i>	Ferruginous hawk	—	SC	Occurs in grassland and shrubland habitats; rare in pinon-juniper woodlands. Rare occurrence in San Luis Valley.	Occurs only rarely and very locally in the San Luis Valley and has not been observed in the park; would not be differentially affected by the GMP alternatives.
d	<i>Centrocercus minimus</i>	Gunnison sage grouse	C	SC	Sagebrush shrublands and proximal grasslands; riparian areas within these habitat types.	Historic range did not include the park; not currently found in or near the park; the park would not be a suitable area for potential reintroduction.

TABLE 4. SPECIAL-STATUS PLANT AND ANIMAL SPECIES

MAJOR GROUP	SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS <sup>1</sup>	COLORADO STATUS <sup>2</sup>	HABITAT COMMENTS AND OTHER NOTES	REASONS FOR DISMISSING FROM DETAILED ANALYSIS, IF DISMISSED
d	<i>Charadrius alexandrinus nivosus</i>	Western snowy plover	—	SC	Found in open beaches, salt flats, or dry mud flats where vegetation is sparse or absent.	Not found in or near the park; a future separate study will analyze potential impacts to this species from alterations in hydrologic regime; no other impacts from GMP alternatives are anticipated.
d	<i>Charadrius montanus</i>	Mountain plover	—	SC	Occurs primarily in grazed grasslands or fallow fields.	Not found in or near the park; no impacts anticipated from implementation of GMP alternatives.
d	<i>Coccyzus americanus</i>	Yellow-billed cuckoo	C	—	Found in lowland riparian forests and urban areas with tall trees.	Not found in or near the park; no suitable habitat in the park.
d	<i>Empidonax traillii extimus</i>	Southwestern willow Flycatcher	LE	E	Nests primarily in swampy thickets, especially of willow, sometimes buttonbush, tamarisk, vines, or other plants where vegetation is 4–7 meters or more in height.	Not found in or near the park; no suitable habitat in the park.
✓	<i>Grus canadensis tabida</i>	Greater sandhill crane	—	SC	Present in the park. Migrants occur on mudflats around reservoirs, in moist meadows, and in agricultural areas. Breeding birds are found in parks with grassy hummocks and water courses, beaver ponds, and natural ponds lined with willows or aspens.	—
d	<i>Haliaeetus leucocephalus</i>	Bald eagle	T	T	Habitat includes reservoirs and rivers. In winter, they may also occur locally in semideserts and grasslands, especially near prairie dog towns.	No known nest or roost sites within the park; GMP alternatives would not affect nesting / roosting sites outside the park.

TABLE 4. SPECIAL-STATUS PLANT AND ANIMAL SPECIES

MAJOR GROUP	SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS <sup>1</sup>	COLORADO STATUS <sup>2</sup>	HABITAT COMMENTS AND OTHER NOTES	REASONS FOR DISMISSING FROM DETAILED ANALYSIS, IF DISMISSED
d	<i>Numenius americanus</i>	Long-billed curlew	—	SC	Short-grass grasslands and sometimes in wheat fields or fallow fields. Most nests are close to standing water, so that many otherwise suitable areas may be unoccupied.	One single transient individual recorded for the park and vicinity; future and separate study will analyze potential impacts to this species due to alteration in hydrologic regime; no other impacts from the GMP alternatives anticipated.
d	<i>Strix occidentalis lucida</i>	Mexican spotted owl	T	T	Occurs in unlogged, closed canopy forests in steep canyons. Nests in caves and on cliff ledges in steep-walled canyons.	Not found in or near the park; potential nesting and foraging habitat would not be affected by the GMP alternatives.
<b>Mammals</b>						
✓	<i>Lynx canadensis</i>	Canada lynx	T	E	Present in the park. Northern coniferous forests are preferred habitat, especially uneven-aged stands with relatively open canopies and well-developed understories.	—
d	<i>Mustela nigripes</i>	Black-footed ferret	E, XN	E	Historically occupied areas ranging from the shortgrass and midgrass prairie to semidesert shrublands.	Not found in or near the park; no prairie dog colonies (prey) in or near the park are large enough to support reintroduction.
✓	<i>Corynorhinus townsendii pallescens</i>	Townsend's big-eared bat subsp.	—	SC	Present in the park (documented along Deadman Creek). Found in caves and riparian areas.	—
d	<i>Thomomys talpoides agrestis</i>	Northern pocket gopher subsp.	—	SC	Found in many different habitat types including agricultural and pasture lands, semidesert shrublands, and grasslands at lower elevations upwards into alpine tundra. Very resilient to transient human disturbance (e.g., hikers and horseback riders).	<i>Thomomys talpoides</i> documented in park, but subspecific status unknown; regardless of subspecific status, these populations would not be affected by the GMP alternatives.

TABLE 4. SPECIAL-STATUS PLANT AND ANIMAL SPECIES

MAJOR GROUP	SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS <sup>1</sup>	COLORADO STATUS <sup>2</sup>	HABITAT COMMENTS AND OTHER NOTES	REASONS FOR DISMISSING FROM DETAILED ANALYSIS, IF DISMISSED
<i>Plants</i>						
✓	<i>Cleome multicaulis</i>	Slender spiderflower	G2,G3	S2,S3	Present in the park. Occurs around ponds, meadows, or old lake beds. Elevation 7500–8000 ft.	—
✓	<i>Cryptantha cinerea var. pustulosa</i>	James' catseye	G5	SNR	Present in the park. Found on the sand sheet and rocky slopes.	—
✓	<i>Draba smithii</i>	Smith's draba	G2	S2	Present in the park. Occurs on talus slopes, in crevices, and between rocks in shaded protected sites. Elevation 8000–11,000 ft.	—
✓	<i>Platanthera sparsiflora var. ensifolia</i>	Canyon bog orchid	G4	S3	Present in the park. Found in riparian habitats and wetlands (elevation unknown).	—

✓ = impacts to this species discussed in this environmental impact statement

d = impacts to this species dismissed from detailed analysis in this environmental impact statement

<sup>1</sup> C=Candidate, LE = Listed as Endangered; T=Listed as Threatened, XN=Experimental, Nonessential

<sup>2</sup> E=Endangered, T=Threatened, SC=Species of Concern

<sup>3</sup> G2=Globally imperiled, G3=Globally vulnerable to extirpation or extinction, G4=Apparently Secure, G5=Secure

<sup>4</sup> S2=State imperiled, S3=State vulnerable to extirpation or extinction, SNR=State Not Ranked

Table modified from CNHP Web site [ftp://ftp.cnhp.colostate.edu/WEBDL/cnhp\\_tracking\\_list\\_080904.zip](ftp://ftp.cnhp.colostate.edu/WEBDL/cnhp_tracking_list_080904.zip), and augmented with data from CNHP (1999) and Spackman et al. (2004)

GMP alternatives. The analysis indicates that the alternatives are anticipated to have no to negligible adverse impacts on the following species:

- Uncompahgre fritillary
- humpback chub
- bonytail chub
- Colorado pikeminnow
- razorback sucker
- Gunnison sage grouse
- yellow-billed cuckoo
- southwestern willow flycatcher
- bald eagle
- Mexican spotted owl
- black-footed ferret

Based on this analysis, the species listed above have been dismissed as impact topics.

The Canada lynx is the only federally listed species to which impacts may be anticipated. Therefore, the Canada lynx is discussed under “Threatened and Endangered Species” in chapter 4 of the GMP.

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

### **Rio Grande Sucker**

The Rio Grande sucker (*Catostomus plebeius*) listed as endangered in Colorado, is found in the Upper Rio Grande basins of New Mexico and Colorado, along with some disjunct areas in Mexico (CSU 2004). It resides in riffles, runs, and pools in small-to medium-sized clear streams and eats plant and animal material scraped from rocks. Most of the populations in Colorado have been eliminated through habitat degradation and hybridization or competition with the white sucker (*Catostomus comersonii*). During 1996, a

multiagency team introduced the Rio Grande sucker into Medano Creek (CDNR 1996). Medano Creek had appropriate barriers (disappears into the sand dunes) and could serve as a refuge for 200 Rio Grande suckers obtained for transplant from the Rio Tusos in New Mexico. Medano Creek parallels Medano Pass Road and is in the portion of the park already designated as wilderness. Because the action alternatives differ in the management zoning of the Medano Creek corridor, and this may result in differential impacts on the Rio Grande sucker, this species is considered as an impact topic under “Colorado State-Listed Species and Wildlife” in chapter 4.

### **Rio Grande Chub**

The Rio Grande chub (*Gila pandora*) is a state species of special concern. This species is found in pools of small to moderate streams near areas of current. It is found in association with undercut banks, overhanging bank vegetation, and aquatic plants. This native fish is generally restricted to the Rio Grande River basin in Colorado, but has also been collected in small impoundments in the San Luis Valley (NDIS 2005g). This species historically occurred in the park and is a candidate for reintroduction. All three action alternatives would seek to return hydrologic regimes within the park to more natural conditions, resulting in the potential for more water reaching downstream users. Based on this information, the Rio Grande chub is retained for analysis in chapter 4.

### **Rio Grande Cutthroat Trout**

The Rio Grande cutthroat trout (*Oncorhynchus clarkii virginalis*), listed as a species of concern in Colorado, resides in rapidly flowing water with eddies in small

headwater streams of the Rio Grande River drainage (CNHP 1999). It was estimated by Alves (1996) that this species occupied less than 1% of its original habitat in Colorado. Medano Creek has been reclaimed by CDOW to support the Rio Grande cutthroat trout. The creek was selected because it has no outlet and could serve as a refuge for this rare trout species. Little Medano Creek also provides good habitat for the Rio Grande cutthroat trout, and even though it does not connect to Medano Creek year-round, there is a viable population present in the drainage. Because the action alternatives differ in the management zoning of the Medano and Little Medano Creek corridors, and this may result in differential impacts on the Rio Grande cutthroat trout, this species is retained for analysis under “Colorado State-Listed Species and Wildlife” in chapter 4.

### **Greater Sandhill Crane**

The greater sandhill crane (*Grus canadensis tabida*), a state species of special concern, is an abundant fall and spring migrant in the San Luis Valley (NDIS 2005k). Migrants occur on mudflats around reservoirs, in moist meadows, and in agricultural areas. Breeding birds are found in open areas with grassy hummocks and watercourses, beaver ponds, and natural ponds lined with willows or aspens (Ellis and Haskins 1985, Renner et al. 1990). No records of breeding sandhill cranes are known for the San Luis Valley (Rawinski 2004), although this species still nests in some parts of northern Colorado (NatureServe 2005). No records of sandhill cranes utilizing the national park were provided by CNHP (1999), Rawinski (2004), or Giroir (2005). Suitable habitat in the San Luis Valley, including San Luis Lakes State Park, the various national wildlife refuges, and possibly the

southwestern and currently irrigated portion of the national park, all contribute important stop-over habitat for these birds during their spring and fall migrations. The three action alternatives propose to return the hydrologic regime of the national park to a more natural state, which may have some impact on potential stop-over habitat for sandhill cranes. Therefore, this species is carried forward as an impact topic under “Colorado State-Listed Species and Wildlife” in chapter 4.

### **Townsend’s Big-Eared Bat**

Townsend’s big-eared bat (*Corynorhinus townsendii*), a state species of special concern, occupies a variety of habitats across its range, including desert scrub, piñon-juniper woodlands, and deciduous and coniferous forests (Schmidt 2003). This species commonly utilizes riparian corridors within these habitats (Jones 1965, Seidman and Zabel 2001, Fellers and Pierson 2002, others). In Colorado, these bats are primarily associated with abandoned mines, saxicoline brush, sagebrush, semidesert scrub, piñon-juniper woodlands, ponderosa pine woodlands (Adams 1990, Armstrong et al. 1994) and montane forests (Adams 2003). This species is vulnerable to human disturbance at the roost, particularly at maternity roosts during the period immediately prior to parturition (giving birth). Maternity roosts often are at lower elevations to take advantage of warmer temperatures, which increase neonatal development. This species has been documented in the Deadman Creek corridor within the park (NPS 2004), and is carried forward as an impact topic under “Colorado State-Listed Species and Wildlife” in chapter 4.

## Summary—Colorado State-Listed Species

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, have been analyzed relative to the anticipated impacts and differences of those impacts among the four alternatives. The analysis indicates that the alternatives may have the potential to affect riparian species (the Rio Grande sucker, Rio Grande chub, Rio Grande cutthroat trout, and Townsend’s big-eared bat) and wetlands species (the greater sandhill crane). These taxa are evaluated, along with other members of their communities (species associated with riparian corridors and wetlands-associated species) identified below under “Wildlife,” as impact topics in chapter 4. Due to the lack of anticipated impacts on the ferruginous hawk, western snowy plover, mountain plover, long-billed curlew, and northern pocket gopher, these species are dismissed from further analysis in chapter 4.

## WILDLIFE

The elevational range encompassed by the Great Sand Dunes National Park and Preserve incorporates a diversity of plant communities which, in turn, provide habitat for a remarkable array of wildlife species. Recent faunal inventories of the park indicate the presence of at least 29 species of mammals (Valdez 2003), 110 species of birds (Giroir 2005), 6 species of reptiles, and 4 amphibian species (Muths and Street 2002). As such, the following description of wildlife species in the park is not all-inclusive, but provides a context for consideration of those wildlife species that may be differentially affected by the various action alternatives. Wildlife

characterization of the park is presented by life zones, although many taxa, particularly larger species, move among the life zones.

### Wildlife of the Sabkha Life Zone

This low-lying, salt-encrusted plain is sparsely vegetated by saltbush and saltgrass. The playa lakes and wetlands within the sabkha provide important habitat for a variety of migratory birds such as sandhill cranes (*Grus canadensis*) and American white pelicans (*Pelecanus erythrorhynchos*). A diverse complex of shorebirds, including American avocets (*Recurvirostra americana*), spotted sandpipers (*Actitis macularia*), and lesser yellowlegs (*Tringa flavipes*) occupy shorelines around playa lakes and other water bodies within the sabkha.

### Wildlife of the Sand Sheet Grasslands and Shrublands Life Zone

The vast sand sheet surrounding the dunes is stabilized by a mixture of grassland and shrubland habitats. While both of these habitats are utilized by wide-ranging species such as mule deer and elk, the diverse assemblage of wildlife species that typify these habitats includes pronghorn (*Antilocapra americana*), white-tailed jackrabbits (*Lepus townsendii*), silky pocket mice (*Perognathus flavus*), and plains pocket mice (*P. flavescens*). Sage sparrows (*Amphispiza belli*) nest in sagebrush shrublands, but utilize adjacent grasslands and other types of shrublands during migration. Red-tailed hawks and American kestrels frequent this life zone.

### Wildlife of the Dunefield Life Zone

While a number of wildlife species such as coyotes, mountain lions, and elk will

traverse parts of the dunefield, the only mammal to actually establish home ranges within the dunefield is Ord's kangaroo rat (*Dipodomys ordii*). A number of endemic invertebrate species are found only at the Great Sand Dunes; at least seven insect species including five beetles, a robber fly, and a moth appear to be limited to the sand dune habitat (CNHP 1999, Pineda 2002, NPS 2004). The insects that are endemic to the Great Sand Dunes include two species of ant-like flower beetles (*Amblyderus wernerii* and *A. triplehorni*), Great Sand Dunes tiger beetle (*Cicindela theatina*), histerid beetle (*Hypocaccus* species undescribed), circus beetle (*Eleodes hirtipennis*), a robber fly (*Proctacanthus* species new), and an as yet undescribed noctuid moth (*Copablepharon* sp.). Additional rare species of insects observed within the dunefield life zone include the giant sand treader camel cricket (*Daihinibaenetes giganteus*) that was once thought to be endemic, but is now known from other localities, the San Luis Valley sand hills skipper (*Polites sabuleti ministigma*), and the golden-edged gem (*Schinia avemensis*).

### **Wildlife of the Montane Forest and Piñon-Juniper Woodlands Life Zone**

These two systems occupy similar elevations (8,000 to about 9,500 feet), but occur in different positions on the landscape. Montane forest species such as Douglas-fir, aspen, and narrowleaf cottonwood, prefer wet drainages. Piñon pines and junipers occur on sunny hillsides that are drier. This diversity of habitat types provides for great species diversity within this life zone. Bobcats (*Lynx rufus*) commonly hunt these forests and woodlands for rabbits (*Sylvilagus nuttallii*), voles (*Microtus longicaudus* and *M. pennsylvanicus*), mice (*Peromyscus maniculatus* and *Neotoma cinerea*), and

squirrels, including Abert's squirrel (*Sciurus aberti*) and red squirrels (*Tamiasciurus hudsonicus*). Western tanagers (*Piranga ludoviciana*), chipping sparrows (*Spizella passerina*), and green-tailed towhees (*Pipilo chlorurus*) feed among the trees, as do northern goshawks (*Accipiter gentilis*). Canyons, caves, and riparian areas in this life zone are often used by Townsend's big-eared bats (*Corynorhinus townsendii*), and a number of bat species such as long-eared and long-legged myotis (*Myotis evotis* and *M. volans*, respectively) forage among the trees in woodlands and along forest edges.

### **Wildlife of the Subalpine Forest Life Zone**

Subalpine forests, extending from about 9,500 feet up to tree line (~11,000 feet) are characterized by hardy, stout trees such as Englemann and blue spruce, that can withstand the heavy winter snowfalls experienced in this life zone. The heavy winter snows contribute to year-round cold, damp conditions in the subalpine forest. This life zone is typically utilized by bighorn sheep (particularly on steep terrain), elk, mule deer, and black bears, beaver, and mountain lions. Warbling vireos (*Vireo gilvus*), Steller's jays (*Cyanocitta stelleri*), and gray jays (*Perisoreus canadensis*) may be observed in the subalpine life zone.

### **Wildlife of the Alpine Tundra Life Zone**

This life zone occurs above about 11,000 feet and is characterized by a very short growing season resulting in low-growing plant life. Animals that utilize this zone include American pikas (*Ochotona princeps*), yellow-bellied marmots (*Marmota flaviventris*), and bighorn sheep.

Elk and mule deer may be seen along the forested periphery of this zone. During summer months, golden eagles (*Aquila chrysaetos*), a variety of hawks, and white-throated swifts (*Aeronautes saxatalis*) may be observed flying over, while horned larks (*Eremophila alpestris*) and white ptarmigan (*Lagopus leucurus*) may be observed nesting and foraging on the alpine tundra.

### Summary—Wildlife

Wildlife that may be differentially affected by the proposed alternatives include migratory birds and ungulates (mule deer, elk, and bighorn sheep). Migratory bird species associated with wetlands habitats are collectively considered as wetlands-associated species under “Colorado State-Listed Species and Wildlife” in chapter 4 because alterations of current hydrologic regimes may impact these species.

Management of elk numbers may vary under the different alternatives, having different consequences for mule deer and bighorn sheep numbers and herd health; therefore, these species are considered jointly as an impact topic in chapter 4. Finally, the action alternatives differ with regard to the presence of leashed dogs within the preserve. As these differences may have varying impacts on bighorn sheep, bighorn sheep will be considered as an impact topic in chapter 4.

## SOILS AND GEOLOGIC RESOURCES

### Soils

The lower elevations of the park include the sabkha, sand sheet, and dunefield life zones (see “Vegetation” section for a detailed description). These three zones lie on relatively gentle to moderately sloping topography and the overlying soils are

predominantly Cotopaxi sand (2%–15% slopes), Space City loamy sand, saline (0%–3% slopes), and Dune land.

Soils were mapped by the Natural Resources Conservation Service (NRCS) for Alamosa County in 1973, and Saguache County in 1984, and were mapped in the lower elevations of the counties where there is a greater potential for agricultural use or development. The mapping performed by NRCS for these areas combined the above three soil types into two general map units that are described as follows: (1) the Dune land (NRCS 1984) or Cotopaxi-Dune land association (NRCS 1973), which encompasses approximately 40% of park soils, is comprised of deep, gently rolling to hilly, excessively drained sandy (coarse) soils; and (2) the Space City-Cotopaxi (NRCS 1984) or Hooper-Corlett (NRCS 1973) association, which occupies nearly level topography, makes up the remaining 60% of park soils, and is characterized by deep, nearly level to hummocky, well-drained to excessively drained, moderately fine- to coarse-textured soils that are strongly affected by alkali. Both of these general soil types are formed from eolian sand and sandy alluvium and are distributed across the park, with the Space City-Cotopaxi (Hooper-Corlett) association covering the western half of the park and the Dune land (Cotopaxi-Dune land) association covering the eastern half.

In the preserve (foothill, montane, subalpine, and alpine) life zones, the soils have not been mapped as extensively as in the lower elevations within the park. However, general mapping shows them to be primarily covered by Comodore very stony loam, Comodore-Rock outcrop complex, and Mount Home-Saguache cobbly sandy loam. These soil types represent shallow to deep, well-drained soil of ridges, mountain slopes, or alluvial

fans formed from igneous and metamorphic rocks.

More specific mapping of the area by NRCS identified 24 different soil types across the park and immediate vicinity. The general descriptions of these soil types are provided in table 3. There is some difference in soil taxonomy between the Alamosa and Saguache counties surveys; however, the types are combined when possible in table 5 (NRCS 1973, 1984).

Evaluation of the engineering characteristics for the listed soil types found in the vicinity of the park indicate the soils are generally poor for development of structures, including roads. The primary characteristics for this unsuitability include: susceptibility to soil blowing or erosion, caving soils, high permeability, high salinity or alkalinity, shallow soils, large stones, steep slopes, high shrink-swell ratio, shallow groundwater, flooding or wetness, and high potential for pollution of shallow groundwater.

**TABLE 5. SPECIFIC SOIL TYPES PRESENT ON OR IN THE VICINITY OF THE GREAT SAND DUNES**

Map Unit – Name	Description
12 – Comodore very stony loam, 25%–65% slopes	Shallow, well-drained soil of ridges and mountainside slopes that formed in colluvium from igneous and metamorphic rocks.
13 – Comodore-Rock outcrop complex, 40%–65% slopes	Shallow, well-drained soil of mountainsides that formed in thin colluvium from igneous and metamorphic rocks. The rock outcrop consists of rhyolite, closely associated volcanic material, and conglomerate materials.
14, CpB – Corlett-Hooper complex, 0%–15% slopes	Moderately well-drained, alkali soils of terraces and fans adjacent to old creek channels and in old lake basins on alluvial valley floors that formed in alkaline eolian sands, alluvium derived from basalt, and have a wind-deposited sandy surface layer.
16, CtE – Cotopaxi sand, 2%–15% slopes	Deep, somewhat excessively drained soil of dune-like hills and ridges on alluvial valley floors that formed in eolian sand.
22, Du - Duneland	Deep gently rolling to steep, excessively drained sandy soils of dunes.
30, Gn – Gunbarrel loamy sand	Deep, somewhat poorly drained, alkaline and saline soil of terraces and low fans on alluvial valley floors that formed in alluvium.
31, Gs – Gunbarrel loamy sand, saline	Deep, poorly drained soil, severely affected by salts and alkali, of terraces and low fans on alluvial valley floors that formed in alluvium.
35, Ho – Hooper loamy sand	Deep, moderately well-drained soil of floodplains and fans on alluvial valley floors that formed in alluvium derived from basalt and with a wind-deposited surface layer.
36, Hp – Hooper clay loam	Deep, moderately drained soil of floodplains and fans on alluvial valley floors that formed in alluvium derived from basalt.
42, Le – Laney loam, 0%–3% slopes	Deep, well-drained, saline and alkali-affected soil of floodplains and fans on alluvial valley floors that formed in calcareous alluvium.
45, Mc – McGinty sandy loam, 0%–3% slopes	Deep, moderately well-drained soil of fans on alluvial valley floors that formed in calcareous alluvium derived from igneous rock.
46, Mn – Medano fine sandy loam	Deep, poorly drained soil of floodplains on alluvial valley floors that formed in alluvium.
51, MtD – Mount Home-Saguache cobbly sandy loams, 4%–12% slopes	Deep, somewhat excessively drained soils of fans at the foot of the Sangre de Cristo range that formed in alluvium.

**TABLE 5. SPECIFIC SOIL TYPES PRESENT ON OR IN THE VICINITY OF THE GREAT SAND DUNES**

Map Unit – Name	Description
53 – Ouray-Sabe dry complex, 9%–25% slopes	Deep, excessively drained soil of alluvium from sand.
67 – Seitz very stony loam, warm, 15%–65% slopes	Deep, well-drained soil of mountainsides and ridges that formed in colluvium derived from igneous rock.
71, SrB – Space City loamy sand, saline, 0%–3% slopes	Deep, well-drained soil along the margins of intermountain valleys and basins on alluvial valley floors with undulating topography that formed in eolian sand.
72, StE, Space City-Hooper complex, 0%–15% slopes	Deep, somewhat excessively drained and moderately well-drained soils of low dunes on alluvial valley floors that formed in eolian sand on low dunes and alluvium derived from basalt and have a wind-deposited surface layer.
78, UrF – Uracca very cobbly loam, 15%–35% slopes	Deep, somewhat excessively drained soil of fans covered by cobble at the foot of the Sangre de Cristo range that formed in alluvium.
Am – Alamosa loam, 0%–1% slopes	Deep, somewhat poorly drained soil on floodplains on alluvial valley floors that formed in alluvium.
CmF – Comodore extremely rocky loam, 40%–50% slopes	Shallow, well-drained soil of mountainsides that formed in colluvium and is covered by angular stones and rounded cobblestones.
CoE – Corlett sand, hilly	Deep, somewhat excessively drained, alkali soils of low dunes and ridges on the valley floor that formed in eolian sand.
CsA – Costilla loamy sand, 0%–2% slopes	Deep, somewhat excessively drained soil of alluvial floodplains that formed in alluvium.
Hs – Hooper soils, occasionally flooded, 0%–1% slopes	Deep, somewhat poorly drained soil of old lake beds that formed in alluvium.
ZnB – Zinzer loam, 1%–3% slopes	Deep, well-drained soil of floodplains on the valley floor that formed in calcareous mixed alluvium.

Source: NRCS 1973, 1984

## Geologic Resources

### *Great Sand Dunes Geologic Processes*

The Great Sand Dunes are the result of and an element in a fragile, dynamic system that both influences and sustains dune formation (dunes system map). The dune mass is a huge deposit of eolian sand nestled against the Sangre de Cristo Mountain range. An extensive vegetated sand sheet consisting mostly of flat bedded sand deposits with scattered groups of parabolic dunes, surrounds the dune mass and is stabilized by species of grasses and shrubs. “Blowouts” are concave pockets of sand that are exposed when vegetation is

disturbed. They are promoted by wind erosion and are a source of sand to the dune system. The sabkha is an alkaline plain located west of and adjoining the sand sheet. It is cemented together in many places by minerals deposited by seasonal wetlands. In a comparative study of 1936 and 1990 aerial photography, the dune mass and associated sand sheet did not show any obvious shifts; rather they displayed remarkable stability over the 54-year time period (McArthur and Sanderson 1990). The national preserve protects the watershed of creeks that play a role in dunes sand recycling.

The origin of the dunes was controlled by a combination of geographic, geologic, and

climatic factors (Taylor 1999). Most sand grains (quartz and rhyolite) that make up the dunes result from weathering of Tertiary volcanic rocks of the San Juan Mountains. A smaller amount of quartz sand originates from weathering of Precambrian granites, granodiorites, and gneisses from the Sangre de Cristo Mountains. As sand grains are transported to the valley by streams, strong winds from the southwest erode the grains from valley sediments and move them over the sand dunes. As the winds rise over the Sangre de Cristo Mountains they are funneled to the area of Medano Pass. The Great Sand Dunes and the deposition system contributing to them cover an area of approximately 497 square miles (800 square kilometers) (CNHP 1999).

Streams that drain the Sangre de Cristo Mountain range return wind-blown sand (and some feldspathic sands and gravels and carbonate fragments derived from the mountain bedrock) back to and west of the active dune system in a form of “recycling.” The sand carried downstream by Medano and Sand creeks, in particular, is re-deposited on the sand dune mass by southwesterly winds. Over time, sand, wind, and water function to shape and re-shape the dunefield in a near closed loop system. At the foot of the dunes, the surging water in Medano Creek seasonally provides an interesting and delightful contrast to the near-barren sand surfaces. During the spring, pressure differentials associated with storms generate strong southwesterly winds that can blow for several days and transport millions of sand grains abrasive enough to scour the landscape, prior to depositing on the sabkha, sand sheet, dunefield, or mountains.

The sand dunes are very large, some exceeding 700 feet above the adjacent

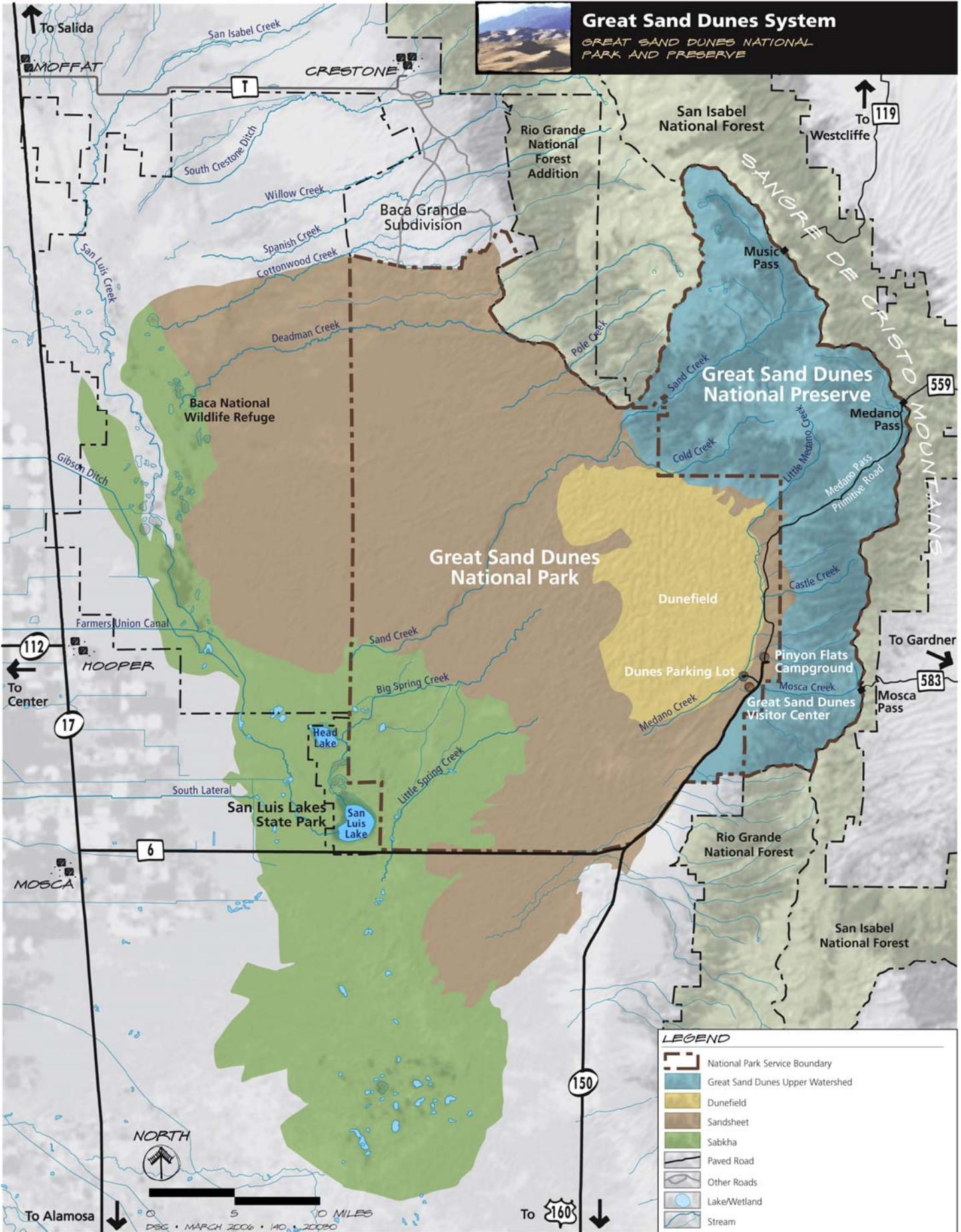
landscape. The dune mass covers approximately 30 square miles, with an average sand thickness of 136 feet (41.42 meters). The thickest dunes lie parallel to Medano Creek and are in line with San Luis Lake (Bunch 1997). Most dunes are oriented in a south to north direction in the main dune mass.

Several dune types are present and their formation is controlled by wind velocity, sand supply, and vegetation. These dune types include: reversing dunes, star dunes, transverse dunes, barchan dunes, parabolic dunes, and climbing dunes. Some very mobile dunes, known as escape dunes, are located east of Medano Creek, and form when the creek disappears during dry seasons or years (Bunch 1997). Between 1936 and 1990, escape dunes smothered a stand of ponderosa pine trees in an area now known as the Ghost Forest (Bunch 1997). Escape dunes move constantly to the northeast.

The dominant movement of the dune mass is to the northeast; however, winds frequently blow from the northeast, stabilizing the dunefield to some extent (Taylor 1999). Medano, and other creeks flowing westerly from the Sangre de Cristo Mountains erode advancing dunes on the east side of the formation, returning the sand to the southwest side where winds blow it back onto the dunes. This represents a natural sand recycling system that is relatively unique. Migration of the dunes is inhibited by the two wind directions and by the presence of wet sand grains a few inches below the dune surface. Erosion of the dune is effectively halted when wet sand is exposed. Dune mapping and the form of reversing dunes indicate that dunes within the dunefield migrate slightly.

# Great Sand Dunes System

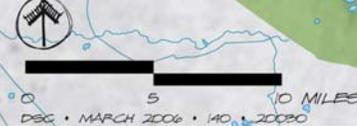
GREAT SAND DUNES NATIONAL PARK AND PRESERVE



### LEGEND

- National Park Service Boundary
- Great Sand Dunes Upper Watershed
- Dunefield
- Sandsheet
- Sabkha
- Paved Road
- Other Roads
- Lake/Wetland
- Stream

NORTH



DSG • MARCH 2006 • 140 • 20080

## Local Mineral Resources

Within the national park, subsurface mineral rights associated with the former Baca Ranch are owned by a private company. This company and others who have owned the mineral interests underlying the former ranch, have conducted extensive exploratory activities for oil and gas, including drilling two exploratory wells. National Park Service and U.S. Geological Survey (USGS) geologists generally agree that oil deposits within the geologic structure underlying the Baca Ranch present little to no prospect for developable quantities of oil or gas. No production activities for oil or gas have been requested or undertaken to date. Oil and gas exploration activities within national parks must be managed pursuant to NPS regulations designed to protect park resources and values (see 36 CFR 9B: *Non-federal Oil and Gas Rights Regulations*).

## WETLANDS

### Wetlands Definition and Classification

Wetlands have been defined both by academicians and agencies responsible for their management. The term “wetlands,” used herein is defined to both the National Park Service and U.S. Army Corps of Engineers conventions.

The U.S. Army Corps of Engineers has jurisdiction for protecting wetlands under section 404 of the Clean Water Act. This agency defines wetlands as “*areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a*

*prevalence of vegetation typically adapted for life in saturated soil conditions (33 CFR 328.3[b]). Wetlands generally include swamps, marshes, bogs, and similar areas.”* Wetlands have three diagnostic characteristics: (1) over 50% of the dominant species present must be classified as obligate, facultative wetlands, or facultative wetlands, (2) the soils must be classified as hydric, and (3) the area is saturated or inundated long enough during the growing season to create anaerobic soil conditions (Environmental Laboratory 1987).

The National Park Service classifies, delineates, and maps wetlands using the USFWS Cowardin classification system (USFWS 1979). This system is based on the more inclusive definition: “. . . *lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water.*” Under this classification, wetlands must have one or more of the following characteristics: (1) the land supports, at least periodically, predominantly hydrophytes (i.e., plants adapted to growing in water or in saturated soils that are oxygen deficient), (2) the substrate is comprised of predominantly undrained hydric (anaerobic) soils, and (3) the substrate is saturated with water or covered by shallow water at some time during the growing season of each year (USFWS 1979).

Both of these wetlands definition and classification systems recognize three parameters (hydrophytic vegetation, hydric soil, and wetlands hydrology), but the Cowardin system defines more habitat types as wetlands. The Cowardin system also recognizes many unvegetated sites or areas without soil (e.g., mudflats, rocky or sandy banks, beaches, stream shallows, saline lakeshores and playas) as wetlands

habitats with important wildlife habitat values.

## Regional Context

In general, wetlands information presented in this section is descriptive and programmatic in nature. Based on the available National Wetlands Inventory maps for the park, it seems that wetlands mapping efforts within the expanded park 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. Details concerning present extent and jurisdictional determination are not included herein and are left for more specific planning and implementation documents. Other sections of this chapter (vegetation, wildlife, ecological critical areas, water resources) provide additional information related to wetlands.

The park contains 12 primary streams that flow westward from the Sangre de Cristo Mountains and provide wetlands hydrology. They include Mosca, Medano, Castle, Sawmill, Buck, Little Medano, Cold, Sand, Pole, Deadman, Big Spring, and Little Spring creeks. Of these, the major streams are Medano and Sand creeks. They originate high in the mountains, filling numerous alpine lakes before flowing into the sand dunes and across the valley floor. Medano Creek flows around the dunefield along the eastern and southeastern borders and then into the southern portion of the sand sheet. Sand Creek flows around the dunefield on its northeastern, northwestern, and western edges and then into the northern portion of the sand sheet. Sand Creek becomes a braided, sand-

bottomed creek in the vicinity of the dunefield and on the sand sheet life zones.

Since there is no surface outlet for groundwater in the northern San Luis Valley, this hydrological system is considered a closed basin. The water infiltrates quickly through the sand, adding to the already high permanent groundwater levels, which typically lie only 5 feet to 15 feet from the ground surface in the shallow aquifer under the park (Cooper 1992). The high water table of San Luis Valley creates an array of wetlands and wildlife habitats. The many types include permanent ponds and lakes, playa lakes, seasonal ponds and marshes, seeps, wet meadows on pond edges, and salt flats. Groundwater flows primarily west and southwest (Rupert and Plummer 2004) across the park. It emerges in the southwestern portion of the park as a line of springs. The water flowing from these springs creates large areas of lush, productive wetlands around Big Spring Creek and ultimately flows into San Luis Lake. In addition to these wetlands formations, wind erosion has removed sand to the elevation of the water table in places, allowing the establishment of interdune wetlands within the sand sheet life zone (CNHP 1999).

Wetlands and associated riparian habitats within the park support nearly one-third of the known plant species listed by Spackman et al. (2004). Cooper (1992) described 24 emergent wetlands associations on only the sand sheet and sabkha life zones of the park. Several rare plant species grow in wetlands habitat and most of the plant communities that are considered rare are associated with wetlands or riparian areas (see the “Ecologically Critical Areas” section).

## **Wetlands Functions and Values**

Wetlands provide keystone habitat for a wide array of animal and plant species. Vegetation production and diversity are usually very high in and around wetlands, with many plant species adapted only to this unique environment. Wetlands destruction, filling, and draining are occurring throughout North America and pose a major threat to wildlife diversity, carrying capacity, and hydrologic regimes. Changes to and destruction of wetlands can have effects that are proportionally greater than elsewhere in an ecosystem (Graber 1996).

Wetlands in general, and those of the San Luis Valley area in particular, perform many beneficial functions (biological and physical processes) in addition to providing habitat for animals and plants (Adamus et al. 1991). These functions and values pertain to water quality, water quantity, landscape health, and human recreation:

- groundwater recharge
- groundwater discharge
- flood flow alteration
- sediment stabilization and shoreline anchoring
- sediment and toxicant retention
- production export
- aquatic diversity and abundance
- wildlife diversity and abundance
- recreation
- uniqueness or heritage value

## **Wetlands Distribution and Management**

The largest acreages are distributed along Deadman, Medano, Sand, Big Spring, and Little Spring creeks and their tributaries. They range from sparsely vegetated playas and seasonal mudflats, to aquatic and

emergent stands in shallow water and irrigated hay meadows, to streamside shrublands, woodlands, and forests, to high elevation ponds, seeps, and snow glades (see the “Vegetation” section). Introduced wetlands have become established due to irrigation of natural meadows (which has occurred for over a century) on Medano Ranch and on banks of excavated ponds, ditches, and canals, which are located mostly at lower elevations on gentle slopes and flats. A particularly high concentration of irrigated wetlands occurs in the lower reaches of Sand, Big Spring, and Little Spring creeks on Medano Ranch. In general, restoration of a natural runoff and drainage regime in these areas, which is proposed in the action alternatives, is expected to reduce the area extent of some wetlands types (e.g., wet meadow, emergent wetlands, aquatic, etc.) and expand or re-establish the extent of other types (e.g., ephemeral ponds, playas, mudflats, etc.).

## **Wetlands Types by Life Zone**

Wetlands occur throughout the park life zones, are diverse, and can broadly be characterized in the Cowardin system as either riverine (rivers, creeks, and streams), palustrine (shallow ponds, marshes, swamps, sloughs), and lacustrine (lakes and deep ponds).

On the lowest elevations, the sabkha life zone supports limited wetlands vegetation due to high soil salinity and alkalinity. In general, aquatic, emergent, and wet meadow plant communities are intolerant of saline soils and lack of fresh water. Wetlands that have become established here are primarily palustrine emergent, consisting of grasses and other graminoids that can tolerate higher alkaline and saline conditions such as saltgrass, alkali cordgrass, and alkali sacaton. The sabkha

wetlands transition to those typically found on the sand sheet life zone in areas where the soil has been flushed by runoff.

The sand sheet and dunefield life zones contain riverine, palustrine, and lacustrine wetlands. Riverine perennial wetlands vegetation is found primarily along the margins of permanent streams (e.g., Medano, Sand, and Big Spring creeks). Palustrine emergent wetlands occur in the form of marshes and wet meadow habitat found along San Luis Creek and on the west side of the dunefield. Palustrine scrub/shrub vegetation characterized by willow species and similar hydrophilic shrubs is found along the primary drainages and margins of the larger bodies of water. Other sites in the San Luis Valley, including drained agricultural fields, barren mudflats, and un-vegetated stream and pond shores may also support wetlands.

The palustrine emergent wetlands of the sabkha and sand sheet life zones were classified into seven general wetlands plant classes and more finely into 27 wetlands and adjacent upland plant associations by Cooper (1992). The seven classes were composed of one or a few common plant species associated with the moisture gradient and include (in order from low open water to higher upland): (1) aquatics (open water), (2) hardstem bulrush (*Schoenoplectus lacustris* ssp. *acutus*), (3) spikerush, (4) three-square bulrush (*Schoenoplectus pungens*), (5) Baltic rush, (6) saltgrass, (7) cordgrass (*Spartina gracilis*), and (8) blue grama grass (upland). Depending on the presence and duration of standing water and the influx of fresh water, some of these classes may be absent or may vary locally in species composition.

The piñon-juniper woodland, montane woodland, and forest life zones contain primarily riverine and palustrine wetlands associated with streams, ponds, and wet

meadows. Riverine wetlands and riparian habitat is found within and adjacent to the flowing water of the permanently flooded rock, cobble, or sand-bottomed stream channels. The vegetation is primarily a lush mix of herbaceous, shrub, and tree species. Palustrine emergent wetlands located in these life zones include beaver ponds, montane meadows, and seeps that typically support stands of sedges and grasses. The palustrine forest and woodland types have become established along streams and include quaking aspen, blue spruce, and narrowleaf cottonwood, among other tree species. Palustrine scrub/shrub wetlands occupy streambanks and saturated soils where they often mix with meadow (palustrine emergent) and riparian (palustrine forest and woodland) species. Several willow species and thinleaf alder shrubs are common shrub/scrub species.

The subalpine life zone supports similar creek bank and palustrine wetlands as those found in the montane zone. This zone also supports lacustrine wetlands associated with subalpine lakes and ponds. Palustrine emergent wetlands characterize subalpine meadows and seeps that occupy peat beds that are permanently or seasonally saturated. Subalpine vegetation is characterized by herbaceous species of grasses, sedges, rushes, and perennial herbs. Palustrine scrub/shrub wetlands in this life zone include stands of willow species and occasionally alder and birch. Palustrine forests and woodlands have become established along streams and on mesic sites that support open to thick stands of conifers, usually blue spruce or Douglas-fir, and deciduous trees, including narrowleaf cottonwood and quaking aspen. Lacustrine limnetic sites include naturally occurring glacial ponds and constructed beaver ponds. In-lake vegetation is typically limited to rooted aquatic grasses, sedges, floating vascular plants, and algae. Meadow (palustrine emergent) and riparian

(palustrine forest and palustrine scrub/shrub) communities generally border lake margins.

Wetlands in the tundra zone are restricted to alpine streams, seeps, ponds, and snow glades. The vegetation is primarily classified as palustrine and includes low-growing species of sedges, grasses, and willows.

## **WATER RESOURCES**

The San Luis Valley is an arid environment with average annual precipitation of 7.1 inches recorded in Alamosa, Colorado, and 8.4 inches recorded in Saguache, Colorado, over a 56-year time period (WRCC 2005). Annual snowfall averages 31.7 inches and 26.4 inches at these two locations, respectively. The Great Sand Dunes has higher precipitation, averaging 10.5 inches (NPS 1995a). Direct precipitation for the San Luis Valley represents a very minor portion of the water supply. The most important source of water to the valley is surface water inflow, which directly or indirectly provides most water used for irrigation, and recharges the aquifers. Surface water inflow largely results from variable snowmelt and runoff from the surrounding mountains and has ranged from a high of 2,783,000 acre-feet in 1941, to a low of 743,000 acre-feet in 1951. The total watershed of the San Luis Valley covers about 5 million acres. Approximately 2,800,000 acre-feet of water enter and leave the San Luis Valley annually (Emery 1997).

The northern portion of the San Luis Valley, north of the Rio Grande, encompasses approximately 2,500 square miles, includes the area of Great Sand Dunes, and is referred to as the “Closed Basin” (CSP 1996). Due to a topographic rise in the valley floor, streams that drain

the northern portion of the valley and its surrounding hills and mountains (Cochetopa Hills, northern San Juan Mountains, northern Sangre de Cristo Mountains) do not flow into the Rio Grande; rather the water is retained underground within the Closed Basin.

## **Water Rights**

The National Park Service holds several water rights for Great Sand Dunes, including rights for domestic and operational uses, instream flow, and wildlife purposes. The National Park Service has instream flow water rights (decreed June 20, 1989; priority date March 17, 1932 or June 17, 1956) for Medano, Little Medano, Horse Canyon, Castle, Sawmill Canyon, Buck, Garden, an unnamed creek, Mosca, Morris Gulch, Sand, and Cold creeks. It also inherited instream flow water rights from the USFS when lands within what is now the national preserve were transferred to the National Park Service (decreed March 30, 2000; priority date October 25, 1999): Medano, Little Medano, Horse Canyon, Castle, Sawmill Canyon, Buck, Garden, an unnamed tributary of Medano, Medano, Mosca, Morris Gulch, Sand, and Cold creeks.

The National Park Service also has federal reserved groundwater rights for domestic and operational uses, and an appropriate water right for Denton Spring for wildlife purposes.

The National Park Service filed a claim for an absolute in-place groundwater right for the Great Sand Dunes on December 30, 2004 (NPS 2004). The claim was filed pursuant to the Great Sand Dunes Act of 2000, which specifically recognized that surface and groundwater systems on and underlying the park and adjacent lands are

necessary for preserving the park's natural and cultural resource values, including pulse flow in Sand and Medano creeks. There is a history of proposals to withdraw groundwater for export from the San Luis Valley to Colorado's eastern slope. The Great Sand Dunes Act of 2000 directed the Secretary of the Interior to obtain and exercise water rights required to fulfill the purposes of the park by maintaining groundwater levels, surface water levels, and stream flow on, across, and under the park. The Great Sand Dunes Act of 2000 requires the United States to follow state procedural law in obtaining the water right and to establish the purposes and other substantive characteristics of the water right pursuant to state and federal law. The Great Sand Dunes Act of 2000 protects uses existing on November 22, 2000, and prohibits the federal reservation of water.

Two irrigation ditches in the headwaters of Medano Creek are associated with water rights senior to those of the park. The Hudson Ditch was constructed in 1886, and the Medano Ditch in 1892. Since no easement was issued for these ditches by the USFS prior to passage of the Great Sand Dunes Act of 2000, the legislative authority for issuing easements and establishing terms and conditions for such easements on these ditches now falls to the National Park Service. However, since the USFS was in the process of issuing easements for these ditches prior to the passage of the 2000 Act, the National Park Service may be required to issue an easement pursuant to the Colorado Ditch Bill (Public Law 99-545, October 27, 1986) despite the fact that this legislation would not normally pertain to an NPS area.

The Closed Basin Division, San Luis Valley Project (Closed Basin Project) is located in the topographic depression (the Closed Basin) of the Valley. The purpose of the project is to pump and deliver unconfined

groundwater and available surface flows in the Closed Basin to the Rio Grande River via a 42-mile conveyance channel. The project assists Colorado in meeting its water delivery commitment to New Mexico and Texas under the Rio Grande Compact of 1939, and assists the United States in meeting its water delivery commitment to Mexico under a treaty dated May 21, 1906. The project also delivers water to the Alamosa National Wildlife Refuge under jurisdiction of the USFWS. Management responsibility for the Closed Basin Project features within the national park remains with the U.S. Bureau of Reclamation (Great Sand Dunes Act of 2000). The water level of San Luis Lake is also maintained for fishing and boating recreation using water from the Closed Basin Project (CNHP 1999). A portion of the Closed Basin Project is located within the southwest corner of the national park.

## **Surface Water**

### ***Surface Water Resources***

Surface water is a key resource at the Great Sand Dunes, transporting sediments for redistribution to the dunefields by wind, thus shaping the landscape and affecting distribution of plants, animals, and visitor use. The surface water resources are in a nearly natural condition and consist of perennial, intermittent, and ephemeral streams. Natural playa lakes, springs, seeps, and wetlands, i.e., interdunal ponds and wet meadows, are also present within the landscape. Stream flows are often heavy following snowmelt and during flood events following storms. Spring runoff from the Sangre de Cristo Mountains, most visibly characterized by Sand and Medano creeks, is the most obvious and plentiful source of surface water and groundwater recharge in the northern San Luis Valley

(CNHP 1999); however, for the most part, the park lies in a closed basin with a high water table, alkaline soils, and little external drainage pattern (NRCS 1973).

Medano Creek, fed by its numerous tributaries, flows from the Sangre de Cristo Mountains and around the dunefield along its eastern and southeastern borders and then disappears beneath the sand in the southern portion of the sand sheet where it deposits or recycles its load of sediment. Sand Creek flows from the mountains, then around the northern, northwestern, and western edges of the dunefield before entering the northern portion of the sand sheet, across which it runs to eventually flow into the San Luis Lakes southwest of the dunefield. Sand and Medano creeks become braided, sand-bottomed creeks in the vicinity of the dunefield and on the sand sheet habitats. Medano and Sand creeks are among the park's "fundamental resources and values" (see chapter 1 for the full list).

Surge or pulsating flows in Medano and Sand creeks represent the mechanism for returning vast quantities of wind-blown sand onto the valley floor. Sand Creek, although it is the largest creek in the park, does not display surge flows as consistently as Medano Creek. The water-borne transport of sand by these creeks is a key part of the eolian/hydrologic process that created and sustains the Great Sand Dunes. Sand is blown or eroded into the creek via landslides. Landslides occur as Medano Creek flows against the base of the dunes and undercuts the toe of the dune slopes. The creeks surge because the sand builds up in the creek bottom, creating a minor damming effect, and when the water reaches sufficient volume and pressure it surges downstream with the load of sand. USGS hydrologists consider the Medano Creek surge flow to be one of the best examples of this phenomenon in the world.

Castle Creek also displays outstanding surge flow at times and was the site at which the explanation for the surge flow phenomenon was developed.

Water percolates from the streams and recharges the shallow aquifer or emerges as a line of springs in what is believed to be an ancient channel of the Medano Creek drainage that was buried by sand deposits (Fryberger et al. 1990). Big Spring Creek originates at Indian Spring, one of the primary examples of an emergent spring on the sand sheet, west of the dunefield, and flows southwest to San Luis Lakes. Based on a study performed by the USGS (2004), it takes over 60 years for groundwater to migrate from Medano and Sand creeks to Big Spring Creek. Because it is fed by groundwater from seeps and springs, Big Spring Creek is the only gaining system in an area where most other drainages are losing systems. Because of its constant source, Big Spring Creek is a nonflooding creek with regular flow.

In the sand sheet habitat, the wind scours sand down to the elevation of the water table, allowing the establishment of interdunal wetlands (CNHP 1999); however, the ponds associated with the interdunal wetlands have been disappearing over the last 60 years. Hammond (1997) studied aerial photographs acquired from the 1930s through 1990s and determined 69 small ponds were present along the western part of the national park in the 1930s and only five remained in the 1990s. The cause of the disappearance of the ponds has not been fully investigated. However, the existence of the ponds is directly related to the level of the shallow or unconfined aquifer of the northern San Luis Valley (USGS 2003).

Sand sheet wetlands (interdunal ponds, Big Spring Creek, and Little Spring Creek) have been identified as fundamental resources

and values for the park (see chapter 1 for the full list).

### **Surface Water Quality**

Preliminary hydrologic research has shown that not only are surface water dynamics in the San Luis Valley complex, but that different sources vary widely in water quality (Cooper and Severn 1992). Most creeks within the park are thought to reflect near-natural water quality conditions and have been determined to maintain the highest water quality in the upper Rio Grande drainage. A USGS study (USGS 2003) found that several Great Sand Dunes perennial streams (Sand, Medano, and Mosca creeks) and ephemeral streams (Cold, Little Medano, Castle, Sawmill Canyon, and Garden creeks) are so pure that they meet the standards for the outstanding waters designation. This designation offers the highest level of water-quality protection available under the Clean Water Act and Colorado regulations, and is designed to prevent any degradation from existing conditions. The National Park Service closely monitors surface water quality within the park and preserve to ensure that high water quality is maintained. Medano Creek, with its outstanding water quality and closed system, has been identified as a fundamental resource of the park.

Potential sources of contamination to surface and groundwater at the park that are pertinent to the GMP alternatives include humans and animals (e.g., horses and dogs), and sedimentation/erosion (NPS 1995a). Oil and gas exploration activities on former Baca Ranch lands would likely not have any impacts on water quality within or near the park; such activities must be conducted according to an NPS-approved plan of operations designed to ensure protection of park

resources, in accordance with 36 CFR Part 9B.

Great Sand Dunes personnel sampled 10 sites along Medano Creek for the presence of fecal coliform during 1995 (Sundermeyer 1997). Samples analyzed for June (flow of 70 cubic feet per second [cfs]) detected nearly no coliform bacteria in the water. Up to 50 organisms per 100 ml of water were detected during an August (flow of 10 cfs) analysis. During the October (flow of 2.5 cfs) sample analysis, coliform bacteria were detected at a rate of 80 organisms per 100 millimeter (ml) of water. Creeks in the park, particularly Medano Creek, continue to be monitored for total coliform and *e. coli*. Results indicate that occurrences of these bacteria are within the range of <16 and <2.2 organisms per 100 ml of water, respectively. These densities are considered in the safe range for water quality; Medano Creek is classified under the Recreational Body of Water, Division I (full body contact) by the Colorado Department of Health and Environment (CDPHE), Water Quality Division.

### **Groundwater**

#### **Groundwater Resources**

The San Luis Valley has two major groundwater aquifers—the shallow or upper unconfined (Alamosa formation) and the deep or lower confined (Santa Fe formation) (USFWS 2003). Groundwater is regionally separated in the Alamosa and Santa Fe aquifers due to a thick layer of impermeable clay, known locally as the blue clay layer, and also lava flows. Both aquifers consist of unconsolidated clay, silt, sand, and gravel. Estimations in 1971 determined that there are over 2 billion acre-feet of groundwater stored above

6,000 feet elevation within the San Luis Valley (NPS 1997). These groundwater aquifers are considered the “fundamental resources and values” of the park (see chapter 1).

The age of the groundwater retained in the Santa Fe aquifer has been dated by the USGS (2004) at approximately 30,000 years before present; plus or minus 3,000 years. However, Magee and Mueller (1991) determined that there is mixing of the unconfined and deep aquifers along the east side of the San Luis Valley because the confining clay layer was absent in monitoring wells drilled and sampled for their study. Many flowing wells from the confined aquifer range in depths from 1,000 feet to over 2,000 feet and some flow at volumes of over 3,000 gallons-per-minute.

The Alamosa aquifer is restricted by the Closed Basin, resulting in very shallow (12 feet or less) groundwater conditions for about 50% of the San Luis Valley. The southern portion of the San Luis Valley, generally south of the Rio Grande, is well drained in terms of surface and groundwater and depth to groundwater can exceed 300 feet.

Seasonal runoff from the local mountains is the predominant recharge source for the Alamosa aquifer. Other sources include infiltration from applied irrigation water, canal leakage, and precipitation (Emery 1997). Studies performed by the USGS (2004) show there is a direct relation between the shallow aquifer and local surface water bodies, i.e., streams, creeks, and ponds. Thus, lowering of the shallow aquifer level would reduce the size and number of interdunal ponds and minimize the ability of creeks to transport or recycle upwind sand downstream to the sand sheet at the park. Historical and current groundwater pumping and water

development have been employed to lower the water table to expand agriculture and build roads in the interior of the San Luis Valley.

Because the depth of the Alamosa aquifer affects the ability of local creeks to recycle sand within the park and the occurrence of the interdunal ponds and wetlands, Great Sand Dunes staff installed 19 shallow groundwater wells between 1990 and 1993 to monitor water levels at the base of the dunefield (NPS 1995a). Eleven wells were placed near Medano Creek, five near Sand Creek, two near Mosca Creek, and one in the sand sheet on the national park boundary. Recently, 10 additional wells were installed near Big Spring and Little Spring creeks. As of 2005, Great Sand Dunes staff were monitoring 27 wells in the area to better understand fluctuations in the Alamosa aquifer and their causes.

### ***Groundwater Quality***

The groundwater of the shallow (Alamosa) aquifer of the San Luis Valley is highly mineralized and gaseous, while the deep (Santa Fe) aquifer is less mineralized and often under enough pressure to maintain artesian flows at well heads (CSP 1996). Concentrations of total dissolved solids from active salvage wells placed in the Alamosa aquifer have increased and sometimes exceed water quality levels for the water to be conveyed to the Rio Grande (CSP 1996).

At San Luis Lakes State Park, salvage well 66 requires extensive treatment for removal of heavy metals, minerals, alkalinity, and dissolved solids. Additionally, iron-feeding bacteria have been found in measurable concentrations within this well (CSP 1996). Evaluation of nitrate data from Alamosa aquifer groundwater samples identified mineral fertilizers as the primary source of

nitrate in the shallow aquifer system of upper San Luis Valley (Stogner 1997). As indicated by high mineralization and nitrification of the shallow aquifer (from fertilizer use), it is evident that this aquifer’s water quality is highly reliant on surface water quality in the northern San Luis Valley. That is, elements in the surface water become concentrated in the groundwater. As such, adverse impacts to surface water quality may also directly affect the quality of the Alamosa groundwater aquifer.

The term “visitor experience” refers to everything that happens to visitors while visiting the Great Sand Dunes—everything they do, learn, feel, and perceive. Insights about visitor activities and experiences come primarily from two visitor surveys. A Visitor Services Project Visitor Survey was conducted at the park June 23 – 29, 2002 (Le and Littlejohn 2003). Three hundred and sixty-four individuals responded to this survey, which is hereafter referred to as the 2002 Visitor Survey. The previous visitor survey was conducted between July and December 1997, which 284 people responded to, hereafter referred to as the 1997 Visitor Survey. These studies were conducted during short time frames and included a relatively small sample of visitors, so results may not be representative of all visitors.

The term “visitor use” refers to details about how many people visit the park, when and where they come from, how long they stay, etc. The Great Sand Dunes is presently experiencing a transition period related to the change from a smaller national monument to a larger park and preserve, opening of new lands to the public, etc. Visitor use also appears to be changing; therefore, it may be too soon to draw conclusions about new patterns of use.

## VISITOR USE AND EXPERIENCE

The national parks were created to “conserve the scenery and the natural and

historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.” One of the specific purposes of Great Sand Dunes National Park and Preserve is to “provide opportunities for visitors to experience, understand, enjoy, and gain a sense of stewardship for the park’s natural and cultural resources.” It is therefore important to consider visitor experiences, opportunities, and visitor use when analyzing the impacts of GMP alternatives.

### Visitor Experience

#### *Fundamental Resources and Values*

Several aspects of the visitor experience at the Great Sand Dunes have been identified as “fundamental opportunities” (see chapter 1 section, “Fundamental Resources and Values”). The National Park Service believes that the park should be managed to maintain these important opportunities. They are fundamental because they are tied closely to park purpose and significance—what is particularly special about the park. Fundamental visitor opportunities include the following:

- climbing and descending the high dunes, which are fairly resilient to recreational use
- experiencing surge flow, playing in Medano Creek near the foot of the dunes
- seeing the heavens (stars, planets, Milky Way, comets, etc.) at night
- viewing the dune mass with the backdrop of the high peaks, and from the mountains

- seeing wildlife in its natural setting (e.g., elk, pronghorn, deer)
- learning about the dunes system—its components and dynamic nature
- experiencing quiet and solitude in a wilderness environment
- driving in sand on the Medano Pass primitive road (high clearance four-wheel drive required)

(e.g., former Baca Ranch) until the GMP details such use.

Although most visitors do not participate in backcountry camping, back-packing, mountaineering, or horseback riding, some visitors come to the Great Sand Dunes specifically for these activities. These types of activities are popular within both the national preserve and the national park. Opportunities range from easy nature walks to strenuous multiday backpack trips. (See the “National Park Service Operations—Facilities” section of this chapter for a list of designated trails.) Horses and pack animals (e.g., burros and llamas) are allowed in most areas of the park, but there is an exclusion zone around the main dune use / visitor center area.

### **Range of Visitor Activities**

The Great Sand Dunes’ spectacular scenery and unusual changing landforms attract people throughout the year. The park offers a variety of recreational activities and opportunities, particularly now that it is larger and includes the lands within the national preserve. According to the 2002 Visitor Survey, the most common visitor activities are climbing the dunes (80%), visiting the visitor center (74%), and scenic driving or photography (56%). The next most common activities include wildlife viewing (32%), dune sliding (31%), hiking (29%), picnicking (29%), and attending ranger programs (22%).

Opportunities for scenic driving are available primarily on the main park road and turnouts, plus the Medano Pass primitive road. The latter requires a four-wheel drive, high clearance vehicle due to deep sand sections (lower elevations), stream crossings, and rocky sections (upper elevations). The Medano Pass primitive road, which leaves the national preserve at the crest of the mountain range and continues on into the western portion of the San Isabel National Forest, is closed when wet, icy, or snow conditions result in resource, public safety, or maintenance concerns. Public vehicle use is not permitted on roads in park expansion lands

Camping is available at the Pinyon Flats campground and at designated sites along Medano Pass primitive road. Camping along Sand Ramp Trail is allowed only at designated backcountry campsites. Visitors can also camp in other undesignated areas in wilderness or nonwilderness portions of the park (permit required and certain conditions apply). However, there is a no-camping zone on the eastern edge of the dunefield. Camping opportunities are also available just outside the park at the Oasis, in San Luis Lakes State Park, and campgrounds in Crestone on the north side of the park and the North Crestone Creek Campground (a USFS campground located just north of Crestone).

Bicycling is restricted to the same park roads where public vehicles are allowed. Bicycles are not permitted on hiking trails or within designated wilderness areas.

The main picnic area is located adjacent to the dunes parking lot, but picnic tables are also available at several turnouts along Medano Pass primitive road.

Hunting and fishing are also popular. Hunting is allowed in the national preserve (Great Sand Dunes Act of 2000), but not in the national park. Fishing is allowed throughout the park. Both activities are conducted in accordance with applicable state and federal laws.

As of 2005, commercially guided visitor activities included guided hiking and horseback rides, photographic workshops, overnight trips with packstock, four-wheel drive tours in open air jeeps (designated route), and guided hunting (preserve only).

Dogs are allowed in all areas of the park, provided they are on a leash. This is atypical in the national park system—most national parks allow dogs only in parking lots and campgrounds. Dogs that are being used for hunting are allowed off-leash within the national preserve (see the “Health and Safety—Dogs” section for details).

### ***Interpretation, Information, and Education***

Basic information about the park, including details about visitor opportunities, facilities, programs, and safety, is available from the park’s Web site, visitor center information desk, and from the interpretive newspaper. The newspaper and the park map and guide are handed out at the fee booth or visitor center. About 500 copies of the newspaper are mailed out annually in response to inquires for trip planning information.

Outdoor and indoor exhibits at the visitor center and various roadside interpretive signs provide orientation information and/or interpret natural resources/systems and cultural resources in keeping with the park’s interpretive themes. The visitor

center also offers visitors a central meeting place and point of orientation.

The visitor center includes an auditorium that is used for several different purposes throughout the year. During the spring and fall school trip seasons, it is used with school groups, and a series of movable, hands-on exhibits designed for that room help teachers and students connect the park with their curriculum. In summer, the park’s interpretive movie is regularly shown in the auditorium.

The visitor center also provides a small space for changing exhibits, allowing for seasonal art exhibits, childrens’ exhibits, or temporary displays. The Western National Parks Association maintains a year-round bookstore in the visitor center, and entrance fees are collected at the building October through April.

Scheduled interpretive programs are offered at the park most days from late May through September, and are designed to help visitors make emotional and/or intellectual connections with park resources. Interpretive programs are also offered October to April on a limited basis, or by request for groups. Programs include short talks at the visitor center, guided interpretive walks or hikes on the dunes or in the foothills, and evening ranger talks and other programs in the campground amphitheater. Sample topics include geology, hydrology, and geography, ecology and ecological systems, natural processes (wind, water, etc.), human connections with the dunes over time, the high country of the national preserve, and programs tailored for children.

Curriculum-based education programs for kindergarten through college students are available throughout the year. Hands-on discovery activities in the dunes, foothills, or wetlands are available seasonally, and in

the local classrooms in winter months. Park staff work with instructors to ensure that presentations are tailored to meet the needs of the class, as well as the park's interpretive themes. Programs are designed to increase student understanding of how their lives are connected with the natural world. The programs provide an outlet for creativity, exploration, and student-driven inquiry. Park staff are generally available for classroom programs in San Luis Valley schools from September through early April.

An online curriculum resource for primary and secondary teachers and students is also available. It includes lesson plans for elementary teachers, research-based online activities for middle schoolers, and special activities for high school students.

Free interpretive publications are available at the visitor center and from park staff; these provide orientation information and more in-depth interpretation on selected topics relative to park resources. Introductory printed information is available in German, French, Spanish, and Japanese for international travelers.

Workshops at The Nature Conservancy's Medano-Zapata Ranch are available spring through fall on a variety of topics. Bison and ranch tours are also available on selected dates.

### **Visitor Perceptions, Opinions, and Motivations**

Respondents to the 2002 Visitor Survey were asked what they liked most about their visit to the Great Sand Dunes. The top 10 most frequently mentioned features or characteristics, in descending order, were: (1) the natural beauty of the area; (2) the dunes themselves; (3) climbing the dunes; (4) hiking; (5) uniqueness of the dunes; (6)

quiet, solitude, peaceful environment; (7) walking; (8) camping; (9) playing in the sand; and (10) the helpful and friendly staff. When visitors were asked what they liked *least* about their visit, the top five were: (1) hot weather/heat; (2) smoke/haze from forest fires; (3) drought—no water in the creek; (4) not enough time to enjoy it all; and (5) long, tiring walk to dunes; all are factors that are essentially outside the control of NPS managers.

According to the 1997 Visitor Survey (conducted prior to park expansion), the most common reasons for visiting the park were photography, education, recreating on the dunes, finding solitude or quiet, watching wildlife, and hiking on developed trails.

Visitors in 2002 were also asked how particular aspects (noise, horses, dogs, night time light pollution, lack of solitude, and "other") affected their park experience. Among those elements, dogs (4%) were mentioned most often as contributing positively to visitors' experience. Lack of solitude (15%), dogs (7%), and noise (6%) were the specific aspects mentioned most as detracting from visitors' experiences.

**Dogs.** As the statistics above indicate, there are wide-ranging visitor perspectives regarding allowing dogs in the park. Some people appreciate (or at least don't mind) dogs being allowed in all areas of the park. There are valid concerns about the safety of dogs left in or tied to vehicles, and many dog owners simply like to take their dogs along while hiking, etc. Other people would prefer that dogs not be allowed, or that they be restricted to certain areas such as parking lots and campgrounds. Concerns about dogs include aggressive dogs, dog waste, effects on wildlife, health of dogs on the hot sand, and noise. The park

occasionally receives letters on both sides of the dog issue.

**Crowding.** Visitors in 2002 (an unusually low visitation year) were asked how crowded they felt during their visit to the park. In 2002, 56% indicated they did not feel at all crowded, and 35% said they felt somewhat crowded. A total of 9% of respondents said they felt crowded, very crowded, or extremely crowded. When these visitors were asked where they felt crowded, the commonly mentioned locations were the campground (mentioned 17 times), visitor center (since enlarged and remodeled—mentioned 9 times), four-wheel drive roads (4 times), dunes (3 times), and parking area (3 times). When visitors were asked what they liked least about their visit, 12 respondents (3%) said the park was too crowded or had poor visitation control—the seventh-most frequently mentioned item (of 26 items). Perceptions of crowding may be higher during years with higher visitation.

### ***Wilderness Values, Including Solitude***

As of 2005, the park contained 75,641 acres of designated wilderness. Of this, 35,955 acres were added when the park was enlarged in 2000 (Sangre de Cristo wilderness portion). According to NPS *Management Policies 2001*, recreational uses in NPS wilderness areas should be of a nature that “enables the areas to retain their primeval character and influence; protect and preserve natural conditions; leave the imprint of man’s work substantially unnoticeable; provide outstanding opportunities for solitude or primitive and unconfined types of recreation; and preserve wilderness in an unimpaired condition.” This means that mechanized and motorized activities are typically not allowed (see appendix G for more information). Most of the designated

wilderness areas in the Great Sand Dunes provide outstanding opportunities for solitude and primitive recreation. The dark night sky and natural quiet are wilderness qualities that are highly valued by visitors to the Great Sand Dunes.

The opportunities and experiences provided by the Great Sand Dunes Wilderness and the Sangre de Cristo Wilderness are rather different due to their natural landscapes. The Great Sand Dunes Wilderness, which includes the dunefield and is located in the national park, is mostly sandy, open country. It’s easy to see people, wildlife, and scenic vistas over long distances, provided the terrain allows. The portion of the Great Sand Dunes Wilderness between the dunes parking lot and the tall dune, including Lower Medano Creek, is extremely popular for free play. While opportunities for solitude here are intermittent, visitors enjoy great freedom in pursuing “primitive and unconfined recreation” as they play on the dunes. People seeking solitude during busy periods can come early or late in the day, or hike over nearby dune ridges to find it. The Sangre de Cristo Wilderness, located in the national preserve, is mostly rugged, forested, and mountainous. Below timberline, rugged topography and dense vegetation make it easier to perceive solitude—it’s harder to tell when other visitors are nearby.

Park visitors in 2002 were asked to rate the importance of solitude to their visits in the designated wilderness area. Thirty percent indicated that they did not visit designated wilderness areas. Of those who did, 70% rated solitude as “very important” or “important.” Eighteen percent said it was “somewhat important,” and 12% said it was not important or had no opinion (2002 Visitor Survey). Of those who said recreating in the park was an important reason for their visit in 1997, more than half

were seeking little or no contact with other people (1997 Visitor Survey).

## **Visitor Use**

### ***Parkwide Visitation***

The National Park Service defines a “visit” as the entry of any person for recreational purposes onto lands or waters administered by the National Park Service. Total annual visitation to Great Sand Dunes National Park since 1932 (the beginning of historical visitation records) steadily increased through the 1970s. Significant declines in visitation occurred in the early 1980s. Visitation rebounded in the late 1980s through the 1990s, then declined significantly again in 2002, before rebounding again in 2003 and 2004 (figure 9)

Several factors are thought to have contributed to the declines in visitation from 1997 through 2002. First, the park converted from pneumatic rubber-hose (above road) vehicle counters to more reliable electrical “loop” counters (wires embedded in the road) in 1998. Park staff estimate the rubber-hose counters inflated visitation statistics by as much as 9%. In 2000, a wildfire closed the park for a time, affecting visitation. There was also a general decline in travel and tourism since 2001 and 2002 associated with drought, regional wildfires, and lagging investments in statewide tourism campaigns.

Total visits to Great Sand Dunes in recent years include the all-time peak visitation of 312,795 in 1994, after which it declined to a low of 235,305 visits in 2002. Average visitation for the 13-year period between 1992 and 2005 is 285,540 visits (figure 10).

Visitation at Great Sand Dunes follows a seasonal pattern typical of many national

parks. Visitor use peaks during the summer (July), with relatively low visitation during the winter, and moderate spring and fall use.

Medano Creek, which runs seasonally at the base of the dunes, may correlate to fluctuations in visitation. In average to wet years, Medano Creek begins as a trickle in early April, increases to a wide, shallow stream at its peak in May, and diminishes throughout the summer. By August, the creek is typically a trickle near the dunes parking area.

Despite fluctuation in total annual visitation, the patterns of visitation during the year are roughly the same. During years with low visitation, the biggest drop is evident during the summer months. Figures 11 and 12 portray cumulative visitation over the year for selected years and the 13-year average.

Visitation is relatively stable during the first and last four months of the year. However, visitation from May through August has substantial year-to-year variation (figure 12). Visitation in July is particularly volatile, with monthly visitation in 1995 nearly double that recorded in 2002, the latter a year in which drought conditions and extensive wildfires in Colorado adversely affected travel and tourism across much of the state.

If history is any indicator of future public visitation patterns to Great Sand Dunes, future management should take into account the typical visitation pattern of peak summer and low winter visitation, with moderate visitation in spring and fall. National crises such as terrorist threats and attacks, economic factors such as gasoline prices, and natural phenomena (including climatic variability, drought, and wildfire) will continue to affect future visitation.

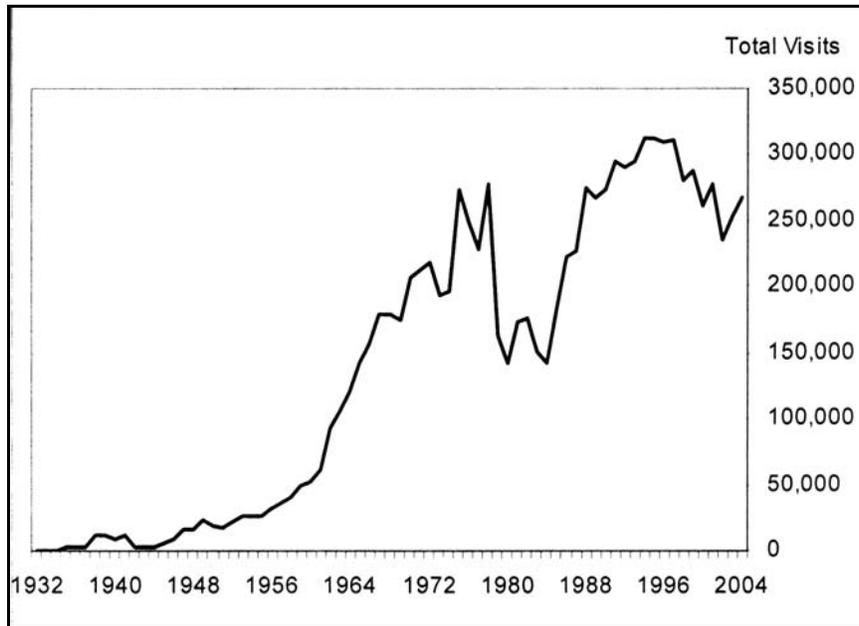


FIGURE 9. TOTAL ANNUAL VISITS TO THE GREAT SAND DUNES, 1932 TO 2004

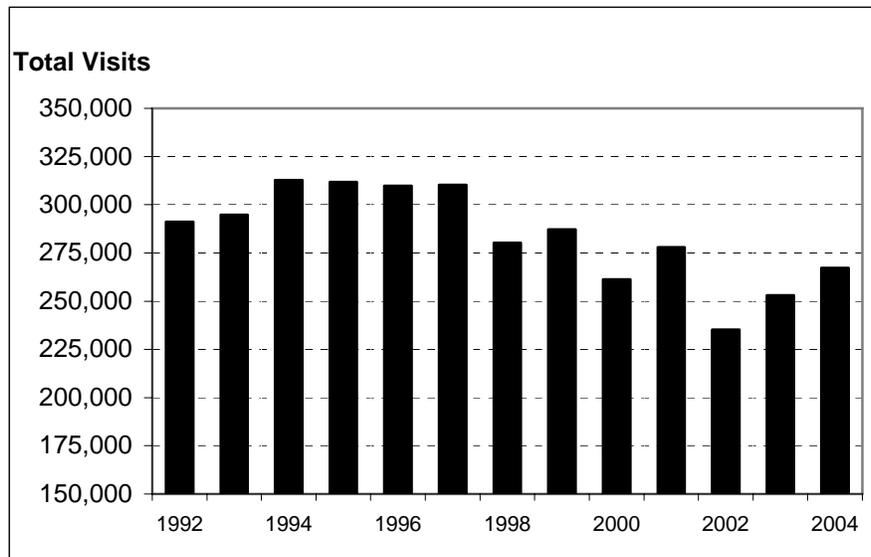


FIGURE 10. TOTAL ANNUAL VISITS TO GREAT SAND DUNES, 1992 TO 2004

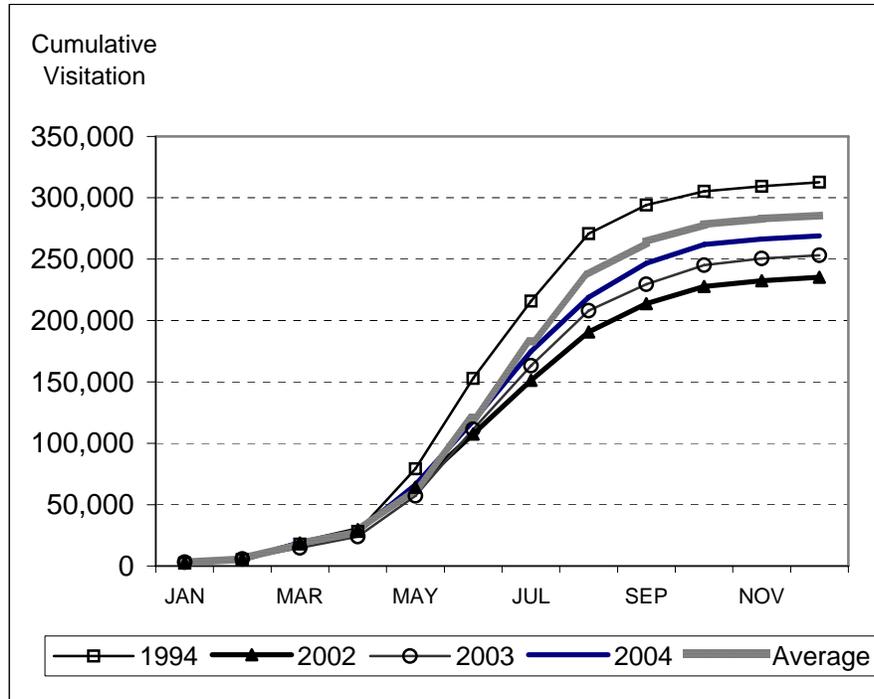


FIGURE 11. CUMULATIVE VISITATION AT GREAT SAND DUNES, SELECTED YEARS AND AVERAGE 1992 TO 2004

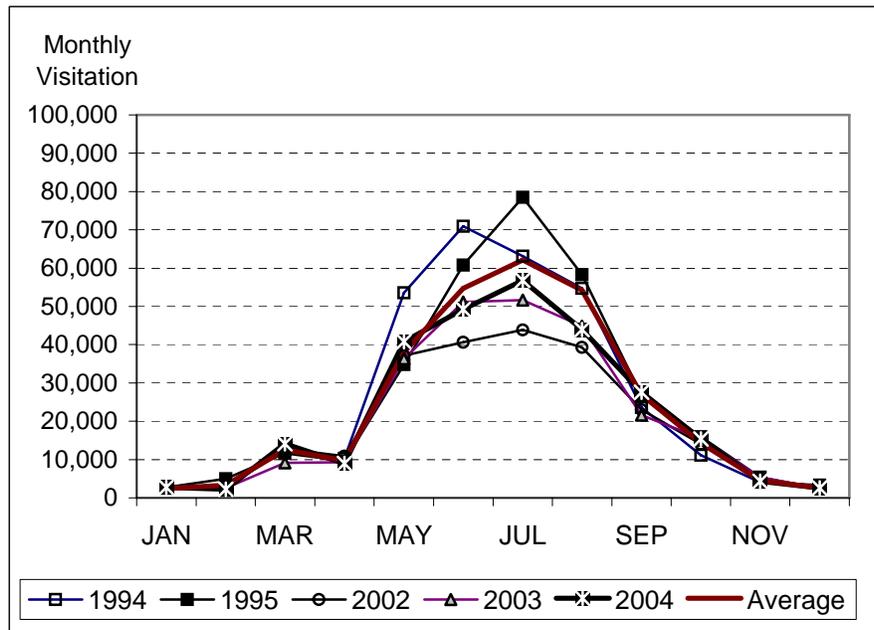


FIGURE 12. MONTHLY VISITATION AT GREAT SAND DUNES, SELECTED YEARS

Expansion of the park’s boundaries and change in administrative management of the preserve resulted in an increase in recreation use. In part, the increase was a simple accounting change as use previously attributable to the national forest now occurs at the Great Sand Dunes. Another source of increase was use that either did not occur previously because the lands involved were privately owned, occurred elsewhere on private or public lands, or represents new use prompted by the establishment of the park.

Accurate tallies of the increase in use are hampered by the large geographic area affected, dispersed nature of use, and remoteness of many points of entry into the park from central administrative facilities. Estimates of such use were consequently developed by park staff, based on information obtained from the USFS, from observed backcountry use, and use at informal parking areas, and from professional judgment. These estimates suggest an increase of about 22,600 annual visitors over and above the counts recorded by the park’s existing counters (table 6). The adjusted total of 291,000 visitors in 2004 provides a basis for comparing future visitation for the GMP alternatives. Annual visitation to the Great Sand Dunes is anticipated to increase over time under the no-action and all action alternatives.

**TABLE 6. ESTIMATED CURRENT ANNUAL USE**

2004 (recorded)	2004 (adjusted baseline)
268,400	291,000

***Use of Different Park Areas***

The dunefield, Medano Creek, and the developed area east of the dunes (visitor center, campground, dunes parking lot,

picnic area) receive the vast majority of visitor use at the Great Sand Dunes. Of park sites accessed by hiking or horseback in 2002, the most frequently visited were the high dunes (67% of visitors surveyed), visitor center loop trail (29%), Medano Creek bed (23%), and the campground trail to the dunes (18%). Of sites accessed by automobile, the most frequently visited were the dunes parking lot (91% of visitors), visitor center (84%), and dunes picnic area (28%). Of visitors surveyed, 12% accessed Medano Pass primitive road (2002 Visitor Survey). It is important to note that this information was gathered before the former Baca Ranch lands were opened to public use in December 2004.

Unless the weather is poor or Medano Creek is not flowing, the dunes parking lot typically fills to capacity at least once daily each weekend day from Memorial Day weekend (late May) through the July 4th holiday weekend. The lot also typically fills over the Labor Day weekend in September. Thus, the lot typically fills for at least some part of the weekend six to eight weekends during the summer months. It’s not unusual for the lots to remain filled for 4 to 6 hours during the middle of the day on the busiest weekends. According to park records, the dunes lot fills on days when about 500 cars enter the park.

Pinyon Flats campground typically reaches capacity on Thursday, Friday, and Saturday nights from mid-May through mid-August, plus a few days around the summer holidays. At least two parking lot turnouts located on Medano Pass primitive road (Point of No Return and Castle Creek) fill up on the holiday weekends and usually on the first two weekends in June. Castle Creek may fill more often. The primitive campsites along Medano Pass primitive road typically fill during the Memorial Day weekend. Depending on the year, they may also fill on early June weekends and during

the July 4th holiday. Medano Pass primitive road experiences enough vehicle use on busy summer weekends (especially holiday weekends) that park rangers or volunteers alternate traffic traveling in opposite directions. This reduces the need for vehicles to pass one another and helps protect roadside resources.

### ***Length of Stay***

Seventy-seven percent of 2002 visitors spent less than 24 hours at the park. Of these, 40% spent less than 2 hours, 37% spent between 2 and 4 hours, and 22% spent more than 4 hours. Of the 23% who spent 1 day or more in the park, 35% spent 1 day, 38% spent 2 days, and 27% spent 3 days or more. Most overnight visitors (86%) stayed in the Pinyon Flats campground, 7% stayed in a backcountry campsite, and another 7% said they used “other” lodging. There are no motel-type accommodations within the park, but the Oasis, a private enterprise located just outside the park on the main entrance road, includes a motel, among other amenities.

### ***Visitor Origin and Other Details***

The following statistics come from the 2002 Visitor Survey. They were gathered over one week in June 2002, and may not be typical of year-round visitation. American visitors were mostly from Colorado (38%), Texas (13%), or California (5%). Of Colorado visitors, nearly 80% came from the more urbanized and densely-populated Front Range counties that include Denver, Fort Collins, Colorado Springs, and Pueblo. Residents of the San Luis Valley accounted for about 8% of the Colorado visitors, though the share is likely higher on an annual basis. International visitors (most from Germany, Holland, or England)

represented only 4% of total visitation. English was the primary language of 97% of respondents. Additional details can be found in the 2002 Visitor Survey.

## **SCENIC RESOURCES AND VISUAL QUALITY**

Great Sand Dunes National Monument was established for “the preservation of the great sand dunes and additional features of scenic, scientific, and educational interest.” The park’s scenery is one reason the park is popular. The park’s fundamental resources and values (see chapter 1) include viewing the dune mass with the backdrop of the high peaks and viewing wildlife in its natural setting. For viewing the dune mass with the backdrop of the high peaks, key elements include: views approaching from the west and south, views from the mountains, changing light conditions, shadows and contrasts on the dunes in early morning and evening, good air quality, and undeveloped mountain slopes.

The scenic resources of the Great Sand Dunes have a high degree of cultural significance. Many of the views into and from the park are iconic and are reflected in the works of artists. The park is a favorite subject for professional and amateur artists, photographers, and writers whose work communicates the striking scenery of the park to visitors and others.

Scenic vistas from many vantage points in and around the park are distinctive and memorable. The spectacular wind swept dunes, the high snowcapped peaks of the Sangre de Cristo range, clean air, changing skies and shadows, the rural agricultural valley, and panoramic views combine to offer a wealth of visual resources. As people move through the park’s various life zones, whether on foot, horseback, or by passenger vehicle, they experience a

sequence or pattern of visual resources that provide a cumulative visual experience. This cumulative experience involves the interaction of multiple elements in relation to each other: the juxtaposition of individual features in the foreground and background, the interface of different surfaces, and the interplay of light reflecting off different colors and textures. Protecting this suite of visual resources is as important as protecting any one element.

Scenery is one of the main reasons visitors come to the park. The 2002 Visitor Survey found that 56% of visitors participated in scenic driving or photography. This was the third-highest rated activity, after climbing the dunes and visiting the visitor center. Today, although buildings and structures intrude on some scenic vistas, the surroundings are mostly natural. Human-made features do not dominate, even in the landscapes where they are visible. To date, scenic resources have not been formally studied or analyzed in the park or preserve.

The preserve stretches from the eastern boundary of the old national monument to the crest of the Sangre de Cristos, from just west of Carbonate Mountain on the south side to Milwaukee Peak on the north, then south through Music Mountain, Tijeras Peak, and Cleveland Peak. The preserve is part of the Sangre de Cristo Wilderness, and offers opportunities for backcountry hiking and camping. Views within the preserve include those of the high mountain peaks, tundra, small mountain lakes, clear blue skies, and clear, starry night skies. There are very few human-made features (e.g., Medano Pass primitive road, hiking trails, and signs) to intrude upon views, and these do not dominate the natural landscape from any perspective. The preserve also offers expansive panoramic views and glimpses of the Sangre de Cristo range, 14,000-foot-plus

peaks, the eastern plains, the San Luis Valley, and the dunes, as visitors move through the landscape.

For many visitors, the ever-changing play of light and shadow on the near-barren, massive dunefield, backed by alpine peaks, provokes strong emotional responses. The dunefield can be viewed from almost anywhere in the park, including the main road and turnouts, the visitor center and loop trail, the dunes parking lot and campground, the valley floor, and from the mountains in the preserve. From the dunes, visitors see a seemingly endless dunefield from some vantage points, and the mountains and rural valley from others. The dunefield is designated wilderness and contains virtually no human-made features. Human-made structures (visitor center, roads, parking lots, campground, amphitheater, and administrative facilities) are not prominent, but they are visible on the eastern edge of the dunes, and can be a visual distraction, though for some they may provide a sense of reassurance.

The new park lands to the west of the dunes contain the grass- and shrub-covered sand sheet, salt-crusted sabkha and creeks, riparian corridors, and wetlands. These lands include features associated with ranching, including fences, two-track roads, cabins, corrals, houses, and outbuildings. Views within the new park lands include grasslands and shrublands with tree stands along some creeks, and distant views of the dunes and mountains, plus typically clear sky during day and night. Views beyond the park boundary to the west, north, and south include the rural agricultural landscape and low-density residential development. Due to the wide-open spaces, these elements do not dominate the landscape, but are merely an element in the mix.

## Visual Quality and Night Sky

Great Sand Dunes National Park and Preserve is a class I air quality area. Class I areas deserve the highest level of air quality protection. The Clean Air Act of 1970, as amended, requires federal officials responsible for managing class I areas to protect the air quality-related values of these areas, including visibility, and to consult with permitting authorities regarding possible adverse impacts from new or modified emitting facilities. The Wilderness Act of 1964 also provides direction for management of air quality; it gives the National Park Service responsibility to manage designated wilderness to preserve and protect its unspoiled character, which can be affected by human-caused air pollution.

Great Sand Dunes National Park and Preserve has consistently attained state and federal ambient air quality standards (Fire Management Plan Environmental Assessment 2005). However, visual quality is often affected by particulates in the air. On most days, visibility is 60 to 80 miles for 180 degrees (NPS Fire Management Environmental Assessment 2005). Air quality was monitored at the then national monument from 1988 to 1995, and a 1997 report summarizing this monitoring program concluded that visibility is best in winter and worst in spring (Binkley 1997). Sulfates, soot, and coarse particulate material contribute most to decreased visibility. Smoke from natural and prescribed fires, woodburning stoves, and campfires is one problem. Effects of agricultural operations (burning stubble, harrowing, planting, etc.) are another. Windy weather increases airborne particulates and decreases visibility, especially in the windier spring months. In 2005, 16 industrial facilities, including refineries, cement plants, a steel mill, a

pharmaceutical manufacturer, and 10 power plants were tentatively identified by the Colorado State Department of Public Health and Environment as sources of haze clouding the region's national parks, including the Great Sand Dunes. Automobiles, wildfires, and dust from feedlots also contribute to the mix of haze-forming pollutants in the region (Denver Post 2005).

Another component of visual quality is ambient light and its effect on the night sky. In accordance with NPS *Management Policies 2001*, the National Park Service strives to preserve natural ambient lightscapes, which are natural resources and values that exist in the absence of human-caused light. Commercial, residential, and agricultural development in the San Luis Valley can introduce light into otherwise naturally dark areas. Within the park, the administrative areas, campgrounds, Medano Ranch, and the visitor center are sources of artificial light. These areas are directly visible from vantage and viewing points within the park and preserve. The National Park Service minimizes extraneous light sources and protects the dark night sky by using shielded lighting, downward directed lighting, and strategically located light sources. The Baca Grande community, located to the north of the national park, has guidelines designed to minimize extraneous light. These include use of motion-activated lights, and shielded or hooded exterior lighting that is limited to entry walks, porches, and exterior patios (Baca Grande 2002). Due to such efforts and the largely rural and undeveloped landscape surrounding the park, there are outstanding opportunities to see the stars, moon, and planets on clear nights. Attempts to measure night darkness at the park have been unsuccessful thus far .

## SOCIOECONOMICS

The influence area for economic and social considerations associated with the Great Sand Dune GMP encompasses Alamosa and Saguache counties in south-central Colorado. The region is predominately rural. The largest community in the region, the city of Alamosa, is located about 25 miles southwest of the park, with several smaller communities in the surrounding area.

### Population

Alamosa and Saguache counties experienced modest population growth during the 1980s and 1990s. After 1990, population growth slowed in Alamosa County. Population growth in Saguache County was substantially higher, with a net increase of 2,410 residents, or 52% compared to 1990 (table 7). The latter growth was concentrated around the community of Center, about 25 miles west of the park, and in the Baca Grande subdivision. Statewide population growth was 40% during the same period, exceeding 4.6 million in 2004.

In Alamosa County, the city of Alamosa population was estimated at 8,545 in 2004. Another 126 residents resided in Hooper, and the remaining 6,417 residents (42%) lived in unincorporated Alamosa County. The majority of Saguache County residents (3,676 est.) lived in unincorporated areas, including the Baca Grande subdivision. Center and Saguache are the county's two largest communities, with 2,500 and 620 residents, respectively, in 2004. Other communities in the region include Bonanza

City, Crestone, and Moffat (U.S. Census Bureau 2005(b)).

Population trends in the two counties are driven by different influences. In Alamosa County, new births are offset in large part by out-migration. Growth in Saguache County has occurred primarily from lifestyle migration into the Baca Grande and Crestone communities, and the settlement in Center of agricultural households employed across the San Luis Valley.

### Economic Overview

Total full- and part-time employment in Alamosa County was 10,521 in 2003, compared to 7,191 in 1990; a gain of 3,330 jobs or 46%. Employment in Saguache increased to 2,750 jobs in 2003 from 2,131 jobs in 1990; a gain of 619 jobs or 29%. Employment data for 2003 highlight structural differences in the economies of the two counties (table 8).

The federal government has a substantial presence and plays an important role in the regional economy. Federal agencies, including the National Park Service, USFWS, USFS, U.S. Postal Service, NRCS (agriculture), and others reported a total of 237 civilian employees in the two counties in 2004, about 1.8% of all jobs. The economic significance of the number of jobs is amplified by their above-average earnings and associated operating, maintenance, and capital expenditures in the local economies.

**TABLE 7. POPULATION GROWTH TRENDS, 1990 TO 2004**

	1990	2000	2004	Change 1990–2004	% Change 1990–2004
Alamosa	13,617	17,966	15,088	1,471	11%
Saguache	4,619	5,917	7,029	2,410	52%
Colorado	3,294,473	4,301,261	4,601,403	1,306,930	40%

Source: U.S. Census Bureau, 2002 and 2005(a)

**TABLE 8. EMPLOYMENT BY MAJOR CATEGORY, 2003 (PERCENT OF TOTAL)**

County	Farming	Industrial *	Trade & Services **	Government ***
Alamosa	8%	15%	56%	21%
Saguache (est.)	20%	26%	31%	23%
* Industrial includes forestry, mining, utilities, construction, manufacturing, transportation and warehousing, management of companies, and administration and waste services.				
** Trade and services includes wholesale and retail trade, information services, finance and insurance, real estate, professional and technical services, education and health care, arts and recreation, accommodation and food services, and other services.				
*** Includes federal, state, and local government				

Source: U.S. Bureau of Economic Analysis, 2005

Agriculture plays a major role in the Saguache County economy, both in terms of direct farm employment, and indirectly through support for agricultural services, transportation, trade, and related private and government services. Agriculture is also important in Alamosa County; however, trade and services are more dominant, reflecting the city of Alamosa’s role as a regional trade and service center.

In 2002, 570 individual farms and ranches, encompassing more than 681,000 acres, were operating in the two counties (table 9). Of those, 318 were in Alamosa County, collectively covering nearly 44% of the county’s total land area. Agricultural operations in Saguache County involved about 24% of the county’s total acreage. In 2002, sales of local crops and livestock

generated more than \$176 million in the two-county region. Potatoes, barley and wheat grains, and forage for livestock feed were the predominant crops in terms of the acres harvested.

Among the local ranch operations is the 103,000-acre Medano-Zapata Ranch owned by The Nature Conservancy. Comprised of two historic ranches, the Medano-Zapata now operates as a working cattle and bison ranch, environmental education center, and landscape-scale conservation area. Eleven full- or part-time positions are associated with Medano-Zapata. Annual economic contributions of the Medano-Zapata Ranch include approximately \$500,000 in sales of livestock and hay, which support ranch operations, a comparably sized operating

**TABLE 9. OVERVIEW OF AGRICULTURAL OPERATIONS IN THE REGION, 2002**

County	Number of Farms	Total Farm Employment	Acres in Farms	Average Size (Acres)	Market Value of Sales (Millions)
Alamosa	318	752	204,640	644	\$ 94.5
Saguache	252	542	477,003	1,893	\$ 81.9

Sources: USDA, 2004 and Bureau of Economic Analysis 2005

budget for The Nature Conservancy’s environmental education and conservation programs, and expenditures in the local community by guests and visitors to the Medano-Zapata Ranch (Robertson 2005).

Recreation and tourism also have a substantial role in the regional economy. In addition to the park, other recreation and tourism attractions in the San Luis Valley include:

- portions of the Rio Grande National Forest
- the Cumbres and Toltec Scenic Railway (a steam-powered excursion railroad)
- Monte Vista, Alamosa, and Baca national wildlife refuges
- San Luis Lakes State Park and multiple-state wildlife management areas
- Los Caminos Antiguos Scenic Byway
- Fort Garland Historic Fort and Museum
- multiple spiritual, new age, and retreat centers in Crestone and the Baca Grande subdivision

- Shrine of the Stations of the Cross in San Luis
- numerous local museums and historical sites
- annual sandhill crane migration and festival

In addition, U.S. highways 160, 17, and 285 carry many tourists through the region to Mesa Verde National Park, Santa Fe, Taos, and a myriad of other cultural, recreational, and historical destinations. Visitors and travelers support numerous jobs in the region’s retail trade, accommodations and dining, and entertainment and other affiliated industries.

**Commercial Services Provided for Great Sand Dunes National Park and Preserve**

As of 2005, one concessioner operated within the park to provide firewood and incidental camper supplies such as sunscreen, insect spray, ice, and vended soft drinks. Ten incidental business permit holders provided services for horseback riding and pack trips, guided hunting, guided hiking, photography workshops, and four-wheel drive tours (NPS records 2005).

## **Income, Poverty, and Unemployment**

Total personal income in Alamosa County was \$350.1 million in 2003, nearly three times the \$120.4 million in Saguache County.<sup>2</sup> More than 11% of all earnings paid to workers in Alamosa County was to workers commuting from outside the county. Saguache County benefited from a net inflow of \$16.8 million. Net earnings flows from Alamosa County and into Saguache County have increased in recent years. Despite recent gains, per capita income in the area lags behind other areas in Colorado (table 10). Per capita incomes of \$23,216 in Alamosa (2003) and \$18,063 in Saguache, ranked 50th and 62nd in the state, respectively.

Over time, local unemployment rates have been persistently above the statewide averages (table 11). The seasonality of many jobs in agriculture, tourism, and trade, and service firms catering to students at Adams State College contribute to that pattern, as well as to the lower than average per capita incomes.

## **Demographic Characteristics**

Alamosa County's population tends to be younger than that of either Saguache County or the state of Colorado. Alamosa County has a higher share of residents between 15 and 34 (table 12). Saguache County, in contrast, has a higher share of residents 55 years and older, many of whom are retired or semi-retired.

Both counties have relatively large minority populations. More than one of four residents in Alamosa and Saguache counties are nonwhite, compared to about one of six statewide. Hispanics and Latinos comprised over 40% of the local population in 2000, and American Indians accounted for 3.7%. Apache, Navajo, Ute, and Latin American were the most commonly reported tribal affiliations. No established American Indian reservations are located in Alamosa or Saguache counties.

Over 72% of all residents in Alamosa County in 2000 had lived in the county in 1995, 28% having moved from elsewhere, primarily elsewhere in Colorado. More than 31% of Saguache County residents had moved there since 1995.

## **Housing**

At the time of the 2000 census, Alamosa and Saguache counties recorded vacancy rates above the statewide average of 8.3%. In Alamosa County, overall vacancy rates were 10.2%, with 621 units vacant. More than 25% of all units were reported vacant in Saguache County (table 13). However, while more than half of the vacant units in Alamosa County were for rent or sale, 46% of the vacant units (361 units) in Saguache County were reported as being for seasonal, recreational, or occasional use. The latter includes about 75 units located in Crestone, the Baca Grande subdivision, and nearby areas.

---

<sup>2</sup> Personal income includes work-related earnings, social security and other income maintenance payments, unemployment benefits, retirement, and income derived from investments. Total personal income is an indicator of the relative size of an economy, while changes in income over time may reflect changes in economic welfare, but also changes in the levels of economic activity, population, and inflation. Per capita, median, and other income measures provides a basis for comparing economic welfare between areas.

**TABLE 10. PER CAPITA PERSONAL INCOME, 2000 TO 2003**

	2000	2001	2002	2003	% Change 2000–2003	Statewide Rank (of 64)
Alamosa County	\$ 20,568	\$ 21,588	\$ 22,984	\$ 23,216	13%	50
Saguache County	\$ 15,260	\$ 17,081	\$ 18,337	\$ 18,063	18%	62
Colorado	\$ 33,370	\$ 34,491	\$ 34,228	\$ 34,561	4%	NA

Source: U.S. Bureau of Economic Analysis, 2005

**TABLE 11. UNEMPLOYMENT RATES, 2000 TO 2005**

	Annual Average					2005 (June)
	2000	2001	2002	2003	2004	
Alamosa County	3.5%	5.8%	6.3%	6.7%	6.2%	5.9%
Saguache County	5.3%	8.6%	7.4%	5.6%	7.0%	7.6%
Colorado	2.6%	3.9%	5.9%	6.0%	5.5%	5.2%

Sources: Colorado Department of Labor and Employment, 2005 and U.S. Bureau of Labor Statistics, 2005

**TABLE 12. SELECTED DEMOGRAPHIC CHARACTERISTICS, 2000**

	Median Age (Years)	Persons 15 to 34 years	Persons 55 years and older	Race: White	Hispanic or Latino
Alamosa County	30.6	32.7%	17.1%	74.6%	41.4%
Saguache County	36.9	23.8%	21.1%	74.1%	45.3%
Colorado	34.3	19.6%	17.6%	85.2%	17.1%

**TABLE 13. SELECTED HOUSING CHARACTERISTICS**

	Census 2000				New Units Built, 2000 to 2004
	Total Units	Percent Occupied	Total Vacant Units	Units for Seasonal, Recreational or Occasional Use	
Alamosa County	6,088	89.8%	621	75	+ 270
Saguache County	3,087	74.5%	787	361	+ 454

Source: U.S. Census Bureau 2002 and 2005c

Recent population growth and migration are reflected in recent levels of new residential construction. An estimated 270 new housing units (a 4% increase over the total housing stock in 2000) have been built in Alamosa County. During the same period, 454 new homes were reported in Saguache County (nearly a 15% increase in 5 years). Many of these units are located in the Baca Grande subdivision, with the pace of new development reportedly spurred by the designation of Great Sand Dunes National Park and Preserve.

As of 2005, housing at the park included 13 dwelling units used on a full-time or seasonal basis, including seven individual units, three of which are shared housing for seasonal employees, one duplex (two units), a triplex apartment building, and one trailer. In addition, two trailer pads are available for seasonal use by employees with their own recreational vehicle (RV) or trailer. An older trailer that does not comply with NPS standards for occupancy is also on the park inventory, but plans are in place to remove it.

### **Traffic and Emergency Services**

The primary highway access to the main entry to the park is via SH 150 from the south and Alamosa County Road 6N from the west. The former connects to SH 160, the major east-west highway across southern Colorado, and the latter connects to SH 17, a key north-south regional highway in the San Luis Valley. Several USFS gravel and dirt roads provide motorized access to the eastern boundary of the preserve.

North of the park, Saguache County Road T is a paved road that extends east from SH 17 and terminates at two destinations—Crestone and the Baca Grande subdivision. Thus, traffic on County Road T is related

primarily to these destinations. The Crestone destination includes the town of Crestone (population 73 in 2000) and three USFS trailheads with a total of 30 to 35 vehicle spaces and a 13-site campground associated with one of the trailheads. The Baca Grande destination includes a small Colorado College satellite facility, a restaurant, and several other small businesses, over 600 residences, more than a dozen spiritual retreat centers, and two informal points of pedestrian access to the national park from the terminus of public (Saguache County) roads. One of these county roads terminates within a few hundred yards of the national park boundary; the other terminates at the boundary, where public vehicle access ends. Both local and nonlocal visitors use these access points; some visitors park their vehicles at or near the terminus of the county roads, which can be inconvenient to those living nearby. Park visitors using horses are not allowed access at these points. Some people also park illegally within the Baca Grande subdivision to access adjacent USFS lands.

County Road T has experienced an estimated increase of 10 to 20 trips per day due to national park-related traffic. As discussed above, some of that traffic continues onto county roads within the Baca Grande subdivision. Traffic data are not available to accurately assess the relative magnitude of such traffic for County Road T and roads within the subdivision. However, traffic increases are expected on county roads in the near future due to residential growth in the Baca Grande subdivision (the number of residences could more than triple during the next 15 to 20 years) and an increase in spiritual retreat visits (from more retreat centers and more events per center). Therefore, the contribution of national park / preserve-related traffic is likely to remain small in comparison to traffic

generated by residents of the Crestone / Baca Grande community; their guests, construction contractors, and recreation visitors to the national forest; and guests and staff of the spiritual organizations, monasteries, and retreat centers in the community.

Traffic on the major state highways in the region, shown in table 14, is heaviest in and around the city of Alamosa, declining rapidly with distance from the city. For example, the annual average daily traffic (AADT) of 5,600 vehicles on SH 17 in Alamosa in 2004 had decreased to 2,800 AADT just north of County Road 6N and to 1,600 AADT north of Moffat. Similarly, traffic volume on SH 160, east of Alamosa, had declined by nearly 60% between the junctions with SH 17 and SH 150. Traffic volume on SH 150, which park staff believe carries more park-related traffic than does County Road 6N, was 670 AADT.

Average annual daily traffic associated with the park is estimated at 400 to 450 vehicles. That estimate is based on vehicle counts at the main entrance and allowances for staff,

vendors, and other traffic that enter the park boundary, but turn around before the main entrance. That traffic volume represents about 6.5% of the combined traffic of SH 160 and SH 17 near their respective intersections with SH 150 and County Road 6N.

Another issue related to highway traffic is that of highway accidents and public safety, specifically demands on local law enforcement and emergency medical first responders. In Alamosa County, the county sheriff responds from its Alamosa headquarters to accidents and incidents on county roads, with a staff of seven patrol officers / first responders. The department reports that incidents are rare in the vicinity of the national park and preserve. Troop 5B of the Colorado State Patrol Troop, headquartered in Alamosa, handles incidents on state highways (150 and 17) and dispatches, as necessary, the Mosca-Hooper Fire Department to provide extrication assistance. Emergency medical service, including ambulance transport, is dispatched from the San Luis Valley Regional Medical Center.

**TABLE 14. TRAFFIC CHARACTERISTICS NEAR THE GREAT SAND DUNES, 2004**

Route/Location	Annual Average Daily Traffic (AADT)	Cars & other Light Duty Vehicles	Trucks
SH 17, north of junction with SH 160 in Alamosa	5,600	5,370	230
SH 17, south of County Road 2S	3,300	3,030	270
SH 17, north of County Road 6N	2,800	2,590	210
SH 17, north of Moffat and County Road U60	1,600	1,470	130
SH 150, north of SH 160	670	610	60
SH 160, at junction with SH 17 in Alamosa	9,900	8,990	910
SH 160, west of Alamosa at El Rancho Lane	4,100	3,460	640
SH 160, at junction with SH 150	4,100	3,470	630

Source: Colorado Department of Transportation 2005

The Mosca-Hooper Volunteer Fire Department (24 volunteers) provides primary structural fire protection for the park. The park is a signatory to the “Annual Fire Operating Plan” for the six-county area of the San Luis Valley. This plan provides for mutual aid, whereby the closest available forces respond as needed to wildland fires within the planning area. The Mosca-Hooper Volunteer Fire Department, Baca-Grande Volunteer Fire Department (a 27-member department supported financially by the Baca Grande Property Owner’s Association), and Kundalini Fire Management (a 20-member department that also serves the Baca Grande subdivision and surrounding area) all respond to fires within the park boundary. Likewise, park staff provide initial attack assistance for wildland fires occurring outside the park boundary in neighboring jurisdictions.

Under agreements between the federal government and neighboring counties, national park rangers may respond to other emergency situations outside park boundaries. The need for such response, which would generally arise when an incident occurs near the park and when on-duty sheriff’s deputies and state patrol officers are responding to other events, arises very infrequently.

In Saguache County, Troop 5B of the Colorado State Highway Patrol responds from its Alamosa headquarters to emergency calls on state highways and dispatches the Baca Grande Volunteer Fire Department and Baca/Crestone Ambulance Service (16 volunteers, 1 paid). The latter provides emergency medical service to an area of approximately 600 square miles. The county sheriff responds to other incidents (Pamela Gribb, pers. comm., 2005).

## Land Use and Ownership

The predominant land uses in the study area include agriculture, forested areas, natural areas supporting wildlife, rural residential, residential, commercial, and industrial lands. The latter are concentrated in and near Alamosa, other communities in the area, and along the major highway corridors through the region.

Land use adjacent to the park is a combination of forested lands (Rio Grande National Forest), range and farmland (including lands associated with Medano Ranch and the newly established USFWS Baca National Wildlife Refuge), the Oasis commercial development immediately adjacent to the park near the main entrance, and rural residential development. The latter includes the Baca Grande subdivision and Crestone to the north, and the Zapata subdivision to the south. The San Luis Lakes State Park and portions of the Bureau of Reclamation’s Closed Basin Project are situated southwest of the park.

The majority of Alamosa and Saguache counties have been zoned as agricultural, with residential uses allowed “by right.” Other uses in unincorporated areas require approvals from the respective zoning administrators and commissions. Separate zoning and land-use regulations govern development in Alamosa, Center, and Saguache.

Privately owned lands comprise over two-thirds of Alamosa County, a higher share than characterizes Colorado as a whole. Another 19% of the land is in federal management and about 12% is owned and managed by the state (table 15). Federal land management agencies include the BLM, USFWS, USFS, National Park Service, and Bureau of Reclamation.

Federal lands account for approximately 69% of the lands in Saguache County, a much higher share than in either the state as a whole or Alamosa County. Another 4% of the land in the county is managed by the state and 27% privately owned. The latter includes a small amount of land managed by local public entities such as municipalities or school districts.

An important dimension of the extensive federal land ownership are payments-in-lieu-of-taxes, or PILT. PILT is a federal program administered by the BLM distributes annual payments to local governments that contain qualified federal lands within their jurisdictional boundaries. The payments are intended to help offset the diminished property taxes receipts due to nontaxable federal lands within their boundaries.

A county’s eligibility for PILT is based primarily on the acres of federal lands in

the USFS and national park systems, and lands administered by Bureau of Land Management. A total of 79,182 entitlement acres were located in Alamosa County in FY 2005, with 1,393,880 acres in Saguache County (table 16). Of those lands, the National Park Service manages 13,081 acres in Alamosa County and 117,670 acres in Saguache County. These NPS acreages reflect federal land acquisition and administrative management changes associated with the park and preserve as of October 1, 2004.

Actual PILT payments are affected by congressional appropriation levels. Fiscal year 2005 PILT payments to counties were \$107,594 to Alamosa County and \$456,617 to Saguache County. In recent years, congressional appropriations have funded about 68% of the total PILT entitlements.

**TABLE 15. LAND OWNERSHIP**

County	Total Land Area (Acres)	Ownership (Percent)		
		Federal	State	Private and Local Gov't
Alamosa	462,854	19%	12%	69%
Saguache	2,027,724	69%	4%	27%
Colorado	66,614,084	37%	5%	58%

Source: Colorado Department of Local Affairs 2001, and Department of the Interior 2005

**TABLE 16. FEDERAL PAYMENT IN LIEU OF TAXES, FISCAL YEAR 2005**

County	Total Land Area (Acres)	PILT Entitlement (Acres)	Entitlement Share of Total	Total PILT Receipts
Alamosa	462,854	79,182	17.1%	\$ 107,594
Saguache	2,027,724	1,393,880	68.7%	\$ 456,617

Sources: Colorado Department of Local Affairs 2001, and Department of the Interior 2005

Saguache and Alamosa counties also received payments under the Refuge Revenue Sharing program. Similar in principle to PILT, this program involves only lands administered by the USFWS. In 2004, payments were \$2,000 to Saguache County and \$10,699 to Alamosa County. The payment to Saguache County reflects lands acquired by the USFWS through September 2004 (Fowler 2005).

### **Economic Contributions of Great Sand Dunes Park and Preserve**

The location and operations of the park function as an important cog in the regional economy. Spending by visitors to the park, as well as NPS personnel and operating and maintenance expenditures, support local business establishments and generate tax revenues to help support local government.

#### **Visitor Spending**

Total recreation visits of 268,824 were recorded at the Great Sand Dunes Park and Preserve in 2004. Of that total, 43,100 visits involved overnight stays in the park; the remainder were day visits. Based on the 2002 Visitor Survey for the park, 64% of the latter were by nonresidents, of which over 90% spent at least one night in the region<sup>3</sup>. Using procedures developed by the National Park Service to estimate the economic impacts of its operations, these figures result in an estimated total of 135,995 party-days.<sup>4</sup>

---

<sup>3</sup> The visitor survey defined the region as locations within a 1-hour drive of the Great Sand Dunes. That radius encompasses Alamosa, Saguache, Crestone/Baca Grande and other communities within the San Luis Valley.

<sup>4</sup> A "party-day" is a standardized measure of visitor use that accounts for varying sizes of travel groups, lengths of visit, day versus overnight visits, and multiple entries into a park. Party-days are used to develop economic impact estimates using expenditure data that are typically collected and reported for a group of visitors, i.e., a party, on an average "per day" or "per trip" basis. The expenditure day typically

Based on the estimated profile of users to the park, average spending per party-day in the region is estimated at \$90.60, yielding total estimated annual visitor spending associated with the park of \$13.13 million (table 17). Most of the total, \$9.02 million (69%), is by visitors staying overnight in area motels, bed and breakfasts, and other lodging accommodations. Nonlocal day users account for the second-largest share of spending, \$2.79 million or 19%.

An estimated \$9.18 million of the total visitor spending is captured in Saguache, Alamosa, or other nearby counties located within a reasonable distance to accommodate overnight visitors prior to or following their visit. The remaining \$3.96 million leaves the region to cover the cost of goods sold. Locally captured receipts include those by motels, RV parks, and other accommodations, as well as restaurants, cafes, retail merchants, and other recreation and entertainment establishments. Locally captured visitor spending includes nearly \$300,000 in annual purchases of books, maps, and other items sold by the Western National Parks Association at the gift shop in the visitor center. A portion of that total is returned to the park as a contribution via an agreement between the National Park Service and Western National Parks Association.

Total spending by visitors also includes entry and camping fees at the park. In FY 2004, such receipts included nearly \$353,000 in entry fees and \$150,000 in camping fees. A portion of the fees collected by the park accrues directly to the park for use in meeting the backlog of capital facility and maintenance needs.

---

includes camping or overnight lodging expenditures. Since not all visitors stay overnight, converting recreation visits to party-days provides a basis for estimating overall expenditures using average expenditures.

**TABLE 17. ANNUAL SPENDING IN SAN LUIS VALLEY BY VISITORS TO THE GREAT SAND DUNES**

Category	User Segment			
	Local Day User	Nonlocal Day User	Motels, B&Bs, etc.	Camping
Spending per Party-Day	\$ 38.11	\$ 45.08	\$ 165.94	\$ 65.69
Party-Days	21,075	32,613	54,372	27,934
Total Spending	\$ 803,000	\$ 1,470,000	\$ 9,022,000	\$ 1,835,000
Total Spending – All Users	\$13,131,000			

Sources: MGM2 and Sammons/Dutton LLC

Overall, visitor spending associated with the park supports an estimated 334 jobs across the region, generating \$4.1 million in annual personal income. This is in addition to jobs and income associated with park operations and staff, which are discussed in the next section.

### ***Park Operations***

The annual budget for NPS operations at the Great Sand Dunes National Park and Preserve represents an economic infusion into the regional economy. Spending of wage and salary income by NPS employees stimulates induced effects in the region, and spending by the National Park Service on utilities, supplies, and services support additional sales, jobs, and income. The effects of National Park Service operations are an addition to the effect of visitor spending associated with the park.

The annual base operating budget at the park for FY 2002 through FY 2004 averaged about \$1.45 million. An increase in the base budget went into affect in FY 2005, coinciding with the expansion of the park.

In 2004, the park was funded for 22 full- and part-time, year-round employees, plus 21 seasonal employees (six FTEs). The NPS payroll for personnel was \$1.45 million in

salaries and benefits, or more than 86% of the total operating budget in fiscal 2004. The National Park Service spent another \$191,000 for utilities, services and travel, supplies, and small equipment items.

National Park Service spending in the local economy in FY 2004 is estimated to have supported 37 jobs in the San Luis Valley, including 28 FTE jobs at the park and an equivalent of nine additional jobs supported by the park's direct local spending and that of NPS employees. National Park Service operations generated an estimated \$1.66 million of personal income in 2004, including the direct payroll of staff.

Overall, spending by the park and park staff generates an estimated \$1.45 million in expenditures for housing, utilities, transportation, and other goods and services.

### ***Combined Effects of Great Sand Dunes Visitor Spending on Park Operations***

The combined effects of Great Sand Dunes visitor spending and park operations include 371 full- and part-time jobs (2.8% of all local jobs), \$15.58 million in spending, and \$5.76 million in personal income. Local spending supports local

businesses and generates various fees and tax revenues that help support local government.

### **Attitudes and Lifestyle Issues Associated with the Park**

Although there is no single, established, defined community associated with the Great Sand Dunes, there is a virtual community comprised of the staff, visitors, neighbors and adjacent landowners, park volunteers, American Indians, and many other interested individuals and entities. The latter include local, nonlocal, and even international residents, private enterprises, public-interest groups, governmental agencies, and other institutions and organizations. The broader community also encompasses the property owners and residents of the nearby Zapata subdivision, employees and members of The Nature Conservancy, and the property owners, residents, institutions, and spiritual retreats in Crestone and the Baca Grande subdivision to the north. Many members of the broader community were active in efforts to see the park established and consider themselves to have a vested interest in the park.

Within that broad community exists a wide spectrum of views, perspectives, and attitudes regarding the park itself and associated resources and opportunities. For some, the park is viewed primarily as an outdoor recreational resource, for others a unique and globally significant environment warranting conservation. Even among outdoor enthusiasts, attitudes regarding the park vary among those who seek solitude and backcountry experiences commonly associated with wilderness, those who desire motorized access to large portions of the existing nonwilderness, and those who view the park and the surrounding environs as significant in a

metaphysical or holistic sense, contributing to their spiritual, emotional, or psychic well-being.

Members of this virtual community, be they individuals, groups, or institutions, ascribe to multiple views toward the park, how it presently affects them, and how it could affect them if the park were managed differently in the future. Moreover, many may see both benefits and adverse effects on their personal and community lifestyle, depending on how the park is managed. For example, some residents of the Crestone/Baca Grande community and elsewhere see economic development potentials associated with future recreation use, while also being concerned about the potential traffic impacts of such use. In fact, among local residents, the subject of public access to the northwest part of the park is perhaps the single most critical issue associated with future management of the park, and resolution of that issue may shape their sentiments toward the park over the long term.

### **HEALTH AND SAFETY**

Approximately 260,000 people visited the Great Sand Dunes during 2004 for recreational purposes, primarily during the summer (NPS 2005a). Because of the expanded land base and redesignation as a national park, visitation is expected to increase in the spring, fall, and winter seasons. Total annual recreation visits are projected to reach approximately 375,000 in 2025.

The health and safety of park visitors, staff, and neighbors are of great importance to the National Park Service. Areas of concern related to health and safety identified during the scoping and planning process for this GMP include: dogs, fire, traffic

safety within the park, and personal accidents/injuries.

## Dogs

Leashed dogs are allowed throughout the national park and preserve. Leashed dogs have been allowed in the park (formerly the monument) for years. Dogs that are being used for hunting are permitted off-leash in the preserve only<sup>5</sup>. Dogs were also allowed in this area (preserve) prior to 2000, when it was managed by the USFS.

Health and safety concerns related to dogs include visitor injury, intimidation, and annoyance; dog waste in surface waters; and safety/health of dogs themselves (from traversing hot sand or temperature extremes while confined to visitor vehicles). Between 2000 and 2004, no dog bites were reported in the park. No information is available about bites that may have occurred, but were not serious enough to require medical treatment. In the 2002 Visitor Survey question about park safety, only one respondent of 364 mentioned off-leash dogs as a safety concern (NPS 2002). However, the park sometimes receives complaints about aggressive dogs. Because no personal injury incidents have been reported, this health and safety issue is not analyzed in detail in this document. Other topics connected with dogs (e.g., water quality, visitor experience, and wildlife effects) are discussed, however, in separate sections of this document.

---

<sup>5</sup> Unleashed dogs, up to eight in a pack, may be used to chase and tree mountain lions in the preserve. As of 2005, the mountain lion hunting season lasted from November 17 – March 31. The preserve is located in Management Unit 82, for which six mountain lion licenses were available in 2005. It is also legal to use unleashed dogs in the preserve to pursue, bring to bay, retrieve, flush, point (but not kill) small game, waterfowl, game birds, or furbearers. Some small game seasons are open year-round.

## Fire

Between 1983 and 1997, there was an annual average of 1.3 recorded wildland fires in the park (NPS et al. 2005). One human-caused wildfire began in the Zapata subdivision south of the park in 2000 and burned into the park, destroying a seasonal residence, the amphitheater, plus various signs, barriers, etc. This fire burned approximately 3,000 acres of mostly grassland and shrubland habitat, with some piñon-juniper and aspen woodlands, plus a riparian area (NPS et al. 2005).

A number of towns, subdivisions, and individual residences are located near the park and could be affected by fires that start in the park. These communities include Crestone/Baca Grande, Moffat, Hooper, Mosca, and Zapata. Park visitors, NPS staff, and Nature Conservancy staff based at Medano Ranch could also be affected, as could Baca National Wildlife Refuge employees. Capacities at various park camping areas include the Pinyon Flats campground (650 people), designated backcountry campsites (42 people), and primitive campsites along Medano Pass Road (400 people). The Nature Conservancy also has guests occasionally at Medano Ranch; most visit between March and October (NPS et. al 2005).

The *Greater Sand Dunes Interagency Fire Management Plan Environmental Assessment / Assessment of Effect* (April 2005), analyzed environmental effects of this cooperative fire management plan. Those discussions are not repeated in this GMP. New fire risks associated with the GMP alternatives are those caused by humans using new areas of the park. In particular, the proposed campground in the northern portion of the park (three public nodes alternative) could pose fire risks. Also, if Medano Ranch buildings are

left unmaintained (dunefield focus—maximize wildness alternative), they could pose a potential structural/wildland fire (accidental or arson) hazard.

### Traffic Safety Within the Park

Visitors are directly affected by the experiences they have when they arrive at the park and make their way to its principal features, primarily by automobile. Scenic driving is a common recreational activity in the park (NPS 2002). The main park road provides access to the park headquarters, visitor center, Montville trailhead, dunes access road, amphitheater, Medano Pass primitive road, and Pinyon Flats campground. In addition, numerous turnouts along the main park road provide panoramic views of the dunes and the surrounding mountain ranges (NPS n.d.).

Twenty-three motor vehicle accidents were reported in the park from 2000–2004 (see tables below) (NPS 2005b). Of this number, 11 were reported along the main road, accounting for nearly half of all accidents of this type in the park. The highest number of motor vehicle accidents (10) occurred in 2004, and half of those occurred along the main road. With the exception of the year 2002, traffic accidents increased in frequency during 2000–2004. It is not clear whether this trend will continue, but it is likely to if more roads are available and if visitation increases. Eighteen of the 23 accidents occurred during the busiest visitor season (May to September), and the most traveled roads—i.e., the main road and Medano Pass Road—experience the largest number of accidents. These patterns are likely to continue.

**TABLE 18. GREAT SAND DUNES ACCIDENTS BY LOCATION 2000–2004**

	Number	% of Total
Main Road (entrance)	11	48
Medano Road	4	17
Medano Pass	3	13
Dunes Lot	2	9
Campground	2	9
Visitor Center	1	4
<b>Total:</b>	<b>23</b>	<b>100 %</b>

**TABLE 19. GREAT SAND DUNES ACCIDENTS BY YEAR**

	Number	% of Total
2000	2	8
2001	5	22
2002	1	4
2003	5	55
2004	10	44
<b>Total:</b>	<b>23</b>	<b>100 %</b>

When the dunes parking lot fills, visitors park along the shoulders of the dunes lot access road and portions of the main park road. Visitors then walk on the road to reach dunes access points. Although this phenomenon has not resulted in accidents to date, this is a safety concern as visitation is expected to increase. Actions proposed in the GMP alternatives that could (1) introduce accidents in new areas, or (2) increase the number of vehicles in existing areas, and which have the potential to affect the incidence of vehicle, vehicle-pedestrian, vehicle-bicycle, or bicycle-pedestrian accidents include:

- public vehicle access to Medano Ranch headquarters

- public vehicle access to the north part of the park (former Baca Ranch)
- increased parking capacity at the dunes parking lot
- multiuse path or bike lanes from the park entrance to the visitor center
- hiking/biking path from Pinyon Flats campground to the dunes lot

Impacts of these actions as they relate to traffic safety are discussed in the environmental consequences chapter.

### Personal Accidents/Injuries

Of the nearly 1 million visitors who visited the park and preserve during the period 2000–2004, 95 experienced accidents or other health-related incidents. This equals roughly one visitor in every 10,500 (NPS 2005b).

Emergency medical service (EMS) and search and rescue (SAR) records from 2000–2004 provide information about visitor safety at the park. During this period, 95 EMS and SAR incidents occurred (NPS 2005b). Of these, six (6%) occurred outside the dunefield area and 89 (94%) occurred in and around the dunefield, including the visitor center and campground. Of the incidents outside the dunefield area, one required both a SAR component and an EMS component. There were 28 SAR incidents and 61 EMS incidents in and around the dunefield. In 18 of 31 SAR incidents, the subjects were found uninjured. The most numerous causes of EMS responses were illness and trauma from falls (NPS 2005b).

New areas open to visitor use or actions in the GMP alternatives that could change the incidence of visitor accidents include:

- visitor use in the north part of park (former Baca Ranch)
- eventual visitor use in the south part of the park (Medano Ranch)
- new hiking trails in the preserve
- allowing historic structures to decline
- encounters with bison

The Medano Ranch and former Baca Ranch areas are open landscapes composed of sand, shrubland, grassland, and riparian corridors. Visitor safety risks in this area include dehydration, heat stroke, lightning, exposure, sudden and unexpected weather changes (frostbite/hypothermia), altitude, and disorientation. In the north part of the park (former Baca Ranch) limited EMS access in the event of an accident is a concern. In the Medano Ranch area, buildings that are allowed to gradually deteriorate by nature's forces and encounters with bison are of interest. To date, there have been no bison/staff or bison/visitor incidents at Medano or Zapata ranches (Robertson 2005).

The mountainous preserve is composed of aspen forests, mixed montane conifer forests, alpine dry tundra and moist meadow, piñon-juniper woodland, and spruce-fir woodland. This mix of terrain and habitat draws many hikers and campers. New hiking trails could affect the incidence of visitor accidents. Technically challenging terrain, altitude, lightning, dehydration, heat stroke, exposure, frostbite/hypothermia, altitude, disorientation, and restricted EMS access in the event of an accident are of concern.

Various historic buildings, which may or may not be maintained, are located in areas where visitors may be present. Buildings that are left to deteriorate by nature's forces could pose safety risks. Although the National Park Service plans to assess buildings to see if they pose a human safety risk, rapid degradation or a shortage of park staff to monitor the condition of buildings could contribute to unsafe conditions. Unsafe conditions could include hantavirus from rodent habitation, or structural failings such as rotting roofs, floors, or frame. Often historic habitation sites have hidden pipes, barbed wire, and other sharp metal objects that pose injury risks. Such buildings could also shelter potentially dangerous wildlife such as rattlesnakes.

## **NATIONAL PARK SERVICE OPERATIONS**

### **Operations and Management**

Great Sand Dunes National Park and Preserve is administered by a superintendent and several division chiefs. Management of the park is organized into several functional divisions. As of 2005, there were 28 FTEs. The GMP alternatives could necessitate minor staff increases. When the expanded park is fully staffed, there would be from 33 to 38 FTEs, depending on the alternative. The added staff would address park operational, maintenance, and visitor service needs for an increasing number of visitors, a larger geographic area, and an expanded inventory of access points, trails, equipment, and facilities. Implicit therein would be a need for future increases in the park's annual operating budget. However, overall budgets for the National Park Service are established by congressional appropriation, with budgets for individual

units established by allocating the overall budget among the competing needs within the agency. Future budget constraints could limit or delay increases in the Great Sand Dunes budget, while inflationary effects erode current budgets. These factors would limit future staffing and implementation of GMP elements.

The park also benefits from cooperative arrangements for managing land resources and providing services (and in some cases, sharing of resources). Nonetheless, these arrangements require staff time and other resources to implement. Numerous federal, state, local, and private organizations and agencies work cooperatively with Great Sand Dunes staff.

### ***Administration***

The administration division provides coordination and is responsible for park budget, fiscal, and real property management activities. Administration also has responsibility for human resources, information management, and park housing administration. As of 2005, there were 2.2 FTEs in this division.

Friends of the Dunes is a nonprofit citizen's support group for the Great Sand Dunes. The organization provides volunteer and financial aid for Great Sand Dunes projects, assists with visitor education efforts, and promotes recreational opportunities at the dunes. Western National Parks Association is a nonprofit cooperating association of the National Park Service that supports interpretive activities at the park through development of publications, book and merchandise sales at the visitor center, etc.

### ***Interpretation and Visitor Services***

Interpretation includes education services for diverse audiences, interpretation of identified park themes, staffing the visitor center, and providing information and orientation for park visitors through personal and nonpersonal services (e.g., park Web site, publications, exhibits, and Volunteer-In-The-Parks program). The main base of operations for interpretive staff is the visitor center building. Depending on the GMP alternative, new interpretive staff could be needed at Medano Ranch. As of 2005, there were four FTEs in interpretation.

Visitor services include fee collection and campground management. Fee collection includes revenue management, greeting visitors, visitor safety, and dissemination of resource protection messages. As of 2005, there were 5.5 FTEs in visitor services.

### ***Resource and Visitor Protection***

The resource and visitor protection division is responsible for visitor and employee safety, resource protection, emergency response, park and facility patrols, security, emergency medical services, search and rescue, structural and wildland fire, law enforcement, air operations, resource protection education, dispatch, and concession operations in the park. This division also provides emergency and law enforcement response and aid to local, county, and state agencies through cooperative agreements. Addition of the preserve and areas like the former Baca Ranch and Medano Ranch substantially enlarged the boundaries of the old national monument. As a result, the park now includes additional natural and cultural resources that require protection and patrols. More area and more visitors means more need for medical services, law

enforcement, dispatch, patrols, resource protection education, fire protection, and search and rescue. As of 2005, there were seven FTEs in this division.

### ***Facility Maintenance***

Maintenance is responsible for the operation and maintenance of all park facilities and equipment including: utilities (water, wastewater, power, and solid waste), structures and grounds, frontcountry and backcountry visitor use areas, trail systems, picnic areas, roads, park signs, and vehicles. New facilities, structures, roads, trails, and use areas will require additional maintenance. As of 2005, there were 7.9 FTEs in this division.

### ***Resource Management / Museum Collections Management***

The resource management division is responsible for management of natural and cultural resources. It oversees the research program; consults with outside resource experts, agencies, and associated tribes; plans for future research and management needs; monitors and protects resources; ensures that management has pertinent scientific information on which to base decisions; and provides information for staff and visitor education. As of 2005, there were 6.5 FTEs in this division.

Resource management and museum collections share museum collections management and library management responsibilities. The park's museum collection includes natural objects (floral and faunal specimens), cultural objects and materials, and archives and photographs.

## Facilities

The park includes structures within the original national monument, and structures within the park expansion area (Alpine Camp and structures associated with Medano Ranch, which is currently owned by The Nature Conservancy, but could be transferred to the National Park Service during the life of this GMP). There are also other historic structures in the former monument (e.g., Shockey’s cabin, Herard Homestead, etc.), but the GMP would not alter management of these structures.

The National Park Service monitors deferred maintenance in the national park system through the use of an asset tracking system known as the Facility Management Software System. Deferred maintenance is work that should have been done at specific times but was not, primarily due to

budget constraints. The National Park Service is striving to reduce the deferred maintenance backlog by prioritizing projects and funding them through various funding sources, including the Fee Demonstration Program.

## Park Buildings

National Park Service buildings and structures associated with the original monument include the visitor center, Pinyon Flats campground, amphitheater, comfort stations at the dunes parking lot, park headquarters and entrance station along the main park road, maintenance buildings, horse shelter and corrals, resource laboratory, and park housing area. Table 20 provides sizes for individual structures.

**TABLE 20. NATIONAL PARK SERVICE BUILDINGS AND STRUCTURES**

Structure	Sq. Feet	Structure	Sq. Feet
Visitor Center	13,800	Comfort Stations (5)	474
Amphitheater	600	Mission 66 Comfort Station	400
Amphitheater Bridge	—	Dome Comfort Station	616
Entrance Station	667	Water Tank	—
Superintendent’s Residence (headquarters)	1,926	Residential Trailer	980
Resources Lab and Offices	2,560	Residential Trailer	840
Shop	3,716	Residence (3)	1,787
Maintenance Storage Bldg.	2,400	Residence (3)	1,512 ea.
Fire/Search and Rescue Cache	2,220	Residence (apartments)	1,625 ea.
Fee Booth	63	Residence (duplex)	2,661
Horse Barn	1,292	Trailer Pads (2)	—
Wood Shed	203	Well Houses (4)	120 ea.

Two new additional housing units would be built in the existing employee housing area under the no-action alternative. No other changes are proposed to any of these areas or structures, so they will not be discussed further in this document.

**Alpine Camp.** Alpine Camp is proposed for use in all alternatives as a backcountry patrol cabin. This site includes a simple one-room “cabin,” a frame privy, a small one-room tack building, and a corral. Alpine Camp is not discussed further because no changes are proposed for this area.

**Medano Ranch.** Medano Ranch includes the headquarters complex, which consists of a main ranch house on the north, and other buildings located along the edges of the open ranch yard. These buildings roughly form a square. Support facilities for ranch workers are located at the east part of the square, while animal facilities are located on the west and south. A large corral area lies south of the buildings. Several smaller log buildings that are no longer needed for ranching operations are now gone. About half of the original Medano Ranch structures still stand.

Buildings and structures are listed in table 21 (NPS 2004):

### ***Roads and Trails***

Roads and trails provide access to many of the park’s natural wonders. Roads provide access to facilities such as the visitor center, picnic areas, and campgrounds. Trails provide access to more remote locations within the park such as lakes, scenic overlooks, mountain passes, and the dunes.

**Roads.** The main park road is a 4.5-mile, two-lane paved road connecting the main

park entrance on the south boundary to the Pinyon Flats campground and amphitheater, which lie at the road’s northern terminus. Piñon Circle is a two-lane paved road running from east to west that provides access to administrative facilities (maintenance area, resource management lab, fire cache facility, and employee residences). The dunes access road is a two-lane paved road running from east to west, connecting the main park road to the dunes parking lot and the Mosca Creek picnic loop. Medano Pass primitive road is an unimproved four-wheel-drive road that runs northeast from near the Pinyon Flats campground through the park and preserve. Cow Camp Road is an improved gravel road in the northwestern portion of the park (NPS n.d.).

At the park headquarters, visitor and employee parking (11 spaces, one wheelchair accessible) is provided north and south of the building. At the visitor center, 54 parking spaces are provided for passenger vehicles, including two wheelchair-accessible spaces and two spaces for RVs and buses. Sixteen spaces are designated for employee parking. The dunes parking lots (north and south) have a combined capacity of 93 passenger vehicle spaces and 11 oversize spaces (for RVs, trailers, etc.). The Montville trailhead parking area provides 25 passenger vehicle spaces (including one wheelchair accessible), for the Montville nature trail, the Wellington Ditch trail, and the Mosca Pass trail. The Pinyon Flats amphitheater parking area provides 22 passenger vehicle spaces, including one wheelchair-accessible space and four RV/bus parking spaces. An RV dump station is located in the center of this parking area, which is also used for loading and unloading visitors’ horses from trailers (NPS 2005b).

TABLE 21. MEDANO RANCH BUILDINGS AND STRUCTURES

Structure	Description
Main Ranch House	Log ranch house consisting of three small one-story cabins joined together with a log addition to the east (pre-1912 with post-1947 additions)
Bunkhouse/Kitchen	A rectangular building measuring 28 ft 8 in x 21 ft
Cook's House	A small one-story, rectangular log building measuring 29 ft 4 in x 13 ft
Harness Shed	A simple one-story rectangular (26 ft 6 in x 12 ft 4 in) frame building
Draft Horse Barn	A one-story square log building measuring 28 ft x 28 ft
Meat House	Pre-1920 log building measuring 13 ft 6 in
Outhouse	Pre-1941 frame building measuring 6 ft 4 in x 6 ft 4 in
Cottonseed Cake House	Pre-1930 (possibly 1880s) frame building measuring 40 ft x 19 ft
Corral	Pre-1912 irregular corral measuring approximately 550 ft (east-west) by 300 ft. (north-south) with wide central alley (15 ft wide) running east-west
Machine Shed	Post-1947, long rectangular structure measuring 81 ft 5 in x 20 ft 7 in
Metal Silo	Post-1947, cylindrical metal silo of unknown dimensions
Shed	Post-1947 log building measuring 48 ft 1 in x 20 ft 4 in
Machine Shed	Post-1947, long, narrow log building measuring 84 ft 4 in x 25 ft

Roads at Medano Ranch include the main ranch road, which extends north from County Road 6N to ranch headquarters, and then west to Dollar Lake and Hooper. Two four-wheel-drive roads run to Big and Little Springs and numerous smaller two-tracks follow fence lines (Robertson 2005).

**Trails.** The Montville Nature Trail is a short loop trail located 0.2 mile east of the visitor center. It showcases flora, fauna, and natural park processes. Mosca Pass Trail heads east from the visitor center into the Sangre De Cristo Mountains to Mosca Pass, where it exits the preserve and becomes a road. From this same trailhead, the Wellington Ditch Trail extends north to the Pinyon Flats amphitheater and campground. From that point, the trail becomes the Sand Ramp Trail and heads north skirting the mountain apron, crosses Medano Creek and then heads west to Sand Creek. North of Sand Ramp Trail, the Sand Creek Trail extends to the northeast

along Sand Creek to the Sand Creek Lakes. Music Pass Trail connects to Sand Creek Trail east of Sand Creek Lakes. The Dunes Overlook Trail is located off the Sand Ramp Trail, north of Pinyon Flats campground. The Medano Lake Trail extends west from a parking area along Medano Pass primitive road, just southwest of the pass summit. There are also several connector trails such as the one between Pinyon Flats campground and the dunefield.

The three public nodes—new dunes experiences and the NPS preferred alternative propose additional trails in the northern portion of the park to provide access to the mountain front.

### **Campgrounds**

Pinyon Flats campground is the only developed campground in the park.

Located north of the visitor center, the campground is open year-round and has 88 campsites available on a first-come, first-served basis. Fire grates, picnic tables, flush toilets, and drinking water are available. The campground is located in piñon-juniper forest and has striking views of the dunes and Sangre de Cristo Mountains. None of the GMP alternatives propose changes to the Pinyon Flats campground. Designated backcountry campsites in the park can accommodate up to 42 people, and primitive campsites along Medano Pass primitive road can accommodate up to 400 people.

The Great Sand Dunes Oasis, which is open seasonally, is located at the entrance to the park. Various facilities are available here, including a store, campground (70 spaces), lodge, RV spaces with hookups, small cabins, showers, and a dump station.

San Luis Lakes State Park, located in the low dunes just outside the southwest corner of the Great Sand Dunes, includes the 51-site Mosca campground (open seasonally). It features a panoramic view of the lake, the surrounding mountains, and the dunes. All sites have electrical hookups, sheltered tables, fire grates, and drinking water. It also includes a dump station and laundry facility, plus a bathhouse with modern restrooms and hot showers. Campsites can accommodate motor homes, trailers, or tents.

The Crestone/Baca Grande community, located immediately north of the park, also has camping facilities. The private Camper Village near Crestone has approximately 10 campsites for RVs (saguache.com 2005). The North Crestone Campground is a USFS campground located 1.2 miles north of Crestone. It has 13 campsites with tables and fire grates. It includes hand pumps for water and vault-style outhouses (USFS 2005b). The UFO Watchtower private

campground, located on Highway 17, has a number of primitive sites with no facilities available (ufowatchtower 2005). Commercial campgrounds are also available in Alamosa and Blanca, Colorado.

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

During the development of the GMP, concerns arose relative to the impacts of the various GMP alternatives on the operations of other public land and resource management agencies (particularly CDOW, USFS, and USFWS) as well as other organizations (e.g., The Nature Conservancy and Lexam). These concerns related to public vehicle access to and through the northern portion of the park, and designation of wilderness (with possible attendant consequences for monitoring, management, and other activities). The bases for these concerns are described below, and the concerns are addressed as an impact topic under "Other Entities and Management Agencies' Operations" in chapter 4.

### ***Public Access Across the Northern Park Boundary***

Public access across the northern boundary of the national park is currently limited to pedestrian access. Due to surrounding land ownership and road patterns, topography, and designated wilderness, there is presently no way to access the northern portion of the national park by vehicle, although visitors can get to the northern boundary via the Baca Grande subdivision. The USFS would like to consider the possibility of public vehicle access to its new lands bordering the park so that the agency can consider activities and facilities in that area during their management planning. The new USFS lands are located east of the Baca Grande subdivision and are

referred to as “Zone B” in the Great Sand Dunes Act of 2000. Liberty Road, which forms much of the border between the new National Park Service and USFS lands in the area just southeast of Baca Grande, actually passes through (instead of running just outside the boundary of) the park for approximately 0.7 mile. The main concerns of the USFS are (1) public vehicle access to USFS lands for general recreation, and (2) public vehicle access to USFS lands to facilitate elk hunting and elk herd population control. The latter of these concerns—facilitation of elk hunting and elk herd population control—has also been expressed by CDOW relative to public vehicle access through the northern portion of the park. The USFS is also concerned about access to and possible future uses of private in-holdings at Liberty, Short Creek, and Pole Creek.

There are two potential future routes for public vehicle entry into the northern portion the national park: (1) via Saguache County public roads through the Baca Grande subdivision, or (2) via road(s) through the Baca National Wildlife Refuge. This potentiality necessitates that the USFS and USFWS also consider these routes in their planning processes. Because public vehicle access via either of these routes is outside the control and jurisdiction of the National Park Service, this GMP does not resolve the question of which option, if either, might ultimately be used. It instead leaves flexibility for either option, should future conditions allow.

Vehicle access across the northern boundary of the park may appeal to some segments of the public, particularly those for whom hiking or horseback riding long distances is difficult or impossible. Public comments during the National Park Service GMP planning process also indicated a general desire to retain the wild character of ecologically sensitive areas such as the

various riparian corridors and canyons in the northern part of the park.

Current estimates for the number of hunters who may want to access the mountain front via Liberty Road (or some other vehicle access route in the northern part of the park) ranges from 20 to 30 hunters for each of the three 5-day hunting seasons, which translates to 60 to 90 hunters annually (CDOW 2005). The number of trips into and out of the area may actually exceed this number if some of the hunters drive in to scout areas before the season(s) begin.

### ***Designation of Additional Wilderness***

Designation of additional wilderness within the park is recommended in two of the GMP alternatives (NPS preferred alternative and the dunefield focus—maximize wildness alternative). The Wilderness Act of 1964 (Public Law 88-577) provided for the establishment of the National Wilderness Preservation System. The Wilderness Act states, “In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness.” Although there is great similarity between the National Park Service Organic Act and the Wilderness Act, Congress applied the Wilderness Act to the National Park Service to strengthen its protective capabilities. National Park Service *Management Policies 2001*, section 6 states, “The National Park Service will evaluate all lands it administers for their suitability for inclusion within the National Wilderness

Preservation System. For those lands that possess wilderness characteristics, no action that would diminish their wilderness suitability will be taken until after Congress and the president have taken final action. The superintendent of each park containing wilderness will develop and maintain a wilderness management plan to guide the preservation, management, and use of the park's wilderness area, and ensure that wilderness is unimpaired for future use and enjoyment as wilderness." Therefore, all wilderness categories, including suitable, study, proposed, recommended, and designated shall be treated as wilderness (Interagency FMP 2005).

The Colorado Division of Wildlife has expressed concern about the potential consequences of wilderness designation on CDOW efforts to control elk numbers. Declines in bighorn sheep and mule deer populations along the Sangre de Cristo range have been attributed, at least preliminarily, to the burgeoning elk population in and near that mountain range. Growing elk numbers are also thought to be responsible for habitat degradation in portions of the Sangre de Cristo Wilderness. It has been suggested that elk are using the national park as a refuge, since no hunting is allowed on NPS lands outside of the preserve. The CDOW concern is that if additional portions of the park are designated as wilderness, methods for controlling the increasing elk herd, particularly those requiring use of motorized vehicles (e.g., "hazing" or herding elk to areas where hunting is permissible) will be unavailable. The result could be that the elk population would grow unchecked, resulting in damage to natural habitats and neighboring

agricultural areas, further declines in other native ungulate species, and increased risk of a disease outbreak in the elk herd itself.

Wilderness designation does not necessarily preclude the use of ATVs or other vehicles or equipment to carry out needed control actions. The "minimum requirement" concept and "minimum tool" and "primitive tool" procedures, as specified in the Wilderness Act (1964), NPS *Management Policies* (NPS 2001), *National Park Service Reference Manual 41*, and *Minimum Requirement Decision Guide* (ACNWTTC 2004), could be applied for elk management activities within designated and recommended wilderness areas. The need for active elk management, and the selection of strategies and tactics, would have to be clearly demonstrated and justified by the cooperative elk/bison study currently being conducted by the National Park Service and others. If that study does demonstrate such a need, elk management actions within designated or recommended wilderness areas would be conducted using minimum impact tactics. Strategies and tactics would be selected commensurate with elk behavior and values to be protected, as well as to minimize long-term environmental impacts. Theodore Roosevelt National Park, most of which is designated wilderness, has made such an evaluation and determined it to be acceptable to use helicopters to round up elk, bison, and horses.

The Colorado Division of Water Resources has expressed concern about the potential impacts of wilderness designation on access to monitoring wells within new wilderness. The minimum requirements process discussed above would also apply to water-monitoring activities.

## IMPACT TOPICS CONSIDERED BUT NOT ANALYZED IN DETAIL

### MUSEUM COLLECTION

Great Sand Dunes National Park and Preserve's museum collection consists of prehistoric and historic objects, natural history specimens, artifacts, and archival and manuscript material. The curation facility at the Great Sand Dunes National Park and Preserve, which is located in the NPS visitor center, provides adequate climate-controlled, secure storage for museum collections. There is adequate storage space for the foreseeable future in this facility. The GMP alternatives do not propose any changes to how museum collection items are curated or stored, so this topic was dismissed from detailed analysis.

### ETHNOGRAPHIC RESOURCES

Ethnographic resources are traditional sites, structures, objects, landscapes, and natural resources that communities define as significant to their way of life.

*Seinanyédi, An Ethnographic Overview of Great Sand Dunes National Park and Preserve*, by David R.M. White, Ph.D., was written for the National Park Service in 2005. This overview identified communities who traditionally have an association with resources in the San Luis Valley and with Great Sand Dunes Park and Preserve.

Over 30 American Indian tribes, Spaniards, Mexicans, Mestizo, Hispanics, African Americans, Asian Americans, Pacific Islanders, and European Americans have affiliations with the San Luis Valley and the park. Connections with ethnographic resources were determined in consultation with the Ute, Navajo, Jicarilla Apache, Keresan Pueblos, Tewa Pueblos, Tiwa

Pueblos, and Towa Pueblo of Jemez (White 2005).

Ethnographic resources within and near the park are particularly important to Jicarilla Apache, Navajo, Puebloan, and Ute people. They often visit and collect resources as part of their cultural heritage. Collected resources may include piñon nuts, various edible and medicinal plants, and sand for sacred sand paintings. Landscape features that pertain to emergence narratives are considered culturally significant. These features include water resources, Mt. Blanca, and areas not disclosed to the public (White 2005).

Ethnographic resources will not be affected by the GMP alternatives. American Indian groups and individuals will continue to be able to collect resources and go to significant areas of the park that they have traditionally visited. This topic was therefore dismissed from detailed analysis. However, a large area within the dunefield considered important by the tribes is addressed in the "Archeology" sections.

### FLOODPLAINS

Executive Order 11988 (*Floodplain Management*) requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with occupancy and modifications of floodplains, and to avoid direct and indirect support of floodplain development whenever there is a practicable alternative. Section 4.6.4 of NPS *Management Policies* states that the National Park Service will manage for the preservation of floodplain values and minimize potentially hazardous conditions associated with flooding. National Park Service Director's Order 77-

2 and the accompanying *Procedural Manual* (2003) provide guidance and procedures for implementing floodplain protection and management actions in units of the national park system.

There are a number of alluvial fans along the western foothills of the Sangre de Cristo Mountains. The main park roadway crosses numerous ephemeral stream drainages and one perennial stream (Mosca Creek). The ephemeral streams tend to develop during flood events that occur periodically on the alluvial fans. Mosca Creek is relatively small (average peak flow of less than 5 cfs) and has a small floodplain of no more than 30 feet across. Surface runoff is carried by corrugated culverts under the roadway and it occasionally runs across the roadway from east to west (NPS 2005c).

The dunes parking lot is situated in the bottomlands adjacent to Medano Creek. Medano Creek is intermittent in this area, generally flowing in the spring and into late summer. When flowing, it is a braided stream that spreads out and moves back and forth across the relatively flat, sandy landscape. Thus, this area lacks a well-defined floodplain such as those associated with more typical, rectangular stream channels. Since this area lacks well-defined floodplains, the statistical parameters used for flood stage, flood frequency, and stream stage cannot be applied here. However, impacts to floodplains associated with providing bike lanes on the main park road (NPS preferred alternative), hiking/biking paths (NPS preferred alternative, dunefield focus—maximize wildness alternative), or new day-use parking lots (dunefield focus—maximize wildness alternative) in the frontcountry zone would be anticipated to be long term, adverse, localized, and negligible. No human risk from floodplains would be associated with these facilities.

A floodplains statement of findings is not required for this project. NPS *Procedural Manual 77-2: Floodplain Management*, B-“Excepted Actions” indicates that exceptions include “picnic facilities, scenic overlooks, foot trails, and small associated daytime parking facilities in non-high-hazard areas provided that the impacts of these facilities on floodplain values are minimized.”

## PRIME AND UNIQUE FARMLANDS

In 1980, the Council on Environmental Quality directed that federal agencies must assess the effects of their actions on farmland soils classified by the NRCS as prime or unique. Prime farmland is defined as soil that produced general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts.

The NRCS has identified several hundred acres of soils north and northeast of the San Luis Lakes State Wildlife Area as “unique farmland,” as “prime farmland if irrigated,” or as “prime farmland if irrigated and reclaimed of excess salts and sodium.” These prime and unique farmland areas, located on Medano Ranch, are owned or leased by The Nature Conservancy. Some are irrigated and used as forage areas for bison on Medano Ranch. None of the GMP alternatives would affect the soil qualities that make these soils prime or unique. Irrigation might be discontinued under certain alternatives if/when The Nature Conservancy transfers management responsibility to the National Park Service, but the qualities that make these soils suited for forage production or other agricultural uses would be maintained, or could be restored at some point in the future if irrigation were restored. Because no prime or unique farmland soils would be destroyed or converted to uses that

would impair their special qualities, this topic was dismissed from detailed analysis.

## AIR QUALITY

The Clean Air Act of 1955, as amended (42 USC 7401 *et seq.*) was established to promote the public health and welfare by protecting and enhancing the nation's air quality. The act established specific programs that provide special protection for air resources and air quality-related values associated with NPS units. Section 118 of the Clean Air Act requires parks to meet all state, federal, and local air pollution standards. NPS *Management Policies 2001* addresses the need to analyze potential impacts to air quality during park planning. Great Sand Dunes National Park is classified as a class I air quality area (Clean Air Act, as amended).

Sources of air pollution within the planning area include automobiles, space and water heating equipment, fuel storage tanks, camp fires, wildfires, wood burning stoves, and agriculture. Despite these sources, air quality within the planning area has historically been excellent. In 2001, estimates of emissions at the park were tabulated for many of these sources (NPS Fire Management EA, 2005). These estimates indicate that Great Sand Dunes National Park and Preserve has attained state and federal ambient air quality standards (Interagency FMP 2005).

The Clean Air Act also states that the federal land manager has an affirmative responsibility to protect park air quality-related values from adverse air pollution impacts.

Today, only PM<sub>10</sub> (particulate matter) is monitored at the park, and visibility is currently the only air quality resource value known to be affected by pollution (Fred Bunch, pers. comm., 2005). Effects of the

GMP alternatives on visibility (primarily from dust kicked up from vehicles) are addressed in the "Scenic Resources" and "Visual Quality" sections of this document. Other impacts on regional or local air quality from the GMP alternatives would be negligible. Air pollution from sources outside the park would continue to be addressed through Clean Air Act authorities and through cooperative efforts between the National Park Service and other entities. Air quality was therefore dismissed from detailed analysis.

## NATURAL SOUNDSCAPE

In accordance with NPS *Management Policies 2001* and Director's Order – 47: *Sound Preservation and Noise Management*, an important component of the National Park Service mission is preservation of natural soundscapes associated with national park units. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all natural sounds that occur in an area, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials. The frequency, magnitude, and duration of human-caused sound considered acceptable varies among NPS units as well as potentially throughout each park unit, being generally greater in developed areas and less in undeveloped areas.

Noise sources in and around the Great Sand Dunes include visitors and employees, vehicles, motorized and mechanical equipment, aircraft passing overhead, and noise generated from surrounding residential and agricultural areas. A study conducted at the then monument from July 1993 until October

1994 concluded that the background sound level averaged less than 45 decibels 99% of the time, less than 40 decibels (the sound of a library) 90% of the time, and less than 35 decibels 50% of the time (NPS 1995 Ambient Sound Monitoring).

New trails, trailheads, public and administrative use areas, and a primitive campground are proposed in various GMP alternatives and could introduce low levels of sound (especially from human voices and passenger vehicles) into new areas of the park, but this would also have a negligible to minor adverse impact on visitors and employees. During construction, human-caused sounds would increase due to construction-related activities, vehicle traffic, and construction crews. Any sounds generated from construction would be temporary, lasting only as long as the construction activity continues, and would have a negligible to minor adverse impact on visitors and employees. The topic of natural soundscapes was therefore dismissed from detailed analysis.

### **WILD AND SCENIC RIVERS**

Ten streams within the national park and preserve have been evaluated and found eligible and suitable for inclusion in the wild and scenic rivers system (appendix H). The GMP alternatives would not adversely affect the qualities that make these streams eligible and suitable for designation. This impact topic was therefore dismissed from detailed analysis.

### **ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL**

The implementing regulations of NEPA require that energy requirements, natural or depletable resource requirements, and conservation potential be analyzed. Any differences between the alternatives in

terms of these factors would be localized and negligible. This impact topic was dismissed from detailed analysis.

### **INDIAN TRUST RESOURCES**

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by Department of the Interior agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes. There are no Indian trust lands, assets, resources, or treaty rights associated with Great Sand Dunes National Park and Preserve. This impact topic was therefore dismissed from detailed analysis.

### **ENVIRONMENTAL JUSTICE**

Executive Order 12898 requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of federal programs and policies on minority and low-income populations and communities. Executive Order 13045 requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of federal programs and policies on children. None of the actions proposed in the GMP alternatives would have a disproportionate and adverse impact on minority populations, low-income populations or communities, or on children. Therefore, this topic was dismissed from detailed analysis.



## Chapter Four: Environmental Consequences

---



## 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.

---

<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

## **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.

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.

## **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 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 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.

---

<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

---

<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* (ACNWTC 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 frontcountry 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
<b>National Park Service Operations</b>	<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>
<b>Operations of Other Entities and Management Agencies</b>	<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>





## Chapter Five: Consultation and Coordination

---



## SUMMARY OF PUBLIC INVOLVEMENT, INCLUDING SCOPING

A 3-day workshop: “Community-Based Ecosystem Stewardship,” was held in Alamosa, Colorado, on November 19–21, 2002. The National Park Service hosted the workshop with the goal of developing solid working relationships among people committed to effective management of public lands within Great Sand Dunes National Park and Preserve. Approximately 40 participants, primarily from the San Luis Valley and representing various formal and informal groups, attended. Participants also included representatives from neighboring federal and state land management agencies.

In January 2003, the public was notified of the Great Sand Dunes GMP effort via three methods: (1) a *Federal Register* notice of intent to prepare an environmental impact statement, (2) distribution of Great Sand Dunes GMP Newsletter 1, and (3) a press release announcing public scoping meetings for the GMP.

### ***Newsletter 1:***

- Provided an overview of the Great Sand Dunes system and the Great Sand Dunes National Park and Preserve Act of 2000.
- Introduced the Great Sand Dunes Advisory Council.
- Discussed the concepts of general management planning and wilderness review.
- Outlined GMP issues and a general schedule for development of the GMP.

- Invited the public to attend four public scoping meetings about the GMP.

Seventeen people attended the Alamosa, Colorado, meeting held on February 13, 2003. Twenty-three people attended the Crestone, Colorado, meeting on February 14, 2003. Twelve people attended the Golden, Colorado, meeting held on February 20, 2003, and 13 people attended the Westcliffe, Colorado, meeting on February 21, 2003. Many questions were answered and about 33 comments were received at these meetings. Superintendent Steve Chaney held a supplemental informal question and answer session in Crestone in April 2003. About 80 people attended this meeting.

Great Sand Dunes National Park Advisory Council members also held formal and informal meetings with various groups and individuals to identify planning issues and concerns. Council members then shared this information with the planning team during advisory council meetings.

Seventy written scoping comments were received by mail, e-mail, or Internet between February 13, 2003 and May 31, 2003.

### ***Newsletter 2, Issued in November 2003:***

- Provided a synopsis of comments received from Newsletter 1 and the public scoping meetings.
- Reviewed the park purpose, significance, mission and interpretive themes.

- Outlined special park mandates, including the advisory council, water resources, wilderness, hunting, fishing, trapping, domestic livestock, and the Closed Basin Project.
- Discussed fundamental resources and values including the dunes system, natural diversity, human connections; and visitor opportunities.
- Updated the planning steps and the status of the wilderness review.

Seventeen written comments were received by mail, e-mail, or Internet between June 23, 2003 and January 3, 2004.

***Newsletter 3, issued in April 2004:***

- Summarized comments received from the second public comment period.
- Revised and condensed fundamental resources and values statements.
- Summarized an interagency meeting related to Great Sand Dunes planning.
- Provided a wilderness review update.
- Provided a Great Sand Dunes National Park Advisory Council update.
- Provided a planning steps update.

***Newsletter 4, issued in July 2004:***

- Discussed parkwide desired conditions (goals).

- Provided an overview of the draft management zones.
- Updated the status of the wilderness review.
- Provided an advisory council update.
- Discussed alternative management concepts.

Twenty-four comments were received by mail, e-mail, or Internet between January 4, 2004 and August 19, 2004.

***Newsletter 5, issued in January 2005:***

- Presented refined alternatives.
- Discussed actions considered but dismissed.
- Provided a planning steps update.
- Invited the public to attend four public meetings.

Ten people attended the Alamosa, Colorado, meeting held on January 31, 2005, about 40 people attended the Crestone, Colorado, meeting on February 1, 2005, four people attended the Golden, Colorado, meeting held on February 8, 2005, and six people attended the Westcliffe, Colorado, meeting on February 2, 2005. Many questions were answered and about 50 comments recorded at these meetings.

About 140 additional written comments were received by mail, e-mail, or Internet between August 20, 2004 and February 24, 2005.

Using input from the public and considering the probable environmental consequences and costs of the alternatives, the planning team developed a preferred alternative. Development of the preferred alternative is discussed in appendix E. A

draft general management plan and environmental impact statement was produced and distributed for public review.

Newsletters and draft documents were also available online.

Great Sand Dunes National Park Advisory Council meetings, which were held every few months and were open to the public, included additional opportunities for public comment. Great Sand Dunes Superintendent Steve Chaney also held several separate, informal question and answer sessions in Crestone as the need arose. These sessions were well attended.

## CONSULTATION

The National Park Service initiated consultation with the Colorado SHPO in January 2005. The Colorado SHPO responded on January 13, 2005, indicating that it concurred with the intent to use the NEPA process and documentation to comply with section 106 of NEPA.

The National Park Service initiated consultation with the USFWS in January 2005, to determine the presence of federally listed threatened, endangered, and candidate species in the park. The USFWS responded on February 15, 2005, with a list of species.

Tribes affiliated with the Great Sand Dunes were identified via an ethnographic overview (White 2005). The National Park Service initiated consultation with these tribes on January 5, 2004, when a letter was sent to each tribe notifying them of the general management plan effort. The letter included as enclosures the GMP newsletters published to date. It also invited the tribes to participate in the planning effort. A year later, on January 11, 2005, a letter was sent to each tribe inviting representatives to participate in a March, 2005 meeting of the Great Sand Dunes National Park Advisory Council; the Oglala Lakota

and Jicarilla Apache responded affirmatively and participated in the meeting. On February 8, 2005, the National Park Service sent another letter to the tribes regarding a land exchange effort that is not directly related to the GMP. This letter included a reminder that the National Park Service also seeks their input on the GMP. Park staff conducted follow-up meetings and telephone calls with representatives from several tribes throughout the planning process.

A series of interagency meetings (for federal and state agencies) on the GMP / wilderness study were hosted by the National Park Service during the planning process. The first meeting was held in November 2004, to aid understanding of the different agencies' missions, roles, and concerns related to management of lands in and near the Great Sand Dunes. The second meeting was held in April 2004, and its purpose was to share the National Park Service and advisory council's preliminary ideas about management alternatives for the national park and preserve, and to get feedback on these ideas. The third meeting was held in March 2005, and its purpose was to gather input from the agencies on more detailed alternatives for the park.

**TABLE 27. COMPLIANCE WITH SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT**

<b>Action</b>	<b>Section 106 Compliance</b>
<ul style="list-style-type: none"> <li>▪ New bike lanes along the park entrance road</li> <li>▪ Fee booth replacement in a new location near the park entrance</li> </ul>	<p>These elements of the NPS preferred alternative would not have an adverse effect on a historic property and therefore would not require consultation with the Colorado SHPO.</p>
<ul style="list-style-type: none"> <li>▪ Adaptive use of Medano Ranch headquarters for an NPS administrative center, and for public uses on a limited, scheduled basis</li> <li>▪ Wilderness recommendation for areas within the park expansion area</li> </ul>	<p>These elements of the NPS preferred alternative have potential to adversely affect an eligible historic property and therefore would require consultation with the Colorado SHPO.</p>
<ul style="list-style-type: none"> <li>▪ New backcountry zone in the north of the park (includes an access road and trailhead)</li> <li>▪ New trails in as yet undetermined locations within the backcountry adventure and guided learning zones</li> <li>▪ New hike/bike path connecting Pinyon Flats campground to dunes parking lot and visitor center</li> <li>▪ Adaptive use of Medano Ranch headquarters for an NPS administrative center, and for public uses on a limited, scheduled basis.</li> </ul>	<p>These elements of the NPS preferred alternative have potential to adversely affect a potentially eligible historic property and therefore would require consultation with the Colorado SHPO. If it is determined that a resource is not eligible, consultation would not be required for that resource.</p>

**LIST OF AGENCIES CONTACTED FOR INFORMATION  
OR SENT A COPY OF THE PLAN**

**Federal Agencies**

Advisory Council on  
Historic Preservation  
Bureau of Land  
Management  
Bureau of Reclamation  
Federal Highway  
Administration  
U.S. Environmental  
Protection Agency  
U.S. Fish and Wildlife  
Service  
U.S. Forest Service  
U.S. Geological Survey  
U.S. Natural Resources  
Conservation Service

USDA Resource  
Conservation and  
Development

**Tribes**

Cheyenne and Arapahoe  
Tribes of Oklahoma  
Comanche Indian Tribe of  
Oklahoma  
Hopi Indian Tribe  
Jicarilla Apache Indian Tribe  
Kiowa Tribe of Oklahoma  
Navajo Nation  
Northern Arapaho Indian  
Tribe  
Northern Cheyenne Indian  
Tribe

Pine Ridge Oglala Lakota  
Indian Tribe  
Pueblo of Acoma  
Pueblo of Cochiti  
Pueblo of Jemez  
Pueblo of Picuris  
Pueblo of San Juan  
Pueblo of Santa Clara  
Pueblo of Taos  
Pueblo of Zia  
San Juan Southern Paiute  
Tribe  
Southern Ute Tribe  
Uintah and Ouray Ute Tribe  
Ute Mountain Ute Tribe  
White Mesa Ute Tribe

**U.S. Senate / House of  
Representatives**

Senator Wayne Allard  
Senator Ken Salazar  
Representative Bob  
Beauprez  
Representative Diana  
DeGette  
Representative Joel Hefley  
Representative Scott  
McGinnis  
Representative Marilyn  
Musgrave  
Representative John T.  
Salazar  
Representative Thomas  
Tancredo  
Representative Mark Udall

**State Agencies**

Colorado Division of Water  
Resources  
Colorado Division of  
Wildlife  
Colorado Historical Society/  
State Historic  
Preservation Office  
Colorado State Forest  
Service  
Colorado State Land Board  
Colorado State Parks

**Other Agencies and  
Organizations**

Alamosa County, Colorado  
Baca Grande Library—  
Crestone, Colorado  
Baca Grande Water and  
Sanitation District  
Colorado College Library  
Colorado Mountain Club  
Friends of the Dunes  
National Parks and  
Conservation Assoc.  
Saguache County, Colorado  
San Luis Valley Ecosystem  
Council  
Southern Peaks Public  
Library—Alamosa,  
Colorado  
The Nature Conservancy  
West Custer County  
Library—Westcliff,  
Colorado  
The Wilderness Society



## SELECTED BIBLIOGRAPHY

- Adams, R.  
1990 Biogeography of bats in Colorado: Ecological implication of species tolerances. *Bat Research News* 31:17-21.
- Adams, R.  
2003 *Bats of the Rocky Mountain West: Natural History, Ecology, and Conservation*. University Press of Colorado, Boulder, CO. 289 pp.
- Adamus, P.R., L.T. Stockwell, E.J. Clairan, Jr., M.E. Morrow, L.P. Rozas, and D.R. Smith  
1991 "Wetland evaluation technique (WET); Volume I: Literature review and evaluation rationale," Technical Report WRP-DE-2, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A251 739, Vol I; NTIS No. AD A189 986, Vol II.
- Alves, J.A.  
1996 Rio Grande cutthroat trout management plan. Colorado Division of Wildlife.
- American Ornithologists' Union (AOU).  
1983 *Check-list of North American Birds*, 6th edition. Allen Press, Inc., Lawrence, KS. 877 pp.
- Armstrong, D.  
1972 Distribution of mammals in Colorado. Monograph of the University of Kansas Museum of Natural History 3:1-415.
- Armstrong, D., R. Adams, and J. Freeman  
1994 Distribution and ecology of bats in Colorado. University of Colorado Museum, Natural History Inventory 15:1-82.
- Baca Grande Design Guidelines and Requirements  
2002 Baca Grande Property Owners Association, Crestone, CO.
- Bean, L. E.  
1975 *Land of the Blue Sky People*. A Story of the San Luis Valley. Alamosa, Colorado. 121 pp + index.
- Bechard, M. J., and J. K. Schmutz  
1995 Ferruginous Hawk (*Buteo Regalis*). in *The Birds of North America*, No. 172 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C. 20 pp.

SELECTED BIBLIOGRAPHY

Billings, W. D.

- 1988 Alpine vegetation. Pages 391–420 in M. G. Barbour and W. D. Billings, editors. *North American Terrestrial Vegetation*. Cambridge University Press, NY.

Binkley, Dan, et al.

- 1997 Department of Forest Sciences, Status of Air Quality and Related Values in Class I National Parks and Monuments of the Colorado Plateau, April 1997.

Biosystems Analysis, Inc.

- 1989 Endangered Species Alert Program Manual: Species Accounts and Procedures. Southern California Edison Environmental Affairs Division.

Boddie, Peter, Eric Saenger, and Eric J. Harmon

- 1991 Geophysical and Hydrology Studies in Sand Creek, Great Sand Dunes National Monument, CO. HRS Water Consultants. Lakewood, CO.

Brand, C. J., L. B. Keith, and C. A. Fischer

- 1976 Lynx responses to changing snowshoe hare densities in central Alberta. *Journal of Wildlife Management* 40(3):416-428.

Britten, H. B., P. F. Brussard, and D. D. Murphy

- 1994 The pending extinction of the Uncompahgre fritillary butterfly. *Conservation Biology* 8:86-94.

Brown, B. T.

- 1988 Breeding ecology of a willow flycatcher population in Grand Canyon, Arizona. *Western Birds* 19:25-33.

Bunch, Fred

- 1997 Water Rights on Medano Creek. Great Sand Dunes National Monument, CO.
- 1997 Dune Movement. National Park Service. Great Sand Dunes National Monument, CO.

Colorado Board of Land Commissioners

- 2004 Board Order 2004-005; Oil and Gas Lease Auction Approval, Saguache County Tracts. Denver, CO.

Colorado Department of Agriculture

- 2003 Rules pertaining to the administration and enforcement of the Colorado Noxious Weed Act. Accessed via the World Wide Web at <<http://www.ag.state.co.us/DPI/weeds/statutes/weedrules.pdf>>.

Colorado Department of Labor and Employment, Labor Market Information

- 2005 Colorado Area Labor Force Data. <<http://www.coworkforce.com/LMI/ali/lfpag.asp>>.

Colorado Department of Local Affairs, Cartography/GIS Section

- 2001 Land Area of Counties in Colorado. Downloaded from  
<<http://www.dola.state.co.us/oem/cartography/cartog.htm>>.

Colorado Department of Transportation

- 2005 Traffic Data Statistics – 2004. Online at  
<[http://www.dot.state.co.us/App\\_DTD\\_DataAccess/Traffic/](http://www.dot.state.co.us/App_DTD_DataAccess/Traffic/)>.

Colorado Division of Wildlife (CDOW)

- 2004 On-line Species Profile for Gunnison Sage Grouse. Available at:  
<[http://wildlife.state.co.us/species\\_profiles/gunnisonsagegrouse.asp](http://wildlife.state.co.us/species_profiles/gunnisonsagegrouse.asp)>.

- 2005 On-line Species Profile for Humpback Chub. Available at:  
<[http://wildlife.state.co.us/species\\_profiles/humpback.asp](http://wildlife.state.co.us/species_profiles/humpback.asp)>.

- 2005 On-line Species Profile for Colorado Pikeminnow. Available at:  
<[http://wildlife.state.co.us/species\\_profiles/pikeminnow.asp](http://wildlife.state.co.us/species_profiles/pikeminnow.asp)>.

- 2005 On-line Species Profile for Boreal Toad. Available at:  
<[http://wildlife.state.co.us/species\\_profiles/boreal.asp](http://wildlife.state.co.us/species_profiles/boreal.asp)>.

- 2005 Maps of historical and current distributions of boreal toads. Available by links  
from: <<http://wildlife.state.co.us/aquatic/boreal/index.asp>>.

- 2005 General Locations of Lynx (*Lynx canadensis*) Reintroduced to Southwestern  
Colorado from February 4, 1999 through February 1, 2005. April 2005, 13 pp.

- 2005 Rivale, R. Personal communication with Miki Stuebe (e<sup>2</sup>M) on 28 April 2005 at  
Interagency Meeting for Great Sand Dunes GMP, Alamosa, CO.

Colorado Division of Local Government

- 2004 Preliminary Population Forecasts by County and Region. 20003–2030. Accessed  
online at: <<http://dola.colorado.gov/demog/populationtotals.cfm>>.

Colorado Natural Areas Program. State of Colorado

- 2005 Indian Spring Designated Colorado Natural Area. Available online at:  
<[http://parks.state.co.us/cnap/Natural\\_Areas/NA%20pages/indianspg.htm](http://parks.state.co.us/cnap/Natural_Areas/NA%20pages/indianspg.htm)>.

Colorado Natural Areas Program. State of Colorado

- 1984 Colorado Natural Areas Act of 1984. CRS 33-33-101.

Colorado Natural Heritage Program (CNHP)

- 1999 A Biological Inventory and Conservation Recommendations for the Great Sand  
Dunes and San Luis Lakes, Colorado. March 1999. 87 pp. Prepared by Phyllis M.  
Pineda, Renee J. Rondeau, and Anne Ochs, Colorado State University, College of  
Natural Resources, Fort Collins, CO.

SELECTED BIBLIOGRAPHY

- 1998 Saguache County, Closed Basin Inventory, Volumes I and II: A Natural Heritage Assessment Final Report. February 1998. Prepared by Colorado Natural Heritage Program, Renee J. Rondeau, Daniel Sarr, Michael B. Wunder, Phyllis M. Pineda, Gwen M. Kittel. Report prepared for The Nature Conservancy, San Luis Valley Program. Saguache, CO.
- Colorado Partners In Flight (COPIF)
- 2005 Long-billed Curlew Page. Available at:  
<<http://www.rmbo.org/pif/bcp/phy36/grasland/lbcu.htm>>.
- Colorado State Historic Preservation Office
- 2005 Site record 5AL411. Compass Web site access on July 16, 2005.
- 2005 Site record 5AL101. Compass Web site access on July 12, 2005.
- Colorado State Parks
- 1996 San Luis Lakes State Park Management Plan. Colorado Department of Natural Resources, Division of Parks and Outdoor Recreation. Denver, CO.
- Conservation Foundation
- 1984 The state of the environment: an assessment at mid-decade. Washington DC.
- Cooper, David
- 1992 Wetland of the San Luis Valley, Colorado: An ecological study and analysis of the hydrologic regime, soil chemistry, vegetation and potential effects of a water table drawdown. Research Paper for State of Colorado Division of Wildlife U.S. Fish and Wildlife Service Rio Grande Water Conservation District.
- de Vargas, D.
- 1694 Journal of the Vargas Expedition into Colorado, 1694. Archivo de la Nación, Mexico City, Mexico in Jodry, M. A. B. 1999. Folsom technological and socioeconomic strategies: views from Stewart's Cattle Guard and the Upper Rio Grande Basin, Colorado. Ph.D. Dissertation, American University, Washington, D.C. 20016. 396 pp inc. appendices + index.
- Denver Post
- 2005 "Haze clouds parks' future." Newspaper article, July 25, 2005.
- Ellis, K. L. and J. Haskins
- 1985 Unusual Nest Site for Greater Sandhill Cranes in Colorado. *Western Birds* 16:185-186.
- Emery, Philip A.
- 1997 Hydrogeology of the San Luis Valley, Colorado: An Overview – and a Look at the Future. *Al2O3 Geohydrology*. Lake Havasu City, AZ.

Environmental Laboratory

- 1987 "Corps of Engineers Wetlands Delineation Manual," Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Fellers, G. and E. Pierson

- 2002 Habitat use and foraging behavior of Townsend's big-eared bat (*Corynorhinus townsendii*) in coastal California. *Journal of Mammalogy* 83:167-177.

Fowler, Ron

- 2005 Division of Realty, U.S. Fish and Wildlife Service. Personal communication with R. Dutton, September 15, 2005.

Fryberger, S.G., L.F. Krystinik, and C.J. Schenk

- 1990 Modern and ancient eolian deposits: Petroleum exploration and production. Rocky Mountain Section, Society of Economic Paleontologists and Mineralogists. Denver, CO.

Giroir, G.

- 2005 Draft Final Report on the General Avian Inventory of Great Sand Dunes National Park and Preserve, Colorado. Submitted to Mike Britten, NPS, 12795 W. Alameda Parkway, Lakewood, CO on 18 February 2005.

Graber, D.

- 1996 Status of terrestrial vertebrates. In Sierra Nevada Ecosystem Project: Final report to Congress, Vol. II, chapter 27. Davis: University of California, Centers for Water and Wildland Resources.

Graul, W.D.

- 1975 Breeding biology of the mountain plover. *The Wilson Bulletin* 87(1):6-31.

Graul, W.D. and L.E. Webster

- 1976 Breeding status of the mountain plover. *Condor* 78:265-267.

Great Sand Dunes

- 2002 NM&PRES VSP Visitor Study June 23-29, 2002, Visitor Services Project Great Sand Dunes National Monument and Preserve

Great Sand Dunes National Monument

- 1997 An Interpreter's Guide to Great Sand Dunes Research. Volunteer In Park: Elizabeth Sundermeyer, Editor.

Gripp, Pamela

- 2005 Personal communication with Pamela Gripp, Baca/Crestone Ambulance Service administrator.

SELECTED BIBLIOGRAPHY

Hammond, Dave

- 1997 Pond Disappearance. Geology Department, Colorado State University. Fort Collins, CO.

Hansen, R. and V. Reid

- 1973 Distribution and adaptations of pocket gophers. Pp. 1-19 in Pocket gophers and Colorado mountain rangeland (G. Turner, R. Hansen, V. Reid, H. Tietjen, and A. Ward, eds.). Experiment Station Bulletin, Colorado State University 2:1-554.

Hawks Aloft, Inc.

- 2002 Southwestern willow flycatcher surveys in the San Luis Valley, Colorado. Report dated 26 November 2002, submitted to Kelli Stone, Wildlife Biologist, Alamosa NWR. 13 pp + appendices.

Hoffer, Roger, Thom Curdts, Vern Thomas, Eric Windesheim

- 1990 Landsat Thematic Mapper Classification of the Great Sand Dunes National Monument. Colorado State University. Fort Collins, CO.

Jodry, Margaret A. and Dennis J. Stanford

- 1997 Changing Hydrologic Regimes and Prehistoric Landscape Use in the Northern San Luis Valley, Colorado. Smithsonian Institution, Paleoindian/Paleoecology Program, National Museum of Natural History. Washington, DC.

- 1992 Stewart's Cattle Guard Site: An Analysis of Bison Remains in a Folsom Kill-Butchery Campsite. In Ice Age Hunters of the Rockies. Denver Museum of Natural History and University Press of Colorado, Niwot, CO.

Jodry, M. A. B.

- 1999 Folsom technological and socioeconomic strategies: views from Stewart's Cattle Guard and the Upper Rio Grande Basin, Colorado. Ph.D. Dissertation, American University, Washington, DC. 20016. 396 pp inc. appendices + index.

Jones, C.

- 1965 Ecological distribution and activity periods of bats of the Mogollon Mountains area of New Mexico and adjacent Arizona. Tulane Studies in Zoology 12:93-100.

Knopf, F.L.

- 1996 Mountain Plover (*Charadrius Montanus*). In A. Poole and F. Gill, editors. The Birds of North America, No. 211. The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, DC. 16 pp.

Knopf, F. L., and B. J. Miller.

- 1994 *Charadrius Montanus* - montane, grassland, or bare-ground plover? Auk 111(2):504-506.

Knopf, F. L., and J. R. Rupert.

- 1995 Habits and habitats of mountain plovers in California. Condor 97:743-51.

Knowles, C. J., C. J. Stoner and S. P. Gieb

- 1982 Selective use of black-tailed prairie dog towns by mountain plovers. *Condor* 84:71-74.

Le, Yen, and Littlejohn, Margaret

- 2003 "Visitor Services Project, Great Sand Dunes National Monument and Preserve". Cooperative Park Studies Unit, University of Idaho, Moscow, ID.

MacArthur, R. A., V. Geist, and R. H. Johnston

- 1979 Factors influencing heart rate in free-ranging bighorn sheep: a physiological approach to the study of wildlife harassment. *Canadian Journal of Zoology* 57:2010-2021.

MacArthur, R. A., V. Geist, and R. H. Johnston

- 1982 Cardiac and behavioral responses of mountain sheep to human disturbance. *Journal of Wildlife Management* 46(2):351-358.

Magee, Pete

- 1991 Preliminary Textural Analyses from Core Samples, The Great Sand Dunes National Monument, South Central Colorado. Adams State College. Alamosa, CO.

\_\_\_\_\_ and Mary K. Mueller

- 1991 Identification of Multiple Groundwaters in the Great Sand Dunes National Monument, South Central, Colorado. Adams State College. Alamosa, CO.

Martorano, Marilyn A., Ted Hofer III, Margaret (Pegi) A. Jodry, Vince Spero, and Melissa A. Taylor

- 1999 *Colorado Prehistory: A Context for the Rio Grande Basin*. Colorado Council of Professional Archaeologists, Denver, CO.

Martorano, Marilyn A.

- 2005 Personal communication regarding archeological resources in the Great Sand Dunes Park and Preserve. July 7, 2005.

- 2004 Cultural Resources Interim Report, Archaeological Investigations in the Northern Sands, Great Sand Dunes National Monument and Preserve, Colorado. Lakewood, CO.

- 2002 Final 2001 Field Season Cultural Resources Interim Report, Great Sand Dunes National Monument and Preserve, Colorado. Lakewood, CO.

- 2001 Area Emergency Rehabilitation (BAER) Cultural Resources Interim Report, Great Sand Dunes National Monument, Colorado. Lakewood, CO

SELECTED BIBLIOGRAPHY

Martorano, Marilyn A. and Heather Mrzlack

- 2003 Field Season Cultural Resources Interim Report, Archaeological Inventory in the High Country, Great Sand Dunes National Monument and Preserve, Colorado. Lakewood, CO.

McArthur, Durant and Stewart Sanderson

- 1990 Vegetation Patterns: 1960 (1936) – 1990, Great Sand Dunes National Monument. U.S. Forest Service. Ogden, UT.

McCalpin, James C.

- 1991 Stream Flow Measurements in Sand Creek. Utah State University. Logan, UT.

——— Seasonal and Diurnal Discharge Fluctuations in Medano Creek, Great Sand Dunes National Monument. Utah State University. Logan, UT.

Muths, E. and S. Street

- 2002 Report to Great Sand Dunes National Monument and Preserve: NPS Inventory and Monitoring Project – Amphibians and Reptiles. Final Report submitted 1 November 2002. 30 pp.

National Park Service, U.S. Department of the Interior (NPS)

- 2005 Public Use Statistics Office – The Money Generation Model II. <<http://www2.nature.nps.gov/stats/>>.

2005 Natural Resources Reference Manual 77: Air Resources Management. Accessed online at: <<http://www.nature.nps.gov/rm77/air/authority.cfm>>.

2005 Great Sand Dunes National Park and Preserve Environmental Assessment/Assessment of Effect, Rehabilitate Main Park Roads.

2005 Great Sand Dunes National Park and Preserve. Emergency medical services, search and rescue, and motor vehicle accident records.

2004 Groundwater Claim Filed for Great Sand Dunes National Park and Preserve. National Park Service Water Resources Division Annual Report. By William R. Hansen.

2003 Great Sand Dunes National Monument and Preserve – Visitor Study, Summer 2002. Completed by Le, Yen and Margaret Littlejohn.

2003 Dogs in Parks. Accessed online at: <<http://www.nps.gov/jotr/manage/dogs/dogs.ntml>>.

2002 Great Sand Dunes National Monument and Preserve Visitor Study, Summer 2002. Park Studies Unit, Resource Recreation and Tourism Department, University of Idaho.

- 2001 National Park Service Management Policies. Washington, D.C.
- 1998 NPS Director's Order 77-1: Wetland Protection. Washington, D.C.
- 1997 Visitor Use Survey, Great Sand Dunes National Monument. On file at Great Sand Dunes National Park and Preserve, CO.
- 1995 Water Resources Management Plan; Great Sand Dunes National Monument, Colorado. Coordinated by Mark Chatman, Geologist, Planning and Evaluation Branch, Water Resources Division. Fort Collins, CO.
- 1995 Colorado Plateau Ambient Sound Monitoring Program: Results of Monitoring at Great Sand Dunes National Monument 7/93 – 10/94. Denver Colorado, October 1995. Colorado Air Quality Report to the Public, 1990, the Colorado Air Quality Control Division.
- 1993 Guiding Principles of Sustainable Design. Denver Service Center, Denver, CO.
- 1984 Soil Survey of Saguache County Area, Colorado. U.S. Soil Conservation Service in cooperation with the Colorado Agricultural Experiment Station; U S DI-BLM; and Saguache County. Author: James M. Yenter. Denver, CO.
- 1973 Soil Survey of Alamosa Area, Colorado. U.S. Soil Conservation Service in cooperation with the Colorado Agricultural Experiment Station. Authors: James P. Pannell, James M. Yenter, Stanley O. Woodyard, and Richard E. Mayhugh. Denver, CO.
- n.d. Great Sand Dunes National Park and Preserve Visitor Map.
- National Park Service, U.S. Fish and Wildlife Service, and The Nature Conservancy  
2005 Greater Sand Dunes Interagency Fire Management Plan Environmental Assessment/ Assessment of Effect. April 25, 2005.
- National Register of Historic Places Registration Form. Medano Ranch Headquarters.
- Natural Diversity Information Source (NDIS)
- 2005 NDIS Bonytail Wildlife Page:  
<<http://ndis.nrel.colostate.edu/wildlifesp.aspx?SpCode=010630>>.
- 2005 NDIS Razorback Sucker Wildlife Page:  
<<http://ndis.nrel.colostate.edu/wildlifesp.aspx?SpCode=010595>>.
- 2005 NDIS Yellow-billed Cuckoo Wildlife Page:  
<<http://ndis.nrel.colostate.edu/wildlifesp.aspx?SpCode=040277>>.
- 2005 NDIS Bald Eagle Wildlife Page:  
<<http://ndis.nrel.colostate.edu/wildlifesp.aspx?SpCode=040231>>.

SELECTED BIBLIOGRAPHY

- 2005 NDIS Canada Lynx Wildlife Page:  
<<http://ndis.nrel.colostate.edu/wildlifesp.aspx?SpCode=051036>>.
- 2005 NDIS Black-tailed Prairie Dog Wildlife Page:  
<<http://ndis.nrel.colostate.edu/wildlifesp.aspx?SpCode=051006>>.
- 2005 NDIS Rio Grande Chub Wildlife Page:  
<<http://ndis.nrel.colostate.edu/wildlifesp.aspx?SpCode=010580>>.
- 2005 NDIS Mexican Spotted Owl Wildlife Page:  
<<http://ndis.nrel.colostate.edu/wildlifesp.aspx?SpCode=040019>>.
- 2005 NDIS Northern Leopard Frog Wildlife Page:  
<<http://ndis.nrel.colostate.edu/wildlifesp.aspx?SpCode=020191>>.
- 2005 NDIS Ferruginous Hawk Wildlife Page:  
<http://ndis.nrel.colostate.edu/wildlifesp.aspx?SpCode=040229>>.
- 2005 NDIS Greater Sandhill Crane Wildlife Page:  
<<http://ndis.nrel.colostate.edu/wildlifesp.aspx?SpCode=040701>>.
- 2005 NDIS Long-billed Curlew Wildlife Page:  
<<http://ndis.nrel.colostate.edu/wildlifesp.aspx?SpCode=040489>>.
- NatureServe  
2004 International Ecological Classification Standard: Terrestrial Ecological Classifications. Great Sand Dunes NP vegetation mapping project area. NatureServe Central Databases. Arlington, VA and NatureServe, Boulder, CO. Data current as of April 20, 2005.
- Olson, S.L.  
1984 Density and distribution, nest site selection, and activity of the mountain plover on the Charles M. Russell National Wildlife Refuge. M.S. thesis. University of Montana, Missoula. 62 pp.
- Olson, S.L., and D. Edge  
1985 Nest site selection by mountain plovers in northcentral Montana. *Journal of Range Management* 38(3):280-282.
- Olson-Edge, S. L. and W. D. Edge  
1987 Density and distribution of the mountain plover on the Charles M. Russell National Wildlife Refuge. *The Prairie Naturalist*. 19(4):233-238.
- Page, G. W., L. E. Stenzel, and C. A. Ribic  
1985 Nest site selection and clutch predation in the snowy plover. *Auk* 102:347-353.

Phillips, A., J. Marshall, and G. Monson

1964 The birds of Arizona. The University of Arizona Press, Tucson, AZ.

Pike, Z. M.

1810 Sources of the Mississippi and the Western Louisiana Territory, to the Sources of the Arkansaw, Kans, La Platte, and Pierre Jaun, River's Performed by Order of the Government of the United States During the Years 1805, 1806, and 1807, and a Tour Through the Interior Parts of New Spain, When Conducted through These Provinces, by Order of the Captain-General, in the year 1807. Philadelphia: C. & A. Conrad in White, D. R. M. 2005. Seinanyédi: An Ethnographic Overview of Great Sand Dunes National Park and Preserve. Applied Cultural Dynamics, Santa Fe, New Mexico. Report to the National Park Serviced, U.S. Department of the Interior, Great Sand Dunes National Park and Preserve, Colorado. 338 pp + appendices.

Pineda, Phyllis M.

2002 Natural History of the Great Sand Dunes Tiger Beetle, *Cincindela theatina* Rotger (*Coleoptera: Carabidae*), and Invertebrate Inventory of Indian Spring Natural Area, at Great Sand Dunes, Colorado. M.S. Thesis, Colorado State University, Fort Colins, CO.

Popovich, S. J., W. D. Shepperd, D. W. Reichert, and M. A. Cone

1993 Flora of the Fraser Experimental Forest, Colorado. U.S. Forest Service General Technical Report RM-233. 62 pp.

Quinn, N.W.S. and G. Parker

1987 Lynx. pp. 682-694. in Novak, M., Baker, J.A., Obbard, M.E., and B. Malloch (eds). 1987. Wild Furbearer Management and Conservation in North America. Ontario Ministry of Natural Resources. Toronto. 1150pp.

Rawinski, J.J.

2004 Birds of the Rio Grande National Forest and San Luis Valley Area: A summary of bird observations. Summary report produced for and provided by the Rio Grande National Forest.

Renner, L., P. Gray, and V. Graham

1990 Greater sandhill crane nesting success and recruitment in northwest Colorado, December 1991. Prepared by Colorado Division of Wildlife, Terrestrial Wildlife Section, Grand Junction, Colorado. 56 pp.

RMC Consultants, Inc.

2005 Class I Cultural Resources Overview of the Baca Land Exchange BLM Parcels, Fremont, Saguache, and Conejos Counties, Colorado. Prepared for: NPS, BLM, FWS: NPS – C124801AA01, May 2005.

Robertson, Paul

- 2005 The Nature Conservancy – Unit Manager, Medano-Zapata Ranch. Personal communication with R. Dutton, September 2005.

Rupert, M.G., and Plummer, L.N.

- 2004 Groundwater flow direction, water quality, recharge sources, and age, Great Sand Dunes National Monument and Preserve, south-central Colorado, 2000-2001: U.S. Geological Survey Scientific Investigations Report 2004-5027, 32 p.

San Luis Lakes State Park

- 2005 Online description of San Luis Lakes State Park; San Luis Valley, Colorado. Accessed online at: <http://www.sangres.com/stateparks/sanluislakes.htm>.

Schmidt, C.

- 2003 Conservation assessment for Townsend's big-eared bat (*Corynorhinus townsendii*) in the Black Hills National Forest of South Dakota and Wyoming. Available online at: [www.fs.fed.us/r2/blackhills/projects/planning/assessments/big\\_ear\\_bat.pdf](http://www.fs.fed.us/r2/blackhills/projects/planning/assessments/big_ear_bat.pdf).

Scott, J. Michael and Michael D. Jennings

- 1998 Large-Area Mapping of Biodiversity. Reprinted from the Annals of the Missouri Botanical Garden, Vol. 85, No. 1. Presented

Seamans, M. E., and R. J. Gutierrez

- 1995 Breeding habitat of the Mexican spotted owl in the Tularosa Mountains, NM. *Condor* 97:944-952.

Seidl, A.

- 1995 Larval biology, population dynamics and conservation status of the Uncompahgre fritillary *Boloria acrocne* (*Lepidoptera: Nymphalidae*). M.S. thesis. Colorado State University, Fort Collins, CO.

Seidman, V. and C. Zabel

- 2001 Bat activity along intermittent streams in northwestern California. *Journal of Mammalogy* 82:738-747.

Simes, C. A.

- 1999 "Domestic Dogs in Wildlife Habitats." Pages 8.1-8.17 in G. Joslin and H. Youmans, coordinators. Effects of recreation on Rocky Mountain wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society. 307pp.

Simmons, R. Laurie and Thomas H. Simmons

- 2004 Historical Context (Overview) Medano Ranch and Trujillo Homestead Sites, The Nature Conservancy, San Luis Valley Program, Colorado. Colorado State Historic Fund Project #2000-02-015. RMC Consultants, Inc., Lakewood, CO.

Spackman Panjabi, Susan and K. Decker

- 2002 Great Sand Dunes National Monument and Preserve Vascular Plant Inventory Colorado Natural Heritage Program, Colorado State University, Fort Collins, CO.

Spackman Panjabi, Susan, K. Decker, G. Doyle, and D. Anderson

- 2004 Great Sand Dunes National Monument and Preserve 2003 Vascular Plant Inventory Colorado Natural Heritage Program, Colorado State University, Fort Collins, CO.

Stogner, Robert W., Sr.

- 1997 Variability of Nitrate Concentrations in the Shallow Ground Water in a Selected Area of the San Luis Valley, South-central Colorado. USGS: Water Resources of Colorado, Fact Sheet 004-97. Obtained online at: <http://water.usgs.gov/pubs/fs/fs004-97>.

Sundermeyer, Beth

- 1997 Fecal Coliform Testing in Great Sand Dunes National Monument. National Park Service. Great Sand Dunes National Monument, CO.

Taylor, Milissa L.

- 1999 Colorado Prehistory: A Context for the Rio Grande Basin. Published by the Colorado Council of Professional Archaeologists, distributed through the University of Utah Press.

Trails and Wildlife Task Force, Colorado State Parks, and Hellmund Associates.

- 1998 Planning Trails with Wildlife in Mind. Denver, CO <[www.dnr.state.co.us/parks](http://www.dnr.state.co.us/parks)>

U.S. Fish and Wildlife Service (USFWS)

- 1995 Recovery plan for the Mexican spotted owl (*Strix occidentalis lucida*). Volume 1. Albuquerque, New Mexico. 172 pp
- 2005 Threatened and Endangered Species System (TESS) Species Profile for Razorback Sucker (*Xyrauchen texanus*), available at: <[http://ecos.fws.gov/species\\_profile/servlet/gov.doi.species\\_profile.servlets.SpeciesProfile?scode=E054](http://ecos.fws.gov/species_profile/servlet/gov.doi.species_profile.servlets.SpeciesProfile?scode=E054)>.
- 1979 Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service, Office of Biological Services. 131 pp.

U.S. Forest Service (USFS)

- 2005 Deadman Creek Research Natural Area. Accessed online at: <<http://rna.nris.state.mt.us/rna>>.
- 2005 <<http://www.fs.fed.us/r2>>. Web site accessed July 25, 2005 for information regarding campground facility.

U.S. Geological Survey. (USGS)

- 2003 Investigation of Water Quality in the Great Sand Dunes National Monument and Preserve, Saguache County, Colorado, February 1999 through September 2000: Qualifying for Outstanding Waters Designation.

United States Salinity Laboratory Staff (L.A. Richards, Editor)

- 1954 Diagnosis and Improvement of Saline and Alkali Soils. Agriculture Handbook No. 60, Soil Conservation Research Branch, United State Department of Agriculture, Washington DC.

U.S. Census Bureau

- 2005 Annual Estimates of the Population for Counties of Colorado, April 1, 2000 to July 1, 2004. <<http://www.census.gov/popest/counties/>>.
- 2005 Annual Estimates of the Population for Incorporated Places in Colorado, Listed Alphabetically: April 1, 2000 to July 1, 2004. <<http://www.census.gov/popest/cities/>>.
- 2005 Annual Estimates of Housing Units for Counties: April 1, 2000 to July 1, 2004. <<http://www.census.gov/popest/housing/HU-EST2004-4.html>>.
- 2005 Regional Economic Information System (REIS), Personal income by major source and earnings by industry and full-time and part-time employment by industry, 1969 to 2003. <<http://www.bea.gov/bea/regional/statelocal.htm>>.
- 2004 Small Area Income and Poverty Estimates, Estimates for Colorado Counties, 2002. <<http://www.census.gov/hhes/www/saie/county.html>>.
- 2004 Poverty Thresholds 2002. <<http://www.census.gov/hhes/www/poverty/threshld.html>>.
- 2004c Projected Population of the United States: 2000–2050 (Interim Projections). Accessed online at: <<http://www.census.gov/ipc/www/usinterimproj/>>.
- 2004 Annual Estimates of the Population for Counties of Colorado: April 1, 2000 to July 1, 2004. Accessed online at: <<http://www.census.gov/popest/counties/tables/CO-EST2004-01-08.xls>>.
- 2002 Census 2000, Demographic Profiles – 100 Percent and Sample Data, Colorado. <<http://www.census.gov/Press-Release/www/2002/demoprofiles.html>>.

U.S. Department of Agriculture, National Agricultural Statistics Service

- 2004 2002 Census of Agriculture – Colorado. <<http://www.nass.usda.gov/wy/>>.

U.S. Department of the Interior (DOI)

- 2005 PILT Payment in Lieu of Taxes—Total Payments and Total Acres by State/County. Downloaded from <<http://www.doi.gov/pilt/>>.

Valdez, E.

- 2003 Mammal inventory of Great Sand Dunes and Florrisant Fossil Beds National Monuments, 2003. Report prepared for NPS Inventory and Monitoring Program. 34pp.

Weber, W.A. and R.C. Wittmann

- 2001 Colorado Flora Eastern Slope, Third Edition. University Press of Colorado, Boulder, CO.

Western Regional Climate Center (WRCC)

- 2005 Accessed online: <http://www.wrcc.dri.edu/cgi-bin/clinMAIN.pl?cosaug>

Wuerthner, G.

- 1998 "Are Cows Just Domestic Bison? Behavioral and Habitat Use Differences Between Cattle and Bison," in *International Symposium on Bison Ecology and Management in North America*, edited by L. Irby, L. Knight, and J. Knight. Bozeman: Montana State University.

White, D. R. M.

- 2005 Seinanyédi: An Ethnographic Overview of Great Sand Dunes National Park and Preserve. Applied Cultural Dynamics, Santa Fe, New Mexico. Report to the National Park Service, U.S. Department of the Interior, Great Sand Dunes National Park and Preserve, Colorado. 338 pp + appendices.

Whitson, T.D., L.C. Burrill, S.A. Dewey, D.A. Cudney, B.E. Nelson, R.D. Lee, and R. Parker

- 2000 Weeds of the West, 9th Edition. Western Society of Weed Science, the Western United States Land Grant Universities Cooperative Extension Services, and the University of Wyoming. Grand Teton Lithography, Jackson, WY. 628 pp.

Wilson, D. D.

- 1975 They came to hunt. Early man in the San Luis Valley. In James, H. L. (ed.), 1975, Guidebook of the San Luis Basin, Colorado, twenty-second field conference, September 30–October 1, 1971. New Mexico Geological Society, Alamosa, CO. 325 pp.

## PREPARERS AND CONSULTANTS

### DOCUMENT PREPARERS

Jayne Aaron\*, Architectural Historian/Environmental Planner, engineering-environmental Management, Inc. B.A. Environmental Design (Architecture), M.S. Environmental Policy and Management. Cultural Resources and NEPA: 16 years experience. Responsible for description of existing conditions and impact analysis for: scenic quality and visual resources, health and safety, NPS operations. Also responsible for Appendix H: Wild and Scenic River Evaluation.

Ronald Dutton\*, Regional Economist, Sammons/Dutton LLC. B.S. Economics, M.S. Economics. Experience: 29 years. Responsible for description of existing conditions and impact analysis for: socioeconomics.

Daniel Hart, Historical Archeologist/Architectural Historian, engineering-environmental Management, Inc. B.A. anthropology/history, M.A. anthropology. Experience: 13 years in cultural resource management consulting. Responsible for description of existing conditions and impact analysis for: historic structures and cultural landscapes.

David Hesker, Graphic Designer/Illustrator, ERO Resources Corporation. B.F.A. Colorado State University, emphasis in graphic design. Experience: 15 years. Responsible for maps and other graphic illustrations.

Wanda Gray Lafferty, Technical Publications Specialist, engineering-environmental Management, Inc. Two years undergraduate work. Experience: 27 years in the legal field and as communications director for national environmental nonprofit organization. Responsible for document editing and publication.

Marilyn A. Martorano, Archeologist/Cultural Resource Management Specialist, RMC Consultants, Inc. B.A. Anthropology, M.A. Anthropology/Archeology emphasis. Experience: 27 years. Responsible for description of existing conditions and impact analysis for cultural resource topics.

Cheryl Schmidt, Mammalogist, engineering-environmental Management, Inc. B.S. Biology, M.S. Biology, Ph.D. Biology. Experience: 21 years, 4 years with e<sup>2</sup>M as wildlife biologist. Responsible for: description of existing conditions and impact analysis for: wildlife, federal threatened and endangered species, operations of other management agencies and entities.

Christy J. Smith, Archeologist, engineering-environmental Management, Inc. B.A. Archeology. Experience: 9 years. Responsible for description of existing conditions and impact analysis for archeology.

Miki Stuebe\*, Landscape Architect/Planner, engineering-environmental Management, Inc. B.A. Biology, M.S. Biology-Ecology, M.L.A. Land Resource Planning. Experience: 16 years, 10 years with the National Park Service as Landscape Architect/Planner. Responsible for: description of existing conditions and impact analysis for: visitor use and experience. Also responsible for Chapter 1: Purpose and Need for the Plan, Chapter 2: Alternatives, impact topics considered but not analyzed in detail, Chapter 5: Consultation and Coordination, and appendices B-G, and J.

Jim Von Loh, Senior Biologist, engineering-environmental Management, Inc. B.S. Biology, M.S. Biology. Ecology, Botany and Biology: 31 years experience. Responsible for description of existing conditions and impact analysis for: vegetation, ecologically critical areas, and wetlands.

Craig Vrabel, Senior Geologist, engineering-environmental Management, Inc. B.S. Geology. Geology, Hydrogeology, and Hazardous and Solid Waste Management: 17 years experience. Responsible for description of existing conditions and impact analysis for: soils and geologic resources, water resources.

\*document preparers who are also Core Team Members

## **NATIONAL PARK SERVICE CORE TEAM MEMBERS**

Steve Chaney, Superintendent, Great Sand Dunes National Park and Preserve  
Jim Bowman, Chief Park Ranger, Great Sand Dunes National Park and Preserve  
Fred Bunch, Chief of Resources, Great Sand Dunes National Park and Preserve  
Mark Seaton, Chief of Maintenance, Great Sand Dunes National Park and Preserve  
Carol Sperling, Chief of Interpretation and Visitor Services, Great Sand Dunes National Park and Preserve  
Suzy Stutzman, Landscape Architect/Planner, National Park Service Intermountain Region

## **GREAT SAND DUNES NATIONAL PARK ADVISORY COUNCIL**

Herry Andrews, Alamosa County Administrator; Alamosa, Colorado (*term 2003 – 2007*)  
Christine Canaly, Environmentalist; Crestone, Colorado (*term 2003 – 2007*)  
Hobart Dixon, Botanist; Alamosa, Colorado (*term 2003 – 2007*)  
Bill McClure, former Saguache County Commissioner; Center, Colorado (*term 2003 – 2005*)  
Robert Ogburn\*, Senior Judge; Monte Vista and Pueblo West, Colorado (*term 2003 – 2007*)  
Robert Philleo, former Saguache County Commissioner; Crestone, Colorado (*term 2003 – 2007*)  
Paul Robertson, San Luis Valley Project Director, The Nature Conservancy (Colorado Chapter); Mosca, Colorado (*term 2005 – 2007*)  
Terry Sandmeier, Hunting Guide/Outfitter; Fairplay, Colorado (*term 2003 – 2007*)

Michael J. Spearman, Saguache County Commissioner; Saguache, Colorado (*term 2005 – 2007*)

Michael Tetrault, Director, Western Region, The Nature Conservancy (Colorado Chapter); Mosca, Colorado (*term 2003 – 2005*)

George Whitten, Jr., Rancher; Saguache, Colorado (*term 2003 – 2007*)

Jeff Woodard, Businessman; Alamosa, Colorado (*term 2005 – 2007*)

Robert Zimmerman, former Alamosa County Commissioner; Alamosa, Colorado (*term 2003 – 2005*)

\*Chairman

## CONSULTANTS

Adrienne Anderson, National Park Service Intermountain Region

Beth Hall, former Administrative Clerk, Great Sand Dunes National Park and Preserve

Barb Irwin, former Chief of Administration, Great Sand Dunes National Park and Preserve

Margaret Johnston, Superintendent, Golden Spike National Historic Site

Cay Ogden, Wildlife Biologist, National Park Service Intermountain Region

Phyllis Pineda-Bovin, Biologist, Great Sand Dunes National Park and Preserve

Chris Turk, Regional Environmental Quality Coordinator, National Park Service Intermountain Region

Andrew Valdez, Geologist, Great Sand Dunes National Park and Preserve

Joel Wagner, Hydrologist, NPS Water Resources Division

Bill Wellman, Superintendent, Black Canyon of the Gunnison National Park and Curecanti National Recreation Area

John White, Protection Ranger, Great Sand Dunes National Park and Preserve

Ayesha Williams, Administrative Technician, Great Sand Dunes National Park and Preserve

## **APPENDIX A: LEGISLATION**



## 39. Great Sand Dunes National Monument

Establishment: Proclamation (No. 1994) of March 17, 1932..... Page  
207

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

## A PROCLAMATION

[No. 1994—March 17, 1932—47 Stat. 2506]

WHEREAS it appears that the public interest would be promoted by including the lands hereinafter described within a national monument for the preservation of the great sand dunes and additional features of scenic, scientific, and educational interest;

NOW, THEREFORE, I, Herbert Hoover, President of the United States of America, by virtue of the power in me vested by sec. 2 of the act of Congress entitled "AN ACT For the preservation of American antiquities," approved June 8, 1906 (34 Stat. 225), do proclaim and establish the Great Sand Dunes National Monument and that, subject to all valid existing rights, the following-described lands in Colorado be, and the same are hereby, included within the said national monument:

## SIXTH PRINCIPAL MERIDIAN

- T. 25 S., R. 73 W., secs. 31 and 32;
- T. 26 S., R. 73 W., secs. 3 to 11, inclusive;  
secs. 14 to 23, inclusive;  
secs. 26 to 35, inclusive;
- T. 27 S., R. 73 W., secs. 3 to 10, inclusive;  
secs. 15 to 22, inclusive;

## NEW MEXICO PRINCIPAL MERIDIAN

- T. 40 N., R. 12 E., secs. 1 and 2;  
sec. 11, NE.  $\frac{1}{4}$ ;  
secs. 12, 13, 24, and 25;
  - T. 41 N., R. 12 E., sec. 10, lots 1 to 4, inclusive;  
sec. 11, lots 1 to 4, inclusive;  
sec. 12, lots 1 to 4, inclusive;  
secs. 13 to 15, inclusive;  
secs. 22 to 27, inclusive;  
secs. 34 to 36, inclusive;
- and unsurveyed land which upon survey will probably be described as:
- Fractional T. 40 N., R. 13 E.;
  - Fractional T. 41 N., R. 13 E.;
  - Fractional T. 42 N., R. 13 E.; secs. 30 and 31.

Warning is hereby expressly given to all unauthorized persons not to appropriate, injure, destroy, or remove any feature of this monument and not to locate or settle upon any of the lands thereof.

The Director of the National Park Service, under the direction of the Secretary of the Interior, shall have the supervision, management, and control of this monument as provided in the act of Congress entitled "AN ACT To establish a National Park Service, and for other purposes," approved August 25, 1916 (39 Stat. 535-536), and acts additional thereto or amendatory thereof.

208 VIII. NATIONAL MONUMENTS—GREAT SAND DUNES

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the United States to be affixed.

DONE at the City of Washington this 17th day of March, in the year of our Lord nineteen hundred and thirty-two, and of the Independence of the United States of America the one hundred and fifty-sixth.

By the President:  
HENRY L. STIMSON,  
*Secretary of State.*

HERBERT HOOVER.

## PROCLAMATION 4100

## REVISING THE BOUNDARIES OF GREAT SAND DUNES NATIONAL MONUMENT, COLORADO

WHEREAS the Great Sand Dunes National Monument in the State of Colorado was established by Proclamation No. 1994 of March 17, 1932 (47 Stat. 2565), as modified by Proclamation No. 2681 of March 12, 1945, for the preservation of the great sand dunes and additional features of scenic, scientific, and educational interests; and

WHEREAS it appears that retention of certain lands within the monument is

no longer necessary for such purpose; and

WHEREAS it appears that it would be in the public interest to exclude such lands from the monument; and

WHEREAS certain lands now a part of the Rio Grande National Forest are better suited for national-monument purposes than for national-forest purposes and should be excluded from such forest, and these lands and certain other land adjoining the monument are required for the proper care, management, and protection of the objects of scenic, scientific, and educational interest situated on lands within the monument; and

WHEREAS it appears that it would be in the public interest to reserve such lands as an addition to the monument:

NOW, THEREFORE, I, DWIGHT D. EISENHOWER, President of the United States of America, under and by virtue of the authority vested in me by section 2 of the act of June 8, 1906, 34 Stat. 225 (16 U. S. C. 431), and the act of June 4, 1897, 30 Stat. 24, 18 (16 U. S. C. 472), do proclaim as follows:

1. The following-described lands in the State of Colorado are hereby excluded from the Great Sand Dunes National Monument:

## New Mexico Principal Meridian

T. 41 N., R. 12 E.  
Sec. 22, SW $\frac{1}{4}$ ;  
Sec. 26, all;  
Sec. 27, all;  
Sec. 34, all;  
Sec. 35, all.

T. 40 N., R. 12 E.  
Sec. 2, all;  
Sec. 11, NE $\frac{1}{4}$ ;  
Sec. 12, SW $\frac{1}{4}$ ;  
Sec. 12, W $\frac{1}{2}$ ;  
Sec. 24, all;  
Sec. 25, all.

Fractional T. 40 N., R. 12 E.  
Sec. 19, all;  
Sec. 20, all;  
Sec. 21, all.

## Sixth Principal Meridian

T. 27 S., R. 73 W.  
Sec. 15, SE $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  SE $\frac{1}{4}$ ;  
Sec. 19, all;  
Sec. 20, all;  
Sec. 21, all;  
Sec. 22, all.

The public lands hereby excluded from the monument shall not be subject to application, location, settlement, entry, or other forms of appropriation under the public-land laws until further order of an

authorized officer of the Department of the Interior.

2. Subject to valid existing rights, the following-described lands in the State of Colorado are hereby reserved as and made a part of the Great Sand Dunes National Monument, and so much thereof as is now within the Rio Grande National Forest is hereby excluded therefrom and the boundaries of the said National Forest are modified accordingly:

## Sixth Principal Meridian

T. 26 S., R. 73 W.  
Sec. 2, all.  
T. 27 S., R. 73 W.  
Sec. 2, W $\frac{1}{2}$ .

Warning is hereby expressly given to all unauthorized persons not to appropriate, injure, destroy, or remove any feature of this monument and not to locate or settle upon any of the lands thereof.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Seal of the United States to be affixed.

DONE at the City of Washington this seventh day of June in the year of our Lord nineteen hundred and [SEAL] fifty-six, and of the Independence of the United States of America the one hundred and eightieth.

DWIGHT D. EISENHOWER

By the President:

JOHN FOSTER DULLES,  
Secretary of State.

REDEFINING THE AREA OF GREAT SAND  
DUNES NATIONAL MONUMENT, COLO-  
RADO:

WHEREAS the lands included within the Great Sand Dunes National Monument, Colorado, by Proclamation No. 1994 of March 17, 1932 (47 Stat. 2566), were described therein in conformity with plats then on file in the General Land Office and other maps of the locality:

WHEREAS resurveys by the General Land Office disclose that sections 10, 11, 12, and parts of sections 13, 14, and 15, Township 41 North, Range 12 East, and unsurveyed sections 20 and 21, Township 42 North, Range 13 East, New Mexico Principal Meridian, as described in the said Proclamation, do not exist; and

WHEREAS it appears necessary and desirable in the public interest to re-define the area included within the Monument in accordance with the latest plats of survey:

NOW, THEREFORE, I, HARRY S. TRUMAN, President of the United States of America, under and by virtue of the authority vested in me by section 2 of the act of June 8, 1906, c. 3060, 34 Stat. 225 (U.S.C., title 16, sec. 431), do revise the land description contained in said Proclamation No. 1994 of March 17, 1932, to read as follows:

EIGHTH PRINCIPAL MERIDIAN

T. 25 S., R. 73 W.,  
secs. 31 and 32.  
T. 25 S., R. 73 W.,  
secs. 3 to 11, secs. 11 to 23, and secs. 23 to  
35, inclusive.  
T. 27 S., R. 73 W.,  
secs. 3 to 10 and secs. 15 to 22, inclusive.

NEW MEXICO PRINCIPAL MERIDIAN

T. 40 N., R. 12 E.,  
secs. 1 and 2;  
sec. 11, NE¼;  
secs. 12, 13, 24, and 25.  
T. 41 N., R. 12 E.,  
secs. 12, 14, 15, those parts south of Luis  
Marta Baca Grant No. 4;  
secs. 22 to 27, inclusive;  
secs. 34, 35, and 36.  
Tps. 40 and 41 N., R. 12 E., unsurveyed.  
Containing approximately 44,810 acres.

All other provisions contained in the said Proclamation of March 17, 1932, shall remain in full force and effect.

IN WITNESS WHEREOF I have here-  
unto set my hand and caused the seal  
of the United States to be affixed.

DONE at the city of Washington this  
12th day of March, in the year of our  
Lord nineteen hundred and  
(SEAL) forty-six, and of the Independ-  
ence of the United States of  
America the one hundred and seventieth.

HARRY S. TRUMAN

By the President:

JAMES F. BYRNES,  
Secretary of State.

90 STAT. 2692

PUBLIC LAW 94-567—OCT. 20, 1976

Public Law 94-567  
94th Congress

## An Act

Oct. 20, 1976  
[H.R. 13160]

To designate certain lands within units of the National Park System as wilderness; to revise the boundaries of certain of those units; and for other purposes.

<p><b>Wilderness areas.</b> Designation. 16 USC 1132 note.</p>	<p><i>Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,</i> That in accordance with section 3(c) of the Wilderness Act (78 Stat. 890; 16 U.S.C. 1132(c)), the following lands are hereby designated as wilderness, and shall be administered by the Secretary of the Interior in accordance with the applicable provisions of the Wilderness Act:</p>
<p><b>Bandelier National Monument, N. Mex.</b></p>	<p>(a) Bandelier National Monument, New Mexico, wilderness comprising twenty-three thousand two hundred and sixty-seven acres, depicted on a map entitled "Wilderness Plan, Bandelier National Monument, New Mexico", numbered 315-20,014-B and dated May 1976, to be known as the Bandelier Wilderness.</p>
<p><b>Gunnison National Monument, Colo.</b></p>	<p>(b) Black Canyon of the Gunnison National Monument, Colorado, wilderness comprising eleven thousand one hundred and eighty acres, depicted on a map entitled "Wilderness Plan, Black Canyon of the Gunnison National Monument, Colorado", numbered 144-20,017 and dated May 1973, to be known as the Black Canyon of the Gunnison Wilderness.</p>
<p><b>Chiricahua National Monument, Ariz.</b></p>	<p>(c) Chiricahua National Monument, Arizona, wilderness comprising nine thousand four hundred and forty acres, and potential wilderness additions comprising two acres, depicted on a map entitled "Wilderness Plan, Chiricahua National Monument, Arizona", numbered 145-20,007-A and dated September 1973, to be known as the Chiricahua National Monument Wilderness.</p>
<p><b>Great Sand Dunes National Monument, Colo.</b></p>	<p>(d) Great Sand Dunes National Monument, Colorado, wilderness comprising thirty-three thousand four hundred and fifty acres, and potential wilderness additions comprising six hundred and seventy acres, depicted on a map entitled "Wilderness Plan, Great Sand Dunes National Monument, Colorado", numbered 140-20,006-C and dated February 1976, to be known as the Great Sand Dunes Wilderness.</p>
<p><b>Haleakala National Park, Hawaii.</b></p>	<p>(e) Haleakala National Park, Hawaii, wilderness comprising nineteen thousand two hundred and seventy acres, and potential wilderness additions comprising five thousand five hundred acres, depicted on a map entitled "Wilderness Plan, Haleakala National Park, Hawaii", numbered 162-20,006-A and dated July 1972, to be known as the Haleakala Wilderness.</p>
<p><b>Isle Royale National Park, Mich.</b></p>	<p>(f) Isle Royale National Park, Michigan, wilderness comprising one hundred and thirty-one thousand eight hundred and eighty acres, and potential wilderness additions comprising two hundred and thirty-one acres, depicted on a map entitled "Wilderness Plan, Isle Royale National Park, Michigan", numbered 139-20,004 and dated December 1974, to be known as the Isle Royale Wilderness.</p>
<p><b>Joshua Tree National Monument, Calif.</b></p>	<p>(g) Joshua Tree National Monument, California, wilderness comprising four hundred and twenty-nine thousand six hundred and ninety acres, and potential wilderness additions comprising thirty-seven thousand five hundred and fifty acres, depicted on a map entitled</p>

412 NATIONAL PARK SERVICE LAWS

retary of Agriculture shall be deemed to be a reference to the Secretary of the Interior.

\* \* \* \* \*  
 October 20, 1976.

An Act to authorize additional appropriations for the acquisition of lands and interests in lands within the Sawtooth National Recreation Area in Idaho. (92 Stat. 3467) (P.L. 95-625)

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,*

TITLE III—BOUNDARY CHANGES

SEC. 301. The boundaries of the following units of the National Park System are revised as follows, and there are authorized to be appropriated such sums as may be necessary, but not exceed the amounts specified in the following paragraphs for acquisitions of lands and interests in lands within areas added by reason of such revisions:

\* \* \* \* \*

(8) Great Sand Dunes National Monument, Colorado: To add approximately one thousand one hundred and nine acres as generally depicted on the map entitled "Boundary Map, Great Sand Dunes National Monument, Colorado", numbered 140-80,001-A, and dated November 1974: \$166,000.

SEC. 302. Within twelve months after the date of the enactment of this Act, the Secretary shall publish in the Federal Register a detailed map or other detailed description of the lands added or excluded from any area pursuant to section 301.

SEC. 303. (a) Within the boundaries of the areas as revised in accordance with section 301, the Secretary is authorized to acquire lands and interests therein by donation, purchase with donated or appropriated funds, exchange, or transfer from any other Federal agency. Lands and interests therein so acquired shall become part of the area to which they are added, and shall be subjected to all laws, rules, and regulations applicable thereto. When acquiring any land pursuant to this title, the Secretary may acquire any such land subject to the retention of a right of use and occupancy for a term not to exceed twenty-five years or for the life of the owner or owners. Lands owned by a State or political subdivision thereof may be acquired only by donation.

(b) (1) Lands and interests deleted from any area pursuant to section 301 may be exchanged for non-Federal lands within the revised boundaries of such area, or

## NATIONAL MONUMENTS

413

transferred to the jurisdiction of any other Federal agency or to a State or political subdivision thereof, without monetary consideration, or be administered as public lands by the Secretary, as the Secretary may deem appropriate.

(2) In exercising the authority contained in this section with respect to lands and interests therein deleted from any such area which were acquired from a State, the Secretary may, on behalf of the United States, transfer to such State exclusive or concurrent legislative jurisdiction over such lands, subject to such terms and conditions as he may deem appropriate, to be effective upon acceptance thereof by the State.

(c) It is the established policy of Congress that wilderness, wildlife conservation, and park and recreation values of real property owned by the United States be conserved, enhanced, and developed. It is further declared to be the policy of Congress that unutilized, underutilized, or excess Federal real property be timely studied as to suitability for wilderness, wildlife conservation, or park and recreation purposes. To implement this policy, the Secretary, the Administrator of General Services, and the Director of the Office of Management and Budget shall establish a system with appropriate procedures to permit the Secretary full and early opportunity to make such studies and propose appropriate recommendations to disposing agencies for consideration in connection with determinations of further utilization or disposal of such property under existing law. Each affected executive agency is authorized and directed to provide to the Secretary such advice and information relating to such studies as the Secretary may request.

SEC. 304. The authorities in this title are supplementary to any other authorities available to the Secretary with respect to the acquisition, development, and administration of the areas referred to in section 301.

\* \* \* \* \*

Approved November 10, 1973.

Sec. 202. (a) The Secretary shall administer the property, Site, including personal property comprising the archival collection, acquired for the purposes of this Act in accordance with the Act of August 25, 1916 (39 Stat. 535), as amended and supplemented, and the Act of August 21, 1935 (49 Stat. 666), as amended.

Administration.

(b) The Secretary is authorized to enter into a cooperative agreement with an appropriate entity for the management of the archival collection acquired for the purposes of this Act.

16 USC 461.

(c) Within three years of the date of enactment of this Act, the Secretary shall submit to the Committee on Interior and Insular Affairs of the United States House of Representatives and the Committee on Energy and Natural Resources of the United States Senate, a general management plan for the Site pursuant to the provisions of section 12(b) of the Act of August 18, 1970 (84 Stat. 825), as amended. Within six months of the date of enactment of this Act, the Secretary shall submit a written report to the same committees relating the state of progress of his acquisition and provisions for management and permanent protection of the archival collection. He shall submit a similar report within one year of the date of enactment of this Act to the same committees indicating the final management and protection arrangements he has concluded for such collection.

General management plan, submitted to congressional committees. 16 USC 1a-1.

Report to congressional committees.

Sec. 203. (a) Effective October 1, 1979, there are authorized to be appropriated from the Land and Water Conservation Fund such sums as may be necessary for the acquisition of lands and interests therein.

(b) There is hereby authorized to be appropriated, effective October 1, 1979, an amount not to exceed \$314,000 for the acquisition of the archival collection; an amount not to exceed \$200,000 for development; and an amount not to exceed \$1,230,000 for the preservation of the archival collection.

Appropriation authorization.

## TITLE III

Sec. 301. Notwithstanding any other provision of law, the Secretary shall permit the late Chief Turkey Tayac to be buried in the ossuary at Piscataway Park in Oxon Hill, Maryland. The Secretary shall select the site in such ossuary at which Chief Tayac may be buried. No Federal funds may be used for the burial of Chief Tayac except such funds as may be necessary for the maintenance of the burial site by the Department of the Interior.

Chief Turkey Tayac, burial in Oxon Hill, Md.

## TITLE IV

Sec. 401. The National Parks and Recreation Act of 1978, approved November 10, 1978 (92 Stat. 3467), is amended as follows:

National Park System.

(a) Section 101(8), re: DeSoto National Memorial, is amended by changing the phrase "changing '\$3,108,000' to '\$5,108,000'." to read "by changing '\$175,000' to '\$292,000'."

16 USC 1 note. 92 Stat. 3471. 16 USC 450dd note.

(b) Section 101(20), re: Pecos National Monument, is amended by changing "\$2,375,000" to "\$2,575,000".

92 Stat. 3472.

(c) Section 301, re: revision of boundaries, is amended by changing the words "but not exceed" in the first sentence to "but not to exceed".

92 Stat. 3473.

(d) Section 301(8), re: Great Sand Dunes National Monument, is amended by (1) changing "one thousand one hundred and nine acres" to "one thousand nine hundred acres" and by changing "\$166,000" to "\$265,000"; and (2) by adding the following at the end thereof: "The Secretary shall designate the lands described by this paragraph for management in accordance with the adjacent lands within the monument by publication of a notice in the Federal Register."

Publication in Federal Register.

PUBLIC LAW 106-530—NOV. 22, 2000

114 STAT. 2527

Public Law 106-530  
106th Congress

## An Act

To provide for the establishment of the Great Sand Dunes National Park and Preserve and the Baca National Wildlife Refuge in the State of Colorado, and for other purposes.

Nov. 22, 2000  
[S. 2547]

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,*

**SECTION 1. SHORT TITLE.**

This Act may be cited as the “Great Sand Dunes National Park and Preserve Act of 2000”.

Great Sand  
Dunes National  
Park and  
Preserve Act of  
2000.  
16 USC 410hhh  
note.  
16 USC 410hhh.

**SEC. 2. FINDINGS.**

Congress finds that—

(1) the Great Sand Dunes National Monument in the State of Colorado was established by Presidential proclamation in 1932 to preserve Federal land containing spectacular and unique sand dunes and additional features of scenic, scientific, and educational interest for the benefit and enjoyment of future generations;

(2) the Great Sand Dunes, together with the associated sand sheet and adjacent wetland and upland, contain a variety of rare ecological, geological, paleontological, archaeological, scenic, historical, and wildlife components, which—

(A) include the unique pulse flow characteristics of Sand Creek and Medano Creek that are integral to the existence of the dunes system;

(B) interact to sustain the unique Great Sand Dunes system beyond the boundaries of the existing National Monument;

(C) are enhanced by the serenity and rural western setting of the area; and

(D) comprise a setting of irreplaceable national significance;

(3) the Great Sand Dunes and adjacent land within the Great Sand Dunes National Monument—

(A) provide extensive opportunities for educational activities, ecological research, and recreational activities; and

(B) are publicly used for hiking, camping, and fishing, and for wilderness value (including solitude);

(4) other public and private land adjacent to the Great Sand Dunes National Monument—

(A) offers additional unique geological, hydrological, paleontological, scenic, scientific, educational, wildlife, and recreational resources; and

- (B) contributes to the protection of—
  - (i) the sand sheet associated with the dune mass;
  - (ii) the surface and ground water systems that are necessary to the preservation of the dunes and the adjacent wetland; and
  - (iii) the wildlife, viewshed, and scenic qualities of the Great Sand Dunes National Monument;
- (5) some of the private land described in paragraph (4) contains important portions of the sand dune mass, the associated sand sheet, and unique alpine environments, which would be threatened by future development pressures;
- (6) the designation of a Great Sand Dunes National Park, which would encompass the existing Great Sand Dunes National Monument and additional land, would provide—
  - (A) greater long-term protection of the geological, hydrological, paleontological, scenic, scientific, educational, wildlife, and recreational resources of the area (including the sand sheet associated with the dune mass and the ground water system on which the sand dune and wetland systems depend); and
  - (B) expanded visitor use opportunities;
- (7) land in and adjacent to the Great Sand Dunes National Monument is—
  - (A) recognized for the culturally diverse nature of the historical settlement of the area;
  - (B) recognized for offering natural, ecological, wildlife, cultural, scenic, paleontological, wilderness, and recreational resources; and
  - (C) recognized as being a fragile and irreplaceable ecological system that could be destroyed if not carefully protected; and
- (8) preservation of this diversity of resources would ensure the perpetuation of the entire ecosystem for the enjoyment of future generations.

16 USC 410hhh-  
1. **SEC. 3. DEFINITIONS.**

In this Act:

- (1) **ADVISORY COUNCIL.**—The term “Advisory Council” means the Great Sand Dunes National Park Advisory Council established under section 8(a).
- (2) **LUIS MARIA BACA GRANT NO. 4.**—The term “Luis Maria Baca Grant No. 4” means those lands as described in the patent dated February 20, 1900, from the United States to the heirs of Luis Maria Baca recorded in book 86, page 20, of the records of the Clerk and Recorder of Saguache County, Colorado.
- (3) **MAP.**—The term “map” means the map entitled “Great Sand Dunes National Park and Preserve”, numbered 140/80,032 and dated September 19, 2000.
- (4) **NATIONAL MONUMENT.**—The term “national monument” means the Great Sand Dunes National Monument, including lands added to the monument pursuant to this Act.
- (5) **NATIONAL PARK.**—The term “national park” means the Great Sand Dunes National Park established in section 4.
- (6) **NATIONAL WILDLIFE REFUGE.**—The term “wildlife refuge” means the Baca National Wildlife Refuge established in section 6.

PUBLIC LAW 106-530—NOV. 22, 2000

114 STAT. 2529

(7) PRESERVE.—The term “preserve” means the Great Sand Dunes National Preserve established in section 5.

(8) RESOURCES.—The term “resources” means the resources described in section 2.

(9) SECRETARY.—The term “Secretary” means the Secretary of the Interior.

(10) USES.—The term “uses” means the uses described in section 2.

**SEC. 4. GREAT SAND DUNES NATIONAL PARK, COLORADO.**

(a) ESTABLISHMENT.—When the Secretary determines that sufficient land having a sufficient diversity of resources has been acquired to warrant designation of the land as a national park, the Secretary shall establish the Great Sand Dunes National Park in the State of Colorado, as generally depicted on the map, as a unit of the National Park System. Such establishment shall be effective upon publication of a notice of the Secretary’s determination in the Federal Register.

(b) AVAILABILITY OF MAP.—The map shall be on file and available for public inspection in the appropriate offices of the National Park Service.

(c) NOTIFICATION.—Until the date on which the national park is established, the Secretary shall annually notify the Committee on Energy and Natural Resources of the Senate and the Committee on Resources of the House of Representatives of—

(1) the estimate of the Secretary of the lands necessary to achieve a sufficient diversity of resources to warrant designation of the national park; and

(2) the progress of the Secretary in acquiring the necessary lands.

(d) ABOLISHMENT OF NATIONAL MONUMENT.—(1) On the date of establishment of the national park pursuant to subsection (a), the Great Sand Dunes National Monument shall be abolished, and any funds made available for the purposes of the national monument shall be available for the purposes of the national park.

(2) Any reference in any law (other than this Act), regulation, document, record, map, or other paper of the United States to “Great Sand Dunes National Monument” shall be considered a reference to “Great Sand Dunes National Park”.

(e) TRANSFER OF JURISDICTION.—Administrative jurisdiction is transferred to the National Park Service over any land under the jurisdiction of the Department of the Interior that—

(1) is depicted on the map as being within the boundaries of the national park or the preserve; and

(2) is not under the administrative jurisdiction of the National Park Service on the date of enactment of this Act.

**SEC. 5. GREAT SAND DUNES NATIONAL PRESERVE, COLORADO.**

(a) ESTABLISHMENT OF GREAT SAND DUNES NATIONAL PRESERVE.—(1) There is hereby established the Great Sand Dunes National Preserve in the State of Colorado, as generally depicted on the map, as a unit of the National Park System.

(2) Administrative jurisdiction of lands and interests therein administered by the Secretary of Agriculture within the boundaries of the preserve is transferred to the Secretary of the Interior, to be administered as part of the preserve. The Secretary of Agriculture shall modify the boundaries of the Rio Grande National Forest to exclude the transferred lands from the forest boundaries.

16 USC 410hhh-  
2.  
Effective date.  
Notification.  
Federal Register,  
publication.

16 USC 410hhh-  
3.

(3) Any lands within the preserve boundaries which were designated as wilderness prior to the date of enactment of this Act shall remain subject to the Wilderness Act (16 U.S.C. 1131 et seq.) and the Colorado Wilderness Act of 1993 (Public Law 103-767; 16 U.S.C. 539i note).

(b) MAP AND LEGAL DESCRIPTION.—(1) As soon as practicable after the establishment of the national park and the preserve, the Secretary shall file maps and a legal description of the national park and the preserve with the Committee on Energy and Natural Resources of the Senate and the Committee on Resources of the House of Representatives.

(2) The map and legal description shall have the same force and effect as if included in this Act, except that the Secretary may correct clerical and typographical errors in the legal description and maps.

(3) The map and legal description shall be on file and available for public inspection in the appropriate offices of the National Park Service.

(c) BOUNDARY SURVEY.—As soon as practicable after the establishment of the national park and preserve and subject to the availability of funds, the Secretary shall complete an official boundary survey.

16 USC 410hhh-4, 668dd note.

**SEC. 6. BACA NATIONAL WILDLIFE REFUGE, COLORADO.**

(a) ESTABLISHMENT.—(1) When the Secretary determines that sufficient land has been acquired to constitute an area that can be efficiently managed as a National Wildlife Refuge, the Secretary shall establish the Baca National Wildlife Refuge, as generally depicted on the map.

Effective date. Federal Register, publication.

(2) Such establishment shall be effective upon publication of a notice of the Secretary's determination in the Federal Register.

(b) AVAILABILITY OF MAP.—The map shall be on file and available for public inspection in the appropriate offices of the United States Fish and Wildlife Service.

(c) ADMINISTRATION.—The Secretary shall administer all lands and interests therein acquired within the boundaries of the national wildlife refuge in accordance with the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd et seq.) and the Act of September 28, 1962 (16 U.S.C. 460k et seq.) (commonly known as the Refuge Recreation Act).

(d) PROTECTION OF WATER RESOURCES.—In administering water resources for the national wildlife refuge, the Secretary shall—

(1) protect and maintain irrigation water rights necessary for the protection of monument, park, preserve, and refuge resources and uses; and

(2) minimize, to the extent consistent with the protection of national wildlife refuge resources, adverse impacts on other water users.

16 USC 410hhh-5.

**SEC. 7. ADMINISTRATION OF NATIONAL PARK AND PRESERVE.**

(a) IN GENERAL.—The Secretary shall administer the national park and the preserve in accordance with—

(1) this Act; and

(2) all laws generally applicable to units of the National Park System, including—

(A) the Act entitled “An Act to establish a National Park Service, and for other purposes”, approved August 25, 1916 (16 U.S.C. 1, 2-4); and

(B) the Act entitled “An Act to provide for the preservation of historic American sites, buildings, objects, and antiquities of national significance, and for other purposes”, approved August 21, 1935 (16 U.S.C. 461 et seq.).

(b) GRAZING.—

(1) ACQUIRED STATE OR PRIVATE LAND.—With respect to former State or private land on which grazing is authorized to occur on the date of enactment of this Act and which is acquired for the national monument, or the national park and preserve, or the wildlife refuge, the Secretary, in consultation with the lessee, may permit the continuation of grazing on the land by the lessee at the time of acquisition, subject to applicable law (including regulations).

(2) FEDERAL LAND.—Where grazing is permitted on land that is Federal land as of the date of enactment of this Act and that is located within the boundaries of the national monument or the national park and preserve, the Secretary is authorized to permit the continuation of such grazing activities unless the Secretary determines that grazing would harm the resources or values of the national park or the preserve.

(3) TERMINATION OF LEASES.—Nothing in this subsection shall prohibit the Secretary from accepting the voluntary termination of leases or permits for grazing within the national monument or the national park or the preserve.

(c) HUNTING, FISHING, AND TRAPPING.—

(1) IN GENERAL.—Except as provided in paragraph (2), the Secretary shall permit hunting, fishing, and trapping on land and water within the preserve in accordance with applicable Federal and State laws.

(2) ADMINISTRATIVE EXCEPTIONS.—The Secretary may designate areas where, and establish limited periods when, no hunting, fishing, or trapping shall be permitted under paragraph (1) for reasons of public safety, administration, or compliance with applicable law.

(3) AGENCY AGREEMENT.—Except in an emergency, regulations closing areas within the preserve to hunting, fishing, or trapping under this subsection shall be made in consultation with the appropriate agency of the State of Colorado having responsibility for fish and wildlife administration.

(4) SAVINGS CLAUSE.—Nothing in this Act affects any jurisdiction or responsibility of the State of Colorado with respect to fish and wildlife on Federal land and water covered by this Act.

(d) CLOSED BASIN DIVISION, SAN LUIS VALLEY PROJECT.—Any feature of the Closed Basin Division, San Luis Valley Project, located within the boundaries of the national monument, national park or the national wildlife refuge, including any well, pump, road, easement, pipeline, canal, ditch, power line, power supply facility, or any other project facility, and the operation, maintenance, repair, and replacement of such a feature—

(1) shall not be affected by this Act; and

(2) shall continue to be the responsibility of, and be operated by, the Bureau of Reclamation in accordance with title I of the Reclamation Project Authorization Act of 1972 (43 U.S.C. 615aaa et seq.).

(e) WITHDRAWAL.—(1) On the date of enactment of this Act, subject to valid existing rights, all Federal land depicted on the

114 STAT. 2532

PUBLIC LAW 106-530—NOV. 22, 2000

map as being located within Zone A, or within the boundaries of the national monument, the national park or the preserve is withdrawn from—

(A) all forms of entry, appropriation, or disposal under the public land laws;

(B) location, entry, and patent under the mining laws; and

(C) disposition under all laws relating to mineral and geothermal leasing.

Applicability.

(2) The provisions of this subsection also shall apply to any lands—

(A) acquired under this Act; or

(B) transferred from any Federal agency after the date of enactment of this Act for the national monument, the national park or preserve, or the national wildlife refuge.

(f) WILDERNESS PROTECTION.—(1) Nothing in this Act alters the Wilderness designation of any land within the national monument, the national park, or the preserve.

(2) All areas designated as Wilderness that are transferred to the administrative jurisdiction of the National Park Service shall remain subject to the Wilderness Act (16 U.S.C. 1131 et seq.) and the Colorado Wilderness Act of 1993 (Public Law 103-77; 16 U.S.C. 539i note). If any part of this Act conflicts with the provisions of the Wilderness Act or the Colorado Wilderness Act of 1993 with respect to the wilderness areas within the preserve boundaries, the provisions of those Acts shall control.

16 USC 410hhh-6.

**SEC. 8. ACQUISITION OF PROPERTY AND BOUNDARY ADJUSTMENTS.**

(a) ACQUISITION AUTHORITY.—(1) Within the area depicted on the map as the “Acquisition Area” or the national monument, the Secretary may acquire lands and interests therein by purchase, donation, transfer from another Federal agency, or exchange: *Provided*, That lands or interests therein may only be acquired with the consent of the owner thereof.

(2) Lands or interests therein owned by the State of Colorado, or a political subdivision thereof, may only be acquired by donation or exchange.

(b) BOUNDARY ADJUSTMENT.—As soon as practicable after the acquisition of any land or interest under this section, the Secretary shall modify the boundary of the unit to which the land is transferred pursuant to subsection (b) to include any land or interest acquired.

(c) ADMINISTRATION OF ACQUIRED LANDS.—

(1) GENERAL AUTHORITY.—Upon acquisition of lands under subsection (a), the Secretary shall, as appropriate—

(A) transfer administrative jurisdiction of the lands to the National Park Service—

(i) for addition to and management as part of the Great Sand Dunes National Monument, or

(ii) for addition to and management as part of the Great Sand Dunes National Park (after designation of the Park) or the Great Sand Dunes National Preserve; or

(B) transfer administrative jurisdiction of the lands to the United States Fish and Wildlife Service for addition to and administration as part of the Baca National Wildlife Refuge.

PUBLIC LAW 106-530—NOV. 22, 2000

114 STAT. 2533

(2) FOREST SERVICE ADMINISTRATION.—(A) Any lands acquired within the area depicted on the map as being located within Zone B shall be transferred to the Secretary of Agriculture and shall be added to and managed as part of the Rio Grande National Forest.

(B) For the purposes of section 7 of the Land and Water Conservation Fund Act of 1965 (16 U.S.C. 4601-9), the boundaries of the Rio Grande National Forest, as revised by the transfer of land under paragraph (A), shall be considered to be the boundaries of the national forest.

**SEC. 9. WATER RIGHTS.**

16 USC 410hhh-7.

(a) SAN LUIS VALLEY PROTECTION, COLORADO.—Section 1501(a) of the Reclamation Projects Authorization and Adjustment Act of 1992 (Public Law 102-575; 106 Stat. 4663) is amended by striking paragraph (3) and inserting the following:

“(3) adversely affect the purposes of—

“(A) the Great Sand Dunes National Monument;

“(B) the Great Sand Dunes National Park (including purposes relating to all water, water rights, and water-dependent resources within the park);

“(C) the Great Sand Dunes National Preserve (including purposes relating to all water, water rights, and water-dependent resources within the preserve);

“(D) the Baca National Wildlife Refuge (including purposes relating to all water, water rights, and water-dependent resources within the national wildlife refuge); and

“(E) any Federal land adjacent to any area described in subparagraph (A), (B), (C), or (D).”.

(b) EFFECT ON WATER RIGHTS.—

(1) IN GENERAL.—Subject to the amendment made by subsection (a), nothing in this Act affects—

(A) the use, allocation, ownership, or control, in existence on the date of enactment of this Act, of any water, water right, or any other valid existing right;

(B) any vested absolute or decreed conditional water right in existence on the date of enactment of this Act, including any water right held by the United States;

(C) any interstate water compact in existence on the date of enactment of this Act; or

(D) subject to the provisions of paragraph (2), State jurisdiction over any water law.

(2) WATER RIGHTS FOR NATIONAL PARK AND NATIONAL PRESERVE.—In carrying out this Act, the Secretary shall obtain and exercise any water rights required to fulfill the purposes of the national park and the national preserve in accordance with the following provisions:

(A) Such water rights shall be appropriated, adjudicated, changed, and administered pursuant to the procedural requirements and priority system of the laws of the State of Colorado.

(B) The purposes and other substantive characteristics of such water rights shall be established pursuant to State law, except that the Secretary is specifically authorized to appropriate water under this Act exclusively for the purpose of maintaining ground water levels, surface water

levels, and stream flows on, across, and under the national park and national preserve, in order to accomplish the purposes of the national park and the national preserve and to protect park resources and park uses.

(C) Such water rights shall be established and used without interfering with—

(i) any exercise of a water right in existence on the date of enactment of this Act for a non-Federal purpose in the San Luis Valley, Colorado; and

(ii) the Closed Basin Division, San Luis Valley Project.

(D) Except as provided in subsections (c) and (d), no Federal reservation of water may be claimed or established for the national park or the national preserve.

(c) NATIONAL FOREST WATER RIGHTS.—To the extent that a water right is established or acquired by the United States for the Rio Grande National Forest, the water right shall—

(1) be considered to be of equal use and value for the national preserve; and

(2) retain its priority and purpose when included in the national preserve.

(d) NATIONAL MONUMENT WATER RIGHTS.—To the extent that a water right has been established or acquired by the United States for the Great Sand Dunes National Monument, the water right shall—

(1) be considered to be of equal use and value for the national park; and

(2) retain its priority and purpose when included in the national park.

(e) ACQUIRED WATER RIGHTS AND WATER RESOURCES.—

(1) IN GENERAL.—(A) If, and to the extent that, the Luis Maria Baca Grant No. 4 is acquired, all water rights and water resources associated with the Luis Maria Baca Grant No. 4 shall be restricted for use only within—

(i) the national park;

(ii) the preserve;

(iii) the national wildlife refuge; or

(iv) the immediately surrounding areas of Alamosa or Saguache Counties, Colorado.

(B) USE.—Except as provided in the memorandum of water service agreement and the water service agreement between the Cabeza de Vaca Land and Cattle Company, LLC, and Baca Grande Water and Sanitation District, dated August 28, 1997, water rights and water resources described in subparagraph (A) shall be restricted for use in—

(i) the protection of resources and values for the national monument, the national park, the preserve, or the wildlife refuge;

(ii) fish and wildlife management and protection; or

(iii) irrigation necessary to protect water resources.

(2) STATE AUTHORITY.—If, and to the extent that, water rights associated with the Luis Maria Baca Grant No. 4 are acquired, the use of those water rights shall be changed only in accordance with the laws of the State of Colorado.

(f) DISPOSAL.—The Secretary is authorized to sell the water resources and related appurtenances and fixtures as the Secretary deems necessary to obtain the termination of obligations specified

in the memorandum of water service agreement and the water service agreement between the Cabeza de Vaca Land and Cattle Company, LLC and the Baca Grande Water and Sanitation District, dated August 28, 1997. Prior to the sale, the Secretary shall determine that the sale is not detrimental to the protection of the resources of Great Sand Dunes National Monument, Great Sand Dunes National Park, and Great Sand Dunes National Preserve, and the Baca National Wildlife Refuge, and that appropriate measures to provide for such protection are included in the sale.

**SEC. 10. ADVISORY COUNCIL.**

16 USC 410hhh-8.

(a) **ESTABLISHMENT.**—The Secretary shall establish an advisory council to be known as the “Great Sand Dunes National Park Advisory Council”.

(b) **DUTIES.**—The Advisory Council shall advise the Secretary with respect to the preparation and implementation of a management plan for the national park and the preserve.

(c) **MEMBERS.**—The Advisory Council shall consist of 10 members, to be appointed by the Secretary, as follows:

(1) One member of, or nominated by, the Alamosa County Commission.

(2) One member of, or nominated by, the Saguache County Commission.

(3) One member of, or nominated by, the Friends of the Dunes Organization.

(4) Four members residing in, or within reasonable proximity to, the San Luis Valley and 3 of the general public, all of whom have recognized backgrounds reflecting—

(A) the purposes for which the national park and the preserve are established; and

(B) the interests of persons that will be affected by the planning and management of the national park and the preserve.

(d) **APPLICABLE LAW.**—The Advisory Council shall function in accordance with the Federal Advisory Committee Act (5 U.S.C. App.) and other applicable laws.

(e) **VACANCY.**—A vacancy on the Advisory Council shall be filled in the same manner as the original appointment.

(f) **CHAIRPERSON.**—The Advisory Council shall elect a chairperson and shall establish such rules and procedures as it deems necessary or desirable.

(g) **NO COMPENSATION.**—Members of the Advisory Council shall serve without compensation.

(h) **TERMINATION.**—The Advisory Council shall terminate upon the completion of the management plan for the national park and preserve.

114 STAT. 2536 PUBLIC LAW 106-530—NOV. 22, 2000

<sup>16</sup> USC 410hhh-  
9. **SEC. 11. AUTHORIZATION OF APPROPRIATIONS.**

There are authorized to be appropriated such sums as are necessary to carry out this Act.

Approved November 22, 2000.

---

**LEGISLATIVE HISTORY—S. 2547:**

SENATE REPORTS: No. 106-479 (Comm. on Energy and Natural Resources).

CONGRESSIONAL RECORD, Vol. 146 (2000):

Oct. 5, considered and passed Senate.

Oct. 25, considered and passed House.



**APPENDIX B:  
INFORMATION REGARDING POTENTIAL CONSERVATION SITES,  
COLORADO NATURAL HERITAGE PROGRAM**



The Colorado Natural Heritage Program (CNHP) is Colorado's primary comprehensive biological diversity data center. The program provides comprehensive information on rare, threatened, or endangered species and on natural communities in the state.

CNHP delineates potential conservation sites to successfully protect biotic populations or occurrences. They include ecological processes that are necessary to support the continued existence of elements of natural heritage significance in Colorado. Site boundaries represent an estimate of the landscape area that supports the rare elements and the ecological processes that support them. Factors considered may include (1) the extent of current and potential habitat for the elements present, considering the ecological processes necessary to maintain or improve existing conditions; (2) species movement and migration corridors; (3) maintenance of surface water quality within the site and the surrounding watershed; (4) maintenance of the hydrologic integrity of the groundwater, i.e., by protecting recharge zones; (5) land intended to protect the site against future changes in the use of surrounding lands; and (6) exclusion or control of invasive nonnative species; land necessary for management or monitoring activities (CNHP 1998).

Potential conservation sites are assigned a rank from 1 to 5 to reflect their overall biodiversity significance as follows:

- *B1 - Outstanding Significance:* only site known for an element of an excellent occurrence of a G1 (critically imperiled globally because of rarity or because of some factor of its biology making

it especially vulnerable to extinction) species.

- *B2 - Very High Significance:* one of the best examples of a community type, good occurrence of a G1 species, or excellent occurrence of a G2 (imperiled globally because of rarity or because of other factors demonstrably making it very vulnerable to extinction throughout its range) or G3 (vulnerable through its range or found locally in a restricted range) species.
- *B3 - High Significance:* excellent example of any community type, good occurrence of a G3 species, or a large concentration of good occurrences of state rare species.
- *B4 - Moderate or Regional Significance:* good example of a community type, excellent or good occurrence of state rare species.
- *B5 - General or Local Biodiversity Significance:* good or marginal occurrence of a community type, S1 (critically imperiled state-wide because of rarity or because of some factor of its biology making it especially vulnerable to extinction), or S2 (imperiled state-wide because of rarity or because of other factors demonstrably making it very vulnerable to extinction throughout its range) species.

The methods used to successfully identify potential conservation sites at the Great Sand Dunes followed CNHP's general

approach that has been used successfully in many rare or imperiled species inventories. The basic steps are: (1) collect existing information, (2) identify possible sites, (3)

select and prioritize targeted inventory areas, (4) field surveys, and (5) delineation of potential conservation sites (CNHP 1998).

## **APPENDIX C: RESOURCE OPPORTUNITY AREAS**





SANGRE DE CRISTO MOUNTAINS AND FOOTHILLS	
Location	Upland portions of mountain drainage basins within the park and preserve.
Dunes System	Mountains and passes affect wind patterns, supply creek water, and are the source of some sand in the dunes.
Natural Diversity	Multiple life zones are tied to elevation zones. High vegetative biodiversity. Medano and Little Medano Creek watersheds have a B3 (high significance) biodiversity rating.
<i>Vegetation</i>	Piñon-juniper woodland, montane forest (Douglas-fir, white fir, ponderosa pine, aspen), subalpine forest (Englemann spruce, blue spruce, subalpine fir), krumholz, and alpine tundra plant communities.
<i>Wildlife</i>	Bighorn sheep; deer; carnivores (wolverines, mountain lions, bear); rodents (marmots, pikas).
<i>Water</i>	Snowpack is the source of springtime meltwater runoff in the creeks.
Human Connections	Culturally scarred trees; numerous archeological sites (including wickiups); water diversion; piñon nut and mushroom gathering.
Visitor Opportunities	Experiencing quiet and solitude in a wilderness environment; driving the Medano Pass four-wheel drive road; seeing wildlife in its natural setting; viewing the dune mass from the mountains; serves as backdrop for the dunes. Learning/education opportunities: dunes system and other geology, wilderness values, biodiversity, and habitat.
Wilderness Status / Suitability	Most is already wilderness (exceptions are Medano Road corridor and small exclusion areas near Mosca Pass, the mouth of Mosca Canyon, and diversion ditches).

SANGRE DE CRISTO MOUNTAINS AND FOOTHILLS	
<p>Planning Issues and Opportunities</p>	<ul style="list-style-type: none"> <li>Fire management</li> <li>Access to preserve for hunting and recreation</li> <li>Tundra sensitivity</li> <li>Trans-mountain water diversions</li> <li>Potential for crowding around alpine lakes</li> <li>Human waste management</li> <li>Nonnative species (e.g., leafy spurge)</li> <li>Management of ATV use (currently illegal) on Medano Road</li> <li>Management of illegal off-road ATV use</li> <li>Management of primitive roadside and backcountry camping</li> <li>Opportunities for backcountry-related education, especially for organized groups</li> <li>Wilderness management</li> <li>Management of historic trail corridors</li> </ul>



MOUNTAIN LAKES AND STREAMS	
Location	Mountain stream riparian corridors and high altitude lakes.
Dunes System	Headwaters for creeks that transport water and sand.
Natural Diversity	Sand Creek and Deadman Creek have a B2 (very high significance) biodiversity rating. Medano and Little Medano Creek watersheds have a B3 (high significance) biodiversity rating.
<i>Vegetation</i>	Mountain streams: willows, cottonwoods, river birch, aspens, duckweed. Alpine lakes: sedges, spruces, willows.
<i>Wildlife</i>	Native fish refugia (Medano Creek, with potential in others).
<i>Water</i>	Outstanding water quality (Medano Creek). Medano Creek, and to some extent Sand Creek, is an aquatically isolated system.
Human Connections	Archeological sites.
Visitor Opportunities	Seeing wildlife in its natural setting; experiencing quiet and solitude in a wilderness environment; narrow views down onto dunes. Learning/education opportunities: dunes system, riparian systems, biodiversity, history, and wilderness.
Wilderness Status / Suitability	All is existing wilderness except Medano corridor and Deadman Creek. Deadman Creek is suitable for wilderness.

MOUNTAIN LAKES AND STREAMS	
<p>Planning Issues and Opportunities</p>	<ul style="list-style-type: none"> <li>Transmountain water diversion</li> <li>Concentration of visitors</li> <li>Water quality in streams and alpine lakes due to intensity of human use in surrounding areas</li> <li>Impacts of road adjacent to Medano Creek (and crossings)</li> <li>Management of primitive roadside and backcountry camping</li> <li>Visitor access to and along stream corridors</li> <li>Nonnative fish in Sand Creek and creeks north of there</li> <li>Mitigation or management of retention ponds, restoration opportunities</li> <li>Nonnative plants (e.g., Canada thistle, leafy spurge)</li> </ul>



LOWER MEDANO AND SAND CREEKS	
Location	Downstream from the point where the water begins to interact with the sand substrate (where the stream cross-section changes from a rectangular to a braided channel).
Dunes System	Surface water flows recycle sand and transport it along margins of the dunefield; critical for vertical growth of dunes; great example of surge flow (rare phenomenon); flow dependent on subsurface aquifer (and vice versa); barrier to eastward sand migration; dramatic slip faces formed by stream-caused sand erosion.
Natural Diversity	Lower Sand and Medano creeks are within a B1 (outstanding significance) biodiversity area, but this significance is due primarily to endemic species that occur outside the stream corridors.
<i>Vegetation</i>	Unhybridized narrowleaf cottonwoods; cottonwood/willow riparian forest.
<i>Wildlife</i>	Heavily used by elk, bison, deer; birds abundant in riparian areas; amphibians.
<i>Water</i>	Creeks are a source of recharge to the aquifers.
Human Connections	Important area to certain contemporary American Indian tribes; local community interest in Medano Creek flow.
Visitor Opportunities	Experiencing surge flow; playing in Medano Creek at the foot of the dunes; slip faces to see and play on; sand play; viewing wildlife and birds in their natural setting (Sand Creek). Learning/education opportunities: dunes system (water cycle, see water flowing into ground, water quality); habitat; biodiversity; history; and wilderness.
Wilderness Status / Suitability	Medano Creek: part is existing wilderness and part is not suitable for wilderness. Sand Creek: part is existing wilderness and part is suitable for wilderness.

LOWER MEDANO AND SAND CREEKS	
<p>Planning Issues and Opportunities</p>	<p>Water quality                      Horse use                      Aquifer monitoring                      Dogs                      Crowding and congestion at Castle Creek                      Education opportunities                      Wilderness management, especially appropriate uses                      Human waste management                      Cultural resources not fully surveyed</p>



DUNEFIELD	
Location	Main dune mass.
Dunes System	Active dunefield, including the tall dunes; vertically growing, wind-caused, nonmigratory dunes.
Natural Diversity	Dunefield is within a B1 (outstanding significance) biodiversity area. Opposing elemental interactions within the landscape (contrast between water, wind, sand, and sun).
<i>Vegetation</i>	Mostly unvegetated; some sparse, specially adapted mostly perennial vegetation in dune troughs (e.g., Indian ricegrass, blowout grass, scurfpea, sunflowers).
<i>Wildlife</i>	Endemic insects.
<i>Water</i>	Sand transported around margins of dunefield by creeks; precipitation only—very little infiltration to groundwater aquifer.
Human Connections	Jicarilla Apache collect sand; dunes are a major landmark in contemporary and historic times.
Visitor Opportunities	Climbing and descending high dunes (resilient landscape); free play; experiencing quiet and solitude in a wilderness environment; camping in the dunes; seeing “the heavens” at night; viewing the dunes under changing light conditions; visual focal point of San Luis Valley. Learning and education opportunities: learning about the dunes system; habitat; biodiversity; and wilderness.
Wilderness Status / Suitability	All is existing wilderness.

DUNEFIELD	
<p>Planning Issues and Opportunities</p>	<p>Overcrowding in area between dunes parking area and high dunes                      Trash                      Dogs and horses                      Parking capacity                      Access to the west side of the dunefield                      Water quality (human and dog waste)                      Noise                      Threatened values mostly relate to visitor experience/opportunities                      Most natural values not really threatened in this resource opportunity area                      Visitor exposure to elements: heat, sun, dehydration, lightning, blowing sand                      Dunefield is a fundamental visitor experience, but it is very difficult for some with limited mobility to get there                      Dunes parking area is the easiest/only way for many people to get to the dunes                      Wilderness management (dune wheelchair)                      Wilderness values in a heavily used area</p>



SAND SHEET AND SABKHA	
Location	Relatively flat western (upwind) portion of the national park; wraps along eastern margin of the dunes.
Dunes System	Vegetated portion of the dune system (some small areas lack vegetation); relatively little sand movement; sand sheet stability is precarious—vegetation is the stabilizing factor; immediate source of sand for the dunefield; near-surface water table is the defining factor for the sabkha (creates mineral deposits).
Natural Diversity	Sand sheet is within a B1 (outstanding significance) biodiversity area. Sabkha is within a B2 (very high significance) biodiversity area. Great wildlife diversity.
<i>Vegetation</i>	Sabkha—salt-tolerant plants like four-wing saltbush, saltgrass, and greasewood; sand sheet—rabbitbrush, prickly pear, yucca, and grasses; irrigated meadows in sabkha and on the Baca Ranch provide forage for bison.
<i>Wildlife</i>	Endemic insects; great wildlife habitat overall.
<i>Water</i>	High groundwater table; seasonal standing water in the sabkha.
Human Connections	One of the oldest known Paleo-Indian (Folsom) sites; numerous archeological sites; culturally scarred trees.
Visitor Opportunities	Experiencing quiet and solitude in a wilderness environment; seeing the heavens at night; viewing the dunes with backdrop of the high peaks; viewing wildlife in its natural setting; driving the Medano Pass four-wheel drive road (east side of dunefield). Learning and educational opportunities: learning about the dunes system; prehistory; habitat; biodiversity.
Wilderness Status / Suitability	Most of sabkha is unsuitable for wilderness. Most of sand sheet is suitable for wilderness.

SAND SHEET AND SABKHA	
<p>Planning Issues and Opportunities</p>	<p>Natural gas exploration on the former Baca Ranch lands            Boundaries and trespass            Future management of Medano Ranch            Bicycling opportunities            Access to Liberty and Duncan, Sand and Deadman creeks            Access to west side of dunes            Nonnative plants (e.g., white top, Russian thistle)            Effects of ranching, irrigation, and other human uses on vegetation and wildlife            Fire management            Sensitive archeological resources            Free-ranging bison herd?</p>



SPRING CREEKS AND WETLANDS	
Location	Perennial water sources in the western portion of the national park: Big and Little Spring creeks, interdunal wetlands, and small playa lakes.
Dunes System	Groundwater aquifer near surface greatly affects the landscape; biodiversity related to near surface groundwater; presence and amount of flow in springs and wetlands are indicators of aquifer status.
Natural Diversity	Springs and wetlands are within a B2 (very high significance) biodiversity area. Great vegetative diversity.
<i>Vegetation</i>	Rushes, sedges, duckweed, slender spider flower, cattails; other riparian vegetation; emergent wetlands.
<i>Wildlife</i>	Focal point for wildlife.
<i>Water</i>	Gaining stream (groundwater flows into the stream); groundwater becomes saltier as the water moves downgradient; stream geomorphology is tied to San Luis Lakes.
Human Connections	American Indian ties; numerous archeological sites.
Visitor Opportunities	Experiencing quiet and solitude in a wilderness environment; seeing the heavens at night; viewing the dunes with backdrop of the high peaks; viewing wildlife in its natural setting. Learning and educational opportunities: learning about the dunes system (especially groundwater aquifers); prehistory; habitat; biodiversity.
Wilderness Status / Suitability	Upper stretches suitable for wilderness; lower stretches unsuitable for wilderness.

SPRING CREEKS AND WETLANDS	
<p>Planning Issues and Opportunities</p>	<p>Opportunity to restore natural flows (water has been diverted for irrigation)                      Closed Basin Project has potential to affect aquifer and related natural systems                      Valleywide dewatering of aquifer from agricultural uses                      Visitor access                      Artifacts collecting and location of other sensitive sites                      Vegetation and water quality susceptible to damage from trespass livestock                      Nonnative fish and turtles in Big Spring and Big Spring Creek                      Reintroduction of native amphibians                      Nonnative species (e.g., Canada thistle and white top)                      Standing water—possible West Nile virus concern</p>

## **APPENDIX D: CARRYING CAPACITY STEPS**



The carrying capacity process for national parks typically involves the following steps:

1. Identify desired conditions (goals) for resources and visitors.
2. Identify indicators (things to monitor to determine whether desired conditions are being met).
3. Identify standards (limits of acceptable change) for the indicators.
4. Monitor indicators.
5. Take management action as necessary to ensure that standards are met.
6. Regularly evaluate and make adjustments based on new information and lessons learned.

Step 1: identify desired conditions, involves assigning management zones that have different desired resource and visitor conditions to different park areas.

Step 2: identify indicators, often begins with a discussion of park and zone-specific resource and visitor experience concerns (signs that desired conditions are perhaps not being met). Discussing specific concerns helps managers identify potential resource and visitor experience indicators to monitor. Depending on the situation, managers may also consult scientific literature, conduct research, consult other park managers, consult public opinion, and apply management judgment to assist with identifying indicators.

Step 3: identify standards, involves using scientific information, combined with best judgment, to establish the minimum

acceptable condition for an indicator. (A standard does not define an intolerable condition. It is not a condition that managers should strive to achieve, unless intolerable conditions already exist.)

Step 4: monitor indicators, means checking indicators to see if conditions are deteriorating or if standards are being exceeded. Ideally, monitoring involves systematic and periodic measurement of indicators according to a predefined plan. With limited NPS staff and budgets, park managers must focus on areas where there are definite concerns and/or clear evidence of problems. This means monitoring should generally take place where:

- conditions are at or violate standards
- conditions are changing rapidly
- specific and important values are threatened by visitation
- effects of management actions are unknown

Step 5: take management action, means taking corrective steps to address deteriorating or unacceptable conditions. Management action includes things like expanding education or information, requiring visitor guides or permits, delineating trails, extending seasons or hours, expanding facilities, establishing one-way trails, increasing patrols, implementing temporary closures, or redirecting use. Using a combination of strategies provides managers with greater flexibility and allows them to address multiple dimensions and causes of undesired impacts. Reducing use may appear to be the obvious solution to visitor use impacts, but less restrictive strategies may work as well and have fewer undesired consequences.

Step 6: sometimes referred to as adaptive management, means remaining flexible and

“learning as you go.” Park managers rarely have all the information they desire to make decisions. Nonetheless, they are responsible for ensuring that park resources remain unimpaired for the enjoyment of future generations, which may mean taking a

cautious or conservative approach while gathering additional information. Adaptive management also includes using best judgment, trying different things to see what works, and adapting as new information becomes available.

**APPENDIX E:  
DEVELOPMENT OF THE GENERAL MANAGEMENT PLAN**



## INITIAL PLANNING STEPS

Work on the Great Sand Dunes National Park and Preserve General Management Plan / Wilderness Study / Environmental Impact Statement began in earnest in early 2003. The planning team consisted of Great Sand Dunes staff, specialists from the National Park Service – Intermountain Region, and professionals from the consulting firm engineering-environmental Management, Inc. (e<sup>2</sup>M).

The planning team was assisted by the Great Sand Dunes National Park Advisory Council. The council has operated in accordance with the Federal Advisory Committee Act (5 USC App.) and other applicable laws. Early in the planning process, council members participated in field trips to learn more about the park, its surroundings, and planning issues. As of fall 2005, the council had met 11 times. Advisory council meetings are open to the public and typically include an opportunity for public comment. Advisory council meeting minutes are available online. The council (see “Preparers and Consultants” for a list of members) participated in each step of the National Park Service planning process, including identifying fundamental resources and values, developing management zones and alternatives, gathering and considering public input, and identifying consequences of alternatives. After completion of the general management plan, the council is to be dissolved.

Early steps in the general management plan planning process included the following (see chapter 1 for details):

- Reaffirm the park’s purpose and significance.
- Identify the park’s fundamental resources and values.
- Consider legislative mandates and constraints.
- Recognize planning issues.

The planning team and advisory council conducted field trips, and gathered and studied information and park resources, visitor use and values, and planning issues. With this information, the team and council developed four preliminary concepts for alternatives (including a no-action alternative) for managing natural and cultural resources and visitor use. These concepts were presented to the public in a newsletter, and comments from the public and other agencies were gathered and reviewed.

Based on public input and further consideration, the planning team developed three draft alternatives, each with an accompanying option for new wilderness, from these preliminary concepts. The team also dismissed certain ideas or actions from further consideration. These draft alternatives were then presented in a newsletter and at public meetings, and again comments were collected and reviewed. Possible consequences of the alternatives were discussed, neighboring agencies were consulted, and additional field trips were conducted. Based on all of this information, certain elements of the GMP alternatives were modified.

## DEVELOPING THE NATIONAL PARK SERVICE PREFERRED ALTERNATIVE

The next major step was to identify (develop) a preferred National Park Service alternative. The four revised alternatives, titled “no-action,” “dunefield focus—maximize wildness,” “three public nodes,” and “dispersed use-joint facilities,” were

evaluated. The planning team used an evaluation process called “choosing by advantages.” This process evaluates different choices (in this case, the four management alternatives) by identifying and comparing the relative advantages of each according to a set of criteria. In this case, the criteria were based on the park’s purpose, significance, and fundamental resources and values. The Great Sand Dunes Advisory Council reviewed the criteria and its comments were incorporated.

The criteria area listed below (not in priority order):

- Preserves natural diversity and natural processes (especially fundamental resources and values).
- Preserves human connections (cultural resources), especially fundamental resources and values.
- Provides for visitor opportunities (especially fundamental resources and values).
- Supports the park’s education and research programs.
- Provides for efficient NPS operations and for employee and visitor safety.
- Considers interests of neighboring agencies, communities, and public comments.

The team identified the relative advantages of each alternative for each of the six criteria. Each advantage (not each criterion) was given a point value that reflected its importance. Then, by adding up the scores for each alternative, the team was able to determine how the four alternatives compared overall. Costs of implementing

the alternatives were then compared to examine the relationships between advantages and costs.

The relative advantages of the alternatives for each criterion are summarized below.

*Preserves natural diversity and natural processes (especially fundamental resources and values)*—The dunefield focus—maximize wildness alternative scored highest for this criterion. This alternative had the greatest amount of new wilderness proposed and the most of the natural/wild management zone. It therefore had the least habitat fragmentation, least wildlife disturbance, and permitted a return to a more natural hydrologic regime. The management zones and minimal access would probably lead to relatively light use of the Baca and Medano Ranch areas, which would mean less spread of invasive plants into biologically special areas.

*Preserves human connections (cultural resources), especially fundamental resources and values*—The dispersed use—joint facilities alternative scored highest for its protection of cultural resources, archeological resources, historic structures, and cultural landscapes. Its wilderness recommendation, overlaid with the guided learning zone, would help protect sensitive areas by limiting vehicle access. People would not be permitted to drive to areas containing especially sensitive resources. This alternative also would maintain and preserve the Medano Ranch headquarters historic structures and cultural landscape via administrative and related adaptive use. This would provide an additional level of protection to sensitive cultural resources in and near the Medano Ranch area. A relatively large backcountry adventure zone would allow for trails to be constructed to direct use away from other sensitive areas.

*Provides for visitor opportunities (especially fundamental resources and values)*—The dispersed use—joint facilities alternative scored highest for this factor. It would allow for and could accommodate growth in visitation, and provide for an appropriate range of visitor opportunities. (The quality of visitor experiences was judged more important than having a wide variety of experiences that may not relate to the park’s fundamental resources and values). A modest shuttle system would provide options for transporting visitors to the dunes area during peak visitor use periods. The guided learning zone would encourage a different type of park experience and provides protective measures for especially sensitive resources. A northern access point would be important for addressing neighboring agency needs and providing options for access to the north part of the park.

*Supports the park’s education and research programs*—The three public nodes alternative scored highest for this criterion because it would permit environmental education and interpretive options at the Medano Ranch headquarters and would not limit vehicle access (no new wilderness recommendation) for researchers and educators.

*Provides for efficient NPS operations and for employee and visitor safety*—The no-action alternative scored highest for this criterion due to no increase in fire risk and no access limitations (via wilderness recommendation) for administrative purposes. Also, Medano Ranch would be maintained by The Nature Conservancy, which would mean park staff would remain free for other operational needs. Limited visitor access to new lands would keep additional patrol, response, and maintenance needs (and staff) to a minimum. No new services to provide or

facilities to maintain would help keep park operations small and streamlined.

*Considers interests of neighboring agencies, communities, and public comments*—The dispersed use—joint facilities alternative scored highest for this criterion. It would preserve historic structures and landscapes at Medano Ranch and recommend new wilderness (which may affect management by some other agencies, but also preserves wilderness values that are highly valued by the public). It would provide flexibility to consider various access options to USFS lands and the mountain front. It would also provide some measure of administrative access for park and agency staff, new recreational opportunities for visitors, and partnering opportunities that could enhance socioeconomic interests in the San Luis Valley.

After studying the advantages of the revised alternatives according to the six criteria in the foregoing discussion, the planning team developed the NPS preferred alternative. The dispersed use—joint facilities alternative provided the overall best value (greatest total advantage for the cost expended), so the team started with this alternative, then studied the choosing by advantages results to see where elements of other alternatives could be incorporated to add advantages without adding much additional cost. In this way, certain other elements were incorporated to build the NPS preferred alternative. Having taken this step, the planning team eliminated the dispersed use—joint facilities alternative from detailed analysis and discussion in the GMP/EIS to keep the document manageable and understandable, and because many of its key elements had been incorporated into the NPS preferred alternative.

## **RATIONALE FOR THE NPS PREFERRED ALTERNATIVE**

The following discussion provides the rationale for why various elements were included in the NPS preferred alternative.

### **Frontcountry Zone**

A modest shuttle system for peak visitor use periods was included in the preferred alternative for the following reasons: to minimize the incidence of visitor vehicles parked on road shoulders for safety and resource reasons, to reduce vehicle congestion and visitor frustration because enlarging parking areas within the frontcountry zone would have undesired scenic and resource impacts, and because the frontcountry and dunes play zones can accommodate more visitors (without vehicles) without undue social consequences.

The frontcountry zone was widened slightly along the main park road to provide for future bicycle lanes. Some people ride bicycles along the main park road. To do this, cyclists must share the main park road, which has no shoulders in many places, with large RVs. This is a safety concern, especially when traffic is heavy. Adding bike lanes would improve safety, provide an alternative, more sustainable way of visiting the park (one that does not require a vehicle parking space), and increase recreational opportunities. This option would be less costly and have fewer environmental impacts (e.g., habitat fragmentation) than a multiuse path that is separate from the main road corridor.

A separate biking/hiking path that connects the campground with the visitor center and dunes parking lot/access area) would allow visitors to safely walk or ride bicycles between these areas without creating

additional social trails. Use of such a path would also reduce the amount of traffic on the main park road, and reduce or eliminate danger associated with visitors, including children, sharing this heavily used section of roadway with motor vehicles.

The fee booth would be relocated to near the park boundary. Its current location immediately west of park headquarters presents the following problems: (1) vehicle congestion around the headquarters area, (2) no way for a visitor shuttle bus to bypass the main entrance gate, (3) no way for park staff vehicles to bypass lines of vehicles queuing as they enter or leave the park, and (4) little room for vehicles to turn around in the immediate area (does not provide for redirection of visitor vehicles). The new location would help alleviate these problems and support a modest shuttle system operating out of the Oasis area.

### **Dunes Play Zone**

The dunes play management zone was included to acknowledge and provide management direction for this localized dune and Medano Creek area located just west of the dunes parking lot. The area is special because, although it is located within a designated wilderness area, it receives high concentrations of visitor use during busy summer weekends and holidays. The National Park Service believes that such use is appropriate.

### **Guided Learning Zone**

An area in the south-central portion of the park was zoned guided learning to protect an area of diverse sensitive resources while still allowing public use (guided only). Because Medano Ranch headquarters would not be managed as a public day-use area (see administrative zone below), the planning team felt there was no need to

extend the zone westward to the headquarters as a means of discouraging visitors from wandering into sensitive areas.

### **Backcountry Access Zone**

The Medano Pass primitive road corridor was zoned backcountry access because no big changes in management are needed or desired, and this zone best fits the area.

The backcountry access zone and trailhead in the northern portion of the park provides for future public vehicle access to the north part of the park. The shape and extent of this zone in the northern portion of the park allow maximum flexibility for siting a route either from the refuge or from the Baca Grande subdivision. Similarly, maximum flexibility for public vehicle access to the mountain front—a USFS goal—was retained by including a provision for a joint U.S. Forest Service / National Park Service study of the need for and impacts of: (1) an extension of Cow Camp Road to connect with Liberty Road, and/or (2) access via Liberty Road. Either would require a separate NEPA process.

The backcountry access zone in the northern portion of the park does not include a campground, which was included in another GMP alternative. The planning team felt it best not to introduce noise, visual impacts, night time traffic, and lights in this area. Two campgrounds are located in nearby Crestone. Staff and maintenance requirements for campgrounds far exceed those needed for a trailhead, and this was an agency consideration. There was also substantial concern about encouraging high levels of use near Deadman Creek (a special ecological area) due to the potential for introduction of invasive plant species and damage to streambanks from horse and foot traffic. Risk of wildfire (from campfires) was

a concern, especially with the Baca Grande subdivision in the path of prevailing winds.

### **Backcountry Adventure Zone**

The areas north and south of the frontcountry zone along the main park road and along the southern portion of the Medano Pass primitive road were zoned backcountry adventure. This zoning acknowledges that some visitors wander away from these roads, which are located in the busier frontcountry zone, to explore adjacent areas. Also, the backcountry adventure zone permits the future option to provide hiking or horseback trails from the Oasis commercial area (located just outside the main park entrance) to appropriate dunefield and Medano Creek areas. (Note: there is an established “no public horse use area” located within the main portion of the frontcountry and dunes play zones.) Similarly, it would allow more flexibility in the event that the Oasis served as an alternate base for guided hiking and horseback tours into the Guided Learning Zone.

The planning team felt that the northern portion of the preserve, around Music Pass and Sand Creek Lakes, is an area that already experiences relative high levels of use, and where use may increase substantially in the future. The team zoned this area backcountry adventure to keep management options open for formalizing trails, creating loop trails, providing designated backcountry campsites, and for interfacing with USFS management of the adjacent area.

The National Park Service is in the early stages of learning more about the characteristics and resources of the former Baca Ranch area, located northwest of the dunefield. Thus, this area was zoned backcountry adventure, which gives the

National Park Service future flexibility to define trails and otherwise direct visitor use as needed to protect special or sensitive resources.

### **Natural/Wild Zone**

The dunefield and the area surrounding the Medano Ranch headquarters were zoned natural/wild: the planning team anticipated low use levels in these areas, and trails would be expensive to impossible to build and maintain due to sandy conditions. With the natural/wild zone, it would still be possible, should a trailhead be developed at the San Luis Lakes State Park and Wildlife Area, to access the national park via cross-country foot or horseback travel.

The southern portion of the national preserve was also zoned natural/wild (except for the Mosca Pass trail corridor) because there is a desire to maintain it in a natural, wild condition, the area is unlikely to experience a substantial increase in use, and there are few logical places for additional formal trails.

### **Administrative Zone**

Liberty Road is zoned administrative within the national park to allow for National Park Service and other agency use for administrative purposes. Visitor foot and horseback travel would be permitted, but not general public vehicle use. (Vehicle use by hunters who are accompanied or authorized by agency personnel may be permitted.) If general public vehicle use were allowed on this stretch of road, many people would likely continue by vehicle southward along Liberty Road, spilling into the national preserve and the heart of the national park, both of which are designated wilderness. The planning team felt this might have too many undesired consequences for these NPS areas.

Areas along the eastern boundary of the preserve, near the top of Medano Pass, were zoned administrative to allow access for private entities that own water rights associated with irrigation ditches in the area.

Closed basin pipeline right-of-ways in the far southwest corner of the park were zoned administrative to allow access for agencies to check and maintain these working structures. Certain roads in the southwestern portion of the park were zoned administrative to allow agency access for operational activities such as resource management and monitoring.

The dirt road that accesses Alpine Camp from the north would be zoned administrative to allow NPS vehicle access to the site. Alpine Camp would serve as a base for patrols of the backcountry access and backcountry adventure zones, research and monitoring activities, etc.

The Medano Ranch access road and headquarters are zoned administrative to permit NPS adaptive use of structures for operational and administrative purposes (offices, storage, housing, research activities support, etc.). The area would also be used for scheduled, guided public activities such as interpretive programs, environmental education, a base for guided hiking or horseback tours, and special events; the access road would be gated, and the gate would be opened on a limited, as-needed (scheduled) basis for public vehicle access to the Medano Ranch headquarters area. The planning team decided against zoning the Medano Ranch headquarters as frontcountry, which would have allowed general public use, due to concerns about sensitive resources in this general area of the park, staffing and maintenance costs associated with operating public facilities and visitor safety.

**Wilderness Recommendation** (see also Appendix F: Wilderness Study and Recommendation)

The general approach to wilderness was to recommend designated wilderness for as much of the wilderness-eligible land as possible to protect wilderness values and provide protection for remote natural and cultural resources over the long term. NPS staff had earnest concerns that designating additional large blocks of wilderness would severely constrain National Park Service and other agency access to monitoring equipment (e.g., groundwater monitoring wells along Sand Creek and at Big Spring) and for research and resource management activities. For that reason, the extent of the wilderness recommendation was hotly debated, as were several wilderness exclusions along two-track roads. Ultimately, the team concluded that the wilderness recommendation should be based on what is best for resources and wilderness values over the long term, not on operational convenience and efficiency.

Wilderness-eligible lands excluded from the wilderness recommendation included narrow strips (approximately 200 feet wide) immediately north of and adjacent to County Road 6N and SH 150. The purpose of these exclusions is to allow future flexibility for road, utility, and drainage improvement in these areas. The Alpine Camp area was also excluded to allow the simple facilities there (one-room cabin, corral and stock loading ramp, tack

building, and privy) to serve as an operational base.

**Dogs**

Dogs on leashes have always been allowed in the national park. By law, dogs being used for hunting are allowed in the preserve (see chapter 3 “Health and Safety—Dogs” section for details). After considerable discussion of visitor comments and environmental consequences, the planning team decided on a “middle ground” policy: dogs (leashes required) would be permitted only in the national preserve and in the frontcountry and dunes play zones of the national park. The team seriously considered restricting dogs (on leashes) to parking lots, car campgrounds, and picnic areas. However, there was concern based on past experience that visitors would leave their dogs in hot cars or tied to car bumpers if dogs were not allowed in the dunes play zone. Also, dogs on leashes have been permitted everywhere in the park for years. Many repeat visitors (there are many) count on bringing their dogs when they visit the park. The team decided to allow leashed dogs in the preserve because hunting dogs are allowed, and to minimize the dog policy differences between the preserve and the adjacent national forest, where dogs are allowed and must be within voice control of the owner if not on-leash. However, if dogs become more of a problem over time, the National Park Service may consider further limitations under the authority of the Superintendent’s Compendium.



**APPENDIX F:  
COST ESTIMATES FOR THE GMP ALTERNATIVES**



<b>Cost Summary: Great Sand Dunes GMP Alternatives</b>				
	<b>No-Action Alternative</b>	<b>NPS Preferred Alternative</b>	<b>Dunefield Focus—Maximize Wildness Alternative</b>	<b>Three Public Nodes Alternative</b>
<b>Annual Costs</b> FY 04 Operations Costs: \$1,450,000	\$1,450,000 – \$1,670,000  This estimate includes payroll for 28 FTEs with benefits, personnel support, utilities, transportation, and maintenance.	\$1,870,000 – \$2,150,000  This estimate assumes 8 additional FTEs, a 20% increase in utility and maintenance costs, and a 15% increase in transportation costs. Potential partnership support at Medano Ranch may partially offset operations costs.	\$1,700,000 – \$1,950,000  This estimate assumes 5 additional FTEs, a 5% increase in utility costs, and a 10% increase in transportation and maintenance costs.	\$1,970,000 – \$2,270,000  This estimate assumes 10 additional FTEs, and a 25% increase in utility, transportation, and maintenance costs. Potential partnership support at Medano Ranch may partially offset operations costs.
<b>Initial Capital Costs</b>  (includes construction, exhibits, research support, etc.)	\$5,400,000 – \$6,800,000  Major cost projects include funded expansion / reconfiguration of the dunes parking lot, utilities, and infrastructure improvements (e.g., new water storage tank and distribution lines) and two housing units.	\$16,200,000 – \$21,200,000  Major cost projects include those listed under no action, plus new trails and trailheads, an access road, relocating the fee booth, bike lanes, removal of a bison fence, and structure and utility improvements at Medano Ranch. Costs for the latter may be offset by grants and partnerships.	\$8,200,000 – \$10,600,000  Major cost projects include those listed under no action, plus expansion of parking and restrooms in the frontcountry zone, a multiuse path from the park entrance, and removal of a bison fence.	\$15,800,000 – \$20,600,000  Major cost projects include those listed under no action, plus new trails, an access road, a trailhead, a primitive campground, removal of a bison fence, and structure, and utility improvements at Medano Ranch. Costs for the latter may be offset by grants and partnerships.
<b>Total Life-Cycle Costs over the Life of the Plan</b>	\$28,100,000- \$29,500,000	\$44,600,000- \$49,600,000	\$35,600,000- \$36,700,000	\$46,700,000- \$50,300,000
Important notes and assumptions: <ol style="list-style-type: none"> <li>1. These cost estimates were developed in 2005; they are very general and are intended to be used for comparing alternatives only. They are not intended for budgeting purposes.</li> <li>2. Total life-cycle costs also include other costs that recur at intervals longer than annually (e.g., road paving).</li> <li>3. Initial capital costs were prepared using the NPS Denver Service Center "Class C" estimating guide, and include add-ons of 40% for overhead and profit, 15% for design contingency, 10% for general conditions, a regional location factor of 1.0, and a park location factor of 1.0.</li> <li>4. Cost ranges reflect uncertainty about future costs, especially costs for capital improvement projects.</li> <li>5. Life-cycle costs were determined using the NPS Construction Management LCC template, which assumes a discount rate of 7% and a project life cycle of 25 years.</li> </ol>				
The National Park Service develops 5-year deferred maintenance and capital improvement plans. Project proposals are developed at the park level, but projects are evaluated and ranked in priority order nationally, primarily based on critical health and safety and resource protection considerations.				
Capital developments, maintenance, and staffing proposals in this plan will be evaluated in light of competing priorities for this and other units of the national park system. Because the budget process currently emphasizes alleviating the existing maintenance backlog, funding for new development is not likely within the next 5 years. However, development and operational proposals in this plan may be implemented sooner if funding is available from partnerships that do not rely on the National Park Service budget.				



**APPENDIX G: WILDERNESS STUDY AND RECOMMENDATION**



## INTRODUCTION

The purpose of wilderness designation, which is accomplished solely by congressional action, is to preserve and protect wilderness characteristics and values over the long term while providing opportunities for solitude or primitive and unconfined recreation. With passage of the 1964 Wilderness Act (16 USC 1131 *et seq.*), Congress declared that it is national policy to secure for present and future generations the benefits of enduring wilderness resources.

As of 2005, Great Sand Dunes National Park and Preserve had two designated wilderness areas within its boundaries. The Great Sand Dunes Wilderness Area, comprised primarily of the main dunes within Great Sand Dunes National Park, was established in 1976 by Public Law 94-567 and amended in 1978 by Public Law 95-625. The Sangre de Cristo Wilderness Area was established by the Colorado Wilderness Act of 1993 (Public Law 103-77). In the year 2000, the portion of the Sangre de Cristo Wilderness that is now within the national preserve was administratively transferred from the USFS to the National Park Service (Great Sand Dunes Act of 2000). Total designated wilderness in the national park and preserve amounts to about 75,584 acres.

Wilderness was one of several very important resources identified in the Great Sand Dunes Act of 2000, which authorized expansion of the park. A decision was made to include a wilderness study with the GMP that would review new lands not already designated as wilderness for possible inclusion in the National Wilderness Preservation System. The study consisted of two phases: (1) determining which lands within the expanded park were eligible for wilderness recommendation based on their

characteristics, and (2) deciding which of the wilderness-eligible lands identified in the first phase should be recommended for wilderness designation.

## WILDERNESS DEFINITION

The Wilderness Act of 1964 (Public Law 88-577) describes and defines a wilderness area as follows:

*“A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in the Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which 1) generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable; 2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; 3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and 4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.”*

## BRIEF DESCRIPTION OF THE STUDY AREA

The study area, which is located to the immediate northwest, west, and southwest of the former Great Sand Dunes National Monument, consists of lands that were added to the park unit by the Great Sand Dunes Act of 2000. The area is bounded on the north by the expanded park boundary, on the south by County Rd 6N and SH 150; on the west by the Baca National Wildlife Refuge; and the east by the Sangre de Cristo and Great Sand Dunes Wilderness areas. Land cover types of the area include sand dune shrub complex, greasewood fans and flats, sandy areas, desert shrub, and foothills and mountain grassland.

Except for the narrow Medano Pass primitive road corridor and portions of the Hudson and Medano irrigation ditches, the entire Great Sand Dunes National Preserve, established in 2000, is part of the Sangre de Cristo Wilderness. Thus, there was no need to evaluate the national preserve for wilderness eligibility. Park lands that were originally assessed as unsuitable for wilderness because of nonconforming or incompatible uses must be re-evaluated if the non-conforming uses have been terminated or removed. Land uses within the pre-2000 national monument boundary have not changed appreciably since the Great Sand Dunes Wilderness was established in 1976, so the planning team did not reassess these lands.

The study area includes portions of Medano Ranch and the former Baca Ranch. Most of the study area has been grazed; bison grazing continues on the Medano Ranch portion. Historically there has been little to no public use of the land and there are few formal roads. With the exception of the Closed Basin Project, evidence of human use consists mainly of ranching-related

elements such as ranch buildings, fences, stock tanks, and windmills.

## WILDERNESS CRITERIA AND ELIGIBILITY

The first phase of the wilderness study was to conduct an initial determination of wilderness eligibility, which is a factual determination of whether a park contains lands that possess wilderness character. The Wilderness Act, departmental regulations at 43 CFR Part 19, secretarial orders, NPS management criteria, and NPS memoranda<sup>9</sup> prescribe the criteria that are used to make an objective determination of whether wilderness-eligible lands exist in a park. In general, roadless areas exhibiting characteristics of the Wilderness Act that are at least 5000 acres in size (or of sufficient size to make management as wilderness practicable) are considered suitable for wilderness. Using these criteria, an evaluation of the study area was conducted by the National Park Service. The evaluation concluded that there are nearly 51,000 acres of wilderness-eligible lands within the study area. Details are provided in the paragraphs below.

### Nonfederal Lands or Interests

Nonfederal lands or interests in land within a roadless or undeveloped part of a park do not necessarily disqualify the area from eligibility. The wilderness eligibility assessment should consider whether the nonfederal lands are: (1) a small proportion of the roadless area, (2) dispersed throughout the roadless area, or can they be segregated by prospective boundary shifts, (3) inaccessible or subject to likely

<sup>9</sup> A June 10, 2002, National Park Service memo from the Associate Director, Park Operations and Education, titled "Clarifying the Wilderness Review Process" provided detailed guidance on conducting a wilderness suitability assessment. This memo is an insert to Reference Manual 41: *Wilderness Preservation and Management*.

development, and (4) likely to remain nonfederal indefinitely.

Most of the park expansion area south of the former Baca Ranch is state trust land or private land owned by The Nature Conservancy. This area is part of what is known as Medano Ranch. These nonfederal lands are not likely to remain so indefinitely. There's a good chance that The Nature Conservancy will donate or sell the portion of Medano Ranch within the park boundary to the National Park Service within the life of the GMP. Also, NPS managers are working with the state and the BLM on a land exchange that would transfer state lands within the park boundary to the National Park Service. For these reasons, the National Park Service concluded that most of the Medano Ranch lands located within the national park are wilderness-eligible. Exceptions are discussed in the sections that follow.

The northern portion of the study area is part of what was formerly the Baca Ranch. The National Park Service owns the surface rights, but subsurface mineral rights are held by a private entity, Lexam Explorations, Inc., which has engaged in gas and oil exploration activities during the past decade. Based on the land's geologic properties, the National Park Service Geologic Resources Division believes that the likelihood of gas and oil production occurring on these lands is relatively low. The National Park Service is likely to eventually pursue purchase of these mineral estates (23,835 acres). For this reason, and because the National Park Service owns the surface rights, the National Park Service concluded that most of this land is wilderness-eligible.

Three additional private parcels totaling 52 acres are located within the national park. One parcel is east of the former Baca Ranch

and north of the former national monument. The others are located near the park's main entrance. The National Park Service plans to pursue purchase of these parcels, assuming the owners are willing to sell. Thus, the National Park Service concluded that these lands are wilderness-eligible.

### **Closed Basin Project**

The Closed Basin Project pumps and delivers unconfined groundwater and available surface flows in the Closed Basin to the Rio Grande River via underground pipelines and a 42-mile conveyance channel. A portion of the Closed Basin Project is located within the southwestern part of the study area. The project is likely to remain in operation, and the Bureau of Reclamation will require continued access to pipelines and production/monitoring wells. New wells or pipelines may be needed in the future. The National Park Service concluded that the presence and ongoing operation of the Closed Basin Project renders the Closed Basin portion of the park ineligible for wilderness.

### **Roads**

For the purposes of wilderness eligibility, lands containing unimproved dirt roads or tracks are "roadless areas." Roadless areas include lands containing improved dirt roads that are not passable by four-wheeled vehicles (not four-wheel *drive* vehicles) intended primarily for highways.

Not including roads associated with the Closed Basin Project (see above), there are two improved roads within the park expansion area that are passable by four-wheeled vehicles intended for highway use. The first, referred to in this document as Cow Camp Road, is located in the northwest corner of the park expansion

area, just south of the Baca Grande subdivision. This road, which has an east-west orientation, is associated with oil and gas exploration activities on the former Baca Ranch. Because the area north of Cow Camp Road is less than 5,000 acres in size, the planning team concluded that this portion is not wilderness-eligible. The second road, which has a north-south orientation, bisects the southwest corner of the park expansion area. The southern-most portion of the road is located within the Closed Basin Project area. This road is associated with Medano Ranch and occurs in combination with ranch structures, corrals, above-ground electric lines, and human-made Closed Basin features. The National Park Service concluded that the southwest portion of the park expansion area is not wilderness eligible due to the presence of Medano Ranch Road and a concentration of other human-made features.

Several other roads exist on lands within the expanded park boundary. These roads are not generally passable by four-wheeled passenger vehicle. Most are no more than “two tracks,” and others are too sandy to remain passable with any more than occasional use. A small aircraft landing strip, no longer in use, parallels SH 150 in the southeastern corner of the park expansion area. The strip is unpaved and is substantially unnoticeable. The National Park Service concluded that these roads and the abandoned air strip do not disqualify park expansion lands from wilderness eligibility.

### **Grazed Lands**

Lands that have been grazed may be considered eligible for wilderness designation if, at the time of the assessment, the effects of these activities are substantially unnoticeable or if their

wilderness character could be maintained or restored through appropriate management actions. Most of the lands within the park expansion area have been grazed by cattle and/or bison. In these areas, a number of stock tanks fed by flowing groundwater wells are present. One well pump is powered by a windmill. Grazing ended on the former Baca Ranch portion with its transfer to NPS management in late 2004. Bison grazing continues on the Medano Ranch portion. The effects of grazing are substantially unnoticeable and wilderness character could be restored through management actions (e.g., capping wells below ground and removing stock tanks), so the National Park Service concluded that grazing and associated features do not render these lands ineligible for wilderness.

### **Mined Lands, etc.**

Lands that have been mined may be considered eligible for wilderness designation if, at the time of the assessment, the effects of these activities are substantially unnoticeable or if their wilderness character could be maintained or restored through appropriate management actions. Historic mine sites (e.g., Liberty) are located at the periphery, or northern edge, of the park expansion area. The mine/prospect sites and pond/quarry sites are located in the far northeast corner of the park expansion area. Although evidence of mining, prospecting, and quarrying is apparent, the effects are generally small in scale and are limited primarily to changes in landform. Structures, concrete foundations, and other obvious human-made features are generally absent. The National Park Service believes that the wilderness character of these areas could be restored if the land’s original contours were reestablished. The small flumes or weirs are part of the national park’s water rights quantification and monitoring program. The National Park

Service concluded that the mine and prospect sites, ponds, quarries, and flumes/weirs do not disqualify park expansion lands from wilderness eligibility.

### **Structures and Cultural Features**

Areas may contain cultural resource features such as historic buildings and still be included in wilderness, provided the features are not primary attractions for park visitors. Immediately adjacent to and south of the Cow Camp Road is a small area called Alpine Camp. The camp, which dates to the mid-1900s, includes a small cabin, corrals, and fences. The camp does not disqualify the area from wilderness eligibility.

The only other buildings within the park expansion area are the Medano Ranch structures. Most structures on the ranch date to the late 1880s, but others (bison shed, barns, etc.) are much more recent. These structures do not necessarily render this corner of the park ineligible for wilderness. However, the structures occur in combination with an improved road, aboveground power lines, and other human-made features. As discussed above, this combination and concentration of features renders this area of the park ineligible for wilderness.

Fences and earthen ditches are present on some portions of the park expansion lands. As land uses change due to park expansion in the future, some or all of the fences and ditches may no longer be needed. Fences could be removed and earthen ditches could be filled so that wilderness character is restored. The National Park Service concluded that such features do not disqualify park expansion lands from wilderness eligibility.

### **WILDERNESS OPTIONS ANALYZED IN THIS STUDY**

Two wilderness options are analyzed in detail in this GMP: (1) recommend no new lands for wilderness, and (2) recommend most eligible lands for wilderness. A third wilderness option (recommend moderate amount of wilderness) was considered during initial stages of the planning process, but dismissed from detailed analysis when the matching GMP alternative was dropped. The remaining two wilderness options in this study cover the range of impacts that would be expected; impacts of the dismissed option would be somewhere in between.

The two GMP alternatives that include no new wilderness recommendation are the no-action alternative and the three public nodes—new dunes experiences alternative (see chapter 2 for alternative maps and descriptions). The no-action alternative includes this option because it portrays baseline (existing) conditions in December 2004, soon after the Baca Ranch became federally managed. The three public nodes—new dunes experiences alternative includes this option because it proposes more new facilities and public uses in various areas of the park.

The two GMP alternatives that do include a wilderness recommendation are the dunefield focus—maximize wildness alternative and the NPS preferred alternative (see chapter 2 for alternative maps and descriptions). The dunefield focus—maximize wildness alternative recommends wilderness for most eligible lands because it offers the wildest conditions of the four GMP alternatives. The NPS preferred alternative recommends wilderness for most eligible lands because, after studying the various options, the National Park Service concluded that

wilderness designation is the best long-term management strategy for these lands.

### **WILDERNESS RECOMMENDATION**

According to NPS *Management Policies* (2001), a wilderness recommendation may include two categories: (1) lands recommended for immediate wilderness designation, and (2) potential wilderness additions. The former are lands that are wholly federally owned and are fully qualified to become wilderness. The latter are lands that are surrounded by or adjacent to lands proposed for wilderness designation but that do not themselves qualify for immediate designation due to temporary, nonconforming, or incompatible conditions. Potential wilderness additions, if so authorized by Congress, will become designated wilderness upon the Secretary of the Interior's determination that the nonconforming use has ended.

This study recommends that approximately 50,951 acres within Great Sand Dunes National Park be ultimately recommended for wilderness. This includes 4,556 acres recommended for immediate wilderness designation, and 46,395 acres of potential wilderness additions (table G-1 and figure G-1). A narrow corridor of wilderness-eligible land was excluded from the recommendation because the National Park Service believes a setback (200 feet from the centerlines of County Lane 6 and SH 150) is

needed to allow for potential future utility, drainage, fence, and roadway improvements.

Wilderness-eligible lands recommended for immediate wilderness designation are those that are wholly in National Park Service ownership (former BLM-managed lands transferred to the National Park Service in 2000).

Wilderness-eligible lands recommended for potential wilderness additions include:

1. Medano Ranch lands currently owned by The Nature Conservancy (possible transfer to the National Park Service within 5–7 years)
2. former Baca Ranch lands owned by the federal government, but for which subsurface mineral rights are privately held (long-term objective for National Park Service to acquire)
3. Medano Ranch lands currently owned by the state of Colorado (land exchange underway; completion expected within 1–2 years)
4. lands held in other private ownership (three parcels, acquisition timeline varies)

**Table G-1. Great Sand Dunes Wilderness Status and Recommendations**

	Category Subtotals (acres)		Area (acres)
<b>Designated by Congress</b>			<b>75,584</b>
Designated Wilderness		73,143	
Potential Wilderness – NPS ownership, not yet converted		750	
Potential Wilderness—private subsurface mineral ownership		1,691	
<b>Wilderness Recommendation</b>			<b>50,951</b>
Recommended Designated Wilderness-- NPS ownership		4,556	
Recommended Potential Wilderness		46,395	
The Nature Conservancy ownership	5,611		
Private subsurface mineral ownership	23,835		
State ownership	16,897		
Other private ownership	52		
<b>Total Designated and Recommended Wilderness</b>			<b>126,535</b>

### Implications of Managing Lands Recommended for Wilderness

Park lands that are recommended for wilderness designation in this GMP are to be managed as wilderness until such time as Congress specifically designates new wilderness for these lands (*NPS Management Policies* 2001). That is, management decisions for lands recommended for wilderness will be made in expectation of eventual wilderness designation. This also applies to potential wilderness, meaning it will be managed as wilderness to the extent that existing nonconforming conditions allow.

Wilderness management plans are typically developed to guide preservation, management, and use of NPS wilderness areas. Such plans are developed with public involvement and contain specific, measurable wilderness management objectives for preservation of wilderness values as specified in the Wilderness Act

and NPS Management Policies. Wilderness management plans, which are often combined with backcountry management plans, articulate management actions such as regulations, monitoring, and permit systems.

Management decisions affecting wilderness must be consistent with the “minimum requirements” concept. This concept is a documented process used to determine whether administrative activities affecting wilderness resources or visitor experiences are necessary in wilderness, and if so, how to minimize impacts from such activities. Parks are to complete a minimum requirements analysis on administrative practices and equipment uses that have the potential to affect wilderness character.

Recreational uses of NPS wilderness are to be of a type and nature that enable the areas to retain their primeval character and influence; protect and preserve natural conditions; leave the imprint of man’s work

substantially unnoticeable; provide outstanding opportunities for solitude or primitive and unconfined types of recreation; and preserve wilderness in an unimpaired condition. Public use of motorized equipment or any form of mechanical transport is prohibited, except as provided for in specific legislation. Operating a motor vehicle or possessing a bicycle in wilderness is prohibited.

Scientific activities are to be encouraged in wilderness. Even scientific activities (including inventory, monitoring, and research) that involve a potential impact to wilderness resources or values (including access, ground disturbance, use of equipment, and animal welfare) are allowed when the benefits of what can be learned outweigh the impacts on wilderness resources or values. However, all such activities must be evaluated using the minimum requirement concept.

Wilderness designation does not extinguish valid existing private rights such as ownership, grazing, or valid mineral interests. The validity of private rights within wilderness is determined on a case-by-case basis. Valid private rights in wilderness are administered in keeping with the specific conditions and requirements of the valid right.

Grazing is not curtailed in wilderness areas simply because an area is designated as wilderness. Where practical alternatives do not exist, maintenance or other activities may be accomplished through the occasional use of motorized equipment. The use of motorized equipment should be based on a rule of practical necessity and reasonableness. Motorized equipment need not be allowed for activities that can

reasonably be accomplished on horseback or foot. Motorized equipment uses are normally permitted in those portions of a wilderness area where they had occurred prior to the area's designation as wilderness or are established by prior agreement, and where such use would not have a significant adverse effect on the natural environment. (Congressional Grazing Guidelines, House Report 96-1126).

The National Park Service will seek to remove or extinguish valid mining claims and non-federal mineral interests in wilderness through authorized processes, including purchasing valid rights. Unless and until mineral interests and mining claims within NPS wilderness are eliminated, they must be managed pursuant to existing National Park Service regulations, policies, and procedures. (See 36 CFR Part 9, Subpart A, for mineral development on mining claims; 36 CFR Part 9, Subpart B, for nonfederal oil and gas development; and 43 CFR Parts 3100 and 3500, for federal mineral leasing.).

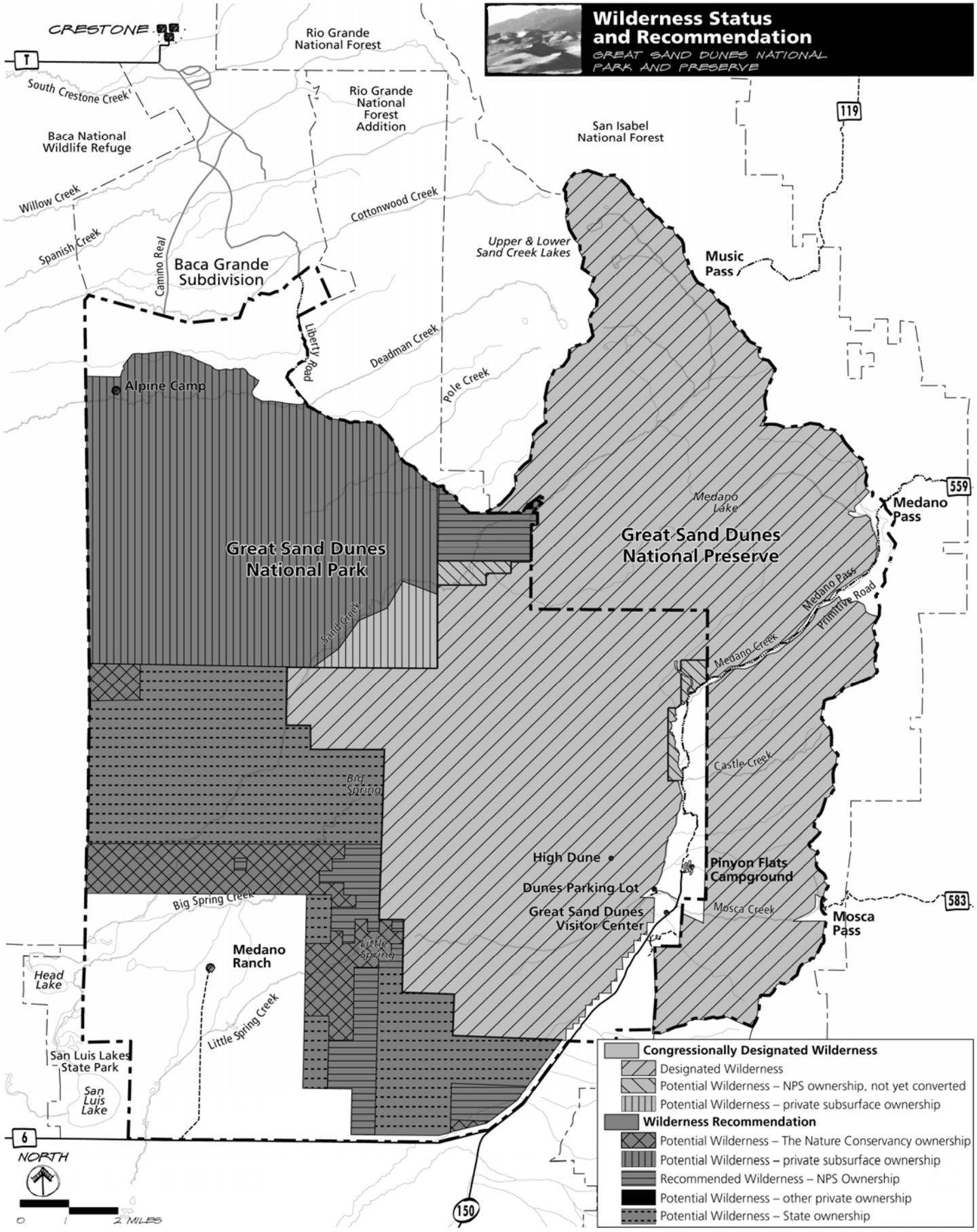
## **Conclusion**

Of the approximately 69,164 acres added to Great Sand Dunes National Park in the year 2000, roughly three-quarters was determined wilderness-eligible because it possesses wilderness characteristics and values. Of the wilderness-eligible land, most (50,951 acres total) is recommended for wilderness. This includes 4,556 acres (8.9%) for immediate wilderness designation, and 46,395 acres (91.1%) for potential wilderness additions.



# Wilderness Status and Recommendation

GREAT SAND DUNES NATIONAL PARK AND PRESERVE



	<b>Congressionally Designated Wilderness</b>
	Designated Wilderness
	Potential Wilderness – NPS ownership, not yet converted
	Potential Wilderness – private subsurface ownership
	<b>Wilderness Recommendation</b>
	Potential Wilderness – The Nature Conservancy ownership
	Potential Wilderness – private subsurface ownership
	Recommended Wilderness – NPS Ownership
	Potential Wilderness – other private ownership
	Potential Wilderness – State ownership



## **APPENDIX H: WILD AND SCENIC RIVER EVALUATION**



## Introduction

This appendix presents the results of a National Park Service study of potential wild and scenic rivers in Great Sand Dunes National Park and Preserve. The purpose of this analysis was to determine if selected creeks, all or in part, should be recommended for inclusion in the national wild and scenic rivers system, based on their resources and Wild and Scenic Rivers Act eligibility guidelines.

In October 1968, the freshly penned Wild and Scenic Rivers Act pronounced “...that certain selected rivers of the Nation, which with their immediate environs, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environs shall be protected for the benefit and enjoyment of future generations.”

The wild and scenic river study process, as described in *the National Wild and Scenic Rivers System: Final Revised Guidelines for Eligibility, Classification, and Management of River Areas* (1982), is composed of three steps:

- Determine if rivers are eligible as components of the national wild and scenic rivers system.
- Determine the appropriate classification of rivers.
- Determine whether the eligible segments would make suitable additions to the national wild and scenic rivers system.

## Eligibility Evaluation

To be eligible for inclusion in the national wild and scenic rivers system, a study

segment must be free flowing and the stream corridor must exhibit at least one outstandingly remarkable resource value.

“Free flowing” may be defined as existing in a largely natural condition without major impoundments, diversions, or other modifications of the waterway. It should be understood that there are no specific requirements for minimum flow for eligible segments and flows are considered sufficient for eligibility if they sustain or complement the outstandingly remarkable values for which the segment would achieve designation. Rivers with intermittent flows have been included in the national system.

Outstandingly remarkable values are scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values that are professionally judged to be regionally significant – those that stand out as among the best on a regional basis. All resources assessed should be directly river related, or owe their location or existence to the river. Features that are exemplary (outstanding examples of common types), as well as those that are rare or unique, should be considered.

## Outstandingly Remarkable Values

An assessment of potential outstandingly remarkable values was made by National Park Service professionals for the major creeks of the park: Mosca Creek, Medano Creek, Castle Creek, Sawmill Creek, Buck Creek, Little Medano Creek, Cold Creek, Sand Creek, Pole Creek, Deadman Creek, Big Spring Creek, and Little Spring Creek. Resources evaluated include biological resources, paleontological resources, cultural resources, as well as scenic and recreational values. The following sections describing the outstandingly remarkable values are very brief. Other sections of this

document (e.g., Chapter 3: Affected Environment) contain more comprehensive information about these streams.

### **Mosca Creek**

Mosca Creek headwaters originate on Mosca Pass and along the drainage there occur numerous prehistoric and historic cultural resources. These include archeological sites, wickiups (temporary shelters made from tree saplings), culturally peeled ponderosa pine trees, ruins of a toll road, and the historic town site of Montville. Mosca Pass was a primary prehistoric and historic route in and out of the San Luis Valley from the east.

The scenic vistas of the Great Sand Dunes are excellent from the Mosca Creek corridor. This corridor also provides recreational opportunities for hiking, camping, birding, and photography.

Mosca Creek's water quality meets standards for the "Outstanding Waters" designation (USGS Publication WRIR #02-4196). The National Park Service holds a federally reserved water right for a designated flow amount for Mosca Creek.

### **Medano Creek**

Medano Creek is essential to the formation, development, and recycling of sand to perpetuate the Great Sand Dunes system as both the impressive east and southeast faces of the Great Sand Dunes are the result of the interaction of Medano Creek and the dunes. Through "surge" or "pulsating flow," the waters return vast quantities of wind-blown sand back to the valley floor. The transport of sand by Medano Creek is a key role of this aeolian/hydrologic system. The mechanism by which Medano Creek transports sand is quite unique and the surging behavior of Medano Creek is

considered by U.S. Geological Survey hydrologists to be one of the best examples of this phenomenon in the world. In addition, Medano Pass serves as a "funnel" for air flow and affects wind and sand deposition, which also influence dune formation.

There are numerous prehistoric and historic sites along Medano Creek. One of the largest stands of culturally scarred ponderosa pine trees grows in close proximity to the creek and this grove is on the NRHP. There are several pioneer homesteads along the creek including the Herard homestead, which was settled in the 1870s, and inhabited for many years. Medano Pass was another prehistoric and historic route into the San Luis Valley from the east.

Medano Creek and its floodplain support a diversity of wildlife habitats. The CDOW has reclaimed the drainage for the native species of Rio Grande cutthroat trout and the federally endangered Rio Grande sucker. Since Medano Creek has no outlet, it represents an ideal drainage for a refuge for both rare fish species.

In addition to the plains pocket mouse (*Perognathus flavescens relictus*), which is a mammal subspecies considered rare for the Great Sand Dunes National Park and Preserve area, bighorn sheep, black bear, mountain lion, elk, deer, bobcat, and beaver are also observed along Medano Creek.

The world class surge flow of Medano Creek causes waves that create a beach-like environment for park visitors. During the spring and summer runoff, thousands of visitors derive great enjoyment from playing in the surging waters of the creek. The corridor of Medano Creek provides outstanding recreational opportunities for hiking, camping, sightseeing, four-wheeling,

photography, birding, and fishing and hunting in the preserve.

In addition to the recreational value of the creek's waters, the water quality of Medano Creek has been tested and identified by the USGS (National Water Quality Assessment Program) as attaining the highest water quality in the upper Rio Grande drainage. As such, Medano Creek's water quality meets standards for the "Outstanding Waters" designation (USGS Publication WRIR #02-4196). The National Park Service holds a federally reserved water right for a designated flow amount for Medano Creek.

### **Castle Creek**

Castle Creek flows into Medano Creek and, although Castle Creek is ephemeral, during periods of significant flow it displays remarkable surge flow. In fact, it is the site at which the explanation for surge flow was developed.

The Castle Creek corridor provides exceptional and unique opportunities to view the Great Sand Dunes. Recreation opportunities include hiking and sightseeing. However, these are typical activities for the region.

Castle Creek's water quality meets standards for the "Outstanding Waters" designation (USGS Publication WRIR #02-4196). The National Park Service holds a federally reserved water right for a designated flow amount for Castle Creek.

### **Sawmill Creek**

The Sawmill Creek corridor provides exceptional and unique opportunities to view the Great Sand Dunes. Recreational opportunities include hiking and

sightseeing. However, these are typical activities for the region.

Sawmill Creek's water quality meets standards for the "Outstanding Waters" designation (USGS Publication WRIR #02-4196). The National Park Service holds a federally reserved water right for a designated flow amount for Sawmill Creek.

### **Buck Creek**

The plains pocket mouse, which is a mammal subspecies considered rare and endemic for the Great Sand Dunes National Park and Preserve area, was observed by the Colorado Natural Heritage Program at the confluence of Medano and Buck creeks.

The creek corridor provides exceptional and unique opportunities to view the Great Sand Dunes. Recreational opportunities include hiking and sight-seeing. However, these are typical activities for the region.

The National Park Service holds a federally reserved water right for a designated flow amount for Buck Creek.

### **Little Medano Creek**

The channel of Little Medano Creek is located in a sand-filled valley. Therefore, the creek carries a large amount of sand to its confluence with Medano Creek, which has world class surge flows.

Little Medano Creek provides suitable habitat for the rare Rio Grande cutthroat trout. Even though there are times of the year when the creek surface flows are disconnected from Medano Creek, there is a viable population of Rio Grande cutthroat trout in the drainage year-round. There are also frequent sightings of wildlife along Little Medano Creek.

Exceptional scenic values are present along Little Medano Creek, including a waterfall and outstanding views of the Great Sand Dunes. There are frequent opportunities for viewing wildlife along the creek drainage. Additional recreation opportunities include backpacking, hiking, photography, and camping. Natural quiet has been monitored along Little Medano Creek and found to be outstanding.

Little Medano Creek's water quality meets standards for the "Outstanding Waters" designation (USGS Publication WRIR #02-4196). The National Park Service holds a federally reserved water right for a designated flow amount for Little Medano Creek.

### **Cold Creek**

The Cold Creek corridor provides outstanding scenic vistas of the Great Sand Dunes. There are frequent opportunities for viewing wildlife along Cold Creek. There are opportunities for wilderness recreation such as backpacking, hiking, horseback riding, photography, and camping due to the remoteness of the drainage.

Cold Creek's water quality meets standards for the "Outstanding Waters" designation (USGS Publication WRIR #02-4196). The National Park Service holds a federally reserved water right for a designated flow amount for Cold Creek.

### **Sand Creek**

This creek was evaluated in two segments because the character of the drainage changes significantly where it flows west from the Sangre de Cristo Mountain Range.

### **Sand Creek (from the headwaters to the mountain front)**

The upper Sand Creek supports a narrowleaf cottonwood riparian community, designated by the Colorado Natural Heritage Program as globally rare. The narrowleaf cottonwood trees along this drainage represent a pure strain and there is no hybridization with other cottonwoods. The trees are considered some of the oldest cottonwoods in the west, having been dated up to 340 years old. The upper Sand Creek corridor provides outstanding scenic vistas of the Great Sand Dunes. Recreation opportunities include backpacking, hiking, horseback riding, photography, fishing, and camping. Sand Creek's water quality meets standards for the "Outstanding Waters" designation (USGS Publication WRIR #02-4196).

### **Sand Creek (from the mountain front to where it exits the park)**

Sand Creek is the largest drainage in the park and, through the transport of sand, plays an important role in the development of the dunes. Surge flow does occur in Sand Creek, but not as consistently as in Medano Creek. Sand Creek borders the western and northwestern portion of the Great Sand Dunes, forming the western boundary of the dune mass.

There are also important historic resources along this stretch of Sand Creek (e.g., Stamp Mill).

There are frequent sightings of wildlife along lower Sand Creek, which supports high quality wildlife habitat. The lower Sand Creek corridor provides outstanding scenic vistas of the Great Sand Dunes. Recreation opportunities include backpacking, hiking, photography, fishing, and camping.

## Pole Creek

The status of Pole Creek was considered eligibility unknown, because there has not yet been enough information gathered to evaluate it for the wild and scenic rivers program.

## Deadman Creek

The Colorado Natural Heritage Program has identified the Deadman Creek corridor as a potential conservation site with a biodiversity rank of B2 (Very High Significance). The Deadman Creek corridor provides outstanding scenic vistas of the Great Sand Dunes and Sangre de Cristo mountain front. Recreation opportunities include backpacking, hiking, photography, fishing, camping, and wildlife viewing.

## Big Spring Creek

Big Spring Creek flows from Indian Springs, a designated Colorado natural area administered by Colorado State Parks. It is a very unique hydrologic system and critical water source located in the sand sheet west of the Great Sand Dunes. Big Spring Creek is a gaining system in an area where most of the other drainages are losing systems. Groundwater, in the form of seeps and springs, contributes flows and as a result, Big Spring Creek is a non-flooding creek with constant flow.

Big Spring Creek is also an important archeological area.

Big Spring Creek represents an exceptional focal point for wildlife, including waterfowl. Fathead minnow (*Pimphales promelus*) are found in Big Spring Creek. *Cleome multicaulus* (slender spiderflower), a wetlands plant identified as a globally rare species by the Colorado Natural Heritage

Program, is found in the riparian habitat along Big Spring Creek.

The Big Spring Creek corridor provides outstanding scenic vistas of the Great Sand Dunes. Recreational opportunities include backpacking, hiking, photography, and camping. Wildlife viewing opportunities along Big Spring Creek are excellent.

## Little Spring Creek

*Cleome multicaulus* (slender spiderflower), a wetlands plant identified as a globally rare species by the Colorado Natural Heritage Program, is found in the riparian habitat along Little Spring Creek. This creek is also an important archeological area. Little Spring Creek has been channelized along most of its length, from its spring origin to where it enters a playa lake, approximately 4 miles.

## Summary of Eligibility Evaluation

Ten of the 12 evaluated creeks, or segments thereof, were considered eligible for inclusion in the national wild and scenic river system: Mosca Creek, Medano Creek, Castle Creek, Sawmill Creek, Buck Creek, Little Medano Creek, Cold Creek, Sand Creek on and west of the mountain front, Deadman Creek, and Big Spring Creek. These creeks were found to be free flowing and exhibited at least one outstandingly remarkable value. They are further evaluated for classification and suitability below. The two that were not considered eligible are Pole Creek and Little Spring Creek. Pole Creek is located in the expansion area of Great Sand Dunes National Park. There has not yet been enough information gathered to evaluate its eligibility for Wild and Scenic River designation at this time. Little Spring Creek exhibits outstandingly remarkable values, but is considered ineligible for designation

as a wild and scenic river because it has been channelized along most of its length.

### **Classification**

Classification is based on development conditions existing in the river corridor at the time of designation. The Wild and Scenic Rivers Act provides three classifications defined as follows:

- Wild river areas are generally inaccessible, except by trail. Wild river areas do not contain roads, railroads, or other provisions for vehicle travel within the river area. The existence of a few inconspicuous roads leading to the boundary of the river area at the time of study does not necessarily bar wild river classification. Wild rivers are free of impoundments with watersheds or shorelines essentially primitive and waters unpolluted. These represent the vestiges of primitive America.
- Scenic river areas are free of impoundments, with shorelines largely undeveloped, but accessible in places by roads.
- Recreational river areas are readily accessible by road or railroad, may have some development along their shorelines, and may have undergone some impoundment or diversion in the past.

Table H-2 lists the proposed classification for the 10 creeks considered eligible for inclusion in the national wild and scenic rivers system.

### **Suitability**

The suitability phase of the study evaluates whether designation as a national wild and scenic river would be the best way to manage eligible rivers. Suitability considerations include the environmental and economic consequences of designation and the manageability of the river, if designated.

Each of the above 10 eligible creeks has at least one exceptional natural, cultural, or recreational resource value, and most of the creeks have two to several of these values. Therefore, these creeks would make a valuable addition to the national wild and scenic rivers system.

### **Conclusion**

The above-listed eligible creeks within the Great Sand Dunes National Park are free flowing and contain outstandingly remarkable values that make them eligible for inclusion in the national wild and scenic river system. Their freedom from impoundments and relatively undeveloped character qualify them as either a wild or scenic river area, depending on each individual proposed classification.

Table H-1. Proposed Classifications

Creek	Classification
Mosca Creek	Scenic
Medano Creek	Scenic
Castle Creek	Wild
Sawmill Creek	Wild
Buck Creek	Wild
Little Medano Creek	Wild
Cold Creek	Wild
Sand Creek (from the headwaters to the mountain front)	Wild
Sand Creek (from the mountain front to where it exits the park)	Wild
Deadman Creek	Wild
Big Spring Creek	Scenic



## **APPENDIX I: CONSULTATION LETTERS**



United States Department of the Interior  
NATIONAL PARK SERVICE



Great Sand Dunes National Park and Preserve  
11500 Highway 150  
Mosca, Colorado 81146-9798  
Phone 719-378-6300 Fax 719-378-6310



In Reply Refer to:  
1470A16

January 5, 2005

Georgianna Contiguglia  
State Historic Preservation Office  
Colorado Historical Society  
The Colorado History Museum  
1300 Broadway  
Denver, CO 80203

Dear Ms. Contiguglia:

The National Park Service is in the process of developing a *general management plan* for Great Sand Dunes National Park and Preserve. We are just beginning our scoping and data gathering efforts for this plan. As set forth in 36 CFR 800 and the Programmatic Agreement between the Advisory Council on Historic Preservation, the National Conference of State Historic Preservation Officers and the National Park Service, we would like to initiate the consultation process.

The Great Sand Dunes *general management plan* will provide management direction for resource stewardship, visitor understanding and appreciation, partnerships, facilities, and operations for the next 15-20 years. As part of this planning effort the NPS will conduct a *wilderness review*, which is required by law and National Park Service policy. The *wilderness review* will examine areas within the expanded Great Sand Dunes boundary to determine whether they are suitable for, and should be proposed as, wilderness.

Great Sand Dunes National Monument was established in 1932 to preserve lands containing spectacular and unique sand dunes and additional features of scenic, scientific, and educational interest for the benefit and enjoyment of future generations. The Great Sand Dunes National Park and Preserve Act of 2000 enlarged Great Sand Dunes National Monument from 39,000 acres to over 100,000 acres, and also established Great Sand Dunes National Preserve, which exceeds 40,000 acres. The purpose of the 2000 legislation was to protect the entire Great Sand Dunes natural system.

In fulfillment of requirements of the National Environmental Policy Act, the National Park Service has initiated the preparation of an environmental impact statement (EIS) that will evaluate potential impacts of the planning alternatives on natural and cultural resources, and other relevant topics. The process and documentation required for preparing the EIS will be used to comply with Section 106 of the National Historic Preservation Act. In accordance with section 800(3)(c) of the Advisory Council on Historic Preservation's regulations (36 CFR 800), I am providing your office advance notification of the NPS intention to use the general management planning and EIS process to meet its Section 106 obligations.

To assist Great Sand Dunes National Park and Preserve and the National Park Service Intermountain Region staff in refining issues to be addressed in the *general management plan* and *wilderness review*, please provide us with written comments concerning interests within your agency's responsibilities. A copy of the most recent newsletter is enclosed for your information.

Your response within 30 days from receipt of this letter will be greatly appreciated. Should you have any questions regarding this request or would like to request a specific consultation, please contact me (719) 378-6311 or Fred Bunch at (719) 378-6361 or by electronic mail, at [fred\\_bunch@nps.gov](mailto:fred_bunch@nps.gov). Thank you for your participation in this planning effort.

Sincerely,

Steve W. Chaney  
Superintendent

Enclosure

United States Department of the Interior  
NATIONAL PARK SERVICE



Great Sand Dunes National Park and Preserve  
11500 Highway 150  
Mosca, Colorado 81146-9798  
Phone 719-378-6300 Fax 719-378-6310



In Reply Refer to:  
1470 A16

January 18, 2005

Ms. Jane Crisler  
Advisory Council on Historic Preservation  
12136 Bayaud Avenue  
Suite 330  
Lakewood, CO 80226

Subject: Consultation for the Great Sand Dunes National Park and Preserve Draft General Management Plan/Wilderness Review/Environmental Impact Statement

Dear Ms. Crisler:

The National Park Service has a *general management plan* and *wilderness review* underway for Great Sand Dunes National Park and Preserve. As set forth in 36 CFR 800 and the Programmatic Agreement between the Advisory Council on Historic Preservation, the National Conference of State Historic Preservation Officers and the National Park Service, we would like to continue the consultation process.

The Great Sand Dunes *general management plan* will provide management direction for resource stewardship, visitor understanding and appreciation, partnerships, facilities, and operations for the next 15-20 years. As part of this planning effort the NPS will conduct a *wilderness review*, which is required by law and National Park Service policy. The *wilderness review* will examine areas within the expanded Great Sand Dunes boundary to determine whether they are suitable for, and should be proposed as, wilderness. Preliminary scoping began in January, 2003. The planning team has been analyzing park resources and developing alternatives with public involvement. The enclosed newsletters document the effort to date. A draft General Management Plan /Wilderness Review/Environmental Impact Statement will be printed and distributed in January of 2006.

Great Sand Dunes National Monument was established in 1932 to preserve federal land containing spectacular and unique sand dunes and additional features of scenic, scientific, and educational interest for the benefit and enjoyment of future generations. The Great Sand Dunes National Park and Preserve Act of 2000 enlarged Great Sand Dunes National Monument from 39,000 acres to over 100,000 acres, and also established Great Sand Dunes National Preserve, which exceeds 40,000 acres. The purpose of the 2000 legislation was to protect the Great Sand Dunes natural system.

In fulfillment of requirements of the National Environmental Policy Act, the National Park Service has initiated the preparation of an environmental impact statement (EIS) that will evaluate potential impacts of the planning alternatives on natural and cultural resources, and other relevant topics. The process and documentation required for preparing the EIS will be used to comply with Section 106 of the National Historic Preservation Act. In accordance with section 800(3)(c) of the Advisory Council on Historic Preservation's regulations (36 CFR 800), I am providing your office advance notification of the NPS intention to use the general management planning and EIS process to meet its Section 106 obligations.

To assist Great Sand Dunes National Park and Preserve and the National Park Service Intermountain Region staff in refining issues to be addressed in the *general management plan* and *wilderness review*, please provide us with written comments concerning interests within your agency's responsibilities. We are continuing consultation with the Colorado State Historic Preservation Officer. Should you have any questions regarding this request or would like to request a specific consultation, please contact me at (719)-378-2312 or by electronic mail, [GRSA\\_Superintendent@nps.gov](mailto:GRSA_Superintendent@nps.gov). Thank you for your participation in these planning efforts.

Sincerely,

Steve Chaney, Superintendent  
Great Sand Dunes National Monument and Preserve  
*11500 Highway 150*  
*Mosca, CO 81146*

Encl. newsletters 1-5

1/28/05



**COLORADO  
HISTORICAL  
SOCIETY**

**The Colorado History Museum 1300 Broadway Denver, Colorado 80203-2137**

January 13, 2005

Steve W. Chaney  
National Park Service  
Great Sand Dunes National Park and Preserve  
11500 Highway 150  
Mosca, CO 81146-9798

Re: General Management Plan for Great Sand Dunes National Park and Preserve/1470A16.  
(CHS #24811)

Dear Mr. Chaney,

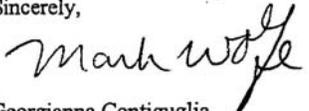
Thank you for your correspondence dated January 5, 2005 and received by our office on January 10, 2005 regarding the above-mentioned project.

After review of the submitted information, we concur with your intent to use the NEPA process and documentation to comply with Section 106, as stipulated in 36 CFR 800.8(c).

In regards to the Dunefield Focus-Maximum Wilderness Concept (page 8 of the National Park and Preserve General Management Plan Newsletter), two possible alternatives are listed for the Medano Ranch. Of the two alternatives, we recommend that the resource be documented and then removed.

If we may be of further assistance, please contact Amy Pallante, our Section 106 Compliance Coordinator, at (303) 866-4678.

Sincerely,

*for*   
Georgianna Contiguglia  
State Historic Preservation Officer



United States Department of the Interior  
NATIONAL PARK SERVICE



Great Sand Dunes National Park and Preserve  
11500 Highway 150  
Mosca, Colorado 81146-9798  
Phone 719-378-6300 Fax 719-378-6310



In Reply Refer to:  
1470 A 16

January 5, 2005

Associate Regional Director  
Ecological Services  
U.S. Fish & Wildlife Service  
P. O. Box 25486, DFC  
Denver, CO 80225

Dear Sir/Madam:

The National Park Service is in the process of developing a *general management plan* for Great Sand Dunes National Park and Preserve. We are just beginning our scoping and data gathering efforts for this plan. We request the most current list of threatened, endangered, proposed, and candidate species, and designated critical habitat that may be present at the Great Sand Dunes and the surrounding area, which is located within Saguache and Alamosa counties, and adjacent to Huerfano and Custer Counties.

The Great Sand Dunes *general management plan* will provide management direction for resource stewardship, visitor understanding and appreciation, partnerships, facilities and operations for the next 15- 20 years. As part of this planning effort, the NPS will conduct a *wilderness review*, which is required by law and National Park Service policy. The *wilderness review* will examine areas within the expanded Great Sand Dunes boundary to determine whether they are suitable for, and should be proposed as, wilderness.

Great Sand Dunes National Monument was established in 1932 to preserve lands containing spectacular and unique sand dunes and additional features of scenic, scientific, and educational interest for the benefit and enjoyment of future generations. The Great Sand Dunes National Park and Preserve Act of 2000 enlarged Great Sand Dunes National Monument from 39,000 acres to over 100,000 acres, redesignated it as a national park, and established Great Sand Dunes National Preserve, which exceeds 40,000 acres. The purpose of the 2000 legislation was to protect the entire Great Sand Dunes natural system.

To assist Great Sand Dunes National Park and Preserve and the National Park Service Intermountain Region staff in refining issues to be addressed in the *general management plan* and *wilderness review*, please provide us with written comments concerning interests within

your agency's responsibilities. A copy of the most recent newsletter is enclosed for your information.

In fulfillment of requirements of the National Environmental Policy Act, the National Park Service has initiated the preparation of an environmental impact statement (EIS) that will evaluate potential impacts of the planning alternatives on natural and cultural resources, and other relevant topics. In accordance with Section 7 of the Endangered Species Act of 1973, as amended, we are requesting an official list of federally listed threatened or endangered species, which might be affected by the proposed action.

Your response within 30 days from receipt of this letter will be greatly appreciated. Should you have any questions regarding this request, please contact me at 719- 378- 6311 or by electronic mail, [GRSA\\_Superintendent@nps.gov](mailto:GRSA_Superintendent@nps.gov). Thank you for your participation in this planning effort.

Sincerely,

Steve W. Chaney  
Superintendent

Enclosure

02/15/05 12:14 FAX 303 275 2371

US FISH & WILDLIFE

001



UNITED STATES DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE  
ECOLOGICAL SERVICES



COLORADO FIELD OFFICE  
755 PARFET STREET, SUITE 361  
LAKEWOOD, COLORADO 80215

Phone: (303) 275-2370

FAX: (303) 275-2371

SENT TO: <u>Steve Chang</u>	PHONE NO. <u>    -    -    </u>
SENT BY: <u>Danna</u>	FAX NO. <u>719-378-6310</u>
PAGES TO FOLLOW: <u>9</u>	
SUBJECT: <u>Spec Act</u>	
COMMENTS:	

MAILING ADDRESS:  
755 PARFET STREET, SUITE 361  
LAKEWOOD, COLORADO 80215



**U. S. Fish and Wildlife Service**  
**Ecological Services**  
**Colorado Field Office**  
(Effective August 16, 2004)  
**FEDERALLY LISTED AND CANDIDATE SPECIES & THEIR STATUS IN COLORADO**

COUNTIES	A D A M S	A L A M O S S A	A R A P A H O E	A R C H U L K T A	B A C C A	B B E N T	B O U L D E R	B R O O M F I E L D	C H A F F E E	C H E Y E N N E	C L E A R C R E E K	C O N E J O S	C O S T I L L A	C R O W L E Y	C U S T E R	D E L T A	D E N V E R
✓ Bald eagle, <i>Haliaeetus leucocephalus</i> , Listed Threatened	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓ Gunnison sage-grouse, <i>Centrocercus minimus</i> , Candidate for Listing		✓		✓			✓	✓	✓								✓
✓ Least tern (anterior population), <i>Sterna antillarum</i> , Listed Endangered	▲		▲			✓				✓	▲						▲
✓ Lesser prairie chicken, <i>Tympanuchus pallidicinctus</i> , Candidate for Listing	✓		✓	✓			✓				✓	✓	✓	✓			
✓ Mexican spotted owl, <i>Strix occidentalis lucida</i> , Listed Threatened	✓		✓	✓			✓	✓			✓	✓	✓	✓			✓
✓ Piping plover, <i>Charadrius melodus</i> , Listed Threatened	✓		✓	✓		✓	✓	✓			✓	✓	✓	✓			✓
✓ Southwestern willow flycatcher, <i>Empidonax traillii eximius</i> , Listed Endangered	✓		✓	✓			✓	✓			✓	✓	✓	✓			✓
✓ Whooping crane, <i>Grus americana</i> , Listed Endangered	✓		✓	✓			✓	✓			✓	✓	✓	✓			✓
✓ Yellow-billed cuckoo, <i>Coccyzus americanus</i> , Candidate for Listing	✓		✓	✓			✓	✓			✓	✓	✓	✓			✓
✓ Black-footed ferret, <i>Mustela nigripes</i> , Listed Endangered	✓		✓	✓			✓	✓			✓	✓	✓	✓			✓
✓ Canada lynx, <i>Lynx canadensis</i> , Listed Threatened	✓		✓	✓			✓	✓			✓	✓	✓	✓			✓
✓ Preble's meadow jumping mouse, <i>Zapus hudsonius preblei</i> , Listed Threatened	✓		✓	✓			✓	✓			✓	✓	✓	✓			✓
✓ Boreal toad, <i>Bufo boreas boreas</i> , Candidate for Listing	✓		✓	✓			✓	✓			✓	✓	✓	✓			✓

Page 1/8

002

US FISH & WILDLIFE

02/15/05 12:15 FAX 303 275 2371

COUNTIES	DENVER	DELTA	CUSTER	CROWLEY	COSTILLA	CONNORS	CLEARCREEK	CHEYENNE	CHAFFEE	BROOMFIELD	BOULDER	BENT	BACA	ARCHULETA	ARAPAHOE	ALAMOSA	ADAMS
U. S. Fish and Wildlife Service Ecological Services Colorado Field Office (Effective August 16, 2004)																	
FEDERALLY LISTED AND CANDIDATE SPECIES & THEIR STATUS IN COLORADO																	
✓ Arkansas darter, <i>Etheostoma caeruleum</i> , Candidate for Listing		✓															
✓ Bonytail, <i>Gila elegans</i> , (presumed-historical) Listed Endangered		Ⓢ															
✓ Colorado pikeminnow, <i>Ptychocheilus lucius</i> , Listed Endangered							✓										
✓ Greatback cutthroat trout, <i>Oncorhynchus clarki stansburii</i> , Listed Threatened											✓						
✓ Humphack Chub, <i>Gila cypha</i> , Listed Endangered											▲						▲
✓ Pallid sturgeon, <i>Scaphirhynchus albus</i> , Listed Endangered																	▲
✓ Razorback sucker, <i>Xyrauchen texanus</i> , Listed Endangered																	
✓ Clay-loving wild buckwheat, <i>Eriogonum pinnatifidum</i> , Listed Endangered																	
✓ Colorado butterfly plant, <i>Coarctata leucocoma</i> ssp. <i>coloradensis</i> , Listed Threatened																	✓
✓ Unita Basin hoodless cactus, <i>Sclerozanthus glauca</i> , Listed Threatened																	✓
✓ Uncompahgre fritillary butterfly, <i>Boloria acronema</i> , Listed Endangered																	✓
✓ The ladies'-tresses, <i>Spiranthes albidifolia</i> , Listed Threatened																	✓

U. S. Fish and Wildlife Service  
Ecological Services  
Colorado Field Office  
(Effective August 16, 2004)

FEDERALLY LISTED AND CANDIDATE SPECIES & THEIR STATUS IN COLORADO

COUNTRIES	D O L O R E S	D O U G L A S	E A G L E	E L B E R T	E L P A S O	F R E M O N T	G A R F I E L D	G I L P I N	G R A N D	G U N N I S O N	H I N S D A L E	H U B E R F A N O	J A C K S O N	J E F F E R S O N	K I O W A	K I T C A R S O N
Bald eagle, <i>Haliaeetus leucocephalus</i> , Listed Threatened	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Common sage-grouse, <i>Centrocercus urophasianus</i> , Candidate for Listing	✓		✓													
Least tern (interior population), <i>Sterna antillarum</i> , Listed Endangered		▲		▲				▲					▲	▲		
Lesser prairie chicken, <i>Tympanuchus pallidirostris</i> , Candidate for List	✓	✓		✓	✓	✓	✓	✓				✓	✓	✓		
Mexican spotted owl, <i>Strix occidentalis healdi</i> , Listed Threatened		▲		▲	▲			▲					▲	▲		
Piping plover, <i>Charadrius melodus</i> , Listed Threatened	✓										✓					
Southwestern willow flycatcher, <i>Empidonax traillii eximius</i> , Listed Endangered		▲		▲	▲			▲					▲	▲		
Whooping crane, <i>Grus americana</i> , Listed Endangered	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Yellow-billed cuckoo, <i>Coccyzus americanus</i> , Candidate for Listing		✓	✓	✓	✓	✓	✓	✓				✓	✓	✓		
Black-footed ferret, <i>Mustela nigripes</i> , Listed Endangered	✓		✓													
Canada lynx, <i>Lynx canadensis</i> , Threatened		⊙		✓	✓	✓						✓		⊙		
Prairie meadow jumping mouse, <i>Zapus leucostriatus preblei</i> , Listed Threatened				✓	✓	✓						✓				
Arkansas darter, <i>Etheostoma caeruleum</i> , Candidate for Listing	*		*				✓		*	*	*					
Bonynall, <i>Gilia efegans</i> , (presumed historical) Listed Endangered	*		*				⊙		*	*	*					
Colorado pikeminnow, <i>Ptychocheilus lucius</i> , Listed Endangered		✓			✓											
Greenback cutthroat trout, <i>Oncorhynchus clarki stansleyi</i> , Listed Threatened	*						✓		*	*	*					
Humpback chub, <i>Gila cypha</i> , Listed Endangered																

COUNTRIES*	D O L O R E S	D O U G L A S	E A G L E	E L B E R T	E L P A S T O	F R E M O N T	G A R F I E L D	G I L P I N	G R A N D	G U N N J O N	H I N S D A L E	H U E R F A N O	J A C K S O N	J E F F E R S O N	K J O W A	K I T C A R S O N
U. S. Fish and Wildlife Service Ecological Services Colorado Field Office (Effective August 16, 2004) FEDERALLY LISTED AND CANDIDATE SPECIES & THEIR STATUS IN COLORADO																
Pallid sturgeon, <i>Scaphirhynchus albus</i> , Listed Endangered		▲		▲	▲			▲					▲	▲		
Razorback sucker, <i>Xyrauchen texanus</i> , Listed Endangered	*		*				⊕		*	*	*					
Pewee montane skipper, <i>Hesperia leonardus montana</i> , Listed Threatened		✓								✓	✓					
Uncompagnie fritillary butterfly, <i>Boloria acrocrania</i> , Listed Endangered	✓		✓				✓	✓	✓	✓	✓		✓			
Boreal toad, <i>Rhizo boreas boreas</i> , Candidate for Listing	✓		✓					✓								
Colorado butterfly plant, <i>Gaura nasonevada</i> ssp. <i>coloratensis</i> , Listed Threatened		✓					✓									
De Beque phacelia, <i>Phacelia subornata</i> , Candidate for Listing																
North Park phacelia, <i>Phacelia formosula</i> , Listed Endangered										✓						
Osterhout milkvetch, <i>Astragalus osterhoutii</i> , Listed Endangered								✓								
Parachute beardtongue, <i>Penstemon debilis</i> , Candidate for Listing										✓						
Penland beardtongue, <i>Penstemon penlandii</i> , Listed Endangered																
Slender moonwort, <i>Botrychium lineare</i> , Candidate for Listing																
Utah Basin bookless cactus, <i>Scierocactus glaucus</i> , Listed Threatened																✓
Ute ladies-tresses, <i>Spiranthes dilatata</i> , Listed Threatened																✓

<p>Page 5/8</p> <p>U. S. Fish and Wildlife Service Ecological Services Colorado Field Office</p> <p>(Effective August 14, 2004)</p> <p>FEDERALLY LISTED AND CANDIDATE SPECIES &amp; THEIR STATUS IN COLORADO</p>		COUNTRIES -														
	L A K E	L A P L A T A	L A R I M E R	L A S A N I M A S	L I N C O L N	L O G A N	M E S A	M I N E R A L	M O F A T	M O N T E Z U M A	M O N T R O S E	M O R G A N	O T E R R O	O U R A Y	P A R K	P H I L L I P S
Bald eagle, <i>Haliaeetus leucocephalus</i> , Listed Threatened	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cummins sage-grouse, <i>Centrocercus minimus</i> , Candidate for Listing	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Least tern (interior population), <i>Sterna antillarum</i> , Listed Endangered			▲	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lesser prairie chicken, <i>Tympanuchus pallidirostris</i> , Candidate for Listing		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mexican spotted owl, <i>Syriz occidentalis lucida</i> , Listed Threatened			▲	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Piping plover, <i>Charadrius melodus</i> , Listed Threatened		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Southwestern willow flycatcher, <i>Empidonax traillii eximius</i> , Listed Endangered		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Yellow-billed cuckoo, <i>Coccyzus americanus</i> , Candidate for Listing		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Whooping crane, <i>Grus americana</i> , Listed Endangered		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Black-footed ferret, <i>Mustela nigripes</i> , Listed Endangered		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Canada lynx, <i>Lynx canadensis</i> , Listed Threatened		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Preble's meadow jumping mouse, <i>Zapus hudsonius preblei</i> , Listed Threatened			Ⓞ	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Arkansas darter, <i>Etheostoma caeruleum</i> , Candidate for Listing				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bonetail, <i>Gila elegans</i> , (presumed-historical) Listed Endangered				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Colorado pikeminnow, <i>Ptychocheilus lucius</i> , Listed Endangered		*		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Greenback cutthroat trout, <i>Oncorhynchus clarkii stansburii</i> , Listed Threatened	✓								Ⓞ							
Humpback chub, <i>Gila cypha</i> , Listed Endangered							Ⓞ									

COUNTIES -		P	H	I	L	L	I	P	S
		P	A	R	K	O	U	R	A
		M	O	T	E	R	O	M	O
		M	O	R	G	A	N	M	O
		M	O	N	T	R	O	S	E
		M	O	N	T	E	Z	U	M
		M	O	F	A	T	M	I	N
		M	E	S	A	M	I	N	E
		L	O	G	A	N	L	O	G
		L	I	N	C	O	L	L	I
		L	A	S	A	N	I	M	A
		L	A	R	I	M	E	R	A
		L	A	P	L	A	T	A	L
		L	A	K	E	H			
U. S. Fish and Wildlife Service Ecological Services Colorado Field Office Effective August 16, 2004	FEDERALLY LISTED AND CANDIDATE SPECIES & THEIR STATUS IN COLORADO								
Pallid sturgeon, <i>Scaphirhynchus albus</i> , Listed Endangered									
Razorback sucker, <i>Xyrauchen texanus</i> , Listed Endangered									
Boreal toad, <i>Bufo boreas boreas</i> , Candidate for Listing									
Pewee montane skipper, <i>Heperia leonardus montana</i> , Listed Threatened									
Uncompahgre fritillary butterfly, <i>Boloria arizonana</i> , Listed Endangered									
Clay-loving wild buckwheat, <i>Eriogonum peliopetalum</i> , Listed Endangered									
Colorado butterfly plant, <i>Gaura neomexicana</i> ssp. <i>coloradensis</i> , Listed Threatened									
De Beque phacelia, <i>Phacelia submissa</i> , Candidate for Listing									
Knowlton's cactus, <i>Pediocactus knowltonii</i> , Listed Endangered									
Manitou milkvetch, <i>Astragalus humiflumis</i> , Listed Endangered									
Mesa Verde cactus, <i>Srieroctactus mesae-verdae</i> , Listed Threatened									
Piedmont alpine fen mustard, <i>Einarsia penlandii</i> , Listed Threatened									
Sleeping Ute milk-vetch, <i>Astragalus toripes</i> , Candidate for Listing									
Slender monardella, <i>Botrychium lineare</i> , Candidate for Listing									
Uinta Basin hookless cactus, <i>Scleroactis glaucus</i> , Listed Threatened									
Ute ladies'-tresses, <i>Spiranthes diluvialis</i> , Listed Threatened									

Page 7/8 U. S. Fish and Wildlife Service Ecological Services Colorado Field Office (Effective August 16, 2004) FEDERALLY LISTED AND CANDIDATE SPECIES & THEIR STATUS IN COLORADO		COUNTIES -	P I T K I N	P R O W E S S	P U E B L O	R I O B L A N C O	R I O G R A N D E	P R O U T	S A G U A C H E	S A N J U A N	S A N M I G U E L	S E D W I C K	S U M M I T	T E L L E R	W A S H I N G T O N	W E L D	Y U M A
Bald eagle, <i>Haliaeetus leucocephalus</i> , Listed Threatened			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Gunnison sage-grouse, <i>Centrocercus minimus</i> , Candidate for Listing			✓											▲	▲		
Least tern (interior population), <i>Sterna antillarum</i> , Listed Endangered				✓													
Lesser prairie chicken, <i>Tympanuchus pallidirostris</i> , Candidate for Listing			✓										✓				
Mexican spotted owl, <i>Strix occidentalis lucida</i> , Listed Threatened			✓		✓									▲	▲	▲	
Piping plover, <i>Charadrius melodus</i> , Listed Threatened				✓													
Southwestern willow flycatcher, <i>Empidonax traillii eximius</i> , Listed Endangered																	
Whooping crane, <i>Grus americana</i> , Listed Endangered																	
Yellow-billed cuckoo, <i>Coccyzus americanus</i> , Candidate for Listing			✓														
Black-footed ferret, <i>Mustela nigripes</i> , Listed Endangered				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Canada lynx, <i>Lynx canadensis</i> , Listed Threatened			✓														
Preble's meadow jumping mouse, <i>Zapus hudsonius preblei</i> , Listed Threatened														⊙			
Pawnee montane skipper, <i>Hesperia leonardus montana</i> , Listed Threatened																	
Uncompahgre fritillary butterfly, <i>Boloria acrocrasus</i> , Listed Endangered			✓														
Arkansas darter, <i>Etheostoma caeruleum</i> , Candidate for Listing				✓													
Bonytail, <i>Gila elegans</i> (presumed-historical) Listed Endangered			*			*			*		*		*				
Colorado pikeminnow, <i>Psychrolutes microporosus</i> , Listed Endangered			*			⊙		*	*	*	*		*				

U. S. Fish and Wildlife Service  
Ecological Services  
Colorado Field Office

(Effective August 16, 2004)

FEDERALLY LISTED AND CANDIDATE SPECIES & THEIR STATUS IN COLORADO

COUNTIES -	PITKIN	PROWERS	URBANO	RIOBLANCO	RIOGRANDE	ROUT	SAGUACHE	SANJUAN	SANMIGUEL	SEGWICK	SUMMIT	TELLER	WASHINGTON	WELD	YUMA
Greenback cutthroat trout, <i>Oncorhynchus clarki stonias</i> , Listed Threatened			✓								*				
Humpback Chub, <i>Gila cypha</i> , Listed Endangered	*			*		*	*	*	*			▲	▲	▲	
Pallid sturgeon, <i>Scaphirhynchus albus</i> , Listed Endangered										▲	*				
Rainbow trout, <i>Salmo gairdneri</i> , Listed Endangered	*			*		*	*	*	*		✓				
Boreal toad, <i>Bufo boreas boreas</i> , Candidate for Listing	✓														✓
Colorado butterfly plant, <i>Gaura neomexicana</i> spp. <i>coloradensis</i> , Listed Threatened			✓												
Dudley Bluffs (Piceance) twinpod, <i>Physaria obcordata</i> , Listed Threatened			✓												
Dudley Bluffs bladderpod, <i>Lesquerella congesta</i> , Listed Threatened			✓												
Graham fourchotonye, <i>Penstemon grahmanii</i> , Candidate for Listing				✓											
Penland alpine fen mustard, <i>Entrema penlandii</i> , Listed Threatened															✓
Ute ladies'-tresses, <i>Spiranthes alvinae</i> , Listed Threatened															
White River beardtongue (penstemon), <i>Penstemon scariosus</i> var. <i>albiflorus</i> , Candidate for Listing				✓											

**TABLE TERMINOLOGY**

✓	The check mark indicates that the species is present in that county or that the county is within the historical range of the species
*	Water depletions in the Upper Colorado River and San Juan River basins, in these counties may affect these species
▲	Water depletions in the North or South Platte rivers, in these counties may affect these species
⊕	The species is present in the county and there is designated critical habitat for the species within the county
Candidate	Means there is sufficient information indicating that formal listing under the ESA may be appropriate
Proposed	Means the species is proposed for possible addition to the Lists of Endangered and Threatened Wildlife and Plants under the ESA
Endangered	Means the species could become extinct
Threatened	Means the species could become endangered



## U.S. Fish and Wildlife Service



*San Luis Valley National Wildlife Refuge Complex*  
 9383 El Rancho Lane • Alamosa, CO 81101  
 Phone (719)589-4021 • Fax (719)587-0595

January 28, 2005

Steve Chaney, Superintendent  
 Great Sand Dunes National Park and Preserve  
 11500 Highway 150  
 Mosca, Colorado 81146-9798

Dear Mr. Chaney:

Over the past year I have worked with the National Park Service and Great Sand Dunes National Park Advisory Council in preparation of the General Management Plan for the Great Sand Dunes National Park and Preserve (Park). Based on my participation in this planning process it is obvious that public access to the northern portion of the Park, that formerly owned by the Baca Ranch and Rio Grande National Forest, is an important topic to the public and consequently to your planning process. At least one of the routes that could be used to satisfy this desire crosses the Baca National Wildlife Refuge (Baca NWR). I want to share with you results of my recent discussions with the Regional Fish and Wildlife Service staff in Refuge Planning and Operations about this public access question.

At this time there are two National Wildlife Refuge System policies that will drive how we consider any proposal for access across the Baca NWR. I have spoken to you and the Advisory Council several times about the National Wildlife "Refuge Compatibility Policy." This rule basically requires assessment of a proposed use or activity on a National Wildlife Refuge against the purpose for which a refuge is acquired and managed. If the use is found to materially interfere with or detract from the fulfillment of the mission of the National Wildlife Refuge System or the purposes of the national wildlife refuge, it cannot be approved. A copy of this policy is enclosed.

At the last Advisory Council meeting we discussed the "Appropriate Refuge Uses Policy." This relatively new, draft policy describes several criteria that must be met prior to a refuge manager allowing any non-wildlife dependent recreational use, in addition to those described in the Refuge Compatibility rule. Proposals to access the Park and Rio Grande National Forest across the Baca Refuge need to clearly meet the criteria identified in the policy. Enclosed is a copy of this policy.

We have discussed that initiation of a Comprehensive Conservation Plan for the Baca NWR is not scheduled and is unlikely to be started until after 2012. It is during this planning process we hope to address all foreseeable public uses and assess their impacts on biotic and abiotic processes on the Refuge. The Fish and Wildlife Service recently decided to start the formal planning process in 2008. This will allow two years for baseline data collection to take place

before initiating the plan and provide the Park Service and public information that concerns potential use of the Baca NWR in much more timely fashion.

During this planning process we will assess potential public uses of Baca NWR. Any access to the Park or Rio Grande National Forest across Baca NWR must be consistent with Refuge purposes and goals stated in this plan. The plan will actively assess the potential for wildlife dependent public uses. These include hunting, fishing, wildlife observation, wildlife photography, environmental education and interpretation. It will also assess other non-wildlife dependent public uses foreseen and for which we have received requests for consideration. The plan will allow for uses determined appropriate and compatible, and could conceivably include a road or trail allowing access to the Park via some mode of travel if it did not materially interfere with the purpose of the Baca NWR and met standards described in the Appropriate Use Policy.

Much interest has been expressed in use of the "Lexam" or "Cow Camp" road as a means to allow public access to public lands east of the refuge. This road transects, what at this time we view as some of the most sensitive wetland habitats on Baca NWR. The use of this road appears problematic at this time due to its proximity to wetland habitat. We also have to question the very existence of this road and need to assess its impacts on hydrology, wildlife movement and habitat fragmentation. Removal of the road and restoration of the associated habitat will be considered in the planning process along with various modifications and potential uses.

In summary, U.S. Fish and Wildlife Service policies and lack of resources prevent serious consideration of public uses until we gather baseline information on the Baca NWR, have the opportunity to analyze this information and involve the public in formulating a management plan that addresses all aspects of refuge management. We do have serious concerns about the presence and use of the "Lexam" road. The Comprehensive Conservation Planning process for the Baca NWR will start in 2008 and will thoroughly assess this access question.

Thank you for your patience while working on this complex question and I continue to offer whatever help I can provide in your planning process. It has been a pleasure working with the National Park Service and meeting the challenges presented during the General Management Planning process. Please let me know if you have questions or concerns.

Sincerely,



Michael Blenden  
Project Leader

Cc: Peter Clark, Supervisor Rio Grande National Forest

Enclosures



United States  
Department of  
Agriculture

Forest  
Service

Rio Grande National Forest

1803 West Hwy 160  
Monte Vista, CO 81144  
719-852-5941

1565-1 ✓

File Code: 1900  
Date: February 14, 2005

Steve W. Chaney  
Superintendent  
Great Sand Dunes National Park and Preserve  
11500 Hwy 150  
Mosca, CO 81146

Dear Steve,

Please consider this my official response to the request for comment on the Great Sand Dunes National Park and Preserve General Management Plan. Decisions made during this planning process could have significant impacts on our ability to manage adjoining National Forest System (NFS) lands and I appreciate the opportunity to comment.

In anticipation of acquisition of the Baca Ranch, we held several multi agency meetings at which potential issues were identified and discussed. I believe that two important issues are not addressed in the proposed alternatives and they both center on public access to NFS lands. The two issues not addressed are the type of access the public will have to NFS lands and the ability to manage the burgeoning elk population proximate to the newly acquired federal lands. These issues are intimately linked and should be addressed in the EIS. Although we have not started the planning process for the newly acquired mountain tract, we believe that the range of alternatives the National Park Service is proposing severely limits our options for managing this portion of the Rio Grande National Forest.

As a multiple use agency we must consider a broad range of objectives when deciding what type of public access to provide on NFS lands. In all alternatives provided, the National Park Service has restricted vehicular access to NFS lands to administrative use only. To better address some management concerns we have for the National Forest, I request you analyze the following in the EIS:

- 1) Unencumbered vehicular access through the National Park to the Liberty Road and development of a maintenance agreement between NPS and USFS.
- 2) The vehicle access corridor will allow for the possession of firearms and wild game without a special permit from the National Park Service.
- 3) Joint opportunities for long distance hiking and equestrian trails across public lands of both agencies.
- 4) Joint developed recreation sites with the USFS, such as trailhead and camping areas, to maximize visitor satisfaction to the dunes and mountain areas.
- 5) Providing administrative vehicular access through the National Park to the Rio Grande National Forest.
- 6) Unencumbered vehicular access to private in-holdings at Liberty, Short Creek and Pole Creek.



Caring for the Land and Serving People

Printed on Recycled Paper



1567 end

My staff and I have significant concerns with the overpopulation of elk in, and adjacent to the Sangre de Cristo range. We are currently experiencing alarming habitat degradation in portions of the Sangre de Cristo Wilderness. It appears that this over utilization has resulted in sharp declines in mule deer and bighorn sheep numbers in the area. According to the Colorado Division of Wildlife, the current post harvest elk population in Unit 82 is estimated at 6000 animals. This is four times the management objective of 1500 and approximately 80% of these elk winter within the new National Park boundary. The current bighorn sheep population estimate in Unit S-9 is 400, down from 600 over the past 3 years. The current mule deer estimate in Unit 82 is 4000, below the management objective of 4500.

Elk are having obvious negative impacts on other species dependent upon this landscape. We cannot in good conscience tolerate habitat degradation by elk that we would not tolerate from permitted livestock grazing. This shift to elk dominating the landscape at the expense of bighorn sheep and mule deer are of great concern to us.

The Rio Grande National Forest relies on the Colorado Division of Wildlife to manage wildlife numbers. However, their ability is extremely limited if the elk can use the park as a refuge. For all land management agencies, the management of wildlife populations is essential to habitat management.

To help mitigate the current situation of habitat degradation and hopefully strike a balance between ungulate species, I am requesting you consider the following:

- 1) Unencumbered vehicle access across the park for hunters to the NFS lands on the Liberty Road, Mosca Pass Road, and Medano Pass Road.
- 2) Having the vehicle access corridor allow for the possession of firearms and wild game without a special permit from the National Park Service.
- 3) Making the proposed wilderness area of the Dunefield Focus alternative a national preserve to allow hunting.
- 4) In lieu of item 3) above, consider eliminating this area from wilderness recommendation. This would allow the Colorado Division of Wildlife to employ tools such as hazing to prevent an unreasonable buildup of elk not available for harvest.

I know you are concerned about all public lands both in and around the National Park and Preserve. I appreciate the good working relationship we have enjoyed and I expect that relationship to grow in the future. Thanks you for the opportunity to comment and please contact me if you have any questions or concerns.

Sincerely,



PETER L. CLARK  
Forest Supervisor/Center Manager

cc: Suzy Stutzman

United States Department of the Interior  
NATIONAL PARK SERVICE



Great Sand Dunes National Park and Preserve  
11500 Highway 150  
Mosca, Colorado 81146-9798  
Phone 719-378-6300 Fax 719-378-6310



In reply refer to:  
File Code (1470)L76

November 30, 2004

Ms. Catherine Wilson, Area Conservationist  
Natural Resources Conservation Service  
Monte Vista Area Office  
0881 North Highway 285  
Monte Vista, CO 81144

Re: Identification of prime or unique farmland request under the Farmland Protection Policy Act (PL 97-98; U.S.C. 4201 et seq.) and Prime and Unique Agricultural Lands Act (DOI-ESM94-7) for the environmental impact statement: Great Sand Dunes National Park and Preserve General Management Plan and Wilderness Study.

Dear Ms. Wilson,

The National Park Service is developing a new general management plan and wilderness study for Great Sand Dunes National Park and Preserve. An environmental impact statement (EIS) will be prepared to address the impacts of the general management plan and wilderness study alternatives. The general management plan will guide resource stewardship, visitor use and services, partnerships, facilities, and operations in the park for the next 15-20 years. Great Sand Dunes National Park and Preserve is located in the San Luis Valley, in Saguache and Alamosa Counties, Colorado.

We are requesting that the Natural Resources Conservation Service (NRCS) identify prime or unique farmland within the national park and preserve (please see attached map). The information provided by the NRCS will be presented in the environmental impact statement and evaluated relative to effects, alternatives, or mitigation, if warranted. We would appreciate it very much if you could provide your response by January 15, 2005. Please feel free to contact me by phone (719-378-6311) or electronic mail ([steve\\_chaney@nps.gov](mailto:steve_chaney@nps.gov)) if you need additional clarification. Thank you for your assistance.

Sincerely,

Steve W. Chaney  
Superintendent



United States Department of Agriculture



Natural Resources Conservation Service  
Alamosa Agricultural Service Center  
2205 State Avenue  
Alamosa, Colorado 81101  
ron.riggenbach@co.usda.gov

719-589-6432 - Office  
719-589-0613 - Fax  
719-588-2917 - Cell

12/27/2004

Mr. Steve W. Chaney, Superintendent  
Great Sand Dunes National Park and Preserve  
11500 Highway 150  
Mosca, CO 81146-9798

Re: File Code (1470)L76 Identification of prime or unique farmland request under the Farmland Protection Policy Act (PL 97-98; U.S.C. 4201 et seq.) and Prime and Unique Agricultural Lands Act (DOI-ESM94-7) for the environmental impact statement: Great Sand Dunes National Park and Preserve General Management Plan and Wilderness Study.

Dear Mr. Chaney:

Enclosed with this letter you will find a map outlining prime farmland and unique farmland as requested.

If you have any questions, please feel free to contact me.

Sincerely,

A handwritten signature in cursive script, appearing to read "Ronald Riggenbach".

Ronald Riggenbach  
District Conservationist  
Alamosa Field Office

cc: Catherine Wilson, Area Conservationist  
Robert McBride, District Conservationist Saguache County

The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

An Equal Opportunity Provider and Employer





United States Department of the Interior  
NATIONAL PARK SERVICE

Great Sand Dunes National Monument and Preserve  
11500 Highway 150  
Mosca, Colorado 81146-9798  
Phone 719-378-6300 Fax 719-378-6310



In Reply, Refer to:  
DI8 (1470)

January 5, 2004

Cheyenne & Arapaho Business Committee  
Cheyenne & Arapaho Tribes of Oklahoma  
Chairman Robert Taylor  
P.O. Box 38  
Concho, OK 73022

Dear Mr. Taylor,

Great Sand Dunes National Monument would like to consult with the Cheyenne & Arapaho Tribes of Oklahoma regarding a management plan that is now being started for the monument. The National Park Service recognizes that all the lands we now manage are part of the original homelands of many American Indian peoples. With this recognition in mind, it is our sincere desire to involve in the planning process tribal communities who consider the monument an important part of their heritage – both past and present. This initial contact letter is simply a notification of the beginning of this planning process. We will follow this letter with a phone call to discuss with you the tribe's interest in being consulted during all phases of the plan's development. The plan will take three to four years to complete and it is our view that involvement of affiliated tribal communities in this process is essential for its success.

A review of existing literature, and recent consultation with tribes on other issues have revealed that a number of American Indian tribes consider the San Luis Valley and the Great Sand Dunes important to their culture and traditions. The new plan will address a number of natural and cultural resources issues that are likely be of interest to these tribal communities. It is hoped that on- going consultation with your community, and with other tribal communities, will lead to a plan that fully takes into consideration tribal concerns. An overview of this planning project and the need for a new management plan is explained more fully in the enclosed newsletters.

As mentioned above, a member of the planning staff will contact your office soon to discuss the Cheyenne & Arapaho Tribes of Oklahoma's interest in being consulted on this plan. If you have any questions or concerns prior to our phone call to your office please do not hesitate to

call me at (719)- 378- 6311. Our planning team and the monument staff look forward to working with you on this important matter.

You are on the mailing list for the general management plan, and will receive newsletters and drafts of the plan. If you have additional interests or concerns regarding the general management plan or would like to request a specific consultation, please contact me at (719)- 378- 6311 or by electronic mail, [GRSA\\_Superintendent@nps.gov](mailto:GRSA_Superintendent@nps.gov). Thank you for your participation in these planning efforts.

Sincerely,

Steve W. Chaney  
Superintendent

Enclosures

Newsletter #1 and #2  
Park Brochure  
Region map w/physiography

United States Department of the Interior  
NATIONAL PARK SERVICE



Great Sand Dunes National Park and Preserve  
11500 Highway 150  
Mosca, Colorado 81146-9798  
Phone 719-378-6300 Fax 719-378-6310



In Reply Refer to:  
1470 A1619

January 11, 2005

Chairman Robert Taylor  
Cheyenne and Arapahoe Tribes of Oklahoma  
P. O. Box 38  
Concho, OK 73022

Dear Chairman Taylor:

We would like to invite two members of your tribe to participate in a meeting of the Great Sand Dunes National Park and Preserve Advisory Council in March. We would welcome both a representative of your government, as well as someone with particular traditional interest or knowledge of the Great Sand Dunes area. The Advisory Council was established by the legislation that expanded the park to advise on the general management plan, and members were appointed by the Secretary of the Interior. The National Park Service has a *general management plan* for Great Sand Dunes National Park and Preserve underway. We are developing alternatives for the management of the park and preserve, including the new lands that have been added. The advisory council will be discussing the draft alternatives and their possible impacts, and part of the meeting will be dedicated to listening to the interests and concerns of invited tribal members.

The meeting will be held on March 3, 2005, at the new visitor center for the national park near Mosca, Colorado. The advisory council will meet from 8:30 a.m. to 4:30 p.m., and time for tribal member discussion will be set aside between 2:00 p.m. and 4:00 p.m. We will provide appropriate travel and consultation costs.

Please contact me at (719)-378-6311 or by electronic mail, [GRSA\\_Superintendent@nps.gov](mailto:GRSA_Superintendent@nps.gov) with your reply. If you have additional interests or concerns regarding the general management plan or would like to request a specific consultation at another time, also feel free to contact me. Thank you for your participation in these planning efforts.

Sincerely,

Steve Chaney, Superintendent  
Great Sand Dunes National Monument and Preserve

*11999 Highway 150*  
*Mosca, CO 81146*

Enclosures

Newsletter #1, #2, #3, #4, #5  
Park Brochure

## Tribal Invitations List

Governor Simon Suina  
Pueblo of Cochiti  
P. O. Box 70  
Cochiti, NM 87072

Chairman Wayne Taylor  
Hopi Indian Tribe  
Hopi Tribal Council  
P. O. Box 123  
Kykotsmovi, AZ 86039

President Leonard Atole  
Jicarilla Apache Indian Tribe  
Jicarilla Apache Tribal Council  
P. O. Box 507  
Dulce, NM 87528

President Albert Hale  
Navajo Nation  
Navajo Nation Tribal Council  
P. O. Box 308  
Window Rock, AZ 86515

President William Walksalong  
Northern Cheyenne Indian Tribe  
Northern Cheyenne Tribal Council  
P. O. Box 128  
Lame Deer, MT 59043

Governor Gerald Nailor  
Pueblo of Picuris  
Picuris Pueblo  
P. O. Box 127  
Penasco, NM 87553

Governor Stanley Pino  
Pueblo of Zia  
135 Capitol Square Drive  
Zia Pueblo, NM 87053

President Evelyn James  
San Juan Southern Paiute Tribe  
San Juan Southern Paiute Tribal Council  
P. O. Box 2656  
Tuba City, AZ 86045

Governor  
Pueblo of Taos  
P. O. Box 1846  
Taos, NM 87571

Chairperson Judy Knight- Frank  
Ute Mountain Ute Tribal Council  
General Delivery  
Towaoc, CO 81344

Chairman Robert Taylor  
Cheyenne and Arapahoe Tribes of  
Oklahoma  
P. O. Box 38  
Concho, OK 73022

Chairman Johnny Wauqua  
Comanche Indian Tribe of Oklahoma  
P. O. Box 908  
Lawton, OK 73052

Governor Randolph Padilla  
Pueblo of Jemez  
P. O. Box 100  
Jemez Pueblo, NM 87024

Chairman Billy Horse  
Kiowa Tribe of Oklahoma  
Kiowa Business Committee  
P. O. Box 369  
Carnegie, OK 73015

Chairman Burton Hutchinson  
Northern Arapaho Indian Tribe  
Northern Arapaho Business Council  
P. O. Box 217  
Fort Washaki, WY 82514

President John Steele  
Pine Ridge Oglala Lakota Indian Tribe  
Oglala Lakota Tribal Council  
Pine Ridge, South Dakota 57770

Governor Ron Shutiva  
Pueblo of Acoma  
P. O. Box 309

Acomita, NM 87034

Governor Earl Salazar  
Pueblo San Juan  
P. O. Box 1099  
San Juan, NM 87566  
Chairman Leonard Burch  
Southern Ute Indian Tribe  
P. O. Box 737  
Ignacio, CO 81137

Chairperson Ruby Atwin  
Unitah and Ouray Ute Tribe  
P. O. Box 190  
Fort Duchesne, UT 84026

Chairwoman Mary Yazzi  
White Mesa Ute  
White Mesa Ute Board  
P. O. Box 340  
Blanding, UT 84511

# THE HOPI TRIBE



**Wayne Taylor, Jr.**  
CHAIRMAN

VICE-CHAIRMAN

March 16, 2005

Mr. Steve Chaney, Superintendent  
USDI-National Park Service  
Great Sand Dunes National Park and Preserve  
11500 Highway 150  
Mosca, CO 81146-9798

Dear Superintendent Chaney:

The Hopi Cultural Preservation Office received a copy of your letter date January 11, 2005 addressed to Hopi Tribal Chairman, Mr. Wayne Taylor, Jr., inviting the Hopi Tribe to send two tribal representatives to attend a meeting regarding the development of a Draft General Management Plan (GMP) for the Great Sand Dunes National Park and Preserve.

We apologize for the delay in providing you with our response and appreciate your invitation to come to Great Sand Dunes National Park and Preserve and consult with you and other tribal representatives on the GMP, and regret that we were not able to send representatives to the March 3<sup>rd</sup> meeting.

As you might be aware the Hopi Tribe has claimed cultural and ancestral affinity to the prehistoric Hsatsinom, whom are defined archaeologically as the Anasazi cultural group with Hopi Tribal Council Resolution, H-70-94 (enclosure). Furthermore the Hopi Tribe supports the avoidance and disturbance of archaeological sites attributed to the various archaeologically defined cultural groups contained in the resolution. Therefore we would like to request for a copy of the draft General Management Plan for review and comment.

Additionally, at this time the Hopi Cultural Preservation Office is unaware of any specific places which may be of cultural and religious importance to Hopi clans and religious societies. Such a determination would require a site visit to the park and preserve by knowledgeable individuals.

However, our office is aware that the "lakes" situated with in the dunes are important to members of the Tewa people, whom were brought to Hopi by the Walpi Snake Clan, and currently resided at Hopi.

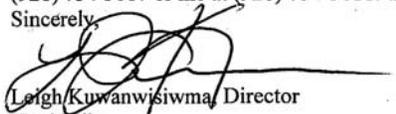
Therefore, the Hopi Cultural Preservation Office would also like to extend an invitation to you and staff members to attend our April Cultural Resource Advisory Task Team (CRATT) to present and discuss potential impacts to historic properties located within the park and reserve as a result of the development of the General Management Plan with Tewa Clan Leaders and our cultural advisors.

P .O. BOX 123      KYKOTSMOVI, AZ.      86039      (928) 734-3000

The meeting has been scheduled for April 21, 2005 in Kykotsmovi, AZ. Please contact Ms. Sharon Sockyma, Secretary at (928) 734-3613 for the place of the meeting and the time for your presentation.

Should you require additional information, please contact Clay Hamilton, Research Assistant at (928) 734-3617 or me at (928) 734-3611. Thank you for consulting with the Hopi Tribe.

Sincerely,



Leigh Kuwanwisiwma, Director  
Hopi Tribe  
Cultural Preservation Office

**APPENDIX J: WETLANDS STATEMENT OF FINDINGS**



**General Management Plan / Wilderness Study**

---

**Great Sand Dunes National Park and Preserve**

**Wetlands Statement of Findings for the  
General Management Plan / Wilderness Study**

**Recommended:**

---

Superintendent, Great Sand Dunes National Park and Preserve

Date

**Certification of Technical Adequacy and Servicewide Consistency:**

---

Chief Water Resources Division

Date

**Approved:**

---

Regional Director Intermountain Region, National Park Service

Date



## INTRODUCTION

The National Park Service (NPS) has prepared and made available the Draft General Management Plan / Wilderness Study/ Environmental Impact Statement for Great Sand Dunes National Park and Preserve (“the park”). The park, which was recently expanded in size nearly fourfold, is located in Alamosa and Saguache counties, Colorado.

Executive Order 11990 (*Protection of Wetlands*) requires the National Park Service and other federal agencies to evaluate the likely impacts of actions on wetlands. NPS Director’s Order 77-1: *Wetland Protection* and Procedural Manual 77-1 provide NPS policies and procedures for complying with Executive Order 11990. This statement of findings (SOF) documents compliance with these NPS wetland protection procedures.

### PURPOSE OF THIS STATEMENT OF FINDINGS

The purpose of this Wetlands Statement of Findings is to document review of the Draft General Management Plan / Wilderness Study for Great Sand Dunes National Park and Preserve relative to Executive Order 11990 (*Protection of Wetlands*) and NPS Procedural Manual 77-1: *Wetlands Protection*. Specifically, this wetlands SOF:

- Describes effects on wetlands values associated with the NPS preferred alternative.
- Describes how the NPS preferred alternative avoids, to the extent possible, adverse impacts to wetlands.

- Describes mitigation measures developed to achieve compliance with Executive Order 11990 (*Protection of Wetlands*) and National Park Service Procedural Manual 77-1: *Wetland Protection*.
- Describes how the NPS preferred alternative ensures no net loss of wetlands functions or values.

### AFFECTED WETLANDS

The Great Sand Dunes Act of 2000 authorized the expansion and redesignation of Great Sand Dunes National Monument to a national park and preserve that is four times larger in area (146,757 acres). Wetlands mapping efforts to date have focused on particular areas of the park, such as the national park’s southwestern portion, Sand Creek, and Medano Creek. Wetlands in many new areas of the park (e.g., along Deadman Creek, Cold Creek, and Pole Creek) are not shown on the National Wetlands Inventory map because wetlands surveys for these areas have not yet been conducted. The total area of wetlands within the park is not known.

The park contains 12 primary streams that flow westward from the Sangre de Cristo Mountains and provide wetlands hydrology. The water infiltrates quickly through the sand, adding to the high groundwater levels which typically lie 5 to 15 feet from the ground surface in the shallow aquifer under the park. The high water table of San Luis Valley creates an array of wetlands habitats, including permanent ponds and lakes, playa lakes, seasonal ponds and marshes, seeps, wet

meadows on pond edges, and salt flats. Groundwater flows primarily west and southwest across the park. It emerges in the southwestern portion of the park as a line of springs. The water flowing from these springs creates large areas of lush, productive wetlands around Big Spring Creek and it ultimately flows into San Luis Lake, located immediately west of the park. In addition to these wetlands, wind erosion has removed sand to the elevation of the water table in places, allowing the establishment of interdune wetlands within the sand sheet life zone.

The largest wetlands acreages are distributed along Deadman, Medano, Sand, Big Spring, and Little Spring creeks and their tributaries. They range from sparsely vegetated playas and seasonal mudflats, to aquatic and emergent stands in shallow water and irrigated hay meadows, to streamside shrublands, woodlands, and forests, to high elevation ponds, seeps, and snow glades. Introduced wetlands have become established due to irrigation of natural meadows (which has occurred for over a century) on Medano Ranch and on banks of excavated ponds, ditches, and canals, which are located mostly at lower elevations on gentle slopes and flats. A particularly high concentration of irrigated wetlands occurs in the lower reaches of Sand, Big Spring, and Little Spring creeks on Medano Ranch (figure J-1).

Wetlands occur throughout the seven park life zones, are diverse, and can be broadly characterized in the Cowardin system as riverine (rivers, creeks, and streams), palustrine (shallow ponds, marshes, swamps, sloughs), and lacustrine (littoral zones of lakes and deep ponds). The environmental impact statement section on wetlands (Chapter 3: Affected Environment) describes wetlands functions and values and specific wetlands types in

more detail. Chapter 3 also provides wetlands-related information on vegetation, wildlife, ecological critical areas, and water resources.

## **ENVIRONMENTAL CONSEQUENCES OF THE NATIONAL PARK SERVICE PREFERRED ALTERNATIVE ON WETLANDS**

### **Analysis**

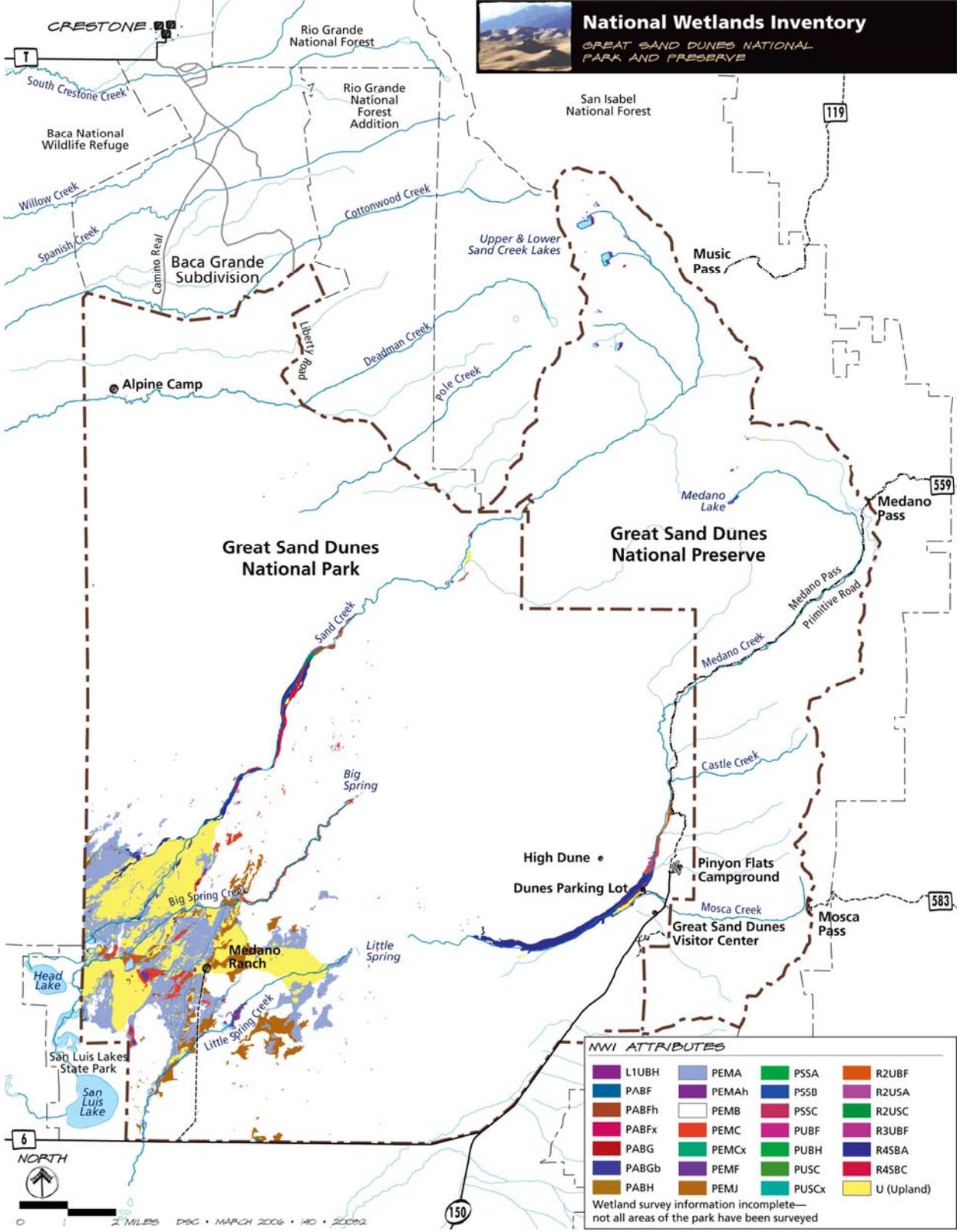
Under the NPS preferred alternative, visitation in the frontcountry and dunes play management zones would increase over time, so Medano Creek wetlands in these zones would experience more use. Providing guided hiking and equestrian trails in the guided learning management zone would direct use around sensitive wetland 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 in the north part of the national park would encourage more hiker and equestrian use in this portion of the park. The mature narrowleaf cottonwood groves on the banks of Deadman Creek would likely attract some hikers and 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 to protect the natural



# National Wetlands Inventory

GREAT SAND DUNES NATIONAL PARK AND PRESERVE



**NWI ATTRIBUTES**

L1UBH	PMA	PSSA	R2UBF
PABF	PMAh	PSSB	R2USA
PABFh	PMB	PSSC	R2USC
PABFx	PMEC	PUBF	R3UBF
PABG	PMECx	PUBH	R4SBA
PABGb	PEMF	PUSC	R4SBC
PABH	PEMJ	PUSCx	U (Upland)

Wetland survey information incomplete—  
not all areas of the park have been surveyed

resources within it. 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 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 probably 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 wetland 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 probably 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.

## **ALTERNATIVES CONSIDERED**

Alternatives considered in the Draft General Management Plan / Wilderness Study / Environmental Impact Statement (Chapter 2: Alternatives) include no action, dunefield focus—maximize wildness, and three public nodes. These alternatives are briefly summarized below, along with elements that are common to all action alternatives.

### **No-Action Alternative**

The no-action alternative was developed to provide a baseline for evaluating the changes and impacts of the three action alternatives. This baseline is characterized primarily by conditions in December 2004, roughly 2 months after ownership and management of the Baca Ranch was transferred to the U.S. government, and by continuation of current management practices into the future. (There are funded projects planned for very near term; these are included in the no-action alternative). Most visitor use would continue to be focused in or near the eastern part of the dunefield. The developed area east of the dunes (main park road, visitor center, and campground) would remain essentially the same. Some visitors would continue to explore backcountry areas of the park and preserve via designated trails and roads, and

cross-country horse and hiking use would also continue. Some people would enter the north part of the park on foot from the Baca Grande subdivision, via the two county roads that end at the park boundary.

No new areas would be recommended for wilderness. New park lands that were not open to public use before December 2004 would be managed in a very conservative manner. That is, there would be no new development, and visitor use would be managed so as to not establish new practices for camping, types and routes of access, etc.

New park areas would be inventoried for natural and cultural resources and managed according to NPS policies that emphasize natural processes (for example, nonnative species, interior pasture fences, and artificial water holes and sources would be removed). Existing trails and trailheads in the park and preserve would be maintained, but there would be no new trails or trailheads. The Nature Conservancy would continue to manage Medano Ranch, including the Medano Ranch headquarters. There would be no public use of Medano Ranch. Bison grazing would continue within the park on lands leased or owned by The Nature Conservancy. Leashed dogs would generally be allowed within the park and preserve.

### **Elements Common to the Action Alternatives, including the NPS Preferred Alternative**

If and when The Nature Conservancy ceased agricultural uses (e.g., bison grazing and forage production) on their owned and leased lands, and transferred the lands to the National Park Service, surface irrigation of meadows would be discontinued and the bison fence would be removed. Before surface irrigation was discontinued, a study would be conducted to better understand

how this action might affect wetlands, groundwater supplies, downstream water users, federal water rights, the Closed Basin Project, and other such factors. Roads that the National Park Service does not intend to use for public or administrative purposes would be abandoned and not maintained. Toilets would be installed if/when visitor use levels are high enough that human waste disposal and sanitation is a concern, and if a more suitable solution does not exist.

### **Dunefield Focus—Maximize Wildness Alternative**

In the dunefield focus—maximize wildness alternative, most visitor use and visitor activities would be focused in or near the eastern edge of the dunefield. Most of the rest of the park and preserve would remain wild and undeveloped, allowing natural processes to continue with minimal human influence. Backcountry areas would be primitive and rugged, providing outstanding opportunities for solitude and adventure. A large portion of the park expansion lands would be recommended for future designation as wilderness.

Existing trails and trailheads would be maintained. Most visitors would continue to visit the main dunefield area (main park road, visitor center, dunes parking lot, and picnic area). Parking and related support facilities, such as restrooms, could be expanded in the frontcountry zone if dunes parking lots filled too often. A new multiuse trail for bicyclists and pedestrians would extend from near the park's main entrance to the visitor center, dunes parking lot/picnic area, and to the Pinyon Flats campground. A gate for horse access would be provided on the north boundary of the national park, and pedestrian access from the Baca Grande subdivision would continue.

The National Park Service would seek acquisition of Medano Ranch and would manage it as a natural/wild area. Ranch structures would not be maintained (or would be removed after documentation). Leashed dogs would be restricted to parking areas, picnic areas, and car campgrounds within the national park—they would not be permitted in the national preserve.

### **Three Public Nodes Alternative**

In the three public nodes alternative, most visitors would gain access to the park and preserve via three areas or “nodes.” Visitor facilities and trails would be concentrated in or near the three nodes, and the rest of the park and preserve would remain largely undeveloped. This alternative would provide fairly diverse options for visitors to experience different portions of the dunes system.

The first node, located at the existing developed area east of the dunes, would remain essentially the same. The second node would be located at the Medano Ranch headquarters. The National Park Service would seek acquisition of Medano Ranch and would manage the ranch headquarters as a public day-use area, most historic ranch structures would be maintained, and guided hiking and horseback tours to nearby high interest areas could be provided. The third node, located in the north part of the park, would include a backcountry trailhead and a primitive campground if an appropriate public vehicle access route could be identified via the Baca National Wildlife Refuge or the Baca Grande subdivision.

Dogs would not be permitted in areas where there is increased potential for or a history of conflicts with visitors or with wildlife; otherwise leashed dogs would be allowed. No new wilderness would be recommended

in this alternative. The USFS, in consultation with the National Park Service, may study the need for (and impacts of) providing public vehicle access to USFS lands via Liberty Road or via an extension of Cow Camp Road to the mountain front; these options would be studied in a separate NPS/USFS environmental analysis study.

### **JUSTIFICATION FOR SELECTING THE NATIONAL PARK SERVICE PREFERRED ALTERNATIVE: FACTORS AND TRADEOFFS**

Reasons for selecting the NPS preferred alternative are discussed in detail in the draft GMP, appendix E (see section titled “Rationale for the NPS Preferred Alternative”). In short, this alternative best supports and protects the fundamental resources and values of Great Sand Dunes National Park and Preserve; these resources and values are described in chapter 1 of the GMP. The NPS preferred alternative provides for visitor use in new areas of the park in a way that minimizes harm to wetlands to the greatest extent practicable. The NPS preferred alternative would have adverse impacts on some wetlands, as would all the GMP alternatives, including the no-action alternative. These impacts would be due primarily to visitor use in new areas of the park, and would be largely unavoidable (unless public use was not permitted at all). The NPS preferred alternative also provides wetlands benefits. Actions such as eliminating managed bison grazing, controlling nonnative noxious plants, and reestablishing more natural drainage regimes would have long-term benefits ranging from minor to major depending on wetlands type and location.

### **HOW THE NATIONAL PARK SERVICE PREFERRED ALTERNATIVE WAS**

### **DESIGNED TO MINIMIZE WETLANDS IMPACTS**

Various elements of the NPS preferred alternative were included, in whole or in part, to minimize adverse wetlands impacts. Because most adverse impacts would result from visitor use in new park areas, most of these elements are related to visitor use management.

The NPS preferred alternative apportions the park into different management zones (NPS “Preferred Alternative” map). For each management zone, specific resource concerns are described, preliminary indicators of resource condition are outlined, priority areas for monitoring are identified (most are wetlands areas), and potential management actions to address resource threats are listed.

In many cases, specific management zones were applied in particular locations, in whole or in part to minimize wetlands impacts. In the north part of the national park, the backcountry access (brown) zone is located well north of the Deadman Creek riparian corridor for most of the zone’s length. It follows Cow Camp Road and does not cross Deadman Creek. This means that the proposed public vehicle use and trailhead would be located primarily in disturbed areas rather than in or near the Deadman Creek corridor. The backcountry adventure (green) zone surrounds the Deadman Creek area, the upper portion of the Sand Creek riparian corridor, and Upper and Lower Sand Creek lakes. Unlike the yellow (natural/wild) zone, the green zone allows new trails to be provided to direct hiking and horseback use away from wetlands areas and discourage more dispersed use that often results in social trails, vegetation damage, and sedimentation of streams and lakes. Similarly, the guided learning zone was

applied to an area that includes the Big and Little Spring wetlands areas. This management zone requires that visitors be accompanied by a certified guide or escort. The intent is to allow visitors to enjoy and learn about special resources areas while protecting such resources at the same time. Guides/escorts and carefully laid trails would help ensure that visitors are guided in such a way that wetlands values are protected.

The NPS preferred alternative includes a wilderness recommendation for nearly all wilderness-eligible lands, amounting to about 75% of lands added to the national park since 2000. Protection of wetlands was among the many considerations that led to this recommendation. Uses of NPS wilderness are to be of a type and nature that enable the areas to retain their primeval character; protect and preserve natural conditions; leave the imprint of man's work substantially unnoticeable; provide outstanding opportunities for solitude or primitive and unconfined recreation; and preserve wilderness in an unimpaired condition. This means that key wetlands areas would be protected in perpetuity from many influences that typically result in adverse impacts. More information regarding the wilderness study and recommendation can be found in appendix G of the GMP.

Mitigation measures common to the action alternatives, some of which address wetlands areas, are listed in chapter 2 of the GMP.

## COMPENSATION

Two actions in the NPS preferred alternative would result in loss of *artificial* (introduced) wetlands. The NPS preferred alternative would remove livestock watering

ponds and structures on Medano Ranch and former Baca Ranch lands, and it would discontinue hay meadow irrigation on Medano Ranch; both measures are intended to reestablish a more natural hydrologic regime in keeping with NPS management policies. The introduced wetlands that would be lost were created as long as a century ago, when surface water from Sand, Big Spring, and Little Spring creeks was diverted to irrigate natural upland meadows to improve forage production for cattle. According to Procedural Manual 77-1 (Section 4.2A.1.e), activities with adverse impacts on artificial wetlands may be excepted from Statement of Findings and compensation requirements if they are "designed specifically for the purpose of restoring degraded (or completely lost) natural wetlands, stream, riparian, or other aquatic habitats or ecological processes."

The NPS preferred alternative would not result in *loss* of natural wetlands. However, all of the GMP alternatives (including the no action) would adversely affect some natural wetlands. In particular, natural chemical and biological processes and wetlands species composition could be affected due to unintentional introduction of nonnative plant species, and trampling (compaction) of wetland soils and streambanks associated with visitor use. Short of prohibiting visitor use in areas added to the park since 2000, there are no alternatives that would avoid such impacts.

Restoring a more natural hydrologic regime would allow other wetlands (e.g., ephemeral ponds, playas, mudflats, etc.) to expand or become reestablished. Although the acreage of wetlands habitats that would be expanded or reestablished is not known, the areas involved are large enough that beneficial impacts should more than compensate for minor to moderate adverse effects to wetlands from visitor use. Before

surface irrigation of meadows was discontinued on Medano Ranch, a study would be conducted to allow park managers and others to better understand how this action would affect wetlands, wildlife, groundwater supplies, federal water rights, the Closed Basin Project, etc.

## CONCLUSION

The NPS preferred alternative was designed to avoid and minimize adverse impacts on wetlands, and to restore lost natural wetlands habitats and ecological processes

within Great Sand Dunes National Park and Preserve. No natural wetlands would be lost, although some would be unavoidably affected by visitor use. Restoring a more natural drainage regime in the southwestern (Medano Ranch) portion of the national park would allow natural wetlands to expand or become reestablished.

The NPS finds that this alternative is consistent with the policies and procedures of Director's Order 77-1: *Wetlands Protection*, including the "no net loss of wetlands" policy.



## INDEX

**A**

administrative zone, 52, 53, 62, 65, 70, 229, 374, 376

**B**

Baca Grande subdivision, iii, iv, v, 34, 36, 54, 60–62, 67, 140–45, 147, 151, 160, 161, 171, 201–09, 230, 233, 237, 256, 259, 283, 286–89, 296–97, 373, 386, 447–48

Baca Ranch, iii, 8, 35, 54, 58, 76, 119, 126, 129, 136, 154, 156, 170–71, 191, 193, 197–00, 215, 217, 221–25, 235, 243–44, 248, 250–54, 261, 268, 270, 274, 276–78, 288, 296, 359–60, 373, 384–88, 446–50

Baca National Wildlife Refuge, iv, v, 7, 34–37, 60–61, 67, 79, 142, 147, 152, 161, 170–71, 210, 233, 235, 237, 262, 286, 288–89, 384, 448

backcountry access zone, 34–35, 46–47, 60–62, 67, 69, 79, 222, 229, 233, 237, 254–56, 264, 275, 280, 282, 286, 289–90, 294, 296, 373

backcountry adventure zone, 49–52, 61, 67, 78–80, 211, 218–19, 222, 224, 226, 264, 267, 271–72, 275, 278, 370, 373–74

backcountry management plan, 80, 389

Big Spring Creek, 14, 101, 120, 122, 125, 252, 362, 395, 399, 401, 444

bison, iii, iv, 22, 33, 54, 57, 63–65, 69–72, 81, 131, 141, 154, 162, 164, 191–95, 199–00, 208, 215–17, 223–25, 232, 235, 238, 242–45, 251–52, 258–62, 268–71, 277–78, 285, 288, 293–96, 312, 321, 355, 359–60, 379, 384, 386–87, 446–49

Blanca Peak (Mt. Blanca), 3, 163

Bureau of Land Management (BLM), 36, 147–48, 315, 317, 385, 388

**C**

campground, iii–v, 21, 28, 34–35, 44, 47, 56, 58, 60–64, 67, 69–70, 79, 88, 129, 131–32, 136–39, 145, 152–60, 166, 188, 201–02, 212–16, 222, 226–29, 234, 239, 242–47, 252–55, 261, 264–72, 275–89, 393–97, 304, 319, 372, 375, 379, 447–48

camping, iii, 45, 49, 51–54, 129, 131, 138, 149, 150, 152, 160, 202, 205, 231, 258, 284, 352, 354, 357, 396, 398–99, 447

carrying capacity, 18, 26, 33, 42–53, 80, 121, 197, 214–17, 221, 242–45, 249, 267, 269, 271, 275, 293–94, 363, 365

Castle Creek, 43, 125, 136, 246, 356, 395, 397, 399, 401

Closed Basin Project, 12–13, 52, 57, 62, 74, 124, 147, 302, 362, 384–86, 448, 451

Colorado Wilderness Act of 1993, 12, 383

commercial services, 30–32, 44–53, 56, 60, 64, 69, 142

Cow Camp Road, iv, v, 34–35, 43, 57, 60–62, 67, 69, 79, 158, 215, 217, 219, 223, 229, 237, 268, 270, 272, 277, 290, 373, 385–87, 444, 449

Crestone, 3, 33, 51–52, 129, 140–47, 151–52, 160, 171, 189, 201, 204–07, 211, 231, 233–34, 237, 240, 259–60, 265, 284, 286–89, 296, 301–05, 307, 311, 323, 373

culturally peeled trees, 6, 87, 396

cultural resources, i–v, 7, 9, 14, 18, 22–23, 30, 33, 41, 44, 46, 48–54, 74–75, 86, 128, 130, 156, 169, 173–74, 189, 213–14, 239, 241, 266–67, 313–17, 322, 356, 369, 370, 375, 395–96, 447

**D**

Deadman Creek, 61, 67, 80, 101, 108, 111, 120, 182, 192–95, 198–00, 215, 217, 219, 223, 242–46, 250, 252, 268–73, 277, 294, 319, 353, 360, 373, 395, 399, 401, 443–46, 449

desired conditions, 16, 22, 25, 29, 41–42, 56–57, 69, 255, 302, 365

## Index

dunefield, iii, iv, 6, 10, 13, 15, 41, 54, 62, 64–65, 70, 76–78, 87, 90, 93, 112–14, 117, 120, 122, 124, 127, 129, 132, 136, 138, 153–54, 159–64, 169, 191–94, 198, 201–03, 214, 227–29, 239–63, 267–71, 280, 283, 286, 293, 355, 357–359, 369, 370, 373–74, 379, 387, 447, 448

dunes play zone, iv, 45–46, 60, 62, 69–70, 80, 218, 224, 226–29, 252, 254–55, 269, 272, 281, 372–73, 375

dunes system, v, 13, 15–19, 34–35, 67, 99, 116, 129, 301–02, 351, 353, 355, 357, 359, 361, 396, 448

## F

Friends of the Dunes, 25, 155, 305

frontcountry zone, iv, 43–45, 60, 62, 64–65, 69–70, 78–80, 164, 212, 222, 236, 239, 245, 249–55, 261–63, 266–69, 276, 280–82, 288, 294–97, 372–73, 379, 448

fundamental resources and values, iii, 6–9, 13–16, 25–26, 30–35, 41, 57, 92–93, 97, 99, 125, 127–28, 137, 177, 183–84, 260, 286, 302, 369–71, 449

## G

GIS, 20, 23, 309

grazing, iii, 12, 19, 22, 54, 57, 69, 72, 81, 170, 178, 191–95, 199–00, 215–17, 223, 242–45, 251, 268–71, 277–78, 293–94, 386, 390, 446–49

Great Sand Dunes Advisory Council, 6, 7, 11, 13, 32, 41, 75, 174, 212–14, 301–04, 323, 369, 370

Great Sand Dunes National Park and Preserve Act of 2000, v, 6, 8, 11–13, 33, 36, 54, 56–57, 123–24, 130, 161, 171, 235, 301, 383–84, 443

Great Sand Dunes Wilderness Area, 3, 8, 12, 33, 383, 384

guided learning zone, vi, 48–49, 60–62, 65, 69, 70, 76, 78–80, 211, 216, 219, 224, 226–28, 231, 235–36, 265, 267, 269–72, 276–82, 288, 289, 293–97, 304, 370–73, 446, 449

## H

hiking, iii–v, 44, 47–65, 69–70, 79, 129–31, 136, 138, 142, 154, 161, 164, 171, 191–95, 198–02, 212, 214, 216, 219, 223, 226–27, 234–35, 242–50, 261–62, 267–72, 276–77, 280, 294–95, 372–74, 396–99, 444, 446–49

horseback riding, iv, v, 45–61, 64, 69–70, 78–79, 108, 129–30, 136–37, 142, 161, 193, 201, 211, 215, 217, 219, 223, 226–28, 240, 244–46, 250, 254–55, 268, 272, 277, 280, 295, 373–74, 390, 398, 448–49

Hudson Ditch, 12, 124

hunting, 12, 14, 33, 47, 49, 51–52, 56–60, 64, 69–71, 80, 130, 142, 152, 161–62, 194, 196–98, 209, 218–21, 227, 236, 245–49, 271–75, 280, 294, 297, 323, 352, 375, 397

## I

interdunal ponds, 14, 20, 124–25, 127

## L

landowner, 20–24, 27, 41, 98, 151, 186–87

lightscares, 49, 51, 139

Little Spring Creek, 14, 120–21, 125, 127, 195, 199–00, 223, 225, 251–52, 277–78, 361, 395, 399, 444, 446, 450

Lower Sand Creek Lakes, 43, 50, 52, 80, 449

## M

management zone, 31, 34, 42–43, 56, 62, 65, 69–70, 78, 184–85, 211–14, 216–19, 223, 242–46, 250, 265, 267, 269, 271, 276, 302, 365, 369–72, 444, 449, 450

Medano Creek, 3, 12, 13–15, 44–45, 69, 80, 85, 105, 110–11, 120, 124–28, 132–36, 159, 164, 182, 194, 198, 202, 219, 223, 246, 250, 252, 254, 276, 295, 308, 314, 351, 353–55, 372–73, 395–01, 443–44

Medano Ditch, 12, 22, 124

Medano Pass primitive road, 15, 62, 65, 70, 129, 136–38, 153, 158–60, 193, 202, 254, 281, 373, 384

Medano Ranch, iii–vi, 8, 33, 34, 52–57, 60, 62–70, 74, 78–80, 87–89, 121, 139, 147, 152–59, 164, 181, 189–95, 199–01, 205–08, 211, 217–18, 220, 223–32, 235–36, 239–53, 256–70, 273, 276–89, 293–98, 304, 315, 318, 360, 370–74, 379, 384–87, 444, 446–51

Mosca, I, 3, 86, 120, 123, 126–27, 146–47, 152, 158–60, 164, 193, 202, 205, 218, 226, 245, 254, 323–24, 351, 374, 395–96, 399, 401

Music Pass, 51–52, 64, 69, 159, 245, 373

## N

National Wilderness Preservation System, I, 8, 33, 161–62, 383

natural/wild zone, 46, 51–52, 64, 69, 78, 233, 241, 245, 246, 250, 252, 255, 293–94, 374

## R

resource opportunity areas, 15, 349, 358

Rio Grande cutthroat trout, 14, 20, 101, 105, 110–12, 108–81, 192, 194, 219, 246, 272, 307, 396–97

Rio Grande National Forest, 7, 12, 36, 61, 103, 142, 147, 170, 179, 210, 317

Rio Grande sucker, 14, 104, 110, 112, 180–81, 194, 219, 246, 272, 396

## S

sabkha, 6, 13–15, 90, 92, 112, 114, 116–17, 120–22, 138, 191–92, 215–16, 228, 242, 255, 267–68, 359

Sand Creek, 13–15, 43, 50, 52, 54, 64, 69, 80, 86, 99, 101–02, 117, 120, 125, 127, 159, 182, 192–93, 201, 216–17, 227–28, 244–46, 252, 254, 269–70, 280,

281, 294, 308, 314, 353–55, 373, 375, 395, 398–99, 401, 443, 449

sand sheet, 3, 6, 13–15, 19–22, 87, 90, 92–93, 99, 101–02, 109, 112, 114, 116–17, 120, 122, 125, 127, 138, 191–92, 215–17, 228, 242–44, 255, 267–70, 359, 399, 444

Sangre de Cristo Wilderness Area, 8, 12, 33, 132, 138, 162, 171, 196, 202–03, 209, 220, 228, 247, 255, 273, 282, 383–84

San Isabel National Forest, 7, 129, 171

San Luis Lakes State Park, v, 7, 24, 56–58, 79, 101, 111, 127, 129, 142, 147, 160, 223, 226, 251, 277, 310, 318, 374, 446

special mandates, 9, 11, 41

Superintendent's Compendium, 43, 57, 60, 220, 236–37, 273, 290, 375

surge flow, 10, 13, 15, 125, 128, 355, 396–98

## T

The Nature Conservancy, iii, 22, 24, 34–37, 54, 57, 64, 69, 72, 78, 81, 88, 131, 141–42, 151–52, 157, 160, 164, 171, 189–92, 195, 199–01, 206–08, 211, 215, 217, 225–26, 232, 235, 238–39, 242, 244, 252–53, 258, 261–62, 264, 268, 270, 278, 285, 288, 293, 305, 310, 315, 318, 323, 324, 371, 385, 388–89, 447

## V

visitor center, iii, iv, 44, 54, 58, 64, 79, 87–90, 129–32, 136, 138–39, 149, 153–63, 170, 202, 204, 208, 212, 214, 216, 222, 227–30, 234, 239, 242–43, 249, 256, 261, 280, 282, 284, 287, 304, 372, 447–48

## W

wild and scenic rivers, I, 33, 85, 166, 322, 393, 395, 399, 400







As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. Administration.