CHAPTER 4:
ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

The National Environmental Policy Act requires that environmental documents discuss the environmental impacts of a proposed federal action, feasible alternatives to that action, and any adverse environmental effects that cannot be avoided if a proposed action is implemented. In this case, the proposed federal action would be the adoption of a general management plan for Guadalupe Mountains National Park. The following portion of this document analyzes the environmental impacts on natural resources, cultural resources, visitor understanding and experience, the socioeconomic environment, and park operations of implementing the four alternatives. The analysis includes both beneficial and adverse effects of implementing the alternatives.

Because of the general, conceptual nature of the actions described in the alternatives, their impacts can only be analyzed in general, qualitative terms. Thus, this environmental impact statement should be considered a programmatic analysis. When specific developments or other actions are proposed for implementation after this general management plan has been adopted, appropriate, environmental and cultural compliance documentation will be prepared in accord with National Environmental Policy Act and National Historic Preservation Act requirements.

This chapter begins with a description of the methods and assumptions used for analyzing the impacts. Each analysis also considers cumulative impacts (see below) and presents a conclusion. At the end of each alternative, there is a brief discussion of unavoidable adverse impacts; irreversible and irretrievable commitments of resources; and the relationship of short-term uses of the environment and the maintenance and enhancement of long-term productivity. The impacts of each alternative are briefly summarized in table 7 at the end of Chapter 2.

CUMULATIVE IMPACTS AND PROJECTS THAT MAKE UP THE CUMULATIVE IMPACT SCENARIO

A cumulative impact is described in the Council on Environmental Quality's regulation 1508.7 as follows:

> "Cumulative impact" is 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 non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

To determine potential cumulative impacts, projects in the area surrounding Guadalupe Mountains National Park were identified. This process included conducting meetings and phone calls with county and town governments, state and federal land managers, and other stakeholders. Potential projects identified as cumulative actions included any past activities and any planning or development activity that was currently being implemented or that would be implemented in the reasonably foreseeable future. These actions are briefly described below.

Past Actions That Could Contribute to Cumulative Effects

Cattle Grazing. Active range management on private and public lands around all sides of the park has greatly reduced the native plant populations, densities, and distribution. This in turn has altered soils and led to erosion. Ranching activities involve the use of herbicides to kill unwanted plants and the

introduction of exotic species of plants. In some areas, natural hydrology and landforms have been modified to create dams and stock tanks. These provide water for domestic livestock and sometimes attract native park wildlife. Fences have been built to limit the movement of livestock into the park.

Subdivision Development. Subdivision development exists or is proposed on the west side of the park in the Salt Basin and on the south boundary east of the Patterson Hills (surrounding the NPS-owned square-mile section on the south that has been recommended for boundary inclusion in all of the alternatives). This has led to the construction of a limited number of structures and roads and the loss of natural plant and animal habitat.

Agricultural Activities. Agricultural activities in the Dell City agricultural district contribute to windborne soil erosion and obscured visibility on the west side of the park.

Current and Future Actions That Could Contribute to Cumulative Effects

Regional Population Growth. Population has grown in the wider region, primarily in the urban areas of Midland-Odessa and El Paso. Population centers in the regional area represent a large percentage of park visitation. Increased park visitation could cause localized crowding at visitor facilities and degrade wilderness experiences and resource values on more popular trails.

Subdivision Development. Continuing 10-acre subdivisions and associated unregulated development on the west and south sides of the park (specifically in the Salt Basin and east of the Patterson Hills) will lead to the incremental construction of structures and roads. This will result in the loss of natural plant cover and animal habitat, increases in windborne particulates, and increased intrusions in the western escarpment viewshed.

Mining and Drilling. The Bureau of Land Management currently is preparing an environmental impact statement on natural gas development. Projects include pipelines south of the park, and exploration and the installation of wells for natural gas and oil in the Otero Mesa and Crow Flats areas of New Mexico north and northwest of the park. Oil and gas exploration also is occurring on private lands in Texas south and east of the park. Concerns related to these activities increased air pollution and reduced visibility, both for daytime scenic vistas and the visibility of the night sky.

Windmill Farms. Wind energy generating towers along the Delaware Mountains could disrupt the park viewshed when approaching Guadalupe Pass from the west on U.S. Highway 62/180 and could adversely affect views from within the park.

Potential Wind Energy Development. Future installation of windmills on Texas General Land Office and other lands adjacent to the park could impact the movement of wildlife, including peregrine falcons and bighorn sheep, and also could impact scenic vistas.

Water Exports. There are proposals to export water from the Dell City aquifer and the aquifer immediately south of the park in Culberson County. Proposals to export water from these aquifers could dramatically lower groundwater tables and impact surface vegetation, soil stability, and water supplies available for local agricultural activities and for park use. Related development, roads, pipelines, and the proposed desalination plant could also impact park resources, alter ecosystems, and affect air quality and scenic vistas.

Aircraft Overflights. Military aircraft, primarily from Holloman Air Force Base but

also from other bases, conduct training flights over and near the park. Pilots make overflights along many routes, but flights most often are near the park's western boundary in the Salt Basin and south of the park adjacent to the boundary. This flight training activity, consisting most frequently of low-flying, supersonic aircraft, is extremely loud. In addition to disrupting the activities of visitors and park staff, the noise impacts wilderness and wildlife resource values.

Surrounding Wilderness Areas. There are wilderness study areas within Bureau of Land Management lands in the Brokeoff Mountains northwest of the park, in Bureau of Land Management lands northeast of the park, and in U.S. Forest Service lands on the northern boundary. Some of these study areas are adjacent to or less than 10 miles from new, controversial oil and gas exploration sites in the Otero Mesa and Crow Flats areas. Drilling activities and follow-on production could impact regional wilderness characteristics and values.

Communication Towers. Radio and microwave communication towers are located adjacent to the southeast park boundary on the ridge of the Delaware Mountains. There is the potential for more communication towers, especially cell phone towers, in this area and at other locations along the ridge. Towers cause impacts on the park viewshed from U.S. Highway 62/180 and from inside the park.

Carlsbad Caverns National Park, New Mexico. Actions at this park could affect regional archeological resources. Recent, current, or near-future actions at Carlsbad Caverns National Park include rehabilitation of the main park road; stabilization and preservation of several buildings, now used for maintenance, that date from the Civilian Conservation Corps era (1933 to 1942); and reconstruction of the visitor center. Archeological surveys are performed prior to all such projects, and data retrieval is conducted in consultation with the state historic preservation officer if important archeological resources cannot be avoided.

Lincoln National Forest, New Mexico. No major development is anticipated in this national forest during the next five years. Ongoing projects include routine trail and road maintenance and the stabilization and preservation of several Civilian Conservation Corps era (1933 to 1942) buildings for future U.S. Forest Service maintenance purposes.

Commercial and Tourist Development. *Blue Origin*, a Seattle-based company, is planning on developing a rocket launching facility about 30 miles south of the park. The installation will launch suborbital rockets that will take individuals into space and back, and will include rocket launchers and landing pads. This will likely cause indirect impacts by bring more development to the region and will add additional traffic (including hazardous materials) traveling through the park.

Wallacetown. A developer purchased the small town of Cornudas, about 50 miles west of the park, and plans to develop a full-scale theme park at this location. Plans include the expansion of the existing café and the addition of stores and other facilities, including a motel/hotel, spa, condominiums, a golf course, and a historic town where entertainment will be provided. If successful, this development could change the regional demographics, impact water resources in the region, alter transportation needs, increase traffic on the highway through the park, alter park visitation patterns, and impact night sky visibility from the wilderness areas of the park.

These cumulative actions are evaluated in the cumulative impact analysis in conjunction with the impacts of each alternative. The objective is to determine if they would have any additive effects on natural re-

sources, cultural resources, visitor use, the socioeconomic environment, or NPS operations. Because some of these cumulative actions are in the early planning stages, the evaluation of cumulative effects was based on a general description of the project.

DECISION-MAKING TO AVOID IMPAIRMENT OR UNACCEPTABLE IMPACTS ON RESOURCES OF GUADALUPE MOUNTAINS NATIONAL PARK

Impairment

In addition to determining the environmental consequences of implementing the preferred and other alternatives, Section 1.4 of *Management Policies 2006* (NPS 2006b) requires the analysis of potential effects to determine whether proposed actions would impair park resources and values.

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 always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts on park resources and values when necessary and appropriate to fulfill the purposes of a park, as 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 a park, that discretion is limited by the statutory requirement that the National Park Service must leave 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 and values, including the opportunities that otherwise would be present for the enjoyment of those resources or values (Section 1.4.5 of *Management Policies 2006*, NPS 2006b). An impact on any park resource or value may constitute an impairment, and would be more likely to constitute an impairment to the extent it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park
- identified in the park's general management plan or other relevant NPS planning documents as being of significance

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. A determination on impairment is made in the conclusion section for each impact topic that relates, in the wording of the Organic Act, to the park's "scenery and the natural and historic objects and the wild life therein." Impairment is not considered for impact topics related to visitor use and experience, NPS operations, or the socioeconomic environment.

The impact threshold at which impairment occurs is not always readily apparent. Therefore, the National Park Service manages to avoid impacts that fall short of impairment, but are still not acceptable within Guadalupe Mountains National Park's environment. Guidelines for the identification of unacceptable impacts are provided in section 1.4.7.1 of *Management Policies 2006* (NPS 2006b).

Unacceptable Impacts

The impact threshold at which impairment occurs is not always readily apparent. Therefore, the National Park Service applies a standard that offers greater assurance that impairment will not occur. The National Park Service does this by avoiding impacts that it determines to be unacceptable. These are impacts that fall short of impairment, but are still not acceptable within a particular park's environment.

Virtually every form of human activity that takes place within a park has some degree of effect on park resources or values, but that does not mean the impact is unacceptable or that a particular use must be disallowed. Therefore, for the purposes of these policies, unacceptable impacts at Guadalupe Mountains National Park are impacts that, individually or cumulatively, would

- be inconsistent with the park's purposes or values, or
- impede the attainment of the park's desired future conditions for natural and cultural resources as identified through the park's planning process, or
- create an unsafe or unhealthful environment for visitors or employees, or
- diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values, or
- unreasonably interfere with
  - park programs or activities, or
  - an appropriate use, or
  - the atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the park
  - NPS concessioner or contractor operations or services

In accordance with *Management Policies 2006* (NPS 2006b), park managers must not allow uses that would cause unacceptable impacts to park resources. To determine if unacceptable impacts could occur to the resources and values of Guadalupe Mountains National Park, the impacts of both existing and proposed actions in this general management plan have been evaluated, based on the preceding criteria.

METHODS FOR ANALYZING IMPACTS

The planning team based the impact analysis and the conclusions in this chapter largely on the review of existing literature and studies, information provided by experts in the National Park Service and other agencies, and Guadalupe Mountains National Park staff insights and professional judgment. The team's method of analyzing impacts is further explained below. All the impacts were assessed assuming that mitigating measures have been implemented to minimize or avoid impacts. If mitigating measures described in the "Alternatives, Including the Preferred Alternative" chapter were not applied, the potential for resource impacts and the magnitude of those impacts would increase.

Director's Order #12 and Handbook: Conservation Planning, Environmental Impact Analysis, and Decision Making presents an approach to identifying the duration (short-term, long-term, or permanent), type (adverse or beneficial), and intensity or magnitude (negligible, minor, moderate, or major) of impacts. That approach has been used in this document. Because definitions of intensity vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this environmental impact statement.

Each alternative is compared to a baseline, represented by future conditions that would occur under the alternative of no action / continue current management (alternative A), to determine impacts. In the absence of quantitative data, best professional judgment was used to identify impacts.

Direct and indirect effects caused by an action were considered in the analysis. Direct effects are caused by an action and occur at the same time and place as the action. Indirect effects also are caused by the action, and although they may occur later in time or farther removed from the place, they are still reasonably foreseeable.

The impact analyses for the no action alternative compare resource conditions in the year 2022 to existing conditions in 2007, assuming continuation of current management direction. The impact analysis for the action alternatives (the preferred alternative and alternatives B and C) compare the action alternative in the year 2022 to the no action alternative in the year 2022. As a result, the impacts of each action alternative represent the *difference between* implementing the no action alternative and implementing that action alternative. To understand a complete "picture" of the impacts of implementing any of the action alternatives, the reader must also take into consideration the impacts that would occur under the no action alternative.

NATURAL RESOURCES

Analysis of natural resources was based on research, knowledge of park resources, and the best professional judgment of planners, biologists, hydrologists, geologists, and paleontologists who have experience with similar types of projects. Information on the park's natural resources was gathered from state and local sources and park records. As appropriate, additional sources of data are identified under each impact topic heading.

Where possible, map locations of sensitive resources were compared with the locations of proposed developments and modifications. Predictions about short- and long-term site impacts were based on previous studies of visitor and facilities development impacts on natural resources. Sociological studies comparing the deterrent effects of signs versus ranger presence on sites were also considered in this analysis.

The impact threshold definitions below assume that mitigation would be implemented. For this document, the planning team qualitatively evaluated the impact intensity for natural resources.

Soils

All available information on soils potentially impacted in various areas of the park was compiled. Where possible, map locations of sensitive soils were compared with locations of proposed developments and modifications of existing facilities. Predictions about short- and long-term site impacts were based on previous projects with similar soils and recent studies. The thresholds of change for the intensity of an impact are defined as follows:

- **Negligible.** Soils would not be affected or the effects on soils would be below or at the lower levels of detection. Any effects on soils would be slight, and no long-term effects on soils would occur.
- **Minor.** The effects on soils would be detectable. Effects on soil area would be small. Mitigation might be needed to offset adverse effects and would be relatively simple to implement and likely to be successful.
- **Moderate.** The effect on soil would be readily apparent, would likely be long-term, and would result in a change to the soil character over a relatively wide area. Mitigation measures would be necessary to offset adverse effects and would likely be successful.
- **Major.** The effect on soil would be readily apparent and long-term, and would substantially change the character of the soils over a large area of the park. Mitigation measures to offset adverse effects would be needed and extensive, and their success could not be assured.
- **Duration.** Short-term: soil resources recover in less than three years. Long-term: soil resources require more than three years to recover.

Plant Communities and Vegetation

All available information on vegetation and plant communities potentially impacted by the general management plan alternatives was compiled. Where possible, locations of sensitive vegetation species, populations, and communities were identified on maps and were avoided. Predictions about short- and long-term site impacts were based on previous projects with similar vegetation and recent studies. The thresholds of change for the intensity of an impact are defined as follows.

- **Negligible.** No native vegetation would be affected, or some individual native plants could be affected as a result of implementing the alternative. However, there would not be any effect on native species populations. The effects would be on a small scale.
- **Minor.** Implementing the alternative would affect some individual native plants and would also affect a relatively minor portion of one or more species' populations. Mitigation to offset adverse effects could be required and would be effective.
- **Moderate.** Implementing the alternative would affect some individual native plants and would also affect a sizeable segment of one or more species' populations and over a relatively large area. Mitigation to offset adverse effects could be extensive but would likely be successful.
- **Major.** Implementing the alternative would have a considerable effect on native plant populations and would affect a relatively large area of the park. Mitigation measures to offset adverse effects would be required and extensive, and success of the mitigation measures would not be assured.
- **Duration.** Short-term: vegetation resources recover in less than three years. Long-term: vegetation resources require more than three years to recover.

Wildlife

The Organic Act, which directs parks to conserve wildlife unimpaired for future generations, is interpreted by the National Park Service to mean that native animal life should be protected and perpetuated as part of the park's natural ecosystem. Natural processes are relied on to control populations of native species to the greatest extent possible; otherwise they are protected from harvest, harassment, or harm by human activities.

Management goals for wildlife include maintaining components and processes of naturally evolving park ecosystems, including natural abundance, diversity, and the ecological integrity of plants and animals. Information on the park's wildlife was taken from park documents and records. Information also was obtained from the park's natural resource management staff, U.S. Fish and Wildlife Service, Texas Parks and Wildlife Department, and Texas Commission on Environmental Quality. The thresholds of change for the intensity of an impact are defined as follows:

- **Negligible.** There would be no observable or measurable impacts on native species, their habitats, or the natural processes sustaining them. Impacts would be well within natural fluctuations.
- **Minor.** Impacts would be detectable, but they would not be expected to be outside the natural range of variability and would not be expected to have any effects on native species populations, their habitats, or the natural processes sustaining them. Mitigation measures, if needed to offset adverse effects, would be simple and successful.
- **Moderate.** Specific species are present during particularly vulnerable life-stages, such as breeding, juvenile stages, or migration. Mortality or interference with activities necessary for survival may be expected on an occasional basis, but would not threaten the continued existence of the species in the park. Impacts on species populations, their habitats, or the natural processes sustaining them would be detectable, and they could be outside the natural range of variability. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.
- **Major.** Impacts on native species populations, their habitats, or the natural processes sustaining them would be detectable and outside the natural range of variability. Key ecosystem processes might be disrupted. Loss of habitat might affect the viability of at least some native species populations. Extensive mitigation measures would be needed to offset any adverse effects, and their success would not be assured.
- **Duration.** Short-term: wildlife resources recover in less than three years. Long-term: wildlife resources require more than three years to recover.

Geologic Resources

Congressional legislation that created the park specifically cites "outstanding geological values together with scenic and other natural values of great significance," which establishes geological resources as a focal point for consideration of environmental impacts. Geological resources consist of both the geological features and the geological processes that continually modify the Earth's surface and subsurface.

Published reports on geology, geological maps, and topographic maps were used to assess the importance of geological features and processes in various areas of the park. Park records were used to determine positions and importance of the park's cave resources. Geologic and topographic maps and park records were especially used to compare with locations of proposed developments and modifications of existing facilities and infrastructure. Unless otherwise noted,

impacts should be considered site-specific. The thresholds of change for the intensity of an impact are defined as follows:

- **Negligible.** The action could result in a change in a geologic process or feature, including a cave, but the change would be at the lowest level of detection, or not measurable. Mitigation measures would not be necessary.
- **Minor.** The action could result in a detectable change to a geologic process or feature, but the change would be slight and local. Mitigation might be used to offset adverse effects, but would be relatively simple to implement and likely successful.
- **Moderate.** The action would result in a clearly detectable change in geologic processes or features, or would affect a substantial area. Mitigation measures would be necessary to offset adverse effects and would likely be successful.
- **Major.** The action would result in the permanent loss or substantial alteration of an important geologic process or feature that would be highly noticeable or would affect a large area. Mitigation measures to offset the adverse effects would be necessary and extensive and their success could not be guaranteed.
- **Duration.** Natural physical processes such as rock weathering, mass wasting, stream migration, dune formation, and the development of sinkholes and other features found in limestone formations, such as caves, are constantly impacting the geologic resources of the park. These processes are described in physical geology publications and the rate of change is strongly influenced by local environmental conditions. In the Guadalupe Mountains National Park environment, the change in geologic processes and features is largely driven by changes in temperature and the presence of water. Because the park is in an arid environment, the rate of change for the geologic features and processes is typically slow but is punctuated by catastrophic events such as flash floods.

  Within the context of this general management plan, an issue is the increase in the rate of change in the geologic resources that is caused by activities in the park. For example, while erosion is a natural geologic process, the *rate* of erosion in some areas of the park could increase because of road and trail development or maintenance. These impacts could be at least partially mitigated but would still continue. Consequently, virtually all impacts on geological features or processes would be long-term.

Paleontological Resources

Information from published reports on paleontology, geology, geologic maps, and field inspections was used to compile an assessment of the extent and distribution of paleontological resources in the park. In addition, a map predicting areas with a high potential for paleontological resources was created using these same resources.

The paleontological resources in the park are exposed and decay naturally through weathering processes. The process is generally very slow because of the hard Permian limestone formations that make up the Guadalupe Mountains. Although new fossils emerge as others are eroded away, the resources are not renewable. Impacts can be mitigated using a variety of measures, which include collecting and preserving fossils that might be lost or transported from their original context, onsite stabilization and preservation, molding and casting of in-place fossils, enhancement of partially exposed fossils, or avoidance where possible. However, certain types of microfossils are so abundant and widespread in the Permian limestone that mitigation measures would not be necessary. The thresholds of change for the intensity of an impact are defined as follows:

- **Negligible:** There would be no measurable impact to or loss of fossils because (a) the activity would occur in a geologic layer not known to contain extensive fossils and the volume of bedrock disturbance would be negligible, or (b) the activity would occur in a fossil-rich geologic layer, but the volume of bedrock disturbed would be nearly indiscernible. Monitoring would likely not detect fossils and the loss of fossils and/or associated contextual information would be minimal.
- **Minor:** A few fossils might be lost through illegal collecting, or there would be a low probability of effects from a ground-disturbing activity because (a) the activity would be in a geologic layer not known to contain extensive fossils, and the volume of bedrock disturbance would be low or (b) the activity would be in a fossil-rich geologic layer, but the volume of bedrock disturbed would be nearly indiscernible. Monitoring would be likely to detect fossils, but the loss of fossils and/or associated contextual information would be minimal.
- **Moderate:** A number of fossils might be lost through illegal collecting, or there would be a moderate probability of effects from a ground-disturbing activity because (a) the activity would be in a geologic layer not known to contain extensive fossils, and the volume of bedrock disturbance would be large or (b) the activity would be in a fossil-rich geologic layer, but the volume of bedrock disturbed would be small. Most fossils uncovered probably would be found by monitoring, but some fossils and/or associated contextual information could be lost.
- **Major:** Many fossils could be lost through illegal collecting, or there would be a high probability of effects from a ground disturbing activity because the activity would be in a geologic layer of high fossil richness, and the volume of bedrock disturbance would be large. Even with monitoring, many fossils and/or associated contextual information probably would be lost.
- **Duration.** Duration for paleontological resources is always long-term. Any disturbance could affect *in situ* information (age and stratigraphy) and specimen relationships (ancient environment and ecology) and, thus, would not be subject to recovery to the original situation before disturbance, which is implied in short-term duration.

CULTURAL RESOURCES

Cultural Resources Listed, or Eligible to Be Listed, in the National Register of Historic Places

Potential impacts on cultural resources (archeological resources, prehistoric or historic structures, cultural landscapes, and traditional cultural properties) either listed in or eligible to be listed in the National Register of Historic Places were identified and evaluated in accordance with the Advisory Council on Historic Preservation's regulations implementing Section 106 of the National Historic Preservation Act (36 *Code of Federal Regulations* 800, "Protection of Historic Properties"): by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that are national register -listed or -eligible; (3) applying the criteria of adverse effect to affected resources; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

Under the Advisory Council's regulations, a determination of *adverse effect* or *no adverse effect* must be made for affected national register-listed or -eligible cultural resources. An *adverse effect* occurs whenever an action alters directly or indirectly any of the characteristics of a cultural resource that qualify it for inclusion in the national register, i.e., di-

minishing the integrity (the extent to which a resource retains its historic appearance) 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 *Code of Federal Regulations* 800.5(a)(1)). A determination of *no adverse effect* means there is an effect, but the effect would not meet the criteria of adverse effect (36 *Code of Federal Regulations* 800.5(b)).

In this general management plan, the criteria for characterizing the severity or intensity of impacts on national register-listed or -eligible archeological resources, prehistoric or historic structures, and cultural landscapes (there are no cultural resources that are designated as traditional cultural properties in Guadalupe Mountains National Park) are the Section 106 determinations of effect: *adverse effect* or *no adverse effect*.

Ethnographic Resources and Museum Collections

Ethnographic resources that are not traditional cultural properties and museum collections (prehistoric and historic objects, artifacts, works of art, archival documents, and natural history specimens), which are generally ineligible for listing in the national register, are not subject to Section 106 of the National Historic Preservation Act. In this general management plan, potential impacts on ethnographic resources and museum collections are described in terms of context (are the effects site-specific, local, or regional?), duration (are the effects short-term, lasting less than a year; long-term, lasting more than a year; or permanent?) and intensity (is the degree or severity of effects negligible, minor, moderate, or major?). The definitions of impact intensity for museum collections and ethnographic resources follow:

Ethnographic Resources.

- **Negligible:** Impact would be barely perceptible and would neither alter resource conditions, such as traditional access or site preservation, nor the relationship between the resource and the associated group's body of practices and beliefs.
- **Minor:** Adverse impact — would be slight but noticeable but would neither appreciably alter resource conditions, such as traditional access or site preservation, nor the relationship between the resource and the associated group's body of practices and beliefs.
  Beneficial impact — would allow access to and/or accommodate a group's traditional practices or beliefs.
- **Moderate:** Adverse impact — would be apparent and would alter resource conditions. Something would interfere with traditional access, site preservation, or the relationship between the resource and the associated group's practices and beliefs, even though the group's practices and beliefs would survive.
  Beneficial impact — would facilitate traditional access and/or accommodate a group's practices or beliefs.
- **Major:** Adverse impact — would alter resource conditions. Something would block or greatly affect traditional access, site preservation, or the relationship between the resource and the associated group's body of practices and beliefs, to the extent that the survival of a group's practices and/or beliefs would be jeopardized.
  Beneficial impact — would encourage traditional access and/or accommodate a group's practices or beliefs.

Museum Collections.

- **Negligible:** Impact is at the lowest levels of detection. It is barely measurable with no perceptible consequences, either adverse or beneficial, on museum collections.

- **Minor:** Adverse impact — would affect the integrity of a few items in the museum collection but would not degrade the usefulness of the collection for future research and interpretation.
  Beneficial impact — would stabilize the current condition of the collection or its constituent components to minimize degradation.
- **Moderate:** Adverse impact — would affect the integrity of many items in the museum collection and diminish the usefulness of the collection for future research and interpretation.
  Beneficial impact — would improve the condition of the collection or protect its constituent parts from the threat of degradation.
- **Major:** Adverse impact — would affect the integrity of most items in the museum collection and destroy the usefulness of the collection for future research and interpretation.
  Beneficial impact — would secure the condition of the collection as a whole or its constituent components from the threat of further degradation.

VISITOR EXPERIENCE AND UNDERSTANDING

In assessing impacts related to interpretation, factors such as participation rates, quality, importance, and communication effectiveness should be considered. The following definitions were developed to describe the thresholds of change for the intensity of an impact on visitor experience or understanding.

- **Negligible:** Changes in visitor use and the visitor experience would not occur or would not be detectable. There would not be any noticeable change in visitor experience or in defined indicators of visitor satisfaction or behavior.
- **Minor:** Changes in visitor use and/or experience would be small but detectable. Visitors could be aware of the effects, but the changes would not appreciably alter critical characteristics of the visitor experience, visitor satisfaction, or levels of park use.
- **Moderate:** Some changes in characteristics of the park experience would be readily apparent, or the number of visitors engaging in an activity or in the use of the park would be substantially altered. Most visitors would be aware of changes, and many would be able to express an opinion regarding the difference. Visitor satisfaction would change as a result of the impact.
- **Major:** Changes in multiple critical characteristics of the desired experience would be readily apparent. Most visitors would be aware of the effects and would likely express a strong opinion about the changes. Participation in desired experiences or in park visitation would be considerably altered, and would result in substantial changes in the defined indicators of visitor satisfaction or behavior.
- **Duration.** Short-term: the impact is temporary and occurs for less than one year. Long-term: impact occurs for more than one year.

THE SOCIOECONOMIC ENVIRONMENT

The analysis of effects of the alternatives on the socioeconomic environment considered the magnitude, intensity, and duration of consequences, as well as the context (local, park, regional) of the impact. The primary events or actions in the alternatives that could trigger socioeconomic impacts include

- construction expenditures
- changes in NPS staffing and annual operating and maintenance expenditures
- changes in the number, activity patterns, or locations of park visitation

- changes in business opportunities associated with the park's management emphasis

Socioeconomic impacts were based on a qualitative analysis of potential changes. Factors included the relative magnitude, timing, and (where appropriate) location. The impacts of those changes were then determined based on those descriptors, insight, and judgment. More detailed, quantitative analysis will be completed as part of the implementation process. The thresholds of change for the intensity of an impact are defined as follows:

- **Negligible.** Effects on population, economic activity, housing, community infrastructure, public sector fiscal conditions, local governance and social institutions, or quality of life would be below detectable levels, or detectable only through indirect means, and would result in no discernible effect on the character of the affected social and economic environment.
- **Minor.** Effects on population, economic activity, housing, community infrastructure, public sector fiscal conditions, local governance and social institutions, or quality of life would be detectable but localized in geographic extent or size of population affected and would not be expected to alter the character of the established social and economic environment.
- **Moderate.** Effects on population, economic activity, housing, community infrastructure, public sector fiscal conditions, local governance and social institutions, or quality of life would be readily detectable across a broad geographic area or segment of the community and could have an appreciable effect on the social and economic environment.
- **Major.** Effects on population, economic activity, housing, community infrastructure, public sector fiscal conditions, local governance and social institutions, or quality of life would be readily apparent, affect a substantial segment of the population, extend across the entire community or region, and likely have a noticeable influence on the social and economic environment.
- **Duration.** Short-term: impacts that are temporary in nature, for example jobs supported by construction activity, and those anticipated to endure for five years or less. Long-term: impacts extending beyond five years.

PARK OPERATIONS, FACILITIES, AND EQUIPMENT

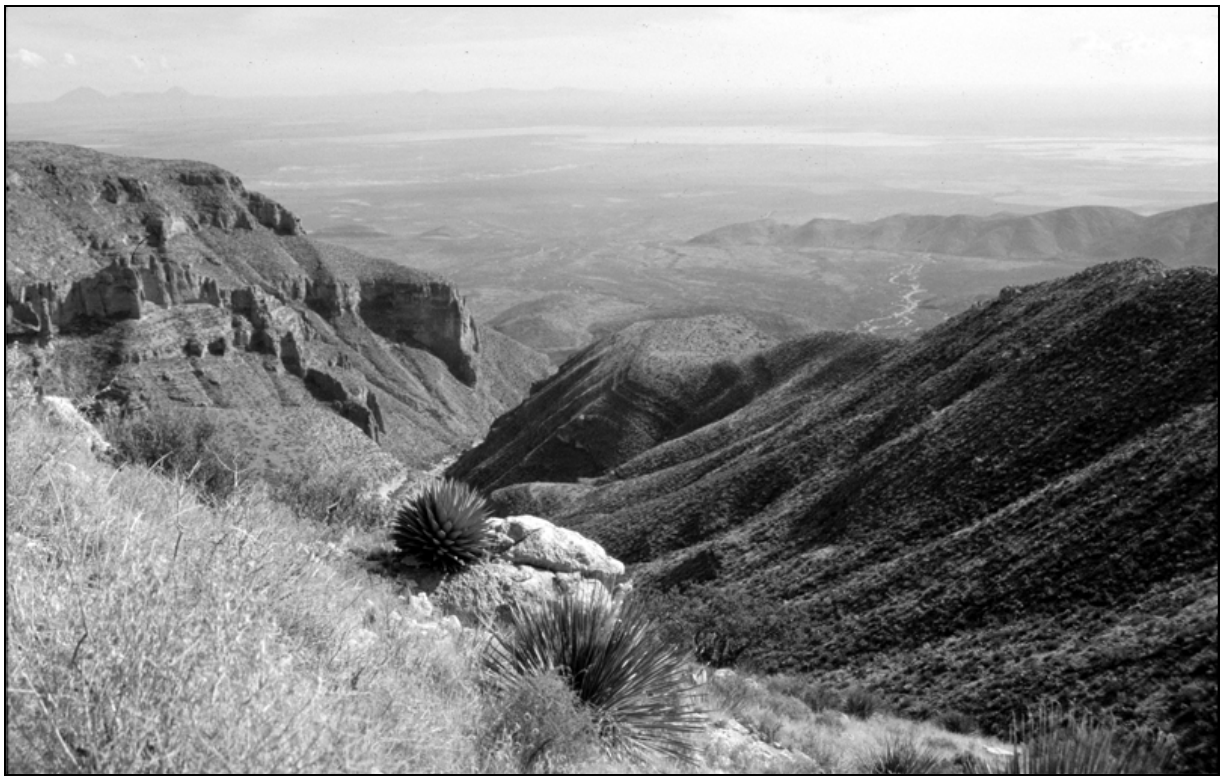
The impact analysis evaluated the effects of the alternatives on the following aspects of park operations:

- management, administration, and staffing
- infrastructure, including employee housing, maintenance, and visitor facilities

Only the impacts related to new activities, those likely to undergo major operational changes, or those that are likely to increase or decrease in the level of activity are included in the analysis. Most daily and programmatic activities are likely to have negligible effects, that is, there would not be measurable change in or difference in park operations. These activities are generally not included in the analysis. The analysis is more qualitative than quantitative because of the conceptual nature of the alternatives. Consequently, professional judgment was used to reach reasonable conclusions as to the intensity, duration, and type of potential impact.

- **Negligible.** Park operations would not be affected or the effect would be at or below detectable levels and would not have an appreciable effect on park operations.
- **Minor.** The effects would be detectable, but would be of a magnitude that would not have an appreciable effect on park operations.

- **Moderate.** The effects would be readily apparent and would result in a substantial change in park operations in a manner noticeable to staff and the public.
- **Major.** The effects would be readily apparent, would result in a substantial change in park operations in a manner noticeable to staff and the public, and would be markedly different from existing operations.
- **Duration.** Short-term impacts would be less than one year. Long-term impacts would extend beyond one year and have a permanent effect on operations or facilities.



Looking down El Capitan Trail

ALTERNATIVE A: NO ACTION

NATURAL RESOURCES

Soils

Developed areas in the park that are currently disturbing soils include Pine Springs, Frijole Ranch, McKittrick Canyon, Ship-on-the-Desert, Williams Ranch, and Dog Canyon. Existing facilities causing impacts on soils include roads, parking areas, trails, campgrounds, picnic areas, buildings, footbridges, utility systems (water, wastewater, and the overhead power lines at McKittrick Canyon), and corrals.

Alternative A would result in ongoing soil disturbance caused by the use of these facilities. Ongoing soil disturbances also would result from maintenance activities such as trail and road grading, road resurfacing, repairing buildings, and maintaining the water and wastewater systems. These ongoing actions would be restricted to small areas that previously had been disturbed. Sites with soil disturbance would continue to have accelerated wind and water erosion, at least temporarily, until soils were stabilized through mitigation or natural processes. Collectively, disturbances from ongoing use and maintenance of park facilities would have minor, adverse, long-term impacts on the soil resource.

Removing the power line at McKittrick Canyon would result in negligible to minor, short-term, adverse soil disturbance. All equipment needed would traverse the already-impacted utility corridor. The power poles would either be cut off flush with the ground surface or pulled out and the resulting holes filled and recontoured. Once the poles were removed, the utility corridor would not be used by utility vehicles and would be allowed to return to natural conditions, resulting in long-term, beneficial soil impacts.

Hiker and horse traffic on trails would continue to compact soils, decrease permeability, alter soil moisture, and diminish water storage capacity. Collectively, these actions would increase erosion and change the composition of vegetation. Altered vegetative composition would create changes in soil chemistry. Because of the relatively small areas involved, the intensity of the long-term, adverse impacts would be minor.

To minimize the soil erosion associated with foot traffic, most visitor developments have been constructed where slopes are less than 15 percent. Trails were constructed to minimize impacts on soils by concentrating hikers on a maintained surface, with water and erosion control measures to mitigate impacts. Visitors are encouraged to stay on trails, especially in more heavily used areas. Ongoing trail rehabilitation would continue to include design methods of mitigation in areas where the slope is high and soils are easily eroded by wind and water. These impacts have already occurred to some degree because all of the areas involved have been disturbed. Ongoing soil erosion by wind and water and soil nutrient transport would cause minor, long-term, adverse impacts.

Past development has wholly or partly eliminated the direct inflow of water, such as Manzanita Spring; has created impervious surfaces, such as building roofs and paved roads; and has diverted precipitation from some natural drainages. In addition, soils that have been compacted have reduced rates of water infiltration. To minimize or mitigate these adverse impacts, the National Park Service would continue to implement management actions such as visitor education on the impacts of off-trail use, site hardening or trail paving, placement of fences to

direct visitor use, designated trails and campsites, and the restoration of impacted sites as funding was available. Most impacts have already occurred in the developed areas; consequently, impacts would continue to be minor, long-term, and adverse.

Soils of the two NPS-owned parcels of land proposed for addition to the park (near the southern boundary) would be protected from development. Because the area within the two parcels would continue to be protected from development, there would be no new human-caused impacts on soils.

Cumulative Effects. Past actions that have impacted soil resources outside the park include development and use of roads and trails, subdivision developments, mining and drilling, and the installation of structures such as communication towers and power lines. Soils also have been disturbed or altered by cutting and filling; removing or adding soil; tilling, grazing, and other agricultural practices; and covering with impermeable surfaces.

Agriculture, especially dryland farming and ranching, has led to the erosion of soils by removing native vegetation and replacing it with plants not necessarily suited to the desert environment. This, along with tilling the soil, has left soils exposed to erosion by wind and water.

Current and future projects that would affect soils outside the park include regional population growth and development to support that growth, subdivision developments, mining and drilling, and windmill farms in and near the Delaware Mountains.

These actions have resulted and would continue to result in long-term, moderate to major, adverse impacts on soil resources.

Within Guadalupe Mountains National Park, if efforts to restore soils and natural hydrologic processes at specific areas were successful, there would be long-term, beneficial impacts on soils at those locations. Locally, soil restoration projects in the park would have beneficial impacts, and the regional impact would be negligible because of the small areas involved.

The effects on regional soil resources caused by past, current, and foreseeably future practices, in conjunction with the impacts of alternative A, would be moderate to major, long-term, and adverse. Most of the impacts would be the result of development actions outside the park that might or might not be mitigated. The actions associated with alternative A would have a negligible long-term contribution to these cumulative impacts on soil resources.

Conclusion. Soil disturbance from ongoing use and maintenance of park facilities would have minor, adverse, long-term impacts. Removing the power lines and poles in McKittrick Canyon would result in a negligible to minor, short-term, adverse soil disturbance, and long-term, beneficial impacts on soils of the utility corridor. Trail use and its related soil erosion would result in minor, long-term, adverse impacts. Impacts of past development, such as the creation of impervious surfaces, the diversion of precipitation from natural drainages, and the compaction of soils, would continue to be long-term, adverse, and minor.

Regionally, cumulative impacts on soils would be moderate to major, long-term, and adverse. This alternative's contribution to these effects would be negligible.

Alternative A would not result in any impairment of park resources or values related to soils.

Plant Communities and Vegetation

Developed areas in the park that are currently disturbing plant communities and vegetation include Pine Springs, Frijole

Ranch, McKittrick Canyon, Ship-on-the-Desert, Dog Canyon, and Williams Ranch. There would be ongoing plant community and vegetation disturbance caused by the use of roads, parking areas, trails, campgrounds, picnic areas, buildings, footbridges, utility systems, corrals. Vegetation disturbances also would result from maintenance activities such as trail and road grading, road resurfacing, revegetation, exotic species control, native species reintroduction, repair of buildings, and maintenance of water and wastewater systems. Some plants would continue to be killed from the exposure of root systems, trampling, and removal. Plant death would continue to impact plant communities by changing the relative abundance of species and resultant species composition. Because most of these activities would continue to occur over small areas that have been previously disturbed, this would be a continuing negligible to minor, long-term, adverse impact.

Removing the power lines at McKittrick Canyon would result in negligible to minor, short-term, adverse vegetation disturbances to any plants growing in the utility corridor. Once the poles were removed, the vegetation would be allowed to return to natural conditions, resulting in long-term, beneficial vegetation impacts.

The irrigation of shade trees and lawns at the Frijole Ranch would continue to cause the growth of unnaturally lush vegetation and would allow exotic species to flourish. This would be an ongoing, minor to moderate, long-term, adverse impact.

Management of Manzanita Spring would not change. The spring would be dredged periodically to remove accumulated sediment and maintain an open pond. This would result in a negligible impact on existing plant communities and vegetation.

The two NPS-owned parcels of land proposed for addition to the park near the southern boundary would continue to be excluded from development. Because none of the area within the two parcels would be impacted by development, there would be no new human-caused impacts on vegetation.

Lands outside the park boundary that are considered critical to protecting important park-related resources, including habitat for important species of plants, might be acquired from willing sellers or through donation, or could be protected through agreements or easements. If this occurred, there would be long-term, beneficial impacts on these resources.

Cumulative Effects. Past actions that have impacted vegetation resources outside the park include development and use of roads, trails, subdivision developments, U.S. Highway 62/180, mining and drilling, communication towers, and power line installation. Vegetation communities and individual plants have been disturbed or altered by soil cuts and fills; soil removal or addition; soil loss through agricultural practices of farming, ranching, and plowing; and soil covering with impermeable surfaces.

Agriculture, especially, including dryland farming and ranching, has led to the erosion of soils by removing native vegetation and replacing it with plants not necessarily suited to the desert environment. Agriculture has, thus, greatly reduced the abundance and diversity of native desert plants outside the park. Plants have been affected by being killed and displaced, and habitat has been lost through agricultural uses and introduction of nonnative plants. This, along with tilling the soil, has disrupted vegetative communities and caused substantial vegetative changes.

The development of some private lands outside the park for residential, commercial, tourist-related, or other uses, and the construction of structures in the park, has in-

creased runoff, wind erosion, social trails, and soil compaction and has altered soil regimes. As a result, soils are less able to support vegetative growth or the establishment of new or replacement vegetation.

These actions have resulted and could continue to result in long-term, moderate to major, adverse impacts on vegetative resources. The actions of alternative A would contribute a very small increment to the cumulative impacts.

Conclusion. Maintenance and ongoing visitor use would continue to have negligible to minor, long-term, adverse effects on vegetation. Removing the power lines at McKittrick Canyon would result in negligible to minor, short-term, adverse vegetation disturbance in the utility corridor and a long-term, beneficial impact. Continued irrigation of shade trees and lawns at the Frijole Ranch would encourage non-native species, a minor to moderate, long-term, adverse impact. The proposed boundary change would have negligible impacts on vegetation, and beneficial impacts could result from arrangements that protected vegetation and plant communities outside the park.

The cumulative impacts on vegetation would continue to be long-term, moderate to major, and adverse. This alternative's contribution to these effects would be very small.

Alternative A would not result in any impairment of park resources or values related to plant communities and vegetation.

Wildlife

There would be no change in the amount of wildlife habitat or its quality in the park under the no action alternative. Development would continue to occupy less than 1,000 acres or a little more than 1 percent of the 86,416 acres in the park.

Developed areas in the park that are currently disturbing wildlife, wildlife movement, and wildlife habitat include Pine Springs, Frijole Ranch, McKittrick Canyon, Ship-on-the-Desert, and Dog Canyon. Existing facilities causing impacts on wildlife, wildlife movement, and wildlife habitat loss and fragmentation include roads, parking areas, trails, campgrounds, picnic areas, buildings, footbridges, utility systems, and corrals. Impacts are also continuing because of ongoing maintenance activities, such as trail and road grading, road resurfacing, revegetation, exotic species control, native species reintroduction, repair of buildings, and maintenance of water and wastewater systems.

Many wildlife species are disturbed by the presence of people and developments. In addition, herbivores are adversely affected by the removal of vegetation that they use for habitat, cover, and food, while predators are adversely affected by the lack of habitat, cover, and prey species.

With the implementation of alternative A, people would continue to concentrate at developed areas intended for public and administrative use, disturbing wildlife and degrading habitat at those sites and along the trails to and from those sites. Developments themselves, regardless of how far apart they are spaced, contribute to habitat fragmentation, and roads fragment habitat and movement by some animals. Some wildlife species, such as coyotes, deer, rodents, and some birds, have long been acclimated to humans and human developments and may benefit from developments, while other species avoid such areas. Considering the large acreage of the park, the small percent of the park's wildlife habitat that has been developed, and the fact that many wildlife species have become habituated to humans and human developments, these impacts would be adverse and long-term and the intensity would be negligible to minor.

Removing the power lines at McKittrick Canyon would result in negligible to minor, short-term, adverse disturbances to wildlife within or near the utility corridor. Once the poles were removed, the habitat would be allowed to return to natural conditions, resulting in long-term, beneficial wildlife impacts.

Visitors to less-used sites, such as backcountry camping areas and wilderness, would continue to cause intermittent disruption of wildlife movement and behavior. This adverse impact would be minor and long-term.

Vehicle traffic would continue to cause a relatively low incidence of collisions with wildlife, resulting in road kill. This would result in a minor, long-term, adverse impact on wildlife.

The two NPS-owned parcels of land proposed for inclusion in the park boundary near the southern boundary would be excluded from development. Because none of the area within the two parcels would be impacted by development, there would be no new human-caused impacts on wildlife.

Lands outside the park boundary that are considered critical to protecting important park-related resources, including habitat for important species of animals, could be acquired from willing sellers or through donation, or could be protected through agreements or easements. If this occurred, there would be long-term, beneficial impacts on these resources.

Cumulative Effects. Past actions that have impacted wildlife outside the park include vegetation clearing, development and use of roads and trails, subdivision developments, U.S. Highway 62/180, mining and drilling, communication towers, and power line installation. Wildlife have been disturbed, killed, and forced to relocate by various development actions including agriculture, introduction of exotic species, hunting, trapping, collisions with vehicles on highways, and vermin control. Wildlife continues to be disrupted by development and human activity.

The development of some private lands adjacent to the park for residential, commercial, tourist-related, or other uses, and the construction of facilities in the park has adversely affected wildlife habitat and habits and has caused the loss of wildlife in some areas. Water use at these developments could reduce water available for wildlife. Road kill would increase because more development probably would increase traffic.

The current effect on wildlife caused by past practices of agriculture and ranching covers wide areas and is adverse. Impacts on wildlife of current and anticipated future actions outside the park, in conjunction with the impacts of the no action alternative, would be cumulative, moderate to major, long-term, and adverse. Most of the impacts would be the result of development actions outside the park. The actions proposed in alternative A would contribute only very slightly to these cumulative impacts on wildlife resources.

Conclusion. Activities associated with the use and operation of the park would continue to have long-term, negligible to minor, adverse impacts on wildlife. Removing the power lines at McKittrick Canyon would result in negligible to minor, short-term, adverse wildlife disturbances in the utility corridor and a long-term, beneficial impact. Collisions of vehicles with wildlife would continue to have in a minor, long-term, adverse impact on wildlife. The proposed boundary change would have negligible impacts on wildlife, and beneficial impacts could result from arrangements that protected wildlife resources outside the park.

The cumulative impacts on wildlife would be moderate to major, long-term, and adverse.

This alternative's contribution to these effects would be very small.

Alternative A would not result in any impairment of park resources or values related to wildlife.

Geological Resources

Geologic processes continually modify the features and resources within the park. Some changes are obvious (such as rock weathering), and others (such as stream migration) may be more subtle. Alternative A would have negligible impacts on such geologic processes as rock weathering, mass wasting, dune formation, and the development of sinkholes.

Alternative A would have long-term implications relating to changes in the flow of water in the desert environment. Some park activities, such as trail and infrastructure development and maintenance, could impact geologic processes by, for example, increasing erosion rates or diverting or channeling natural runoff. The impacts of development and maintenance activities can be partially mitigated by best management practices such as constructing water bars to facilitate trail drainage while minimizing erosion, or by installing silt fencing at construction sites to reduce sedimentation of water bodies. Consequently while the impacts on geologic processes from these activities would continue to be long-term and adverse, the intensity would be negligible to minor.

Changes in geologic processes relating to water could continue to impact other park resources. Trails and other types of construction could change natural runoff patterns, which could cause changes to recharging aquifers or could alter the flow regime of ephemeral streams in the park. These changes could in turn impact the vegetation and wildlife that depend on the stream in this arid region. While these impacts would continue to be adverse and long-term, the intensity would be minor because of the small areas involved and the ongoing park maintenance and mitigation (such as rerouting of problem trail segments) that prevents serious problems from developing.

The park would continue to require that all visitors to caves have a permit for safety and management purposes. Potential adverse impacts on the geologic resources in the caves include compaction of the cave floor, intentional and inadvertent breaking of cave formations, and scuff marks on the cave walls. At the current low level of visitation, the adverse impacts on the caves would continue to be negligible over the long term.

There are three areas in the park that contain the reference stratotype for a particular geologic formation. Potential impacts from theft or vandalism would continue to be limited by the remote locations of these areas, and the adverse, long-term impacts would remain negligible. Individuals who have obtained a permit from the park can collect samples from the reference stratotype areas for research purposes. Currently, the number of permits issued each year is low, and the adverse impacts of continuing this system would be negligible to minor and long-term. Because these resources are nonrenewable, ongoing monitoring would be required to ensure that the aggregate impact from visitors and researchers would not increase.

Two sections of NPS-owned land outside the park's legislated boundary contain rare exposures of geological formations. One exposure is the official reference stratotype for the formal rock unit, the Pipeline Shale Member of the Brushy Canyon Formation. Gas and petroleum pipeline rights-of-way cut through this section and are responsible for exposing some of the classic outcroppings. This management plan proposes a boundary change to include these NPS-owned areas in the park. Current management activities include documentation and

monitoring of the condition of the rock unit. The park staff is working cooperatively with the pipeline companies to minimize any impacts on the formations from pipeline construction and maintenance. Currently the impacts on the geological formations in these sections are adverse, negligible, and long-term.

Lands outside the park boundary that are considered critical to protecting important park-related resources, including groundwater, the Salt Basin Dunes, and type localities for geologic resources, could be acquired from willing sellers or through donation, or could be protected through agreements or easements. If this occurred, there would be long-term, beneficial impacts on these resources.

Cumulative Impacts. Past actions that have impacted geologic resources outside the park include development and use of roads and trails, subdivision developments, U.S. Highway 62/180, mining and drilling, communication towers, power line installation, and use of some caves. Geological resources have been disturbed or altered by cuts and fills; soil removal or addition; soil loss (thus exposing geologic resources) from agricultural practices of farming, ranching, and plowing; drilling or removal through mining; and covering with impermeable surfaces.

Current and future projects that would affect geological resources outside the park include regional population growth and development to support that growth, subdivision developments, mining and drilling, and windmill farms in and near the Delaware Mountains.

Long-term, adverse impacts on the near-surface geology from these developments have been localized and range in intensity up to moderate. Cumulative impacts from these developments on geologic formations that are more than 50 feet from the surface have been negligible. The actions proposed in alternative A would contribute only very slightly to near-surface cumulative impacts on geologic resources and would have negligible effects on deeper formations.

Conclusion. Long-term, adverse impacts of negligible to minor intensity would result from continued park operation, particularly from the use and maintenance of trails. Long-term adverse impacts would continue to be negligible for caves and negligible to minor for the three areas of geologic formation reference stratotypes. The proposed boundary change would have negligible impacts on geology, and beneficial impacts could result from arrangements that protected geological resources outside the park.

The cumulative impacts on near-surface geologic resources would be long-term and adverse, and locally could be of moderate intensity. This alternative's contribution to these effects would be very small.

Alternative A would not result in any impairment of park resources or values related to geologic resources.

Paleontological Resources

Current park facilities, including roads, parking lots, and buildings are not sited on areas that would adversely impact paleontological resources.

About 18 miles of the park's 82 miles of trails extend across areas identified as having high potential for paleontological resources. This is an area equivalent to about 11 acres of the total estimated 27,000 acres of the park having a high potential for paleontological resources. Trail construction and maintenance has had both adverse and beneficial effects on these resources. The initial blasting and rubble clearing had an adverse impact, as does ongoing trail maintenance when rock is removed from the tread and banks, because these activities can damage fossils. Mitigation measures would include collection and

in situ stabilization. Erosion along trails and informal (or social) trails can also damage exposed fossils. These impacts are adverse, minor, and long-term.

Horses impact fossils in park trails because horseshoes grind away the limestone that composes the fossils and rocks. Because of the limited area involved, the impacts are adverse, minor, and long-term.

There are indirect beneficial impacts associated with activities that expose fossils in the park. Because the Permian limestone is hard, the weathering processes that break down fossils act slowly. The ability to see intact fossils *in situ* is beneficial for both research and visitor interpretation and supports the mission and purpose of the park.

The fossils found in the caves are from the Pleistocene and are relatively young, ranging in age from 10,000 to 30,000 years old. Typically, the fossils are buried in the cave floors after falling or washing into the cave with other sediments. Potential impacts on the fossils from visitors include compaction of the cave floor, intentional or inadvertent damage to the fossils, and theft. Currently, cave access is restricted, which limits the long-term, adverse impacts on the paleontological resources to minor.

Within the park there are at least 22 type fossil localities. These areas could be adversely impacted by inadvertent or intentional destruction of the fossils or by theft. Access to these areas is difficult and not always along trails, so the long-term, adverse impacts of continuing current management would be minor.

The two sections of NPS-owned land proposed for inclusion in the park boundaries are locations of rare exposures of geological formations. Several important, historically documented and currently producing paleontological localities occur in these sections. Gas and petroleum pipeline rights-of-way cut through one of these sections. Current management activities of fossil localities away from the right-of-way include documentation and monitoring to prevent losses to the paleontological resources by erosion. The park is working cooperatively with the pipeline companies to minimize impacts on the formations from pipeline construction and maintenance. Currently, the impacts on the reference units are adverse, minor, and long-term.

Lands outside the park boundary that are considered critical to protecting important park-related resources, including paleontological sites and type localities for fossils, could be acquired from willing sellers or through donation, or could be protected through agreements or easements. If this occurred, there would be long-term, beneficial impacts on these resources.

Cumulative Impacts. The effects on paleontological resources caused by past practices cover wide areas and are adverse. These impacts include exposure, damage, or destruction of paleontological resources, and the damage or destruction of important scientific context or other information. Past actions that have caused these effects outside the park include development and use of roads and trails, subdivision developments, U.S. Highway 62/180, mining and drilling, communication towers, power line installation, and allowing use of some caves. Paleontological resources have been disturbed or altered by cuts and fills; soil removal or addition; soil loss (thus exposing paleontological resources) through agricultural practices of farming, ranching, and plowing; and drilling or removal through mining.

Other past actions that have impacted paleontological resources outside the park include development and use of the Carlsbad Caverns and Lechuguilla Cave. Many areas in Carlsbad Caverns are developed for extensive visitor use and include trails, rest-

rooms, dining facilities and souvenir stand, electrical lines and lighting, and elevators. Lechuguilla Cave remains undeveloped and is accessed rarely and only for valid scientific study.

Current and future projects that would affect paleontological resources outside the park include regional population growth and development to support that growth, subdivision developments, mining and drilling, and windmill farms in and near the Delaware Mountains.

Despite the widespread occurrence of long-term, adverse impacts, effects on paleontological resources in near-surface locations and in caves from these developments have been localized and the intensity typically has been no more than moderate. Cumulative impacts from these developments on paleontological resources that are more than 50 feet from the surface (other than those in caves) have been negligible. The actions proposed in alternative A would contribute only very slightly to cumulative impacts on paleontological resources in the near-surface and in caves, and would have negligible effects on deeper resources.

Conclusion. Adverse, minor, long-term impacts on park paleontological resources would continue to occur because of hiking trail use, trail use by horses, use of caves, and access to type fossil localities. Indirect beneficial impacts would result from activities that exposed fossils in the park for research and visitor interpretation. The proposed boundary change would have negligible impacts on paleontological resources, and beneficial impacts could result from arrangements that protected paleontological resources outside the park.

The cumulative impacts on near-surface and cave paleontological resources would be long-term and adverse, and locally could be of moderate intensity. This alternative's contribution to these effects would be very small.

Alternative A would not result in any impairment of park resources or values related to paleontological resources.

CULTURAL RESOURCES

Archeological Resources

Archeological resources adjacent to or easily accessible from trails or picnic, camping, and parking areas, as well as archeological resources in the park's caves that are accessible by permit to visitors, would be vulnerable to surface disturbance, inadvertent damage, and vandalism. A loss of surface archeological materials, alteration of artifact distribution, and a reduction of contextual evidence could result. Continued ranger patrol and increased emphasis on visitor education would help discourage inadvertent destruction of cultural remains and vandalism, and few if any adverse effects would be anticipated. However, sites or areas with archeological resources that are subject to continued degradation could be closed to visitor access to better protect the resources.

Implementation of this alternative would result in continued routine trail maintenance, which could include limited rerouting of problem trail segments to improve resource protection. Archeological surveys would precede any ground disturbance associated with the reconstruction of trail segments. In addition, archeological surveys or monitoring would occur, as appropriate, during the reseeding and/or revegetation of trail segments being rehabilitated to natural conditions. Because national register-listed or -eligible archeological resources would be avoided to the greatest extent possible, no adverse effects on archeological resources would be anticipated. If, however, significant archeological resources could not be avoided during trail construction, the effects

on such resources would be adverse. A memorandum of agreement, in accordance with 36 *Code of Federal Regulations* Part 800.6, "Resolution of Adverse Effects," would be negotiated between Guadalupe Mountains National Park, the Texas state historic preservation officer, and, if necessary, associated American Indians. The memorandum of agreement would stipulate how the adverse effects would be mitigated.

Cumulative Impacts. Past development in the park and the planned construction of subdivisions along the park's southern and western borders (some grading has been done along the western border) might have had adverse effects on archeological resources during excavation and construction activities. In addition, cattle grazing both inside and outside the park might have had adverse effects on archeological resources.

Reasonably foreseeable future actions occurring throughout the region include cattle grazing, continued subdivision development, natural gas and oil exploration and development, and the construction of windmill farms and communication towers. These actions could disturb archeological resources outside the park's boundaries. Impacts on national register-eligible or -listed archeological resources that could not be avoided would be adverse effects.

Because national register-listed or -eligible archeological resources within the park would be avoided to the greatest extent possible during implementation of alternative A, the actions associated with the alternative would contribute only minimally to the adverse effects of other past, present, or reasonably foreseeable actions. Any adverse effects on archeological resources resulting from implementation of alternative A would be a very small component of the cumulative adverse impact.

Conclusion. Avoidance of national register-listed or -eligible archeological resources during the repair of trail segments would result in no adverse effects on archeological resources. Few if any adverse effects would result from inadvertent disturbance or vandalism.

The cumulative impacts on archeological resources would result in adverse effects. This alternative's contribution to these effects would be very small.

Alternative A would not result in any impairment of park resources or values related to archeological resources.

Historic Structures

To appropriately protect the park's national register-listed or -eligible historic structures, including remnant historic ranching structures in the backcountry or wilderness, all stabilization and preservation as well as daily, cyclical, and seasonal maintenance would be undertaken in accordance with standards and guidelines from the Secretary of the Interior (1983, 1995a, and 1995b). There would be no adverse effects on the park's historic structures as a result of any stabilization or preservation efforts.

Past visitor use patterns at Guadalupe Mountains National Park have put some historic structures at risk from visitor activities. For example, unsupervised children have dislodged stones from the remnant limestone walls of the Pinery, and signs of wear on the linoleum floor covering at the schoolhouse of the Frijole Ranch led to changes in how visitors access the ranch. Historic structures accessible to visitors, including the Pinery, Frijole Ranch, Pratt Cabin, and Williams Ranch, would continue to experience wear and tear from increased visitation, and unstaffed or minimally staffed structures could be more susceptible to vandalism.

Visitors in backcountry and designated wilderness areas could encounter remnant his-

toric structures of past ranching activities, such as metal and concrete water storage tanks and metal pipelines. Continued ranger patrol and increased emphasis on visitor education would help discourage vandalism and inadvertent damage of historic fabric. Monitoring the carrying capacity of historic structures that visitors are allowed to enter could result in the imposition of management actions that would contribute to the stability or integrity of the resources without unduly hindering interpretation for visitors. Historic structures subject to continued degradation could be closed to visitor access to better protect the resources. As a result, few if any adverse effects would be anticipated.

Cumulative Impacts. Reasonably foreseeable future actions occurring throughout the region include continued subdivision development, natural gas and oil exploration and development, and the construction of windmill farms and communication towers. These actions would have no potential to affect historic structures in the park but could have adverse effects on historic structures outside the park.

As described above, implementation of alternative A would result in few if any adverse effects on the park's historic structures. Yet, because of the adverse impacts of other past, present, or reasonably foreseeable actions, cumulative impact would result in adverse effects. Any adverse impacts contributed by alternative A to the cumulative impacts would be a very small component of the adverse cumulative impact.

Conclusion. Few if any adverse effects would be anticipated from implementing alternative A.

Cumulative impacts on historic structures would result in adverse effects. This alternative's contribution to these effects would be very small.

Alternative A would not result in any impairment of park resources or values related to historic structures.

Cultural Landscapes

The current rehabilitation of the Frijole Ranch house's cultural landscape is being undertaken in accordance with the cultural landscape report (NPS 1995a) prepared for the property. There would be no adverse effects associated with rehabilitation of the property.

No further changes to the cultural landscapes of the national register-listed Frijole Ranch or the Pinery are proposed. To appropriately preserve and protect the landscapes, all stabilization and preservation efforts would continue to be undertaken in accordance with standards and guidelines from the Secretary of the Interior (1983, 1995a, 1995b). No adverse effects would be anticipated.

Removal of the power lines and poles from McKittrick Canyon would have no adverse effect on the cultural landscape associated with the Pratt Cabin, which is one of the park's 10 cultural landscapes for which a cultural landscape inventory remains to be done. Installation of the power lines and poles postdate the construction of Pratt Cabin (1931-1932) by more than four decades and are not character-defining features of the landscape.

The research necessary to determine the national register eligibility of each of the park's 10 potential cultural landscapes is a prerequisite for establishing the significance and identifying the character-defining features of the landscapes, as well as the basis of informed decision making in the future regarding how the landscapes should be managed. Such research would precede the construction of any trails or trail segments that could potentially alter the character-defining features (spatial organization, topography,

vegetation, circulation features, and land use patterns) of the landscapes. As a result, no adverse effects would be anticipated.

Cumulative Impacts. Over the years, cultural landscapes in the park have been adversely affected by erosion, development, and visitor use. Outside the park, ongoing and reasonably foreseeable future actions include development of the Guadalupe Mountains Estates subdivision along the park's southern and western borders, natural gas and oil exploration and development, and the construction of windmill farms and communication towers. These actions have the potential to disturb cultural landscapes. Impacts on national register-eligible cultural landscapes that could not be avoided could be adverse, depending on the scope of the potential actions and the character-defining features and/or landscape patterns affected.

Because of the adverse impacts of other past, present, or reasonably foreseeable actions, the cumulative impact would be adverse. Alternative A would not contribute any adverse impacts to the cumulative adverse impact.

Conclusion. Implementation of alternative A would result in no adverse effects on the park's cultural landscapes.

Cumulatively, there would continue to be adverse effects on the region's cultural landscapes. This alternative would contribute a very small increment to these cumulative impacts.

Alternative A would not result in any impairment of park resources or values related to cultural landscapes.

Ethnographic Resources

Visitors could intrude on Mescalero Apache or Tigua Indians of Ysleta del Sur Pueblo individuals observing sacred rituals or seeking solitude to practice traditional beliefs. However, visitor access to the ridge of the Guadalupe Mountains and to the slopes of the western escarpment would continue to remain remote and regulated by special permit, and adverse impacts on Mescalero or Tigua practitioners resulting from the distraction of inadvertent visitor encounters would be minor.

Visitation at McKittrick Canyon and Manzanita Spring could also be potentially disruptive to Mescalero traditional use in those areas. Adverse impacts on Mescalero traditional use would be minor.

It is the understanding of the National Park Service that the Tigua Indians of Ysleta del Sur Pueblo would prefer that visitors not be allowed into the gypsum sand dunes. Impacts on Tigua sensitivities from continued visitation of the sand dunes would be moderate, adverse, and long-term.

Visitors using the rest stop off U.S. Highway 62/180 would continue to be able to observe the image of Our Lady of Guadalupe (part of El Capitan rock formation). Because there would be no change, there would be negligible impacts on traditional Spanish American viewing of this ethnographic resource.

Continued American Indian consultations between the park staff and the Mescalero Apache Tribe and the Tigua Indians of Ysleta del Sur Pueblo could result in the sharing of knowledge about indigenous plants that would lead to better resource management of certain plants in the park. Impacts from increased park staff knowledge would be beneficial and long-term.

Cumulative Impacts. Within the park, minor to moderate, long-term, adverse impacts on ethnographic resources result both from the inadvertent interruption of traditional practices by visitors and continued visitor access to the gypsum sand dunes. In addition, ongoing American Indian consultations

result in the beneficial sharing of knowledge of indigenous plants with park staff.

Outside the park, past, present, and reasonably foreseeable actions such as subdivision development, gas and oil exploration and development, and the construction of windmill farms and communication towers could intrude on places of cultural importance. Impacts on ethnographic resources could be adverse and long-term and could range in intensity from minor to moderate. Implementation of the no action alternative would contribute minor to moderate, adverse impacts and minor beneficial impacts to the adverse impacts of other past, present, and reasonably foreseeable actions. The beneficial impacts associated with the no action alternative would be a very small component of the cumulative impacts, which would be minor to moderate and adverse.

Conclusion. Continued park-related use of the sand dunes would result in moderate, adverse, long-term impacts. Visitors using other areas of the park would have minor adverse effects on individuals observing sacred rituals or seeking solitude to practice traditional beliefs. The alternative would have negligible impacts on visitor patterns of viewing the Our Lady of Guadalupe image. Impacts from increased park staff knowledge about indigenous plants would be beneficial and long-term.

The cumulative impacts would be long-term, minor to moderate, and adverse. This alternative's contribution to these effects would be minor to moderate.

Alternative A would not result in any impairment of park resources or values related to ethnographic resources.

Museum Collections

The park's museum collections would continue to be adequately inventoried, accessioned, and protected according to NPS standards. However, more space for curation, storage, and research will be needed in the future. During the life of the general management plan, a part of the park's museum collections could be moved to a facility outside the park, such as a university, college, or museum. There, the specimens would be housed under state-of-the-art museum standards for fire detection and suppression; security; temperature and humidity control; and curation, storage, and research space. Providing more space for curation, storage, and research would have a beneficial, long-term impact on the park's museum collections.

The utmost care would be exercised during the packing, moving, and unpacking of all collections. Therefore, potential impacts on the park's museum collections associated with the risk involved in moving artifacts, specimens, and archives would be negligible to minor, adverse, and short-term. Moving part of the park's museum collections to a facility outside of the park would be less convenient for park staff who need to use the collections for research or study, which would be a minor to moderate, adverse, long-term impact.

Cumulative Impacts. The park's museum collections have been and continue to be adequately stored and protected according to NPS standards. In the future, part of the park's museum collections might have to be moved to quarters with more space, perhaps to a university, college, or museum in the region. Impacts on the park's museum collections when adequate space for curation, storage, and research was acquired would be beneficial and long-term.

At Carlsbad Caverns National Park the museum collections and archives were moved out of the visitor center to a self-contained Bally building. The security and safety of the collections has been improved, and more curatorial and storage space is provided.

This resulted in a long-term, beneficial impact on regional museum collections.

Implementation of the no action alternative would potentially contribute beneficial impacts when associated with other past, present, and reasonably foreseeable actions. The cumulative impact on museum collections would be beneficial and long-term.

Conclusion. Insufficient space in the park would result in negligible to minor, adverse, short-term impacts on museum pieces during moving and a minor to moderate, adverse, long-term impact on the ability of park staff to use offsite collections for research or study.

The cumulative impacts on the museum collections would be long-term and beneficial. This alternative's contribution to these effects would be beneficial.

Alternative A would not result in any impairment of park resources or values related to museum collections.

VISITOR EXPERIENCE AND UNDERSTANDING

Access, Activities and Destinations, and Scenic Views

Access. Most visitors arrive at Guadalupe Mountains National Park by car. Within the park, access to developed sites is mostly by driving, while the interior of the park is accessed by hiking. Horseback riding is allowed on some trails.

Continuing four-wheel drive, high-clearance-vehicle access to Williams Ranch would continue to limit access for some visitors. The Salt Basin Dunes would continue to be accessible only on foot, which limits access for some visitors. This would result in a long-term, adverse impact for visitors who wanted to access these areas but could not. The intensity of the impact would depend on personal perceptions but typically would range from negligible to minor. Visitors who can access these areas and who desire solitude may benefit from the low frequency of encounters with others in these parts of the park.

Activities and Destinations. Visitors would continue to experience the park primarily as a natural scenic resource, with hiking being a popular activity. Developed areas such as Pine Springs, Frijole Ranch, McKittrick Canyon, and Dog Canyon would continue to receive the types and amount of uses that occur today. Use of the backcountry would continue, both for day hiking and backpacking. A small increase in use of the Salt Basin Dunes could occur as a result of publicity and word of mouth. Beneficial impacts would derive from the continued availability of enjoyable experiences.

The parking and picnic areas at Frijole Ranch would be relocated and improved, and the cultural landscape would be rehabilitated. These changes would have a beneficial impact on visitor experience at this location by allowing visitors to experience the ranch and its cultural landscape from the early 1900s era, and by expanding recreational opportunities.

Continuing use of the Ship-on-the-Desert structure as a quarters and meeting facility for researchers and volunteers would have a beneficial impact on its users.

Scenic Views. Guadalupe Mountains National Park visitors described viewing wilderness and scenery, day hiking, viewing nature, and watching wildlife as the most important reasons for visiting the park (University of Texas at El Paso, 1997). Under alternative A, visitors would continue to benefit from the opportunity to view the scenery, including wildlife, geologic formations, and cultural features, from numerous locations within and outside the park. Removing the

electrical lines along McKittrick Creek would have long-term, beneficial impacts on the scenic view by providing a more natural landscape with less evidence of human development.

Cumulative Impacts. Anticipated population growth in urban areas of west Texas and on the western side of the park could cause increased visitation from those areas. This could lead to adverse impacts relating to crowding at highway turnouts or reduced solitude at selected locations.

Development of food, lodging, or gasoline facilities near the park could have adverse impacts on scenic views while improving the availability of visitor services.

Cumulative adverse impacts on access, activities, and destinations would be minor. Implementation of alternative A would have a minor contribution to the cumulative impact. Future outside-the-park development could have a moderate to major adverse impact on scenic views. The beneficial contribution of alternative A to the continued protection of scenic views is substantial.

Conclusion. Alternative A would have negligible to minor, long-term, adverse impacts on visitor access and beneficial impacts for visitors desiring solitude. It would have beneficial impacts on activities and destinations and on scenic views.

Cumulatively, actions of others would have generally adverse impacts. Implementation of alternative A would continue to be important in protecting scenic views outside the park.

Interpretation, Education, and Orientation

Interpretation., Only a small fraction of visitors to Guadalupe Mountains National Park attend interpretive programs. The national average for the National Park Service in 2003 was about 5 percent of visitors attend formal interpretive programs Park staff confirm that this value probably is reasonable for Guadalupe Mountains National Park. Participants' satisfaction with and the perceived importance of those programs is very high. Informal contacts with NPS staff and volunteers are more frequent, and also are highly rated.

Interpretive media, such as the park brochure and wayside exhibits, are encountered by a larger percentage of visitors than are personal programs. Visitor satisfaction with these elements is relatively high. Under alternative A, park visitors would continue to benefit from the availability of effective park and trail folders and outdoor wayside exhibits.

Education. Under alternative A, the impacts of educational programs on participants' attitudes, knowledge, and behavior would continue to be greater than for public interpretive programs. This would include beneficial impacts associated with the ability to contact groups with little previous access to or experience in national parks, and to contact people before they visit the park. The effectiveness of delivering offsite programs would continue to be limited by the absence of direct sensory experiences with park resources.

Orientation. Visitors would continue to receive information and orientation about the park from multiple sources. Contacts with park staff at visitor facilities, through roving contacts, and at programs would continue to be an important, personal source. Other common information sources would continue to be bulletin boards, park publications, area residents and service workers, travel and tour publications, the Internet, telephone and mail inquiries, and friends and neighbors who have visited the park.

Orientation exhibits in the Pine Springs visitor center and McKittrick Canyon contact

station would continue to be supplemented for many visitors by personal services. Information and media on the west side of the park would continue to be limited to a contact station in Dell City, which many visitors miss. This results in continuing minor, long-term, adverse impacts on visitors to the park's west side.

Cumulative Impacts. Internet use among the general population and continued development and improvement of the park Internet site would continue to have a long-term, beneficial impact on visitor information and orientation because of increased availability of information. Activities by partners, including schools, news outlets, community agencies, travel services, and local and state jurisdictions, would provide long-term, beneficial cumulative impacts. Collectively with alternative A, the long-term impact would be beneficial.

Conclusion. Alternative A would have beneficial impacts on interpretation, education, and orientation. Limited access to information at the Dell City contact station would have continuing minor, long-term, adverse impacts on visitors to the park's west side.

The cumulative impact with other information sources would be beneficial.

THE SOCIOECONOMIC ENVIRONMENT

Regional Economic and Demographic Conditions

Implementation of the no action alternative would continue to provide economic benefits to the counties but would contribute little to future growth. Current management practices and visitor services would continue. The park's ongoing efforts to enhance interpretation and the visitor experience would continue. Facility and other capital improvement projects would be undertaken as funding was available.

Little or no change in the park's staffing levels or budgets would occur under the no action alternative.

Visitation levels have fluctuated between about 180,000 and 230,000 visits annually since 1993. Visitation could trend slightly higher over time with an increase in the regional populations and improved visitor interpretation and services. Some of the increase would likely be a result of continuing economic and population growth of the neighboring El Paso and Odessa-Midland metropolitan areas, which are the points of origins for many repeat visitors to the park.

About 90 percent of the visits to the park are day use, with overnight stays accounting for the remainder. Camping fees collected by the park might increase over time. The increased visitation could also generate additional retail spending at park facilities and the few nearby commercial businesses along the primary highway access corridors. The increased visitor spending could boost the park's regional economic stimulus above the current $10.6 million in output and an estimated 177 jobs.

Housing and Community Infrastructure

More than half of the park's staff members live in communities outside the park, primarily Carlsbad, New Mexico, and the entire staff and their dependent households travel to these communities for shopping, health care, banking, education, and other services, which results in a beneficial effect on the local economy. The park also maintains housing for staff in critical positions, operates water and wastewater systems, and has onsite fire and emergency medical equipment. Park personnel provide law enforcement, fire suppression, and emergency medical services within the park. The no ac-

tion alternative would not alter any of these aspects of the park's operations.

Visitors to the park support the region's tourism industry, a beneficial socioeconomic effect. They also impose demands on local services and infrastructure when traveling through these communities or spending one or more nights in local lodging accommodations. Minor adverse impacts of alternative A on the local and regional economy would relate to minimally increased demand for public services, such as police, fire, and road maintenance. These demands are likely to be offset by the fees, sales and property taxes, and other revenues that support state and local government operations and are generated by staff and visitors, for a net beneficial effect. Such revenues would increase over time as visitation increased, resulting in a long-term, beneficial impact to community infrastructure.

Cumulative Effects. Other projects affecting the socioeconomic environment near the park include the construction of telecommunications facilities (including cell phone towers), pipelines, and wind-turbine electric generating facilities along the U.S. Highway 62/180 corridor or in the Delaware Mountains. Potential impacts from such construction include increases in visitation at the park, and short-term demands on highway patrol and highway maintenance functions.

Increases in residential development on private lands adjacent to the park's southern and western sides could result in increased visitation levels at the park and require additional management efforts along those park boundaries. Under the no action alternative, this could require a reallocation of staff, decreasing their availability in other areas of the park.

Cumulative effects on regional socioeconomic conditions generally would be beneficial. The no action alternative's contribution to these effects would be very small.

Conclusion. Alternative A would have beneficial impacts on regional economic and demographic conditions, area housing, and community infrastructure.

Cumulative effects on regional socioeconomic conditions generally would be beneficial and this alternative's contribution to these effects would be very small.

PARK OPERATIONS, FACILITIES, AND EQUIPMENT

Management and Administration

The park staff would continue to use shared administrative functions of procurement, contracting, and human resources services at the "town office" in Carlsbad, New Mexico. This would continue to be a long-term benefit for park operations because it saves park budget and staffing requirements.

There originally were operational efficiencies from the combination of park administration and visitor functions at the centralized Pine Springs headquarters facility. However, because of the growth in office and museum collection space needs, some of the benefits of co-location have been lost as other buildings have been used to accommodate headquarters overflow. This condition would increase under the no action alternative and would result in a long-term, moderate, adverse impact on operations.

Through core operations, the park management is streamlining the organization. To achieve resources management goals, the National Park Service would hire more seasonal and term position rather than using full-time staff for these activities. This will enable park management to be more efficient and flexible in budgeting, and would result in a long-term benefit to park operations.

Employee Housing

Existing onsite park housing, including the Dog Canyon ranger station, would continue to have a long-term, beneficial impact because it would provide an onsite presence and would allow park staff to be available for situations requiring emergency services or timely infrastructure repairs. Although the park currently has adequate housing units for these required residents, some units are being used to supplement the inadequate office space for park administration. Over the long term, alternate uses of park housing units could reduce the park's ability to have housing available to meet future critical staffing needs. This would adversely impact the park's ability to recruit seasonal employees or volunteers who would need park housing and would result in a long-term, moderate, adverse impact.

Maintenance

The park would continue to maintain all park and visitor facilities and infrastructure through cyclic and repair/rehabilitation programs. However, with an aging infrastructure, the past addition of new lands on the park's west side, and the potential of increasing visitation, the park staff could be presented with increasing challenges in carrying out the park's maintenance requirements, and deferred maintenance would continue to accumulate. Based on these factors, this alternative would continue to present a long-term, minor, adverse impact on park operations, resulting from deferred maintenance.

Relocating the pack animal operations to the Pine Springs area would be a long-term benefit because it would consolidate park maintenance activities and increase efficiency.

Cumulative Impacts. Increased development that is occurring outside the park boundary would lead to new access roads, buildings, and informal trails. Additional maintenance activities such as fencing and landscape restoration would be necessary to mitigate the impacts on park lands. This alternative, in combination with the impacts above, would result in cumulative impacts on operations that would be minor, adverse, and long-term. However, this alternative's direct contribution to these effects would be slight.

Conclusion. Insufficient administrative space that resulted in a loss of efficiencies, and the conversion of housing to office space that reduced the park's ability to meet housing needs for critical staff have resulted in long-term, moderate, adverse impacts on operations. Deferred maintenance would represent a long-term, minor, adverse impact on park operations. A long-term benefits result from use of consolidated administrative functions in a "town office" in Carlsbad and relocation of the pack animal operations to the Pine Springs area.

The cumulative impacts would be minor, adverse, and long-term, and this alternative's contribution would be slight.

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The intent of this determination is to identify whether the alternative to continue current management would result in trading the immediate use of the land for any long-term management possibilities or the productivity of park resources that would affect future generations. It is intended to determine whether alternative A would be a sustainable action that could continue over the long-term without environmental problems.

Alternative A would be a sustainable action that would not change the use of Guadalupe

Mountains National Park or affect the long-term productivity of lands affected by its operation for future generations.

ANY IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED SHOULD THE ALTERNATIVE BE IMPLEMENTED

The intent of this evaluation is to identify whether this alternative would result in effects that could not be changed over the long term or would be permanent. An effect on a resource would be irreversible if the resource could not be reclaimed, restored, or otherwise returned to its condition before the disturbance. An irretrievable commitment of resources involves the effects on resources that, once gone, cannot be replaced or recovered.

Alternative A would not involve the irreversible or irretrievable commitment of resources. No resources would experience major adverse impacts and no impairment of park resources would occur as a result of this alternative.

ANY ADVERSE IMPACTS WHICH CANNOT BE AVOIDED SHOULD THE ACTION BE IMPLEMENTED

The intent of this determination is to identify whether this alternative would result in impacts that could not be fully mitigated or avoided. The focus of this assessment is on real environmental issues that would involve major impacts if action was taken.

None of the effects identified in this assessment of alternative A would be considered major adverse impacts. The implementation of this alternative for managing Guadalupe Mountains National Park would not result in impairment of any resources that would affect the basic purpose of Guadalupe Mountains National Park.

Aerial view of Pine Springs and El Capitan

PREFERRED ALTERNATIVE

NATURAL RESOURCES

Soils

Many of the impacts of the preferred alternative on soils would be the same as for the no action alternative. Specifically, soil disturbance from ongoing use and maintenance of park facilities would have minor, adverse, long-term impacts. Removing the power lines and poles in McKittrick Canyon would result in a negligible to minor, short-term, adverse soil disturbance, and long-term, beneficial impacts on soils of the utility corridor. Pedestrian traffic and its related soil erosion would result in minor, long-term, adverse impacts. Impacts of past development, such as the creation of impervious surfaces, the diversion of precipitation from natural drainages, and the compaction of soils, would continue to be long-term, adverse, and minor.

Actions of the preferred alternative would disturb about 200 acres of soil throughout the park. Many of these areas have been previously disturbed. All sites with soil disturbance would undergo accelerated wind and water erosion, at least temporarily, until drainage structures were fully operational and vegetation had recovered in cleared areas that were not converted to impervious surfaces.

During construction, the National Park Service would require the use of best management practices to prevent soil loss. For example, this would include installing silt fences, conserving available organic matter by retaining and replacing topsoil, and requiring prompt revegetation. However, the soils of the area have low resilience to disturbance, and the aridness of the area would increase the time required for vegetation to become established (if it did become established). During construction, the-short-term impacts on soils would be adverse and minor. The long-term, adverse impacts associated with new development would be negligible to minor.

Trail rehabilitation and realignment in the preferred alternative would reduce soil erosion and trail maintenance in problem areas. During implementation, the short-term impacts on soils would be adverse and minor. Long-term impacts in these areas would be beneficial.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact soil resources would be the same as those described for alternative A. These developments have resulted and would continue to result in long-term, moderate to major, adverse impacts on soil resources. The actions associated with the preferred alternative would have a negligible long-term contribution to these cumulative impacts on soil resources.

Conclusion. Most impacts of the preferred alternative on soils would be the same as for the no action alternative. Construction activities on approximately 200 acres would result in short-term, adverse, minor impacts on soils. The long-term impacts from development of new facilities would be adverse and negligible to minor in intensity. The long-term impacts of trail rehabilitation and realignment would be beneficial.

Regionally, cumulative impacts on soils would be moderate to major, long-term, and adverse. This alternative would contribute a very small increment to these cumulative impacts.

The preferred alternative would not result in any impairment of park resources or values related to soils.

Plant Communities and Vegetation

Many of the impacts of the preferred alternative on plant communities and vegetation would be the same as those described for the no action alternative. Specifically, maintenance and ongoing visitor use would have negligible to minor, long-term, adverse effects on vegetation. Removing the power lines at McKittrick Canyon would result in negligible to minor, short-term, adverse impacts during construction and long-term, beneficial impacts on vegetation. Continued irrigation of the shade trees and lawns at Frijole Ranch would maintain the growth of unnaturally lush vegetation and allow exotic species to flourish, a minor to moderate, long-term, adverse impact. The proposed boundary change would have negligible impacts on vegetation, and beneficial impacts could result from arrangements that protected vegetation and plant communities outside the park.

Management of Manzanita Spring would not change. The spring would be dredged periodically to remove accumulated sediment and maintain an open pond. This would result in a negligible impact on existing plant communities and vegetation.

Actions of the preferred alternative would permanently remove about 200 acres of vegetation throughout the park. Because of the relatively small area involved (about 0.2 percent of the park), the intensity of the long-term, adverse impact on native vegetation would be minor.

During and after construction, the National Park Service would require the use of best management practices to minimize impacts on vegetation and plant communities. This would include actions such as marking and strictly enforcing construction area boundaries, conserving available organic matter by retaining and replacing topsoil, and requiring prompt revegetation. To provide more rapid recovery of native vegetation and minimize the encroachment of invading species, seeds of native species gathered in the park would be sown on disturbed areas or would be propagated elsewhere, with the seedlings transplanted to disturbed sites. During a recovery period of several years, the seeded or replanted native vegetation would not be identical in composition to vegetation before construction, but a diverse community similar to the natural condition eventually would develop. As a result, while the short-term impacts of construction would be minor to moderate and adverse, the long-term impact on restored areas would be negligible.

The preferred alternative's approach of eradicating target invasive species of exotic plants throughout the park and implementing more strict prevention measures would result in long-term beneficial impacts on native vegetation and plant communities.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact vegetation and plant communities would be the same as those described for alternative A. These actions have resulted and would continue to result in long-term, moderate to major, adverse impacts on native vegetation and plant communities. The actions associated with the preferred alternative would contribute a very small increment to the cumulative impacts.

Conclusion. Many of the impacts of the preferred alternative on vegetation and plant communities would be the same as for the no action alternative. In addition, there would be minor to moderate, adverse, short-term impacts related to construction, long-term, minor, adverse impacts from the permanent removal of about 200 acres of native vegetation from sites that would be occupied by new development, and long-term beneficial impacts from more aggressive control of invasive, exotic plants.

Cumulatively, there would continue to be moderate to major, long-term, adverse impacts on vegetation. This alternative would contribute a very small increment to these cumulative impacts.

The preferred alternative would not result in any impairment of park resources or values related to plant communities and vegetation.

Wildlife

Many of the impacts of the preferred alternative on wildlife would be the same as those described for the no action alternative. Specifically, past development that resulted in wildlife habitat loss and fragmentation, and ongoing wildlife disturbances by human activities would continue to have negligible to minor, adverse, long-term impacts on wildlife. Removing the power lines at McKittrick Canyon would result in negligible to minor, short-term, adverse wildlife disturbances in the utility corridor and a long-term, beneficial impact. Collisions of vehicles with wildlife would continue to have in a minor, long-term, adverse impact. The proposed boundary change would have negligible impacts on wildlife, and beneficial impacts could result from arrangements that protected wildlife resources outside the park.

Actions of the preferred alternative would permanently remove about 200 acres of wildlife habitat throughout the park. Because of the relatively small area involved (about 0.2 percent of the park), the intensity of the long-term, adverse impact on wildlife would be minor.

During construction, some smaller animals might be killed or forced to relocate to areas outside the construction zones. Larger animals would probably avoid construction sites and would not be at direct risk for increased mortality. Overall, populations of affected species would decrease slightly during construction, a short-term, minor, adverse effect. Once construction was completed and construction sites were restored as described under "Plant Communities and Vegetation," the long-term impacts on wildlife in these areas would be negligible.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact wildlife would be the same as those described for alternative A. These actions have resulted and would continue to result in long-term, moderate to major, adverse impacts on wildlife. The actions associated with the preferred alternative would contribute a very small increment to the cumulative impacts.

Conclusion. Many of the impacts of the preferred alternative on wildlife would be the same as for the no action alternative. In addition, there would be minor, adverse, short-term impacts related to construction and long-term, minor, adverse impacts from the permanent removal of about 200 acres of wildlife and habitats from sites that would be occupied by new development.

Cumulatively, there would continue to be moderate to major, long-term, adverse impacts on wildlife. This alternative would contribute a very small increment to these cumulative impacts.

The preferred alternative would not result in any impairment of park resources or values related to wildlife.

Geologic Resources

Many of the impacts of the preferred alternative on geologic would be the same as those described for the no action alternative. Specifically, this alternative would have negligible impacts on such geologic processes as rock weathering, mass wasting, dune formation, and the development of sinkholes. Long-term, adverse impacts of negligible to minor intensity would result from continued park use and operation, including trail use and maintenance, use of caves, and the use

by researchers and others of the geologic formation reference stratotypes. The proposed boundary change would have negligible impacts on geology, and beneficial impacts could result from arrangements that protected geological resources outside the park.

Development activities on about 200 acres could indirectly impact geologic processes by modifying surface drainage patterns that could impact groundwater and its discharge to ephemeral streams. Careful siting to, for example, route existing drainages around new development, control runoff from newly impervious surfaces, and minimize erosion, would reduce the impacts of development activities. As a result, the intensity of the adverse, long-term impacts would be minor.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact geologic resources would be the same as those described for alternative A. Long-term, adverse impacts on the near-surface geology from these developments are localized and range in intensity up to moderate. Cumulative impacts from these developments on geologic formations that are more than 50 feet from the surface have been negligible. The preferred alternative would contribute only very slightly to near-surface cumulative impacts on geologic resources and would have negligible effects on deeper formations.

Conclusion. Many of the impacts of the preferred alternative on geologic resources would be the same as for the no action alternative. In addition, there would be indirect, long-term, minor, adverse impacts on geology from changes in drainage patterns on and around the approximately 200 acres that would be occupied by new development.

The cumulative impacts on near-surface geologic resources would be long-term and adverse, and locally could be of moderate intensity. This alternative would contribute a very small increment to these cumulative impacts.

The preferred alternative would not result in any impairment of park resources or values related to geological resources.

Paleontological Resources

Many of the impacts of the preferred alternative on paleontological resources would be the same as those described for the no action alternative. Specifically, this alternative would have adverse, minor, long-term impacts because of hiking trail use, trail use by horses, use of caves, and access to type fossil localities. Indirect beneficial impacts would result from activities that exposed fossils in the park for research and visitor interpretation. The proposed boundary change would have negligible impacts on paleontological resources, and beneficial impacts could result from arrangements that protected paleontological resources outside the park.

The proposed low-country camping area below the eastern escarpment is in an area with a high potential for paleontological resources. It might be possible to site the new camping facility in an area of low paleontological sensitivity and to avoid paleontological resources. If paleontological resources could not be avoided, the impacts could be mitigated, such as by collecting or stabilizing *in situ* fossils that might otherwise be destroyed or damaged. As a result, the hike-in camping area would have a minor, adverse, long-term impact on paleontological resources.

Improvement of the McKittrick Nature Trail would cause minor, adverse, long-term impacts on paleontological resources. While salvage mitigation efforts could reduce these impacts, the intensity would remain minor.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact paleontological resources would be the same as those described for alternative A. Long-term, adverse impacts on paleontological resources in the near-surface and in caves from these developments have been localized and range in intensity up to moderate. Cumulative impacts from these developments on paleontological resources that are more than 50 feet from the surface (other than in caves) have been negligible. The preferred alternative would contribute only very slightly to cumulative impacts on paleontological resources in the near-surface and in caves and would have negligible effects on deeper resources.

Conclusion. Many of the impacts of the preferred alternative on paleontological resources would be the same as for the no action alternative. In addition, there would be long-term, minor, adverse impacts on paleontological resources from establishing a low-country camping area below the eastern escarpment and from improving the McKittrick Nature Trail.

The cumulative impacts on paleontological resources in the near-surface and in caves would be long-term and adverse, and locally could be of moderate intensity. This alternative would contribute a very small increment to these cumulative impacts.

The preferred alternative would not result in any impairment of park resources or values related to paleontological resources.

CULTURAL RESOURCES

Archeological Resources

Many of the impacts of the preferred alternative on archeological resources would be the same as those described for the no action alternative. Specifically, few if any adverse effects would be anticipated from existing trails; picnic, camping, and parking areas; and use of caves. Surveys and avoidance would ensure that most trail maintenance would have no adverse effects on archeological resources. If significant archeological resources could not be avoided, the effects would be adverse and a memorandum of agreement would be negotiated with the Texas state historic preservation officer regarding how the adverse effects would be mitigated.

The preferred alternative would result in new facilities on about 200 acres within the park, plus construction disturbances on additional lands surrounding the new facilities. Other park areas that still have evidence of past disturbance would be restored. Archeological surveys would precede any ground disturbance associated with any of these activities. Because national register-listed or -eligible archeological resources would be avoided to the greatest extent possible, no adverse effects on archeological resources would be anticipated. If, however, significant archeological resources could not be avoided, the effects on such resources would be adverse, and an appropriate mitigation strategy would be developed in consultation with the Texas state historic preservation officer and, if necessary, associated American Indians.

Before removal of any remnants of historic ranching activities in backcountry and designated wilderness areas, a survey for archeological resources in the general vicinity of the affected structure would be designed and conducted in consultation with the Texas state historic preservation officer. The excavation, recordation, and mapping of any significant cultural remains would be completed before demolition to ensure that important archeological data that otherwise would be lost was recovered and documented. Impacts on archeological resources associated with such structures would be adverse.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact archeological resources would be the same as those described for alternative A. These actions have resulted and would continue to result in adverse effects on archeological resources. The actions associated with the preferred alternative would contribute a very small increment to the cumulative impacts.

Conclusion. Many of the impacts of the preferred alternative on archeological resources would be the same as for the no action alternative. There could be additional adverse effects from the construction of new facilities on about 200 acres, from site restoration, and from removal of remnants of historic ranching activities.

Cumulatively, there would continue to be adverse effects on the region's archeological resources. This alternative would contribute a very small increment to these cumulative impacts.

The preferred alternative would not result in any impairment of park resources or values related to archeological resources.

Historic Structures

Many of the impacts of the preferred alternative on historic structures would be the same as those described for the no action alternative. Specifically, stabilization or preservation efforts and visitor use of historic structures would result in few if any adverse effects.

In the preferred alternative, rehabilitation would be included in the activities (along with stabilization, preservation, and regular maintenance) that would be undertaken in accordance with standards and guidelines from the Secretary of the Interior (1983, 1995a, and 1995b). As a result, there would be no adverse effects on the park's historic structures from any of this alternative's stabilization, preservation, or rehabilitation efforts.

Impacts on national register-listed or -eligible structures, such as the Cox and Bowl cabins, that either would be removed or allowed to deteriorate naturally would be adverse effects. However, these actions would not occur without prior review by park and region cultural resource specialists, including approval by the regional director and consultation with the Texas state historic preservation officer. Before such a structure was either removed or allowed to deteriorate, appropriate documentation recording the structure would be prepared in accordance with Section 110 (b) of the National Historic Preservation Act and the documentation would be submitted to the Historic American Buildings Survey / Historic American Engineering Record / Historic American Landscape Survey (HABS/HAER/HALS) program.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact historic structures would be the same as those described for alternative A. These actions have resulted and would continue to result in adverse effects on historic structures. The actions associated with the preferred alternative would contribute a very small increment to the cumulative impacts.

Conclusion. Many of the impacts of the preferred alternative on historic structures would be the same as for the no action alternative. Additionally, there could be adverse effects from removing national register-listed or -eligible structures or allowing them to deteriorate naturally.

Cumulatively, there would continue to be adverse effects on the region's historic structures. This alternative would contribute a very small increment to these cumulative impacts.

The preferred alternative would not result in any impairment of park resources or values related to historic structures.

Cultural Landscapes

Many of the impacts of the preferred alternative on cultural landscapes would be the same as those described for the no action alternative. Specifically, there would be no adverse effect associated with the current rehabilitation of the Frijole Ranch house's cultural landscape, ongoing use and maintenance at the national register-listed Frijole Ranch cultural landscape, or removal of the power line from McKittrick Canyon.

Construction of a small structure to exhibit a stagecoach near the Pinery ruins would create a modern intrusion in this national register-listed landscape's historic scene. The structure would be designed and constructed in consultation with the Texas state historic preservation officer. If the intrusiveness of the structure could not be adequately mitigated by sensitive design and the use of appropriate construction materials, an adverse effect would result on the Pinery's cultural landscape.

Before rehabilitation was implemented for the cultural landscapes associated with Williams Ranch and Ship-on-the-Desert, cultural landscape reports would be prepared for each property. Conformance with these reports would ensure that rehabilitation of the landscapes would be undertaken in accordance with standards and guidelines from the Secretary of the Interior (1983, 1995a, 1995b). As a result, there would be no adverse effects on either landscape.

The preferred alternative would not include rehabilitation or other actions for any of the other eight potential cultural landscapes in the park. Within these landscapes, the National Park Service would not perform any construction or removal of any structures or facilities that could potentially alter the character-defining features (topography, vegetation, circulation features, spatial organization, and land use patterns) of the landscapes. As a result, no adverse effects would be anticipated.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact cultural landscapes would be the same as those described for alternative A. These actions have resulted and would continue to result in adverse effects on cultural landscapes. The actions associated with the preferred alternative would contribute a very small increment to the cumulative impacts.

Conclusion. Many of the impacts of the preferred alternative on cultural landscapes would be the same as for the no action alternative. The structure to exhibit a stagecoach near the Pinery ruins could have an adverse effect on the Pinery's cultural landscape. Other aspects of the preferred alternative would result in no adverse effects on the park's cultural landscapes.

Cumulatively, there would continue to be adverse effects on the region's cultural landscapes. This alternative would contribute a very small increment to these cumulative impacts.

The preferred alternative would not result in any impairment of park resources or values related to cultural landscapes.

Ethnographic Resources

Many impacts of the preferred alternative on ethnographic resources would be the same as those described for the no action alternative. Specifically, visitors using many areas of the park would have minor adverse effects on American Indians observing sacred rituals or seeking solitude to practice traditional beliefs. The alternative would have negligible impacts on visitor patterns of viewing the Our Lady of Guadalupe image. Impacts from

increased park staff knowledge about indigenous plants would be beneficial and long-term.

This alternative would increase use of the Salt Basin Dunes area by providing new facilities, including a new trailhead about a mile within the park with a parking lot, picnic tables, and restroom. Increased park-related use of the sand dunes would result in moderate, adverse, long-term impacts on the sensitivities of the Tigua Indians of Ysleta del Sur Pueblo.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact ethnographic resources would be the same as those described for alternative A. These actions have resulted and would continue to result in long-term, minor to moderate, adverse impacts on ethnographic resources. The actions associated with the preferred alternative would result in a minor to moderate, long-term, adverse contribution to the cumulative impacts.

Conclusion. Many impacts of the preferred alternative on ethnographic resources would be the same as those associated with alternative A. Increased park-related use of the sand dunes would result in moderate, adverse, long-term impacts on the sensitivities of the Tigua Indians of Ysleta del Sur Pueblo.

Cumulatively, there would continue to be adverse effects on the region's ethnographic resources. This alternative would result in a minor to moderate, long-term, adverse contribution to the cumulative impacts.

The preferred alternative would not result in any impairment of park resources or values related to ethnographic resources.

Museum Collections

As in the no action alternative, the park's museum collections would continue to be adequately inventoried, accessioned, and protected according to NPS standards. However, the preferred alternative would allow more of the park's museum collections to be stored onsite. This would make access to the collections more convenient for park staff who need to use the collections for research or study and would result in a beneficial, long-term impact. Other effects would be the same as in the no action alternative.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact museum collections would be the same as those described for alternative A.

Conclusion. The preferred alternative would have a beneficial, long-term impact by improving park staff access to museum collections for research or study. Other effects, including cumulative impacts, would be the same as in the no action alternative.

The preferred alternative would not result in any impairment of park resources or values related to museum collections.

VISITOR EXPERIENCE AND UNDERSTANDING

Access, Activities and Destinations, and Scenic Views

Access. Long-term beneficial impacts on automobile access would result from additional parking at several sites throughout the park and from upgrades of the roads to Williams Ranch, the Salt Basin Dunes trailhead, and the PX Well trailhead. Elsewhere in the park, impacts on access by roads would be negligible.

Long-term, beneficial impacts on hiking access would result from new or improved trailheads; improved signage; the mapping of two new, primitive trails that lead from PX Well to the park's interior; and the possible

addition of other primitive trails to the park's inventory. Elsewhere in the park, impacts on access by trails would be negligible.

Potentially, the increase in visitor use that would result from access improvements would have minor, long-term, adverse impacts on those visitors who desire more solitude.

Activities and Destinations. The construction of a new campground near Pine Springs that was designed for recreational vehicles and groups would result in an improved camping experienced for these visitors. The new, hike-in campground below the eastern escarpment would provide a backcountry experience to visitors who formerly were not able to participate in this activity because of the strenuous hike that is required to access other backcountry sites. The new group campsite at Dog Canyon would accommodate additional use of the north part of the park, particularly by organizations based in New Mexico.

Road upgrades, new or upgraded trailheads, and/or improved parking would make the Williams Ranch, Salt Basin Dunes, PX Well, and Guadalupe Pass areas more attractive as destinations and would lead to increased activities at these sites.

Improved and expanded exhibits at Pine Springs, Frijole Ranch, McKittrick Canyon, Dog Canyon, the Salt Basin Dunes, the Dell City contact station, and wayside locations throughout the park would enhance interpretation as an activity and make these sites more attractive as destinations. The exhibits would also make visitors more aware of the destinations and activities that are available throughout the park.

The landscape in the Pine Springs area would have a more natural appearance because of the removal of recreational vehicles from the trailhead parking lot. This also would allow hikers and picnickers to use the trailhead parking lot for its intended purpose. The stagecoach display at the Pinery would create a new feature that could attract more visitors to this part of the Pine Springs complex.

At McKittrick Canyon, rehabilitating the Pratt Cabin and cultural landscape would provide an interesting, theme-related, enjoyable setting with quality interpretation.

The attractiveness of the Williams Ranch area as a destination would be enhanced by rehabilitation of the Williams Ranch house exterior and cultural landscape, and by expanding the parking lot.

Rehabilitating the Ship-on-the-Desert structure and landscape and using them to support research and educational and operational activities would improve the enjoyment of many of its users by providing better facilities.

All of these would result in long-term, beneficial impacts.

Potentially, the increase in visitor use that would result from these improvements would have minor, long-term, adverse impacts on those visitors who desire more solitude.

The preferred alternative would remove many vestiges of ranching, including stock tanks, fences, and structures, from within the park. This action is consistent with the Congressional definition of wilderness, and would be seen as beneficial impacts by visitors who prefer the natural environments without traces of human development. However, these ranching remnants are popular with some visitors, and these people may perceive their loss as an adverse impact.

Scenic Views. Moving the location for recreational vehicle camping to a location outside the Pine Springs viewshed would have a long-term, beneficial impact on scenic views in the area. Removing the electrical lines

along McKittrick Creek would have long-term, beneficial impacts on the scenic view by providing a more natural landscape with less evidence of human development.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact access, activities and destinations, and scenic views would be the same as those described for alternative A. The preferred alternative would have a negligible effects on cumulative impacts compared to the no action alternative.

Conclusion. The preferred alternative would have beneficial, long-term effects on access, activities and destinations, and/or scenic views at numerous sites within and associated with the park, including Pine Springs, Frijole Ranch, McKittrick Canyon, Dog Canyon, Salt Basin Dunes, Williams Ranch, Ship-on-the-Desert, PX Well, Guadalupe Pass, and Dell City. There could be minor, long-term, adverse impacts on visitors who desire more solitude. Cumulative impacts would be the same as the no action alternative.

Interpretation, Education, and Orientation

Interpretation. At the redesigned visitor center at Pine Springs, visitors would benefit from the consolidation of multiple interpretive displays. Because more visitors would see the cultural exhibits, they could get the entire park story at a single location, and would have the opportunity for personal contact with park staff.

Rehabilitation of the ranch house, outbuildings, and cultural landscape features at Frijole Ranch and rehabilitation of the Williams Ranch house and cultural landscape would allow for more complete understanding of these resources. The addition of site-related interpretive exhibits to the rehabilitated Frijole Ranch house would improve visitor understanding and appreciation of west Texas ranching history. These enhancements would have a long-term, beneficial impact on the interpretation and understanding of this aspect of history in the park.

Expanded and renovated interpretive media in the McKittrick Canyon, Dog Canyon, and Dell City contact stations would provide long-term, beneficial impacts by increasing visitor understanding and opportunities for interpretation, education, and orientation.

Waysides and other exhibits that were installed at several locations would provide both orientation and interpretive information to visitors throughout the park. The long-term benefit would be greatest for visitors who do not go to the visitor center or who arrive outside of regular park hours.

Recent Visitor Services Projects surveys of NPS visitors have shown that more than 60 percent of park visitors may contact Internet pages before park visits. Enhancements to the Internet site and other digital interpretive services would have long-term, beneficial effects by providing increased understanding of park significance and recreational opportunities, and appreciation of park values by both “electronic” and actual visitors to the park.

Education. Use of Ship-on-the-Desert to support research, education, and operational activities would have long-term, beneficial impacts on the understanding and appreciation of those participating in residential programs or day-use activities. The resulting research would support understanding and appreciation, and would enhance the management of park resources.

Expanded outreach education programs would have long-term, beneficial impacts on program participants, which would include populations that have not traditionally used the park.

Orientation. Several aspects of the preferred alternative would have beneficial im-

pacts on visitor orientation. These would include enhancement of the contact stations at McKittrick Canyon, Dog Canyon, and Dell City; additional wayside exhibits distributed more widely throughout the park; and improved Internet resources.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact interpretation, education, and orientation would be the same as those described for alternative A. The preferred alternative would have a negligible effects on cumulative impacts compared to the no action alternative.

Conclusion. All of the impacts of the preferred alternative on interpretation, education, and orientation would be beneficial. The cumulative impact with other information sources would be negligible.

THE SOCIOECONOMIC ENVIRONMENT

Regional Economic and Demographic Conditions

Under the preferred alternative, the park's role in the socioeconomic environment would increase compared to the no action alternative. However, the benefits would be spread over the region, which includes four counties in two states, so impacts would not be highly visible.

The planned improvements to visitor services and opportunities to access more areas of the park would be considered an asset and could make a small, indirect contribution to population growth. In addition, the improvements may increase visitation to the park, which would benefit regional businesses, particularly restaurants, hotels, markets, and gas stations.

Staffing levels could fluctuate over the life of this general management plan, with minor changes from year to year in permanent, seasonal, and volunteer staff. However, the effect would not be detectable in the local or regional economy and would be negligible.

Construction job opportunities for regional contractors and construction material and equipment suppliers would be created when new capital projects were undertaken. The impact of these construction-related activities would be beneficial in the short term and negligible in the long term.

Housing and Community Infrastructure

Small fluctuations in staffing levels from year to year would result in small changes for housing demand. However, these changes would not be detectable in the local economy and the impacts would be negligible.

Visitation at the park would be expected to increase compared to the no action alternative. This would result in small increases in demand for public services, such as police, fire, and road maintenance, a long-term, minor, adverse impact. These demands would likely be offset by increases in the fees, sales and property taxes, and other revenues that would be generated by staff and visitors, a long-term, beneficial impact to community infrastructure.

Cumulative Effects. Cumulative impacts would be the same as described in the no action alternative. The contribution to socioeconomic cumulative effects from the preferred alternative generally would be beneficial but very small.

Conclusion. Increased visitation that would result from park improvements would have beneficial impacts on regional economics. Long-term, beneficial impacts to community infrastructure would result. Cumulative effects on regional socioeconomic conditions generally would be beneficial but very small.

PARK OPERATIONS, FACILITIES, AND EQUIPMENT

Management and Administration. Continued use of shared administrative functions at the "town office" in Carlsbad would have a negligible impact compared to alternative A. Continued implementation of efficiencies identified in the core operations analysis would have a long-term benefit.

A new, consolidated headquarters complex at the Pine Springs site would result in a long-term, beneficial impact. This facility would increase the efficiency and effectiveness of park operations and make more space available to support visitor services.

Enlarging the water storage system and providing a fire building at Dog Canyon would enhance the NPS' ability to protect resources in the northern part of the park, a long-term, beneficial impact.

Employee Housing. The new, consolidated headquarters complex would enable the park to apply the two housing units that currently are used for office space to their original purpose. This would improve the ability of the park to recruit seasonal employees and attract volunteers, a long-term, beneficial impact.

Maintenance. All of the maintenance requirements that would occur under the no action alternative would occur in the preferred alternative. Additional maintenance demands would result from this alternative's increased park road use, upgraded infrastructure, and construction of new facilities, including new campgrounds, trailheads, parking, waysides and other exhibits, and the administrative facility. Compared to the no action alternative, the impacts of increased maintenance would have a long-term, moderate, adverse impact on park operations. Reduced maintenance would result from the rehabilitation or realignment of problem trail segments, a long-term, beneficial impact.

Cumulative Impacts. The potential cumulative impacts for the preferred alternative would be the same as described in the no action alternative and would be minor, adverse, and long-term. This alternative's contribution to these effects would be slight.

Conclusion. Long-term, beneficial impacts would result from the new, consolidated headquarters complex near Pine Springs, the ability to reclaim three Pine Springs housing units for their original purpose, improved fire management resources at Dog Canyon, and reduced maintenance of rehabilitated or realigned trail segments. Increased maintenance associated with new or upgraded facilities throughout the park would have a long-term, moderate, adverse impact on park operations. Negligible impacts would result from the continued use of shared administrative functions in Carlsbad. Continued implementation of efficiencies identified in the core operations analysis would have a long-term benefit. Cumulative impacts would be the same as in alternative A, the no action alternative, and this alternative's contribution would be slight.

RELATIONSHIP OF LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The intent of this determination is to identify whether the preferred alternative would result in trading the immediate use of the land for any long-term management possibilities or the productivity of park resources that would affect future generations. It is intended to determine whether the preferred alternative would be a sustainable action that could continue over the long-term without environmental problems.

The preferred alternative would be a sustainable action that would not change the use of Guadalupe Mountains National Park or affect the long-term productivity of lands affected by its operation for future generations.

It is the understanding of the National Park Service that the Tigua Indians of Ysleta del Sur Pueblo would prefer no visitor access to the sand dunes. This alternative calls for improving access and developing new visitor facilities in the vicinity of the sand dunes. Impacts on Tigua sensitivities from an expected increase in visitors to the sand dunes area would be moderate, adverse, and long-term.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The intent of this evaluation is to identify whether this alternative would result in effects that could not be changed over the long term or would be permanent. An effect on a resource would be irreversible if the resource could not be reclaimed, restored, or otherwise returned to its condition before the disturbance. An irretrievable commitment of resources involves the effects on resources that, once gone, cannot be replaced or recovered.

The preferred alternative would not involve the irreversible or irretrievable commitment of resources. No resources would experience major adverse impacts and no impairment of park resources would occur as a result of this alternative. The loss of exposed and subsurface fossils from construction of new facilities and trails would be an irreversible loss of minor intensity.

UNAVOIDABLE ADVERSE IMPACTS

The intent of this determination is to identify whether this alternative would result in impacts that could not be fully mitigated or avoided. The focus of this assessment is on real environmental issues that would involve major impacts if action was taken.

None of the effects identified in this assessment of the preferred alternative would be considered major adverse impacts. The implementation of this alternative for managing Guadalupe Mountains National Park would not result in impairment of any resources that would affect the basic purpose of Guadalupe Mountains National Park.

ALTERNATIVE B

NATURAL RESOURCES

Soils

Many of the impacts of alternative B on soils would be the same as for the no action alternative. Specifically, soil disturbance from ongoing use and maintenance of park facilities would have minor, adverse, long-term impacts. Removing the power lines and poles in McKittrick Canyon would result in a negligible to minor, short-term, adverse soil disturbance, and long-term, beneficial impacts on soils of the utility corridor. Pedestrian traffic and its related soil erosion would result in minor, long-term, adverse impacts. Impacts of past development, such as the creation of impervious surfaces, the diversion of precipitation from natural drainages, and the compaction of soils, would continue to be long-term, adverse, and minor.

Alternative B would include removing of the following facilities and restoring their sites to a natural condition.

- Tent campground at Pine Springs
- NPS pack animal operations at Pine Springs and Dog Canyon
- Public corrals near Frijole Ranch and Dog Canyon
- Recreational vehicle camping area at Dog Canyon

This action would involve restoring natural contours, routing runoff to natural drainages, and revegetating soils with native vegetation. The area to be restored would total about 200 acres, or about 0.2 percent of the park. This action would result in long-term, beneficial impacts on park soils.

This alternative would include a new trailhead with a parking lot just inside the park boundary west of the Salt Basin Dunes, and expansion of the parking lot at Williams Ranch. Their size collectively would be less than an acre, and the surfaces would be compacted soil, perhaps with some gravel. The impact on soils from these two small facilities would be negligible.

Trail rehabilitation and realignment in alternative B would reduce soil erosion in problem areas. During implementation, the short-term impacts on soils would be adverse and minor. Long-term impacts in these areas would be beneficial.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact soil resources would be the same as those described for alternative A. These developments have resulted and would continue to result in long-term, moderate to major, adverse impacts on soil resources. The actions associated with alternative B would have a negligible long-term contribution to these cumulative impacts on soil resources.

Conclusion. Most impacts of alternative B on soils would be the same as for the no action alternative. Long-term, beneficial impacts would result from restoring sites from which facilities had been removed and from trail rehabilitation and realignment.

Regionally, cumulative impacts on soils would be moderate to major, long-term, and adverse. This alternative would contribute a very small increment to these cumulative impacts.

Alternative B would not result in any impairment of park resources or values related to soils.

Plant Communities and Vegetation

Many of the impacts of alternative B on plant communities and vegetation would be the same as those described for the no action alternative. Specifically, maintenance and ongoing visitor use would have negligible to minor, long-term, adverse effects on vegetation. Removing the power lines at McKittrick Canyon would result in negligible to minor, short-term, adverse impacts during construction and long-term, beneficial impacts on vegetation. Continued irrigation of the shade trees and lawns at Frijole Ranch would maintain the growth of unnaturally lush vegetation and allow exotic species to flourish, a minor to moderate, long-term, adverse impact. The proposed boundary change would have negligible impacts on vegetation, and beneficial impacts could result from arrangements that protected vegetation and plant communities outside the park.

As described above for soils, native vegetation would be restored on about 200 acres of the park from which facilities had been removed. This would result in long-term, beneficial impacts to the park's plant communities and vegetation.

This alternative would include a new trailhead with a parking lot just inside the park boundary west of the Salt Basin Dunes, and expansion of the parking lot at Williams Ranch. Their size collectively would be less than an acre, and their impact on vegetation would be negligible.

Manzanita Spring would be allowed to naturally fill with sediment and return to a natural wetland. Restoration of this natural system would be a long-term, beneficial impact.

This alternative would eliminate horse use throughout the park. Removal of horses would eliminate grazing by these animals near backcountry and designated wilderness trails during, for example, their riders' lunch breaks. Non-native vegetation, including invasive exotics, would no longer be introduced into these management zones as seeds that were deposited, undigested, in horse manure or from mud on horses' hooves. Impacts would be long-term and beneficial.

Alternative B would eradicate all species of exotic plants throughout the park and implement more strict prevention measures. To provide more rapid recovery of native vegetation and prevent invading species, locally collected seed would be used in an active planting program. Seeds of native species gathered in the park would be sown on disturbed areas or would be propagated elsewhere, with the seedlings transplanted to disturbed sites. During a recovery period of several years, the seeded or replanted vegetation would not be identical in composition to undisturbed areas, but a diverse community similar to the natural condition eventually would develop. This would result in long-term, beneficial impacts.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact vegetation and plant communities would be the same as those described for alternative A. These actions have resulted and would continue to result in long-term, moderate to major, adverse impacts on native vegetation and plant communities. The actions associated with alternative B would contribute a very small increment to the cumulative impacts.

Conclusion. Many of the impacts of alternative B on vegetation and plant communities would be the same as for the no action alternative. In addition, long-term beneficial impacts would result from restoring native vegetation on about 200 acres from which park facilities had been removed, allowing a natural wetland to develop at Manzanita Spring, eliminating grazing and the spread of non-native seed by horses, and aggressively controlling exotic plants.

Cumulatively, there would continue to be moderate to major, long-term, adverse impacts on vegetation. This alternative would contribute a very small increment to these cumulative impacts.

Alternative B would not result in any impairment of park resources or values related to plant communities and vegetation.

Wildlife

Many of the impacts of alternative B on wildlife would be the same as those described for the no action alternative. Specifically, past development that resulted in wildlife habitat loss and fragmentation, and ongoing wildlife disturbances by human activities would continue to have negligible to minor, adverse, long-term impacts on wildlife. Removing the power lines at McKittrick Canyon would result in negligible to minor, short-term, adverse wildlife disturbances in the utility corridor and a long-term, beneficial impact. Collisions of vehicles with wildlife would continue to have in a minor, long-term, adverse impact. The proposed boundary change would have negligible impacts on wildlife, and beneficial impacts could result from arrangements that protected wildlife resources outside the park.

As described above, native vegetation (wildlife habitat) would be restored on about 200 acres of the park from which facilities had been removed. The locations of the restored areas adjacent to developed, intensely used areas would lessen their desirability for species that do not typically habituate to human use. Therefore, the resulting long-term, beneficial impacts on wildlife primarily would be for smaller species and adaptable larger animals such as deer and coyotes.

This alternative would include a new trailhead with a parking lot just inside the park boundary west of the Salt Basin Dunes, and expansion of the parking lot at Williams Ranch. Their size collectively would be less than an acre, and their impact on wildlife would be negligible.

The restoration of wetland vegetation at Manzanita Spring would provide a substantial amount of very high quality wildlife habitat in a setting were it is rare. This would result in long-term, beneficial impacts on wildlife.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact wildlife would be the same as those described for alternative A. These actions have resulted and would continue to result in long-term, moderate to major, adverse impacts on wildlife. The actions associated with alternative B would contribute a very small increment to the cumulative impacts.

Conclusion. Many of the impacts of alternative B on wildlife would be the same as for the no action alternative. In addition, long-term beneficial impacts would result from restoring wildlife habitat on about 200 acres from which park facilities had been removed, and allowing very high quality wetland habitat to develop at Manzanita Spring.

Cumulatively, there would continue to be moderate to major, long-term, adverse impacts on wildlife. This alternative would contribute a very small increment to these cumulative impacts.

Alternative B would not result in any impairment of park resources or values related to wildlife.

Geologic Resources

Most impacts of alternative B on geologic would be the same as those described for the no action alternative. Specifically, this alternative would have negligible impacts on such geologic processes as rock weathering, mass wasting, dune formation, and the development of sinkholes. Long-term, adverse im-

pacts of negligible to minor intensity would result from continued park use and operation, including trail use and maintenance and use of caves. The proposed boundary change would have negligible impacts on geology, and beneficial impacts could result from arrangements that protected geological resources outside the park.

Alternative B would implement a permit system to provide access to the geologic formation reference stratotypes and fossil locations by researchers. This system would increase accountability and reduce the potential to damage to the reference stratotypes, but would not change the negligible to minor intensity of the long-term, adverse impacts that would occur in the no action alternative.

The removal of park facilities and restoration of natural conditions would have a negligible impact on geologic resources. The corrals and campgrounds that would be involved have few impervious surfaces and their removal would have little effect on groundwater and its discharges to ephemeral streams.

This alternative would include a new trailhead with a parking lot just inside the park boundary west of the Salt Basin Dunes, and expansion of the parking lot at Williams Ranch. Their size collectively would be less than an acre, and their surfaces would be soil, perhaps with gravel. These parking areas would not change the infiltration of precipitation and their impact on geological resources would be negligible.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact geologic resources would be the same as those described for alternative A. Long-term, adverse impacts on the near-surface geology from these developments are localized and range in intensity up to moderate. Cumulative impacts from these developments on geologic formations that are more than 50 feet from the surface have been negligible. Alternative B would contribute only very slightly to near-surface cumulative impacts on geologic resources and would have negligible effects on deeper formations.

Conclusion. Impacts of alternative B on geologic resources would be the same as those that would occur from the no action alternative.

Paleontological Resources

Many of the impacts of alternative B on paleontological resources would be the same as those described for the no action alternative. Specifically, this alternative would have adverse, minor, long-term impacts because of hiking trail use and use of caves. Indirect beneficial impacts would result from activities that exposed fossils in the park for research and visitor interpretation. The proposed boundary change would have negligible impacts on paleontological resources, and beneficial impacts could result from arrangements that protected paleontological resources outside the park.

Alternative B would implement a permit system to provide access to the geologic formation reference stratotypes and fossil locations by researchers. This system would increase accountability and reduce the potential to damage to the fossil locations, but would not change the negligible to minor intensity of the long-term, adverse impacts that would occur in the no action alternative.

This alternative's elimination of horse use in the park would eliminate the impacts on fossils along trails that currently result from the hammering action of horseshoes. This would result in a long-term, beneficial impact.

The parking lot west of the Salt Basin Dunes, and expansion of the parking lot at Williams Ranch would not be in areas that are known

for paleontological resources. The impacts of these facilities would be negligible.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact paleontological resources would be the same as those described for alternative A. Long-term, adverse impacts on paleontological resources in the near-surface and in caves from these developments have been localized and range in intensity up to moderate. Cumulative impacts from these developments on paleontological resources that are more than 50 feet from the surface (other than in caves) have been negligible. Alternative B would contribute only very slightly to cumulative impacts on paleontological resources in the near-surface and in caves and would have negligible effects on deeper resources.

Conclusion. The elimination of the hammering action of horseshoes on fossil deposits in trails would have a long-term, beneficial impact. All other impacts would be the same as those that would occur from the no action alternative.

The cumulative impacts on paleontological resources in the near-surface and in caves would be long-term and adverse, and locally could be of moderate intensity. This alternative would contribute a very small increment to these cumulative impacts.

Alternative B would not result in any impairment of park resources or values related to paleontological resources.

CULTURAL RESOURCES

Archeological Resources

Many of the impacts of alternative B on archeological resources would be the same as those described for the no action alternative. Specifically, few if any adverse effects would be anticipated from existing trails; picnic and parking areas; and use of caves. Surveys and avoidance would ensure that most trail maintenance would have no adverse effects on archeological resources. If significant archeological resources could not be avoided, the effects would be adverse and a memorandum of agreement would be negotiated with the Texas state historic preservation officer regarding how the adverse effects would be mitigated.

Recontouring of the areas from which campgrounds and corrals had been removed would have the potential to affect archeological resources. New or upgraded facilities that could affect archeological resources would include a new trailhead with a parking lot just inside the park boundary west of the Salt Basin Dunes, and expansion of the parking lot at Williams Ranch. Archeological surveys would precede any ground disturbance associated with any of these activities. Because national register-listed or -eligible archeological resources would be avoided to the greatest extent possible, no adverse effects on archeological resources would be anticipated. If, however, significant archeological resources could not be avoided, the effects on such resources would be adverse, and an appropriate mitigation strategy would be developed in consultation with the Texas state historic preservation officer and, if necessary, associated American Indians.

As described for the preferred alternative, archeological resources that were associated with the remnants of historic ranching activities in backcountry and designated wilderness areas could incur adverse effects from the removal of these facilities. A survey for archeological resources in the general vicinity of each affected structure would be designed and conducted in consultation with the Texas state historic preservation officer. The excavation, recordation, and mapping of any significant cultural remains would be completed before demolition to ensure that important archeological data

that otherwise would be lost was recovered and documented.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact archeological resources would be the same as those described for alternative A. These actions have resulted and would continue to result in adverse effects on archeological resources. The actions associated with alternative B would contribute a very small increment to the cumulative impacts.

Conclusion. Many of the impacts of alternative B on archeological resources would be the same as for the no action alternative. There could be additional adverse effects from site restoration, the construction or expansion of two small parking facilities, and removal of national register-eligible structures or other remnants of historic ranching activities.

Cumulatively, there would continue to be adverse effects on the region's archeological resources. This alternative would contribute a very small increment to these cumulative impacts.

Alternative B would not result in any impairment of park resources or values related to archeological resources.

Historic Structures

Many of the impacts of alternative B on historic structures would be the same as those described for the no action alternative. Specifically, visitor use of historic structures would result in few if any adverse effects.

Alternative B would stress stabilization, preservation, and regular maintenance of historic structures, with the only rehabilitation involving the exterior of the Williams Ranch house. Because all of these actions would be undertaken in accordance with standards and guidelines from the Secretary of the Interior (1983, 1995a, and 1995b), there would be no adverse effects on the park's historic structures.

Impacts on national register-listed or -eligible structures, such as the Cox and Bowl cabins, that either would be removed or allowed to deteriorate naturally would be adverse effects. However, these actions would not occur without prior review by park and region cultural resource specialists, including approval by the regional director and consultation with the Texas state historic preservation officer. Before such a structure was either removed or allowed to deteriorate, appropriate documentation recording the structure would be prepared in accordance with Section 110 (b) of the National Historic Preservation Act and the documentation would be submitted to the Historic American Buildings Survey / Historic American Engineering Record / Historic American Landscape Survey (HABS/HAER/HALS) program.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact historic structures would be the same as those described for alternative A. These actions have resulted and would continue to result in adverse effects on historic structures. The actions associated with alternative B would contribute a very small increment to the cumulative impacts.

Conclusion. Many of the impacts of alternative B on historic structures would be the same as for the no action alternative. Additionally, there could be adverse effects from removing national register-listed or -eligible structures or allowing them to deteriorate naturally.

Cumulatively, there would continue to be adverse effects on the region's historic structures. This alternative would contribute a very small increment to these cumulative impacts.

Alternative B would not result in any impairment of park resources or values related to historic structures.

Cultural Landscapes

Many of the impacts of alternative B on cultural landscapes would be the same as those described for the no action alternative. Specifically, there would be no adverse effect associated with the current rehabilitation of the Frijole Ranch house's cultural landscape, ongoing use and maintenance at the national register-listed Frijole Ranch cultural landscape, or removal of the power line from McKittrick Canyon.

Alternative B would remove the tent campground from the Pine Spring area and restore the area to natural conditions. Because the campground is not identified as a character-defining feature in the cultural landscape inventory for the property (NPS 1999), the removal of its facilities would have no adverse effect on the national register-listed cultural landscape of the Pinery.

Allowing the human-made pond of Manzanita Spring to fill in naturally with silt and return to a wetland would have an adverse impact on the Frijole Ranch cultural landscape. The pond is a character-defining feature of the ranch's pioneer landscape. Consultation with the Texas state historic preservation officer would occur before dredging of the pond ceased. Appropriate documentation for the pond would be prepared in accordance with Section 110 (b) of the National Historic Preservation Act and the documentation would be submitted to the Historic American Buildings Survey / Historic American Engineering Record / Historic American Landscape Survey (HABS/HAER/HALS) program.

Alternative B would include stabilizing the cultural landscape at Williams Ranch and preserving the Ship-on-the-Desert cultural landscape. Because these actions would be undertaken in accordance with standards and guidelines from the Secretary of the Interior (1983, 1995a, and 1995b), there would be no adverse effects on cultural landscapes.

Alternative B would not include rehabilitation or other actions for any of the other eight potential cultural landscapes in the park. Within these landscapes, the National Park Service would not perform any construction or removal of any structures or facilities that could potentially alter the character-defining features (topography, vegetation, circulation features, spatial organization, and land use patterns) of the landscapes. As a result, no adverse effects would be anticipated.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact cultural landscapes would be the same as those described for alternative A. These actions have resulted and would continue to result in adverse effects on cultural landscapes. The actions associated with alternative B would contribute a very small increment to the cumulative impacts.

Conclusion. Many of the impacts of alternative B on cultural landscapes would be the same as for the no action alternative. Additionally, an adverse impact on the Frijole Ranch cultural landscape would result from allowing the human-made pond of Manzanita Spring to fill in naturally with silt and return to a wetland. The other elements of this alternative would result in no adverse effects on the park's cultural landscapes.

Cumulatively, there would continue to be adverse effects on the region's cultural landscapes. This alternative would contribute a very small increment to these cumulative impacts.

Alternative B would not result in any impairment of park resources or values related to cultural landscapes.

Ethnographic Resources

Most impacts of alternative B on ethnographic resources would be the same as those described for the no action alternative. Specifically, continued park-related use of the sand dunes would result in moderate, adverse, long-term impacts on the sensitivities of the Tigua Indians of Ysleta del Sur Pueblo. Visitors using other areas of the park would have minor adverse effects on American Indians observing sacred rituals or seeking solitude to practice traditional beliefs. The alternative would have negligible impacts on visitor patterns of viewing the Our Lady of Guadalupe image. Impacts from increased park staff knowledge about indigenous plants would be beneficial and long-term.

Allowing the human-made pond of Manzanita Spring to fill in naturally with silt and return to a wetland could make this area more favorable to the Mescalero Apaches as a traditional-use area. Impacts would be beneficial and long-term.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact ethnographic resources would be the same as those described for alternative A. These actions have resulted and would continue to result in long-term, minor to moderate, adverse impacts on ethnographic resources. The actions associated with alternative B would result in a minor to moderate, long-term, adverse contribution to the cumulative impacts.

Conclusion. Many of the impacts of alternative B on ethnographic resources would be the same as for the no action alternative. Natural restoration of the wetland at Manzanita Spring could make this area more favorable to the Mescalero Apaches as a traditional-use area, a beneficial, long-term effect.

Cumulatively, there would continue to be adverse effects on the region's ethnographic resources. This alternative would result in a minor to moderate, long-term, adverse contribution to the cumulative impacts.

Alternative B would not result in any impairment of park resources or values related to ethnographic resources.

Museum Collections

As in the no action alternative, the park's museum collections would continue to be adequately inventoried, accessioned, and protected according to NPS standards. However, alternative B would allow more of the park's museum collections to be stored onsite. This would make access to the collections more convenient for park staff who need to use the collections for research or study and would result in a beneficial, long-term impact. Other effects would be the same as in the no action alternative.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact museum collections would be the same as those described for alternative A.

Conclusion. Alternative B would have a beneficial, long-term impact by improving park staff to museum collections for research or study. Other effects, including cumulative impacts, would be the same as in the no action alternative.

Alternative B would not result in any impairment of park resources or values related to museum collections.

VISITOR EXPERIENCE AND UNDERSTANDING

Access, Activities and Destinations, and Scenic Views

Access. A long-term, adverse impact on access would result from closing the existing

road from the park's west boundary to the Salt Basin Dunes parking area. The intensity would be minor because, although the walk to the dunes would double, to about 2 miles, visitors could still get to the area on foot.

A minor, long-term, indirect, adverse impact on access would result from removing all camping from the park, other than in the backcountry. About 10 percent of all visitors currently camp overnight. These people would have to find overnight lodging outside the park and, in the morning, drive a substantial distance before they arrived at the park and engaged in recreational activities.

A moderate, long-term, adverse impact on access would result from the elimination of horse use. Some visitors who ride their own horses into the park's higher elevations may not be able to make the demanding climbs on foot and would no longer be able to access much of the park in the backcountry and designated wilderness zones.

Long-term beneficial impacts on automobile access would result from additional parking at Williams Ranch and the Salt Basin Dunes trailhead. Beneficial impacts on access also would result from the possible addition of primitive trails, such as former ranch road traces and trails, to the park's inventory.

Activities and Destinations. The removal of all camping from the park except for the 10 backcountry sites would result in a major, long-term, adverse impact on activities and destinations. Although only about 10 percent of park visitors camp overnight in the park, many of these people perceive the campground as their primary destination. They associate a range of activities that they engage in at the campground, such as cooking and sleeping out, spending time with family and friends, having a campfire, or simply lounging in a chair and enjoying the scenery, as important components of their desired experience. Many of these visitors choose Guadalupe Mountains National Park as their destination because camping and all of the activities associated with it are available.

The impacts of eliminating the use of horses by park visitors would depend largely on whether the visitors have access to horses and ride them in the park.

- Many riders would perceive the loss of horse use as a major, long-term, adverse impact. There are relatively few places to ride on public land in west Texas and southern New Mexico, and none provide the scenery and wilderness amenities of the park. Many riders select Guadalupe Mountains National Park as their destination because riding is allowed.
- Many non-riders would view the loss of horse use as a negligible or even beneficial, long-term impact. Many hikers dislike the horse manure and urine on park trails and may be more likely to choose Guadalupe Mountains National Park as a destination and to engage in hiking if the source of these products was removed. Visitors who enjoy watching horses would perceive a minor, long-term, adverse impact.

Potentially, the decreases in visitor use that would result from eliminating camping and horse use would have long-term, beneficial impacts on those visitors who desire more solitude.

Improved and expanded exhibits at Pine Springs, McKittrick Canyon, Dog Canyon, and the Dell City contact station would have a long-term, beneficial impact. The exhibits would enhance interpretation as an activity and make these sites more attractive as destinations. The exhibits would also make visitors more aware of the destinations and activities that are available throughout the park.

The attractiveness of the Williams Ranch area as a destination, a long-term, beneficial impact, would be enhanced by rehabilitating

the Williams Ranch house exterior, stabilizing the cultural landscape, and expanding the parking lot.

Scenic Views. Removing camping from the Pine Springs viewshed would have a long-term, beneficial impact on scenic views in the area. Removing the electrical lines along McKittrick Creek would have long-term, beneficial impacts on the scenic view by providing a more natural landscape with less evidence of human development.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact access, activities and destinations, and scenic views would be the same as those described for alternative A. Alternative B would have a negligible effects on cumulative impacts compared to the no action alternative.

Conclusions. Minor or moderate, long-term, adverse impacts on access would result from closing the road to the Salt Basin Dunes parking area, eliminating camping except in the backcountry, and eliminating horse use. Beneficial, long-term impacts on access would be associated with providing additional parking at Williams Ranch and the Salt Basin Dunes trailhead and from the possible addition of primitive trails to the park's inventory.

With regard to activities and destinations, a major, long-term, adverse impact would result from eliminating camping except in the backcountry. Eliminating horse use usually would be perceived as a major, long-term, adverse impact by riders and a negligible or beneficial impact by hikers.

Beneficial impacts on scenic views would result from removing camping from the Pine Springs area and removing the electrical lines along McKittrick Creek.

Cumulative impacts would be the same as the no action alternative.

Interpretation, Education, and Orientation

As described for the preferred alternative, all of the interpretation, education, and orientation impacts of alternative B would be long-term and beneficial. However, because interpretation, education, and orientation improvements would be less extensive than in the preferred alternative, the intensity of the benefit would not be as great.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact interpretation, education, and orientation would be the same as those described for alternative A. Alternative B would have a negligible effects on cumulative impacts compared to the no action alternative.

Conclusion. Additional beneficial impacts on interpretation, education, and orientation would occur, but the benefit would be less than in the preferred alternative. The cumulative impact with other information sources would be negligible compared to the no action alternative.

THE SOCIOECONOMIC ENVIRONMENT

The elimination of camping at all but backcountry sites in Guadalupe Mountains National Park would increase regional demand for commercial camping and other overnight lodging. This would have a long-term, beneficial impact on regional economics.

Other impacts of alternative B on regional economic and demographic conditions housing and community infrastructure would be negligible compared to the no action alternative. Improvements in interpretation and other services at the park could increase day-use visitation, while the elimination of developed camping and horseback riding would reduce the use of the park for these purposes. Other changes associated

with alternative B, such as staffing, housing demand, and expenditures for maintenance, would be small and would not be detectable in any jurisdiction within the four-county area around the park.

Cumulative Effects. Cumulative impacts would be the same as described in the no action alternative. The contribution to socioeconomic cumulative effects from the alternative B generally would be beneficial but very small.

Conclusion. Alternative B would have beneficial impacts on the regional economy because it would cause increased demand for commercial camping and other overnight lodging. Cumulative effects on regional socioeconomic conditions generally would be beneficial but very small.

PARK OPERATIONS, FACILITIES, AND EQUIPMENT

Management and Administration

All of the management and administration issues that would occur under the no action alternative also would occur in alternative B. The National Park Service would attempt to meet administrative needs by adapting existing structures in the maintenance and housing complex south of U.S. Highway 62/180, but these facilities already are at or near capacity. The lack of administrative space may seriously impede the ability of the staff to operate the park, resulting in moderate to major, long-term, adverse impacts on management and administration. Negligible impacts would result from the continued use of shared administrative functions in Carlsbad. Continued implementation of efficiencies identified in the core operations analysis would result in a long-term benefit.

Employee Housing

The National Park Service would not commit any additional park housing units to administrative purposes. As a result, the impact on employee housing compared to the no action alternative would be negligible.

Maintenance

The elimination of camping except in backcountry sites would result in few if any reductions in maintenance, because those facilities would continue to be used by day-use visitors. The ability to perform maintenance would be challenged by the lack of space caused by the need to share facilities with administrative services. As a result, alternative B would have a moderate, long-term, adverse impact on the maintenance aspect of operations.

Cumulative Impacts. The potential cumulative impacts for alternative B would be the same as described in the no action alternative and would be minor, adverse, and long-term. This alternative's contribution to these effects would be slight.

Conclusions. The lack of space in buildings that would result from alternative B would have a moderate to major, long-term, adverse impacts on management and administration, and moderate, long-term, adverse impact on the maintenance aspect of operations. Negligible impacts would result from the continued use of shared administrative functions in Carlsbad, continued implementation of efficiencies identified in the core operations analysis, and continued use of employee housing for office space. Cumulative impacts would be the same as in alternative A, and this alternative's contribution would be slight.

RELATIONSHIP OF LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The intent of this determination is to identify whether alternative B would result in trading the immediate use of the land for any long-term management possibilities or the productivity of park resources that would affect future generations. It is intended to determine whether alternative B would be a sustainable action that could continue over the long-term without environmental problems.

Alternative B would be a sustainable action that would not change the use of Guadalupe Mountains National Park or affect the long-term productivity of lands affected by its operation for future generations.

It is the understanding of the National Park Service that the Tigua Indians of Ysleta del Sur Pueblo would prefer no visitor access to the sand dunes. This alternative calls for developing new visitor facilities in the vicinity of the sand dunes, but because they would be more distant than the current facilities, it is unclear if visitor use of this area would increase. If increased visitation to the sand dunes area occurred, impacts on Tigua sensitivities would be moderate, adverse, and long-term.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The intent of this evaluation is to identify whether this alternative would result in effects that could not be changed over the long term or would be permanent. An effect on a resource would be irreversible if the resource could not be reclaimed, restored, or otherwise returned to its condition before the disturbance. An irretrievable commitment of resources involves the effects on resources that, once gone, cannot be replaced or recovered.

Alternative B would not involve the irreversible or irretrievable commitment of resources. No resources would experience major adverse impacts and no impairment of park resources would occur as a result of this alternative.

UNAVOIDABLE ADVERSE IMPACTS

The intent of this determination is to identify whether this alternative would result in impacts that could not be fully mitigated or avoided. The focus of this assessment is on real environmental issues that would involve major impacts if action was taken.

None of the effects identified in this assessment of alternative B would be considered major adverse impacts. The implementation of this alternative for managing Guadalupe Mountains National Park would not result in impairment of any resources that would affect the basic purpose of Guadalupe Mountains National Park.

Alternative B would result in major adverse impacts on visitor experiences relating to camping and the use of horses, and moderate to major adverse impacts on management and administration. None of these would result in impairment of any resources that would affect the basic purpose of Guadalupe Mountains National Park.

ALTERNATIVE C

NATURAL RESOURCES

Soils

Many of the impacts of alternative C on soils would be the same as for the no action alternative. Specifically, soil disturbance from ongoing use and maintenance of park facilities would have minor, adverse, long-term impacts. Removing the power lines and poles in McKittrick Canyon would result in a negligible to minor, short-term, adverse soil disturbance, and long-term, beneficial impacts on soils of the utility corridor. Pedestrian traffic and its related soil erosion would result in minor, long-term, adverse impacts. Impacts of past development, such as the creation of impervious surfaces, the diversion of precipitation from natural drainages, and the compaction of soils, would continue to be long-term, adverse, and minor.

Actions associated with alternative C would disturb about 500 acres of soil throughout the park. Much of this includes new or upgraded roads where some regrading and filling would be needed so that the roads would shed water more easily. Some of the soils in other areas been have previously disturbed, but many are in undeveloped areas.

All sites with soil disturbance would undergo accelerated wind and water erosion, at least temporarily, until drainage structures were fully operational and vegetation had recovered in cleared areas that were not converted to impervious surfaces.

During construction, the National Park Service would require the use of best management practices to prevent soil loss. For example, this would include installing silt fences, conserving available organic matter by retaining and replacing topsoil, and requiring prompt revegetation. However, the soils of the area have low resilience to disturbance, and the aridness of the area would increase the time required for vegetation to become established (if it did become established). During construction, the short-term impacts on soils would be adverse and minor. The long-term, adverse impacts associated with most of the new development would be minor.

Trail rehabilitation and realignment in alternative C would reduce soil erosion and trail maintenance in problem areas. During implementation, the short-term impacts on soils would be adverse and minor. Long-term impacts in these areas would be beneficial.

Two areas of soils that would be disturbed by alternative C require special attention. Both have unique soil properties that also result in important vegetation and/or geologic resources. The actions of alternative C in these areas would result in moderate, long-term, adverse impacts.

Williams Ranch to West Boundary. The proposed road to connect Williams Ranch with the west side of the park would be about 10 miles long. The six miles of road immediately west of the ranch would run downslope over a large alluvial fan. The area is a creosote scrubland, but it contains the greatest cactus diversity in the park. The area is also an important groundwater recharge zone for shallow alluvial aquifers on the margins of the salt basin. Unrestrained rainwater runoff traveling downhill over that distance could cause appreciable erosion of the thin, calcareous soils and the underlying friable alluvial gravels. It could also interrupt normal infiltration of rainwater to recharge groundwater resources.

An alternate, curvilinear road design to alleviate these conditions would have a much

larger impact on the surrounding habitat than a straight road. A road with numerous switchbacks would reduce the potential for runoff and erosion, but would greatly increase the acreage of the impacted habitat and the construction and maintenance costs. Mitigation measures to decrease adverse impacts from the proposed road from, such as water cutouts designed to decrease erosion, would increase the road's development footprint.

The intermediate segment of road (about 4 miles) would cross lake margin gypsum dunes and interdunes that foster appreciable cryptobiotic soil habitat. As described in Chapter 3, the living cryptobiotic soil crusts are important to the desert environment because of their ability to convert atmospheric nitrogen to a form that plants can use, their capacity to intercept and store water, and the stability they provide to the underlying soil material. They also are extremely susceptible to disturbance by human activity.

The western end of the road would cross a small area of active gypsum dune movement. The road could interrupt normal dune migration and occasionally would be inaccessible because of migrating sand waves.

West Boundary to Salt Basin Dunes and PX Well. This roadway would impact about 5 miles, of which about 1.5 miles already are graded and graveled. As shown in the Alternative C Management Zones map in Chapter 2, part of this road would be on private land. Most of the roadway would be along old roads previously established by ranching activities, but upgrading the road for visitor use would impact additional areas along the roadway. The potential for impacts on cryptobiotic soil stability would be high.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact soil resources would be the same as those described for alternative A. These developments have resulted and would continue to result in long-term, moderate to major, adverse impacts on soil resources. The actions associated with alternative C would have a negligible, long-term contribution to these cumulative impacts on soil resources.

Conclusion. Many impacts of alternative C on soils would be the same as for the no action alternative. Construction activities on most of the approximately 500 acres would result in short-term, adverse, minor impacts on soils. The long-term impacts from developing new facilities at most sites would be adverse and minor in intensity. The long-term impacts of trail rehabilitation and realignment would be beneficial. Because of unique soil properties that also result in important vegetation and/or geologic resources, disturbances along the proposed roads from Williams Ranch to the west boundary and from the west boundary to Salt Basin Dunes and PX Well would have moderate, long-term, adverse impacts.

Regionally, cumulative impacts on soils would be moderate to major, long-term, and adverse. This alternative would contribute a very small increment to these cumulative impacts.

Alternative C would not result in any impairment of park resources or values related to soils.

Plant Communities and Vegetation

Many of the impacts of alternative C on plant communities and vegetation would be the same as those described for the no action alternative. Specifically, maintenance and ongoing visitor use would have negligible to minor, long-term, adverse effects on vegetation. Removing the power lines at McKittrick Canyon would result in negligible to minor, short-term, adverse impacts during construction and long-term, beneficial impacts on vegetation. Continued irrigation of the shade trees and lawns at Frijole Ranch

would maintain the growth of unnaturally lush vegetation and allow exotic species to flourish, a minor to moderate, long-term, adverse impact. The proposed boundary change would have negligible impacts on vegetation, and beneficial impacts could result from arrangements that protected vegetation and plant communities outside the park.

Management of Manzanita Spring would not change. The spring would be dredged periodically to remove accumulated sediment and maintain an open pond. This would result in a negligible impact on existing plant communities and vegetation.

Actions of alternative C would permanently remove about 500 acres of vegetation throughout the park. Because of the relatively small area involved (about 0.6 percent of the park), the intensity of the long-term, adverse impact on native vegetation would be minor.

During and after construction, the National Park Service would require the use of the best management practices to minimize impacts on vegetation and plant communities that were described in the preferred alternative. As a result, while the short-term impacts of construction would be minor to moderate and adverse, the long-term impact on restored areas would be minor.

The approach of alternative C of eradicating target invasive species of exotic plants throughout the park and implementing more strict prevention measures would result in long-term beneficial impacts on native vegetation and plant communities.

Expanding horse use to include overnight use in all zones would result in more grazing of native vegetation by horses, and increased transport of hay that might contain the seeds of exotic invasive species. More aggressive monitoring and mitigation measures would help to control the spread of exotic plant species, but a minor, long-term, adverse impact would occur throughout the park, and could be moderate along trails and other areas where horse use was concentrated.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact vegetation and plant communities would be the same as those described for alternative A. These actions have resulted and would continue to result in long-term, moderate to major, adverse impacts on native vegetation and plant communities. The actions associated with alternative C would contribute a very small increment to the cumulative impacts.

Conclusion. Many of the impacts of alternative C on vegetation and plant communities would be the same as for the no action alternative. In addition, there would be long-term, minor, adverse impacts from the permanent removal of about 500 acres of native vegetation from sites that would be occupied by new development; minor to moderate, adverse, short-term impacts and minor, adverse, long-term impacts related to construction; and minor to moderate, long-term, adverse impacts from allowing overnight horse use throughout the park. Long-term beneficial impacts would result from more aggressive control of invasive, exotic plants.

Cumulatively, there would continue to be moderate to major, long-term, adverse impacts on vegetation. This alternative would contribute a very small increment to these cumulative impacts.

Alternative C would not result in any impairment of park resources or values related to plant communities and vegetation.

Wildlife

Many of the impacts of alternative C on wildlife would be the same as those described for the no action alternative. Specifically, past development that resulted in wild-

life habitat loss and fragmentation, and ongoing wildlife disturbances by human activities would continue to have negligible to minor, adverse, long-term impacts on wildlife. Removing the power lines at McKittrick Canyon would result in negligible to minor, short-term, adverse wildlife disturbances in the utility corridor and a long-term, beneficial impact. Collisions of vehicles with wildlife would continue to have in a minor, long-term, adverse impact. The proposed boundary change would have negligible impacts on wildlife, and beneficial impacts could result from arrangements that protected wildlife resources outside the park.

Actions of alternative C would permanently remove about 500 acres of wildlife habitat throughout the park. Because of the relatively small area involved (about 0.6 percent of the park), the intensity of the long-term, adverse impact on wildlife would be minor.

During construction, some smaller animals might be killed or forced to relocate to areas outside the construction zones. Larger animals would probably avoid construction sites and would not be at direct risk for increased mortality. Overall, populations of affected species would decrease slightly during construction, a short-term, minor, adverse effect. Once construction was completed and construction sites were restored, the long-term impacts on wildlife in these areas would be negligible.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact wildlife would be the same as those described for alternative A. These actions have resulted and would continue to result in long-term, moderate to major, adverse impacts on wildlife. The actions associated with alternative C would contribute a very small increment to the cumulative impacts.

Conclusion. Many of the impacts of alternative C on wildlife would be the same as for the no action alternative. In addition, there would be minor, adverse, short-term impacts related to construction and long-term, minor, adverse impacts from the permanent removal of about 500 acres of wildlife and habitats from sites that would be occupied by new development.

Cumulatively, there would continue to be moderate to major, long-term, adverse impacts on wildlife. This alternative would contribute a very small increment to these cumulative impacts.

Alternative C would not result in any impairment of park resources or values related to wildlife.

Geologic Resources

Most impacts of alternative C on geologic would be the same as those described for the no action alternative. Specifically, this alternative would have negligible impacts on such geologic processes as rock weathering, mass wasting, dune formation, and the development of sinkholes. Long-term, adverse impacts of negligible to minor intensity would result from continued park use and operation, including trail use and maintenance and use of caves. The proposed boundary change would have negligible impacts on geology, and beneficial impacts could result from arrangements that protected geological resources outside the park.

Development activities on about 500 acres could indirectly impact geologic processes by modifying surface drainage patterns that could impact groundwater and its discharge to ephemeral streams. Careful siting to, for example, route existing drainages around new development, control runoff from newly impervious surfaces, and minimize erosion, would reduce the impacts of development activities. As described for soils, particular attention would be required for road development on the alluvial fan west of Wil-

liams Ranch. As a result, the intensity of the adverse, long-term impacts would be minor.

Construction of water crossings over McKittrick Creek would have a beneficial, long-term effect because it could allow the precipitation of the natural travertine formations. However, the bridge construction could damage the underlying travertine beds and could weaken the banks above the stream. Consequently, a major flood in the canyon could cause greater damage because the weak areas and bridges would be more susceptible to washing away. These impacts would be adverse and moderate in the short- and long-term.

Upgrading the utility infrastructure in McKittrick Canyon and Pratt Cabin could inhibit travertine formation, which would alter the natural flow regime and could cause downstream impacts, decrease groundwater recharge, and encourage stream migration. Stream migration would impact the flora and fauna of the canyon and could increase maintenance costs of the utility corridor or other infrastructure within the canyon. These impacts could be mitigated by limiting the scale and design of any facilities. These long-term, adverse impacts would be minor to moderate in intensity.

Development activities in the Salt Basin Dunes area could alter sand dune formation and dune stability. These impacts would be adverse, long-term, and minor to moderate.

Alternative C would strive to enhance protection and understanding of specific stratotype and fossil locations by developing minimum impact visitor use education programs. Beneficial impacts could result both within and outside the park by improving visitor education about this interesting and limited resource. However, long-term, minor to moderate, adverse impacts also could occur because more people would be aware of the significance and locations of the park's reference stratotypes, which would increase the exposures of the areas to vandalism or unauthorized sample collecting.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact geologic resources would be the same as those described for alternative A. Long-term, adverse impacts on the near-surface geology from these developments are localized and range in intensity up to moderate. Cumulative impacts from these developments on geologic formations that are more than 50 feet from the surface have been negligible. Alternative C would contribute only very slightly to near-surface cumulative impacts on geologic resources and would have negligible effects on deeper formations.

Conclusion. Many of the impacts of alternative C on geologic resources would be the same as for the no action alternative. In addition, there would be indirect, long-term, minor, adverse impacts on geology from changes in drainage patterns on and around the approximately 500 acres that would be occupied by new development; indirect, long-term, minor to moderate, adverse impacts from upgrading the utility infrastructure in McKittrick Canyon and Pratt Cabin; and long-term, minor to moderate, adverse impacts on sand dune formation and dune stability. Water crossings over McKittrick Creek would beneficially allow precipitation of natural travertine formations but could result in moderate, adverse, short- and long-term impacts during construction and major floods. Development in the Salt Basin Dunes area could alter sand dune formation and dune stability, resulting in adverse, long-term, minor to moderate impacts. Visitor use education programs would have long-term, minor to moderate, adverse impacts relating to increased loss of the park's reference stratotypes and benefits from better education of visitors.

The cumulative impacts on near-surface geologic resources would be long-term and

adverse, and locally could be of moderate intensity. This alternative would contribute a very small increment to these cumulative impacts.

Alternative C would not result in any impairment of park resources or values related to geologic resources.

Paleontological Resources

Many of the impacts of alternative C on paleontological resources would be the same as those described for the no action alternative. Specifically, this alternative would have adverse, minor, long-term impacts because of hiking trail use and use of caves. Indirect beneficial impacts would result from activities that exposed fossils in the park for research and visitor interpretation. The proposed boundary change would have negligible impacts on paleontological resources, and beneficial impacts could result from arrangements that protected paleontological resources outside the park.

The proposed low-country camping area below the eastern escarpment is in an area with a high potential for paleontological resources. It might be possible to site the new camping facility in an area of low paleontological sensitivity and to avoid paleontological resources. If paleontological resources could not be avoided, the impacts could be mitigated, such as by collecting or stabilizing *in situ* fossils that might otherwise be destroyed or damaged. As a result, the hike-in camping area would have a minor, adverse, long-term impact on paleontological resources.

Improvement of the McKittrick Nature Trail would cause minor, adverse, long-term impacts on paleontological resources. While salvage mitigation efforts could reduce these impacts, the intensity would remain minor.

Constructing new trails, widening trails, and redeveloping abandoned roads would have adverse, minor, long-term effects on paleontological resources. These actions could cause exposure of new fossils and, possibly, destruction of fossils currently exposed. Because of the density of fossil resources in the area of Smith Spring, impacts from trail improvement would have to be mitigated to reduce the intensity of the adverse, long-term impact to minor.

Alternative C would strive to enhance protection and understanding of paleontological resources by developing minimum impact visitor use education programs. Beneficial impacts could result both within and outside the park by improving visitor education about this interesting and limited resource. However, long-term, minor to moderate, adverse impacts also could occur because alternative C would provide greater access for visitors throughout the park, while the education program would make more people aware of the significance and locations of the park's fossil reference stratotypes. Together, these features could increase vandalism or unauthorized fossils collecting.

Horses impact fossils in park trails because horseshoes grind away the limestone that composes the fossils and rocks. This alternative's increased use of horses throughout the park and its possible park use by commercial packers or a horse concession would have an adverse, moderate, long-term effect.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact paleontological resources would be the same as those described for alternative A. Long-term, adverse impacts on paleontological resources in the near-surface and in caves from these developments have been localized and range in intensity up to moderate. Cumulative impacts from these developments on paleontological resources that are more than 50 feet from the surface (other than in caves) have been negligible. Alternative C would contribute only very

slightly to cumulative impacts on paleontological resources in the near-surface and in caves and would have negligible effects on deeper resources.

Conclusion. Many of the impacts of alternative C on paleontological resources would be the same as for the no action alternative. In addition, long-term, minor or moderate, adverse impacts on paleontological resources would result from establishing a low-country camping area below the eastern escarpment; improving the McKittrick Nature Trail and Smith Spring Trail; constructing new trails, widening trails, and redeveloping abandoned roads; increasing the potential for vandalism or unauthorized fossil collecting; and increasing the use of horses. Visitor use education programs would provide a beneficial impact.

The cumulative impacts on paleontological resources in the near-surface and in caves would be long-term and adverse, and locally could be of moderate intensity. This alternative would contribute a very small increment to these cumulative impacts.

Alternative C would not result in any impairment of park resources or values related to paleontological resources.

CULTURAL RESOURCES

Archeological Resources

Many of the impacts of alternative C on archeological resources would be the same as those described for the preferred alternative. Specifically, few if any adverse effects would be anticipated from existing trails; picnic, camping, and parking areas; and use of caves. Surveys and avoidance would ensure that most trail maintenance would have no adverse effects on archeological resources. If significant archeological resources could not be avoided, the effects would be adverse and a memorandum of agreement would be negotiated with the Texas state historic preservation officer regarding how the adverse effects would be mitigated.

Alternative C would result in new facilities on about 500 acres within the park, plus construction disturbances on additional lands surrounding the new facilities. Other park areas that still have evidence of past disturbance would be restored. Archeological surveys would precede any ground disturbance associated with any of these activities. Because national register-listed or -eligible archeological resources would be avoided to the greatest extent possible, no adverse effects on archeological resources would be anticipated. If, however, significant archeological resources could not be avoided, the effects on such resources would be adverse, and an appropriate mitigation strategy would be developed in consultation with the Texas state historic preservation officer and, if necessary, associated American Indians.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact archeological resources would be the same as those described for alternative A. These actions have resulted and would continue to result in adverse effects on archeological resources. The actions associated with alternative C would contribute a very small increment to the cumulative impacts.

Conclusion. Many of the impacts of alternative C on archeological resources would be the same as for the preferred alternative. There could be additional adverse effects from the construction of new facilities on about 500 acres and from site restoration.

Cumulatively, there would continue to be adverse effects on the region's archeological resources. This alternative would contribute a very small increment to these cumulative impacts.

Alternative C would not result in any impairment of park resources or values related to archeological resources.

Historic Structures

Many of the impacts of alternative C on historic structures would be the same as those described for the no action alternative. Specifically, stabilization or preservation efforts and visitor use of historic structures would result in few if any adverse effects.

In alternative C, rehabilitation would be included in the activities (along with stabilization, preservation, and regular maintenance) that would be undertaken in accordance with standards and guidelines from the Secretary of the Interior (1983, 1995a, and 1995b). As a result, there would be no adverse effects on the park's historic structures from any of this alternative's stabilization, preservation, or rehabilitation efforts.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact historic structures would be the same as those described for alternative A. These actions have resulted and would continue to result in adverse effects on historic structures. The actions associated with alternative C would contribute a very small increment to the cumulative impacts.

Conclusion. Many of the impacts of alternative C on historic structures would be the same as for the no action alternative. No adverse effects on the park's historic structures would result from any of this alternative's stabilization, preservation, or rehabilitation efforts.

Cumulatively, there would continue to be adverse effects on the region's historic structures. This alternative would contribute a very small increment to these cumulative impacts.

Alternative C would not result in any impairment of park resources or values related to historic structures.

Cultural Landscapes

Many of the impacts of alternative C on cultural landscapes would be the same as those described for the no action alternative. Specifically, there would be no adverse effect associated with the current rehabilitation of the Frijole Ranch house's cultural landscape, ongoing use and maintenance at the national register-listed Frijole Ranch and Pinery cultural landscapes, or removal of the power line from McKittrick Canyon.

Improvements to the interpretive walk and construction of a small structure to exhibit a stagecoach near the Pinery ruins would create modern intrusions in this national register-listed landscape's historic scene. These actions would be designed and constructed in consultation with the Texas state historic preservation officer. If the intrusiveness of the walkway or structure could not be adequately mitigated by sensitive design and the use of appropriate construction materials, an adverse effect would result on the Pinery's cultural landscape.

Before rehabilitation was implemented for the cultural landscapes associated with Williams Ranch and Ship-on-the-Desert, cultural landscape reports would be prepared for each property. Conformance with these reports would ensure that rehabilitation of the landscapes would be undertaken in accordance with standards and guidelines from the Secretary of the Interior (1983, 1995a, 1995b). As a result, there would be no adverse effects on either landscape.

Installing an enlarged, upgraded utility infrastructure at Ship-on-the-Desert would have little or no effect on the existing topography, spatial organization, or land use patterns of the cultural landscapes. Most of the utilities would be installed underground, and the

disturbed ground would be restored to its pre-construction contour and condition. No adverse effects on the potential cultural landscape would be anticipated.

Alternative C would not include rehabilitation or other actions for any of the other eight potential cultural landscapes in the park. Within these landscapes, the National Park Service would not perform any construction or removal of any structures or facilities that could potentially alter the character-defining features (topography, vegetation, circulation features, spatial organization, and land use patterns) of the landscapes. As a result, no adverse effects would be anticipated.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact cultural landscapes would be the same as those described for alternative A. These actions have resulted and would continue to result in adverse effects on cultural landscapes. The actions associated with alternative C would contribute a very small increment to the cumulative impacts.

Conclusion. Many of the impacts of alternative C on cultural landscapes would be the same as for the no action alternative. The structure to exhibit a stagecoach and walkway improvements near the Pinery ruins could have an adverse effect on the Pinery's cultural landscape. Other aspects of alternative C would result in no adverse effects on the park's cultural landscapes.

Cumulatively, there would continue to be adverse effects on the region's cultural landscapes. This alternative would contribute a very small increment to these cumulative impacts.

Alternative C would not result in any impairment of park resources or values related to cultural landscapes.

Ethnographic Resources

Many impacts of alternative C on ethnographic resources would be the same as those described for the no action alternative. Specifically, visitors using many areas of the park would have minor adverse effects on American Indians observing sacred rituals or seeking solitude to practice traditional beliefs. The alternative would have negligible impacts on visitor patterns of viewing the Our Lady of Guadalupe image. Impacts from increased park staff knowledge about indigenous plants would be beneficial and long-term.

This alternative would increase use of the Salt Basin Dunes area by upgrading the road to provide use by low-clearance vehicles and by constructing new facilities, including a contact station, ranger station, parking area, trailhead, comfort station, and campground about a mile from the dunes. Increased park-related use of the sand dunes would result in moderate, adverse, long-term impacts on the sensitivities of the Tigua Indians of Ysleta del Sur Pueblo.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact ethnographic would be the same as those described for alternative A. These actions have resulted and would continue to result in long-term, minor to moderate, adverse impacts on ethnographic resources. The actions associated with alternative C would result in a minor to moderate, long-term, adverse contribution to the cumulative impacts.

Conclusion. Many impacts of alternative C on ethnographic resources would be the same as those associated with alternative A. Increased park-related use of the sand dunes would result in moderate, adverse, long-term impacts on the sensitivities of the Tigua Indians of Ysleta del Sur Pueblo.

Cumulatively, there would continue to be adverse effects on the region's ethnographic

resources. This alternative would result in a minor to moderate, long-term, adverse contribution to the cumulative impacts.

Alternative C would not result in any impairment of park resources or values related to ethnographic resources.

Museum Collections

The park's museum collections would continue to be adequately inventoried, accessioned, and protected according to NPS standards. However, more space for curation, storage, and research would be needed in the future. During the life of the general management plan, much of the park's museum collections would be moved to a new facility outside of the park that was jointly managed with a research and education institution, and housed under state-of-the-art museum standards for fire detection and suppression; security; temperature and humidity control; and curation, storage, and research space. Providing more space for curation, storage, and research in this offsite facility would have a negligible impact compared to the offsite approach that would be employed in the no action alternative.

The utmost care would be exercised during the packing, moving, and unpacking of all collections. Therefore, potential impacts on the park's museum collections associated with the risk involved in moving artifacts, specimens, and archives would be negligible compared to the no action alternative. Moving a part of the park's museum collections to a facility outside the park would result in the same inconveniences as the no action alternative for park staff who needed to use the collections for research or study, and would result in a negligible impact.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact museum collections would be the same as those described for alternative A.

Conclusion. Compared to the no action alternative, alternative C would have negligible impacts on museum collections.

VISITOR EXPERIENCE AND UNDERSTANDING

Access, Activities and Destinations, and Scenic Views

Access. Long-term beneficial impacts on automobile access would result from additional parking at several sites throughout the park and extensive road improvements at and around the Salt Basin Dunes, Williams Ranch, and PX Well. Elsewhere in the park, impacts on access by roads would be negligible.

Long-term, beneficial impacts on hiking access would result from new or improved trailheads, improved signage, additional trails for use by the physically challenged, the development of up to 37 additional miles of trails in the park's interior, and the possible addition of other primitive trails to the park's inventory.

Long-term, beneficial impacts on horseback access by allowing overnight horse use on some trails in all zones.

Potentially, the increase in visitor use that would result from access improvements would have minor, long-term, adverse impacts on those visitors who desire more solitude.

Activities and Destinations. The construction of a new campground near Pine Springs that was designed for recreational vehicles and groups would result in an improved camping experienced for these visitors. The new group picnic area near Pine Springs would serve a visitor segment that currently is not addressed by any of the facilities at the park.

The landscape in the Pine Springs area would have a more natural appearance because of the removal of recreational vehicles from the trailhead parking lot. This also would allow hikers and picnickers to use the trailhead parking lot for its intended purpose. The stagecoach display and improved interpretive walk at the Pinery would create a new feature with improved interpretation that could attract more visitors to this part of the Pine Springs complex.

The new, hike-in campground below the eastern escarpment would provide a backcountry experience to visitors who formerly were not able to participate in this activity because of the strenuous hike that is required to access other backcountry sites.

At McKittrick Canyon, rehabilitating the Pratt Cabin and cultural landscape and operating the area as a visitor gateway would provide an interesting, theme-related, enjoyable setting with quality interpretation.

Operating the Dog Canyon area as a visitor gateway with a wider variety and number of day use and overnight opportunities would enhance the attractiveness of the northern part of the park as a destination.

West of the Salt Basin Dunes, new development consisting of a contact station, ranger station, parking area, trailhead, comfort station, and campground, with a road to the PX Well trailhead, would add activities throughout the area enhance the attractiveness of the north and northwest parts of the park as destinations.

The attractiveness of the Williams Ranch area as a destination would be enhanced by upgrading the road, providing road access from the west, rehabilitating the Williams Ranch house exterior and cultural landscape, improving and expanding the exhibits, and expanding the parking lot.

An upgraded trailhead, and improved parking would make the Guadalupe Pass areas more attractive as a destination and would lead to increased activity in the south part of the park.

Improved and expanded exhibits at Pine Springs, Frijole Ranch, McKittrick Canyon, Dog Canyon, the Salt Basin Dunes, and wayside locations throughout the park would enhance interpretation as an activity and make these sites more attractive as destinations. The exhibits would also make visitors more aware of the destinations and activities that are available throughout the park.

Expansions of the public corrals at Frijole Ranch and Dog Canyon and consideration of operating these facilities for use by commercial packers or a horse concession, as well as visitor-owned horses, could substantially increase the number of visitors who would experience the backcountry by horse.

Rehabilitating the Ship-on-the-Desert structure and landscape and using them as the centerpiece for an expanded research and education program that could include cooperative partners in additional facilities would improve the enjoyment of many of its users by providing better facilities and would enhance its use as a destination.

All of these would result in long-term, beneficial impacts.

Potentially, the increase in visitor use that would result from these improvements would have minor, long-term, adverse impacts on those visitors who desire more solitude.

Scenic Views. Moving the location for recreational vehicle camping to an location outside the Pine Springs viewshed would have a long-term, beneficial impact on scenic views in the area. Removing the electrical lines along McKittrick Creek would have long-term, beneficial impacts on the scenic view by providing a more natural landscape with less evidence of human development.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact access, activities and destinations, and scenic views would be the same as those described for alternative A. alternative C would have a negligible effects on cumulative impacts compared to the no action alternative.

Conclusion. Alternative C would have beneficial, long-term effects on access, activities and destinations, and/or scenic views at numerous sites within and associated with the park, including Pine Springs, Frijole Ranch, McKittrick Canyon, Dog Canyon, Salt Basin Dunes, Williams Ranch, Ship-on-the-Desert, PX Well, and Guadalupe Pass. There could be minor, long-term, adverse impacts on visitors who desire more solitude. Cumulative impacts would be the same as the no action alternative.

Interpretation, Education, and Orientation

Interpretation. Improvements to the Pine Springs visitor center and McKittrick Canyon and Dog Canyon contact stations, the addition of a new contact station at Salt Basin Dunes, and providing a living history working ranch at Frijole Ranch would have long-term, beneficial impacts on visitor understanding and appreciation of park themes and significance. Average length of stay in the facilities would likely increase with expanded interpretive media, which would cause long-term, beneficial impacts.

Waysides and other exhibits that were installed at several locations would provide both orientation and interpretive information to visitors throughout the park. The long-term benefit would be greatest for visitors who do not go to the visitor center or who arrive outside of regular park hours.

Recent Visitor Services Projects surveys of NPS visitors have shown that more than 60 percent of park visitors may contact Internet pages before park visits. Enhancements to the Internet site and other digital interpretive services would have long-term, beneficial effects by providing increased understanding of park significance and recreational opportunities, and appreciation of park values by both "electronic" and actual visitors to the park.

Education. Using Ship-on-the-Desert as part of expanded research and educational facilities would have long-term, beneficial impacts on the understanding and appreciation of those participating in residential programs or day-use activities.

Expanded outreach education programs would have long-term, beneficial impacts on program participants, which would include populations that have not traditionally used the park. Increased interaction with regional and national media would enable the National Park Service to provide information to audiences that may not have been seeking, or even been aware of, the opportunities at Guadalupe Mountains National Park.

Orientation. Several aspects of alternative C would have beneficial impacts on visitor orientation. These would include enhancement of the contact stations at McKittrick Canyon and Dog Canyon, the new contact station west of the Salt Basin Dunes, additional wayside exhibits distributed more widely throughout the park, targeted interpretive programs and activities, and improved Internet resources.

Cumulative Effects. Past, current, and foreseeably future actions within and outside the park that impact interpretation, education, and orientation would be the same as those described for alternative A. Alternative C would have a negligible effects on cumulative impacts compared to the no action alternative.

Conclusion. All of the impacts of alternative C on interpretation, education, and orienta-

tion would be beneficial. The cumulative impact with other information sources would be negligible.

THE SOCIOECONOMIC ENVIRONMENT

The impacts of alternative C on the socioeconomic environment would be the same as those described for the preferred alternative. Specifically,

- The planned improvements may increase park visitation, which would benefit regional businesses.
- The effects of changes in staffing levels would be negligible.
- Benefits from new capital projects in the park would be beneficial in the short term and negligible in the long term.
- Effects on housing demand would be negligible.
- Increases in demand for public services would be a long-term, minor, adverse impact but would be offset by the long-term, beneficial impacts from fees, sales and property taxes, and other revenues.
- Cumulative impacts would be the same as described in the no action alternative.

The effects of alternative C may be slightly greater than those of the preferred alternative. However, because the impacts would be spread over the region, which includes four counties in two states, the intensity of the impacts would not change from those presented for the preferred alternative.

Conclusion. Impacts of alternative C on the socioeconomic environment would be the same as those described for the preferred alternative.

PARK OPERATIONS, FACILITIES, AND EQUIPMENT

The impacts of alternative C on park operations, facilities, and equipment would be the same as those described for the preferred alternative. Specifically,

- Negligible impacts would result from continued use of shared administrative functions at the "town office" in Carlsbad. Continued implementation of efficiencies identified in the core operations analysis would have a long-term benefit.
- A new, consolidated headquarters complex at the Pine Springs site would result in a long-term, beneficial impact.
- Enhanced water storage and fire protection facilities at Dog canyon would provide a long-term, beneficial impact.
- The ability to reclaim two housing units at Pine Springs for their original purpose would have a long-term, beneficial impact.
- Increased maintenance requirements associated with the new facilities would have a long-term, moderate, adverse impact on park operations.

Cumulative impacts would be the same as described in the no action alternative and this alternative's contribution would be slight

RELATIONSHIP OF LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The intent of this determination is to identify whether alternative C would result in trading the immediate use of the land for any long-term management possibilities or the productivity of park resources that would affect future generations. It is intended to determine whether alternative C would be a sustainable action that could continue over the long-term without environmental problems.

Alternative C would be a sustainable action that would not change the use of Guadalupe Mountains National Park or affect the long-

term productivity of lands affected by its operation for future generations.

The National Park Service understands that the Tigua Indians of Ysleta del Sur Pueblo would prefer that visitors not be allowed access to the sand dunes. Alternative C proposes road and trail improvements that would allow people to more easily access the area, and overnight camping in the vicinity would extend the length of some visitor stays. Impacts on Tigua sensitivity to the increased number of visitors in the sand dunes area would be moderate, adverse, and long-term.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The intent of this evaluation is to identify whether this alternative would result in effects that could not be changed over the long term or would be permanent. An effect on a resource would be irreversible if the resource could not be reclaimed, restored, or otherwise returned to its condition before the disturbance. An irretrievable commitment of resources involves the effects on resources that, once gone, cannot be replaced or recovered.

Alternative C would not involve the irreversible or irretrievable commitment of resources. No resources would experience major adverse impacts and no impairment of park resources would occur as a result of this alternative. The loss of exposed and subsurface fossils from construction of new facilities and trails would be an irreversible loss of moderate intensity at some locations.

UNAVOIDABLE ADVERSE IMPACTS

The intent of this determination is to identify whether this alternative would result in impacts that could not be fully mitigated or avoided. The focus of this assessment is on real environmental issues that would involve major impacts if action was taken.

None of the effects identified in this assessment of alternative C would be considered major adverse impacts. The implementation of this alternative for managing Guadalupe Mountains National Park would not result in impairment of any resources that would affect the basic purpose of Guadalupe Mountains National Park.