



Environmental Consequences

INTRODUCTION AND METHODOLOGIES

INTRODUCTION

The National Environmental Policy Act mandates that environmental impact statements disclose the environmental effects of proposed federal actions. In this case, the proposed federal action is the adoption of a general management plan for the North Unit of Badlands National Park. This “Environmental Consequences” chapter analyzes the potential effects of four management alternatives on natural resources, cultural resources, the visitor experience, and the socioeconomic environment of Badlands National Park. By examining the environmental consequences of all alternatives on an equivalent basis, decision-makers can evaluate which approach would create the most desirable combination of the greatest beneficial results with the fewest adverse effects on the park.

The alternatives in this plan provide broad management direction for the park. Because of the general nature of the alternatives, the potential consequences of the alternatives are analyzed in similarly general terms using qualitative analyses. For many actions discussed in this document, subsequent environmental documents would be required; such documents would be completed following the development of detailed alternatives before the action would be implemented.

For the purposes of environmental analysis, it is assumed that the road over Cedar Pass will remain intact. Since this plan will serve as the first phase of tiered planning, the analysis of detailed site-specific road alignments would not add to the purpose of the plan. The National Park Service would conduct additional environmental analyses before implementing site-specific actions. In

particular, additional NEPA compliance would have to be completed before construction could begin on a new alignment for the Loop Road in the Cedar Pass area. If necessary, statements of findings for wetlands and floodplains also would be completed.

The existing conditions for all the impact topics that are analyzed here were identified in the “Affected Environment” chapter. All the impact topics are assessed for each alternative. For each impact topic, there is a description of the beneficial and adverse effects of the alternative, a discussion of the cumulative effects when this project is considered in conjunction with other actions occurring in the region, and a brief conclusion.

The analysis of the no-action alternative (continue current management) includes discussion of what the future conditions in the park would be if no changes were made to facilities or park management. Then the three “action” alternatives are compared to the no-action alternative to identify the incremental changes that would result from changes in park facilities and management. The effects of recent decisions and approved plans, such as expanding the park headquarters area and redeveloping the Sage Creek campground, are not evaluated in this document, except as reasonably foreseeable future projects in the cumulative impact analyses (as described on p. 123). Although these actions would take place during the life of this plan, they have been or are being evaluated in detail in other environmental documents.

At the end of the analysis of each alternative is a brief discussion of energy requirements and conservation potential, 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. A brief summary of the impacts of each alternative appears in table 9, page 69.

METHODOLOGIES FOR ANALYZING EFFECTS

The analysis of effects and the conclusions in this chapter are based largely on information from NPS experts, park staff insights, and professional judgment, as well as on the review of existing literature and studies. The planning team's method of analyzing effects is further explained below. It is important to remember that it is assumed in the analyses that the mitigative measures described in the "Alternatives" chapter would be applied to minimize or avoid impacts. If these measures were not applied, the potential for resource impacts and the magnitude of those impacts would increase.

Basis for Defining Environmental Consequences

The environmental consequences of each impact topic were defined on the basis of *type* of effect, *intensity*, *context*, and *duration*. Cumulative effects also were identified; they are discussed later in this section.

Type refers to an effect being either *adverse* or *beneficial* for the topic being analyzed. Effects also can be *direct* or *indirect*. *Direct* effects are caused by an action and occur at the same time and place as the action. *Indirect* effects are caused by the action and occur later or farther away, but they still are reasonably foreseeable.

Intensity refers to the degree or magnitude to which a resource would be positively or

negatively affected. Each effect was identified as *negligible*, *minor*, *moderate*, or *major* in conformance with the criteria for the classifications established for each impact topic, as described below. Because this is a programmatic document, the intensity of each effect typically is expressed qualitatively.

Context refers to the setting within which an effect is analyzed, such as the affected region or locality. In this document most effects would be either *localized* (site-specific) or *parkwide*. Cumulative effects are either *parkwide* or *regional* (for example, an effect on air quality would be regional). For special status species, such as threatened and endangered species, the context is the species' range.

Duration refers to how long an impact would last. The planning horizon for this plan is approximately 20 years. Unless otherwise specified, in this document the following terms are used to describe the duration of the impacts:

Short term: The effect would be temporary, lasting a year or less, such as effects associated with construction.

Long term: The effect would last more than one year and could be permanent; for example, the loss of soil due to the construction of a new facility

Intensity Definitions by Topic

Natural Resources. The natural resource impact topics analyzed in this document are air quality, soundscapes, geologic features (including soils), paleontological resources, vegetation, wildlife, and special status species (which includes both federally listed species and those listed by the state as threatened and endangered). Information about known resources was compiled and

compared with the locations of proposed developments and other actions. The impact analysis was based on the knowledge and best professional judgment of planners, biologists, and paleontologists; data from park records; and studies of similar actions and effects, when applicable. The planning team qualitatively evaluated the intensities of effects on all the natural resource impact topics.

The intensity of effects on *air quality* was rated as follows:

Negligible: There would be no measurable or detectable effect on air quality.

Minor: The action would have a slight effect on air quality, causing a change in air emissions or visibility.

Moderate: An effect would be clearly detectable; there would be an appreciable change in local air emissions or visibility.

Major: There would be a substantial, highly noticeable change in local or regional air emissions or visibility.

The intensity of effects on *soundscapes* was rated as follows:

Negligible: The natural sound environment might be affected, but the effects would be at or below the level of detection, or changes would be so slight they would not be of any measurable or perceptible consequence to wildlife or the visitor experience.

Minor: There would be a detectable change in the natural sound environment, but the effects would be small, local, and of little consequence to wildlife or the visitor experience.

Moderate: A change in the natural sound environment would be readily

detectable, affecting the behavior of wildlife or visitors in a large area.

Major: A severely adverse or exceptionally beneficial change in the natural sound environment would be obvious and would affect the health of wildlife or visitors or cause a substantial, highly noticeable change in the behavior of wildlife or visitors in a local or regional area.

The intensity of effects on *paleontological resources* was rated as follows:

For paleontological resources the intensities are only minor, moderate, and major.

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, and 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, but the volume of bedrock disturbance would be large or (b) the activity would be in a fossil-rich area, and the area of bedrock disturbance 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 likely be lost.

The intensity of effects on *other geologic features, including soils*, was rated as follows:

Negligible: The action would result in a change in a geologic feature, but the change would be at the lowest level of detection, or not measurable.

Minor: The action would result in a detectable change, but the change would be slight and local. A geologic feature might be slightly altered in a way that would be noticeable. There could be changes in a soil's profile in a relatively small area, but the change would not increase the potential for erosion.

Moderate: The action would result in a clearly detectable change in geologic features — a geologic feature would be obviously altered, or a few features would show changes. There could be a loss or alteration of the topsoil in a small area, or the potential for erosion to remove small quantities of additional soil would increase.

Major: The action would result in the permanent loss of an important geologic feature, or there would be highly noticeable, widespread changes in many geologic features. There would be a permanent loss or alteration of soils in a relatively large area, or there would be a strong likelihood for erosion to remove

large quantities of additional soil as a result of the action.

The intensity of effects on *vegetation* and *wildlife* was rated as follows:

Negligible: The action might result in a change in vegetation or wildlife, but the change would not be measurable or would be at the lowest level of detection.

Minor: The action might result in a detectable change, but the change would be slight and have a local effect on a population. This could include changes in the abundance or distribution of individuals in a local area, but not changes that would affect the viability of local populations. Changes to local ecological processes would be minimal.

Moderate: The action would result in a clearly detectable change in a population and could have an appreciable effect. This could include changes in the abundance or distribution of local populations, but not changes that would affect the viability of regional populations. Changes to local ecological processes would be of limited extent.

Major: The action would be severely adverse or exceptionally beneficial to a population. The effects would be substantial and highly noticeable, and they could result in widespread change and be permanent. This could include changes in the abundance or distribution of a local or regional population to the extent that the population would not be likely to recover (adverse) or would return to a sustainable level (beneficial). Significant ecological processes would be altered, and “landscape-level” (regional) changes would be expected.

For *special status species*, the following impact intensities apply. These definitions are consistent with the language used to determine effects on threatened and

endangered species under the federal Endangered Species Act:

No effect: The action would cause no effect on the species or critical habitat if present.

Not likely to adversely affect: The action would be expected to result in discountable effects on a species or critical habitat (that is, extremely unlikely to occur and not able to be meaningfully measured, detected, or evaluated), or it would be completely beneficial.

Likely to adversely affect: The action would result in a direct or indirect adverse effect on a species or critical habitat, and the effect would not be discountable or completely beneficial.

Cultural Resources. Effects on *historic buildings and other structures* result from physical changes to the fabric or configuration of elements that make them eligible for inclusion in the national register. Adverse effects result from modifying a significant characteristic of a historic building or other structure, removing a significant structural element, or adding a new, incompatible element. Beneficial effects can result from intervention to restore or rehabilitate a resource. Removing incompatible or noncontributing additions also can be seen as beneficial to attaining an acceptable level of conformance to its original or desired historical period.

For a building or other structure to be listed in the national register, it must be associated with an important historic context *and* possess historic integrity of the features necessary to convey its significance — location, design, setting, workmanship, materials, feeling, and association (see National Register bulletin 15: *How to Apply the National Register Criteria for Evaluation*).

The intensity of effects on *historic buildings and other structures* was rated as follows:

Negligible: Effects would be at the lowest level of detection — barely and not measurable. For purposes of section 106, the determination would be *no adverse effect*.

Minor: Adverse effect — the action would not affect the character defining features of a building or other structure that is listed on or eligible for the National Register of Historic Places. **Beneficial effect** — there would be stabilization/preservation of character-defining features in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (USDI 1996) to maintain the existing integrity of a building or other structure. For section 106 purposes, the determination would be *no adverse effect*.

Moderate: Adverse effect — the action would alter a character-defining feature(s) of the building or other structure but would not diminish the integrity of the resource to the extent that its national register eligibility would be jeopardized. For section 106 purposes, the determination would be *adverse effect*. **Beneficial effect** — the building or other structure would be rehabilitated in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (USDI 1996) to make possible a compatible use of the property while preserving its character-defining features. For section 106 purposes, the determination would be *no adverse effect*.

Major : Adverse effect — the action would alter a character-defining feature of the building or other structure, diminishing its integrity to the extent that it no longer would be eligible for listing

in the national register. For section 106 purposes, the determination would be *adverse effect*. **Beneficial effect** — the structure would be restored in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (USDI 1996) to accurately depict its form, features, and character as it appeared during its period of significance. For section 106 purposes, the determination would be *no adverse effect*.

The National Park Service defines *ethnographic resources* as any site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it. The decision to call resources *ethnographic* depends on whether associated peoples perceive them as traditionally meaningful to their identity as a group and the survival of their lifeways. A traditional cultural property is an ethnographic resource eligible to be listed in the national register because of its association with the cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community (National Register bulletin 38, *Guidelines for Evaluating and Documenting Traditional Cultural Properties*).

For ethnographic resources, certain important questions about human culture and history can be answered only by gathering information about the cultural material of cultural resources. Ethnographic resources have the potential to address questions about contemporary peoples or groups and their identity and heritage. The ethnographic linkage is vested in specific places of traditional use with cultural meaning. Ethnographic resources can be

eligible for inclusion in the national register if they meet its criteria for traditional cultural properties. To those for whom the resources hold cultural meaning, effects on ethnographic resources range from barely perceptible, slight but noticeable, apparent, and strikingly obvious. Those effects correlate respectively with the terms *negligible*, *minor*, *moderate*, and *major*.

The intensity of effects on *ethnographic resources* was rated as follows:

Negligible: Adverse effect — the effects would be barely perceptible, and the action would not alter resource conditions such as traditional access or site preservation or the relationship between the resource and the affiliated group's body of beliefs and practices.

Beneficial effect — there would be no change to a group's body of beliefs and practices. For section 106 purposes, the determination of effect on traditional cultural practices would be *no adverse effect*.

Minor: Adverse effect — the effects would be slight but noticeable; the action would not appreciable alter resource conditions such as traditional access or site preservation or the relationship between the resource and the affiliated group's body of beliefs and practices.

Beneficial effect — traditional access would be allowed, or a group's traditional practices or beliefs would be accommodated. For section 106 purposes, the determination of effect on traditional cultural practices would be *no adverse effect*.

Moderate: Adverse effect — effects would be apparent, and the action would alter resource conditions such as traditional access, site preservation, or the relationship between the resource and the affiliated group's beliefs and practices, but the group's beliefs and/or

practices would survive. For section 106 purposes, the determination of effect on traditional cultural practices would be *adverse effect*. **Beneficial effect** — a group's beliefs and practices would be facilitated. For section 106 purposes, the determination of effect on traditional cultural practices would be *no adverse effect*.

Major : Adverse effect — the action would alter resource conditions such as traditional access, site preservation, or the relationship between the resource and the affiliated group's beliefs and practices to the extent that the survival of a group's beliefs and/or practices would be jeopardized. For section 106 purposes, the determination of effect on traditional cultural practices would be *adverse effect*. **Beneficial effect** — the action would encourage a group's beliefs and practices. For section 106 purposes, the determination of effect on traditional cultural practices would be *no adverse effect*.

Visitor Experience. Three factors determine the effects of actions on the visitor experience: *access*, *availability of information*, and the *range and enjoyment of visitor activity*. Changes in available parking spaces, the availability of trailheads, and closure or opening of roads might affect *access* to the primary activity areas of the park. The *availability of information*, orientation, and interpretation can affect visitors' enjoyment of the park, as can the *range of visitor activity*.

The following definitions describe the *types* of effects on the visitor experience:

Visitor Access — **beneficial** indicates there would be an increase in accessibility to a specific area or a reduction in congestion; **adverse** indicates that the accessibility to a

specific area would be reduced or congestion increased.

Availability of Information — **beneficial** indicates an improvement in opportunities for visitors to obtain information, orientation, and interpretation; **adverse** indicates a reduction in opportunities for visitors to obtain information, orientation, and interpretation.

Range of Visitor Activity — **beneficial** indicates more opportunities for recreational activities like those mentioned above; **adverse** indicates a reduction in such opportunities.

The intensity of effects on the *visitor experience* was rated as follows:

Negligible: The effect would be not detectable by visitors or would be barely perceptible to most visitors; therefore, it would have no discernible effect.

Minor: The action might result in a slightly detectable effect that would result in little detracting or improvement in the quality of the visitor experience. There would not be an overall effect on the visitor experience.

Moderate: There would be a change in the experiences of a large number of visitors, resulting in a noticeable decrease or improvement in the quality of the experience. A decrease in quality would be indicated by a change in the frustration level or in the inconvenience for a period of time.

Major: A substantial improvement or a severe drop in the quality of many peoples' experience would result from an action such as the addition or elimination of a recreation opportunity or a permanent change in access to a popular area that would be clearly detectable. A substantial, highly noticeable influence could have an appreciable effect on the

visitor experience by permanently altering access to and the availability of various aspects of the visitor experience.

Socioeconomic Environment. Badlands National Park operates within the regional social and economic environment of Jackson, Pennington, and Shannon Counties. Effects on the social and economic condition within these counties due to the action alternatives are of concern to the National Park Service, park managers, local communities and individuals, local governments, and the public.

Parts of Badlands National Park stretch into all three counties of the affected region. This park is one of the many visitor attractions in southwestern South Dakota. It follows that developments proposed by the action alternatives could have a direct effect on some parts of the social and economic environment of the region. Planning team members team applied logic, experience, professional expertise, and professional judgment to analyze the impacts of each alternative on the social and economic setting.

Socioeconomic data, expected future visitor use, and future developments in the park all were considered in identifying and discussing the potential effects. A simplistic analysis of the direct effects of each alternative was completed. The identification of these impacts is sufficient for the comparison of alternatives for decision-making purposes. For the most part, impacts from the action alternatives would be linked to the three-county regional area.

In the socioeconomic analysis, the duration of effects is as follows: *Short-term* effects would last less than three years; *long-term* effects would last more than three years (and could be considered a permanent change in conditions).

The intensity of effects on the *regional and local economy* was rated as follows:

Negligible: The effect would be at the lower levels of detectability.

Minor: The effect would be slight but detectable.

Moderate: The effect would be readily apparent.

Major: The effect would be severely adverse or exceptionally beneficial.

The regional and local socioeconomic base in the three-county region, including local gateway communities, would be changed by development in the park and the operation and management of its facilities. The socioeconomic base includes such factors as population, income, employment, and earnings. Development projects in the park units would benefit the local construction industry. Park operations would provide employment opportunities for about 60 people.

The greatest effects from park operations would come from the \$4,343,400 increase in the park's annual operating budget and the addition of 73 full-time equivalent (FTE) positions, as detailed in the *Badlands National Park Business Plan 2001* (NPS 2001a). Obviously, these changes would be long-term positive effects on the regional economy. A doubling of the park's annual operating budget and a 125% increase in staff FTEs represent moderate long-term beneficial increases in business and employment opportunities in the depressed economy around the park. These improvements probably would not be implemented all at once; rather, they would take place over the course of the 15-year planning period. Therefore, the benefits also would occur over a period of time.

These significant increases are necessary to meet the standards of operations,

maintenance, and resource protection mandated by the various laws, regulations, and policies that direct the management of the park. For purposes of this analysis, it is assumed that these improvements would be made as part of the continuing management of the park; therefore, they are included as part of the no-action alternative (A). The effects of the action alternatives are evaluated with this situation serving as the baseline for comparison.

DETERMINING CUMULATIVE IMPACTS

Methods Used

The CEQ regulations for implementing the National Environmental Policy Act define a cumulative impact as follows:

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.

Each cumulative effect analysis is additive; that is, the overall effect of the alternative is considered when combined with the effects of other actions (inside and outside the park) that have occurred or would occur in the foreseeable future.

To determine potential cumulative effects, projects in a 15-mile area surrounding the North Unit of Badlands National Park were identified. This area includes the communities of Wall, Scenic, and Interior, the South Unit of Badlands, parts of Buffalo Gap National Grassland and the Pine Ridge Indian Reservation, and parts of Jackson, Pennington, and Shannon counties.

For the air quality impact topic, a different geographic area was used in the analysis of cumulative effects. Because air quality effects in the park result from actions occurring over a large area, the cumulative effects area for this topic was the airshed extending west to the Black Hills and Wyoming.

Actions and Projects Inside Badlands National Park

The primary projects and actions that could contribute to cumulative effects are summarized below. These include ongoing and planned actions and projects in the park, reservation, communities, and adjacent counties:

A plan is being prepared to build a Lakota Heritage and Education Center on land in the South Unit or on land in the reservation that is close to the park. The purpose of this facility is to offer the public an opportunity to learn about the Lakota people and their culture and to provide an area for tribal members to share their cultural heritage. The project is envisioned to be a building housing a museum, a visitor contact area, a meeting room, classrooms, wacipi dance grounds, Lakota lodges, an open-air bazaar, and administrative office space.

The Sage Creek campground is being redesigned to meet the needs of diverse users seeking access to the backcountry. Surrounding natural and cultural resources will be protected. The design includes creating new parking areas, campsites, and group camping shelters in the existing campground footprint, as well as expanding the campground's footprint to make new separate-use areas for horse users and group campers. This project was started prior to this planning effort and therefore a separate environmental assessment is being prepared for this project.

The Park Service likely would conduct some small, limited prairie dog control efforts in areas that are adjacent to private lands upon request from the landowners. All control efforts would be conducted in accordance with federal and state laws and NPS management policies.

Actions and Projects Outside Badlands National Park

The Minuteman Missile National Historic Site, which was recently established near the park, will be administered by the Badlands National Park staff. A general management plan for the site is being prepared. A visitor center / administrative facility and parking lot are planned for an area off I-90 east of Wall.

The U.S. Forest Service is following a land and resource management plan for Nebraska National Forest, which includes the Buffalo Gap National Grassland (USFS 2001b). The plan calls for several actions that could affect Badlands National Park, including the following:

- ◆ a recommendation for a wilderness area (Indian Creek)
- ◆ building a primitive campground/trailhead and trails for hiking and horseback riding southwest of the park's South Unit
- ◆ managing the southwest part of the Wall District to promote prairie dog expansion (primarily adjacent to the park) and black-footed ferret reintroduction habitat
- ◆ designating a backcountry nonmotorized area (Rake Creek)
- ◆ developing trails northeast of the park
- ◆ developing a primitive campground southwest of Wall near the park

Other actions that may be taken in the grassland in the future that could affect the park are making changes in public access (such as limiting or closing public access in areas adjacent to the park), changing livestock stocking rates, and changing fuel treatments (such as prescribed burning).

Prairie dog control efforts are continuing on private lands around the park, which may be affecting prairie dogs leaving the park and possibly ferrets. The U.S. Forest Service is also likely to control prairie dogs near private lands.

The cleanup of the former bombing range in Badland's South Unit is an ongoing effort by the Army Corps of Engineers and the Oglala Sioux Tribe to identify and mitigate public safety concerns relating to the former military use of these lands. The effort involves a thorough survey of the bombing range (including the South Unit), followed by investigations of areas identified to have high concentrations of metals. This involves excavating the area by means that can range from hand tools to a backhoe. All excavated areas are backfilled upon removal or destruction of ordnance. Large excavated areas are seeded with a mix of native plant species.

The Mni Wiconi water project is a regional water distribution system being built to bring potable water from the Missouri River to the Pine Ridge Reservation. A series of pipelines are being built near the park. The construction is primarily within the road prism of existing roads, thus reducing the adverse impacts of the project.

The proposed new Dakota, Minnesota, and Eastern (DM&E) railroad line would be built primarily to transport coal from the Powder River Basin of northeastern Wyoming to the Midwest. The line would be about 6 miles from the wilderness boundary in the North Unit. DM&E received regulatory approval from the U.S.

Surface Transportation Board on January 30, 2002, to proceed with the \$1.5 billion project. Although the route has been approved, construction has been delayed by court challenges. If the rail line is built, emissions of visible particulates from the diesel locomotives might cause perceptible deterioration of visibility in the park.

The Oglala Sioux Parks and Recreation Authority has submitted a proposal to the state of South Dakota for the designation of the Crazy Horse Scenic Byway. The proposed route of the 133-mile byway is detailed beginning on page 26. The designation of a scenic byway probably would increase traffic levels on these roads.

A number of energy development projects are being proposed in the Powder River Basin in northeastern Wyoming. A group of oil and gas companies proposes to extract coalbed methane on public lands. The Bureau of Land Management has forecast that approximately 39,000 new coalbed methane wells and 3,200 oil wells would be developed and operated on federal lands in the Wyoming portion of the Powder River Basin, along with a somewhat smaller coalbed methane project in the Montana portion of the basin, along with various support facilities in the region (BLM 2002).

Other proposed facilities in the area are a 500 megawatt coal-fired power plant (WYGEN 2) near Gillette, Wyoming, as well as the Two Elks unit no. 2 and the Mid-PRB 500 megawatt power plants. Increased emissions are expected from the Dacotah Cement plant near Rapid City. In addition, the startup of the new 500 megawatt Two Elks unit no.1 will likely result in air quality problems. These energy developments could add substantial emissions to the airshed, which in turn could affect the visibility and air quality of Badlands National Park (BLM 2002).

SECTION 106 SUMMARIES FOR CULTURAL RESOURCES

Effects on historic structures and ethnographic resources are described in terms of type, context, duration, and intensity, as outlined above. This is consistent with the CEQ regulations implementing the National Environmental Policy Act. However, these impact analyses also must comply with the requirements of section 106 of the National Historic Preservation Act (36 CFR 800: *Protection of Historic Properties*). In accordance with those regulations, the effects on cultural resources have been evaluated by (a) determining the area of potential effects, (b) identifying cultural resources present in the area of potential effects that are either listed on or eligible to be listed in the National Register of Historic Places, (c) applying the criteria of adverse effect to either listed or eligible affected cultural resources, and (d) considering ways to avoid, minimize, or mitigate any adverse effects.

Under the Advisory Council's regulations, a determination of *no historic properties affected*, *adverse effect*, or *no adverse effect* must be made for cultural resources that are eligible for the national register. An *adverse effect* occurs whenever an action would alter, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the national register. For example, diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association would constitute an adverse effect. Adverse effects also can include reasonably foreseeable effects caused by the preferred alternative that would occur later, be farther removed in distance, or be cumulative (36 CFR 800.5: *Assessment of Adverse Effects*). A determination of *no adverse effect* may mean that there would be an effect, but the effect would not diminish in any way the charac-

teristics of the cultural resource that qualify it for inclusion in the national register.

CEQ regulations and the NPS *Director's Order 12, Conservation Planning, Environmental Impact Analysis, and Decision-making* call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact (for example, changing an effect from major to moderate or minor). However, any resultant reduction in the intensity of an effect due to mitigation is an estimate of the effectiveness of mitigation under the National Environmental Policy Act only; it does not suggest that the level of effect as defined by section 106 would be similarly reduced. Although adverse effects under section 106 may be mitigated, the effect remains adverse.

A section 106 summary is included in the impact analyses for historic structures, ethnographic resources, and the cultural landscape in all alternatives. These summaries have been prepared with the use of definitions consistent with section 106 of the National Historic Preservation Act of 1966, as amended, and the regulations of the Advisory Council on Historic Preservation (36 CFR 800). The summaries assess the effects of the undertaking on cultural resources, based on the criteria of effect and adverse effect found in the Advisory Council's regulations.

IMPAIRMENT OF PARK RESOURCES OR VALUES

In addition to determining the environmental consequences of the preferred alternative, NPS planners are required by NPS *Management Policies 2001* to determine whether or not actions would impair park resources.

The fundamental purpose of the national park system, established by the Organic Act

and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid or minimize to the greatest degree practicable, adverse effects 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. That discretion is limited by the statutory requirement that the National Park Service must leave park resources and values *unimpaired* unless a particular law directly and specifically provides otherwise.

The prohibited impairment would occur when, in the professional judgment of the responsible NPS manager, the integrity of park resources or values would be harmed. Any effect on a resource or value could be an impairment, but impairment would be most likely if it would result in a major or severe adverse effect on a resource or value whose conservation is (a) necessary to fulfill specific purposes identified in the park's establishing legislation or proclamation, (b) key to the natural or cultural integrity of the park or opportunities to enjoy it, or (c) identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment could result from NPS management activities, from visitor activities, or from activities undertaken by concessioners, contractors, and others operating in the park. A determination about impairment is made in the "Conclusion" section for each impact topic except visitor use and the socioeconomic environment. Effects that were found to be moderate or lower in intensity were assumed not to be sufficient to constitute an impairment of park resources or values.

EFFECTS FROM ALTERNATIVE A: CONTINUE CURRENT MANAGEMENT (NO-ACTION ALTERNATIVE)

EFFECTS ON NATURAL RESOURCES

Air Quality

Analysis. No new developments or emission sources would result from alternative A. Vehicle traffic probably would increase slightly if visitation increased, but the effect of vehicular exhaust on the park's air quality would be minor, mostly on the Loop Road. Vehicles being driven on dirt and gravel roads would generate some dust, which would have a minor local adverse effect on visibility. Emissions from NPS diesel generators, vehicles, and wood stoves, primarily in the park headquarters area, would result in minor local adverse impacts.

Cumulative Effects. Short-term minor local adverse effects on air quality from particulates and machinery fumes would result from construction activities in the park's North and South Units, including the development of the Lakota Heritage and Education Center, the redesign of the Sage Creek Campground, and the facilities being built in the park headquarters area.

Periodic prescribed burns throughout the park's grasslands would result in temporary increases in particulates, carbon monoxide, and volatile organic compounds, causing moderate to major local short-term adverse effects on air quality.

As was mentioned in the "Affected Environment" chapter, sources outside the park are believed to be largely responsible for the degradation of the air quality and visibility in Badlands National Park. Future developments would be expected to add to the pollution load affecting the park. Several developments mentioned above (beginning on page 124) have the potential to adversely

affect the park's air quality. In particular, the proposed energy and industrial developments in the Powder River Basin would generate large amounts of particulate matter, sulfur dioxide, nitrogen oxides, and volatile organic compounds, which could cause substantial adverse effects on the visibility and air quality in the park.

Emissions from the DM&E rail line also would result in a long-term effect on the park's airshed. The construction of the rail line and the Mni Wiconi water project would have minor to moderate short-term effects. If the Crazy Horse Scenic Byway was designated, increased traffic on roads near the park would cause minor long-term impacts on air quality. Prescribed burns outside the park and wildfires also would be likely to result in short-term minor to major adverse effects on the park's air quality and visibility.

All the above actions, added to the actions in alternative A, could result in long-term cumulative major adverse effects on the park's air quality. However, the actions in alternative A would add a minimal increment to this cumulative impact.

Conclusion. Implementing alternative A would cause long-term minor adverse effects on the air quality in Badlands National Park primarily from increased vehicle emissions. Overall, the park's air quality and visibility probably would continue to deteriorate because of emissions from sources outside the park. A long-term major cumulative adverse impact on regional air quality would be likely, although the incremental contribution from the actions of alternative A would be minor. Overall, the effects of alternative A would

not constitute an impairment of park resources or values.

Soundscape

Analysis. No new actions would be taken under alternative A that would result in important changes in noise levels. Increases in visitation to the North Unit would result in a slight increase in vehicle traffic and associated noise, causing a long-term minor local adverse effect. Park machinery and visitors also would continue to generate noise, most of which would continue to be confined to primary developed visitor and administrative areas, including the Cedar Pass area, the Sage Creek campground, and the Loop Road.

Cumulative Effects. At different times, short-term minor to moderate adverse effects from noise would be caused by park construction machinery, including that at the new park headquarters facilities and from redesigning the Sage Creek campground. Outside the park, the construction of the Mni Wiconi water project would generate noise that would be audible in places in the North Unit. Commercial helicopter tours would be likely to continue, as would farm-to-market traffic, generating noise intrusions in the North Unit. These effects, added to noise caused by visitors and park operations under alternative A, would result in short and long-term minor to moderate cumulative adverse noise effects in local areas.

Depending on location and wind direction, the construction and operation of the proposed DM&E rail line also could increase noise levels. More traffic resulting from the designation of the Crazy Horse Scenic Byway might be audible in the southwest end of the North Unit. When these noises are combined with the sounds of visitor and administrative use in the southwest end of the North Unit, there

could be a minor, long term, adverse cumulative noise impact.

Conclusion. Most of Badlands National Park would continue to be relatively quiet under alternative A. However, there would continue to be long-term minor adverse effects on the park's soundscape in local areas, largely from visitation and administrative activities in developed areas. Noise from activities in alternative A added to noise from other actions within and outside the North Unit could result in short-and long-term, minor to moderate adverse cumulative effects in local areas. These effects would not be sufficient to constitute an impairment of park resources or values.

Geologic Features, Including Soils

Analysis. None of the actions of alternative A would adversely affect the park's geologic features. However, soils would continue to be compacted and altered in local areas by hikers and backpackers walking cross-country and horseback riding in the park. Soil compaction would continue in areas where vehicles are parked on road shoulders. In some areas, such as the Door and Window area, erosion would continue from "social" trails caused by visitors walking to see and climb on geologic features. Vehicles being driven on the road to Sheep Mountain Table also would continue to cause erosion because of the slope and nature of the road. These long-term adverse impacts would be minor to moderate.

Cumulative Effects. Although other actions would result in several construction activities in and outside the park, alternative A would not result in any cumulative effects. None of the other actions would be in areas where effects from visitor activities or NPS operations under alternative A would result in an additive, cumulative effect on soils.

Conclusion. Alternative A would result in long-term minor to moderate adverse effects on soils in local areas caused primarily by continuing use of the park by visitors. No cumulative effects on soils would be expected, and the effects on soils from this alternative would not result in any impairment of park resources or values.

Paleontological Resources

Analysis. In the recent past, Badlands National Park has been the target of intensive, systematic collecting of fossils (NPS 1999a). Any foot or vehicle traffic on bedrock potentially could result in effects on paleontological resources. The greatest impact on fossil resources from foot traffic would be in intensive visitor use areas such as Door and Window and Fossil Exhibit trail.

Given the size of Badlands National Park and the relatively few NPS law enforcement officers; it is extremely difficult to identify how much illegal fossil collecting occurs in the park. The park initiates 20 to 25 cases a year, which typically result in three to four citations/prosecutions a year. The extent of this long-term adverse effect on the park's resources is somewhat uncertain, but it is thought that it would be a moderate, adverse, long-term impact.

Park visitors such as those in school groups probably would continue to pick up fossils and to take them illegally, either knowingly or unknowingly. Most illegal fossil collecting probably occurs relatively close to roads. Amateur and commercial collectors also probably would continue to take fossils from the park. The number of illegal fossil collection cases investigated has increased from one case in 1998 to 32 in 2000 and 72 in 2001. These cases primarily involved visitors taking a few to large numbers of fossils. However, the number of

documented cases may not accurately reflect the amount of illegal fossil collecting in the park; rather than increased poaching; the upsurge in cases may be due to greater NPS efforts and more awareness training of the staff.

Illegal fossil collecting is a major problem in other areas. A study commissioned by the U.S. Forest Service found that almost one-third of the paleontological sites surveyed in the Oglala National Grassland showed evidence of unauthorized collecting (USFS 2001a; USDI 2000). In Petrified Forest National Park it is estimated that individual visitors remove approximately 12 tons of petrified wood from the park annually, in spite of severe penalties, written and oral warnings, and the opportunity to legally obtain petrified wood (NPS 1999a, 2002b).

Cumulative Effects. Activities in and outside the North Unit could potentially affect paleontological resources. The construction of facilities in the park headquarters area, as well as the redesign of the Sage Creek campground would disturb the ground, thus possibly affecting fossils. However, the use of mitigative measures, including surveys and monitoring by paleontologists, should help minimize the extent of the impacts.

In the South Unit the construction of the Lakota Heritage and Education Center could affect fossils, although mitigative measures should minimize the extent of the impacts. The bombing range cleanup efforts also could adversely affect paleontological resources. Excavation is necessary to recover and destroy unexploded ordnance. Excavations typically are small, using hand tools; however, at times heavy equipment is used. Although surveys and monitoring would help reduce the extent of impacts, the cleanup efforts would have the potential for minor to moderate adverse impacts.]

Construction activities outside the park also could adversely affect paleontological resources. The construction of the proposed DM&E rail line near the South Unit would be likely to result in the loss of fossils through excavation and other disturbance of bedrock. The installation of the Mni Wiconi water project would require excavation, which could adversely affect paleontological resources. However, that effect should be minor, since the waterline would be adjacent to existing roads, and fossils in the road corridors already would have been disturbed.

Several actions in the adjacent national grassland could affect paleontological resources: the construction of trails and primitive campgrounds near the park could directly affect fossils. Indirectly, increased use in the area could result in fossil theft and the vandalism of sites, inadvertent camping on sites, and increased erosion in areas that have not been heavily used (USFS 2001b).

Construction and unregulated fossil collecting on private lands near the park might destroy fossils. All actions in and outside the North Unit, added to the expected effects that would result from continued public use of the park in the no-action alternative would result in a long-term adverse cumulative effect of unknown magnitude on area fossils.

Conclusion. Alternative A would have the potential to result in moderate long-term adverse effect on paleontological resources. This would be caused primarily by the continued illegal removal of fossils from the park by visitors and collectors. These impacts would be mitigated by continued efforts to educate visitors about fossils and efforts to allocate existing law enforcement resources towards fossil protection. Added to this, other actions in and outside the North Unit could result in a long-term

cumulative adverse impact of unknown magnitude.

Although alternative A would lead to adverse effects on paleontological resources, this would not constitute an impairment of park resources or values. Despite the loss of some fossil resources, the National Park Service would not be prevented from fulfilling the purposes for which Badlands National Park was established. The loss of resources would not destroy the integrity of the park relative to paleontological resources — fossils would continue to be present throughout the park, and the park staff would continue to protect, interpret, and provide opportunities for scientific research on paleontological resources. People still could come to Badlands and enjoy its values, including its fossils.

Vegetation

Analysis. Adverse effects on vegetation from visitors would continue under this alternative. Trampling would continue to affect vegetation at overlooks along the Loop Road and in and near campgrounds, campsites, picnic areas, trailheads, administrative buildings, and scenic and interpretive facilities, with the effects ranging from complete absence of vegetation to slight alterations in species composition. Similar effects would be evident along road shoulders, where cars crush vegetation and compact soil, in areas where vehicles are driven off-road on Sheep Mountain Table), and in areas where “social” trails are formed. The long-term adverse effects of vegetation loss in local areas would be minor.

In addition, the unintentional transport of exotic plants into and around the park by visitors would continue (as discussed on p.

91), although the magnitude of this effect is unknown.

The park supports several rare plant species. However, these species occur in sparsely vegetated badlands that are not commonly visited. No impacts are known to be occurring to these populations from visitors at present, and no changes would be expected to occur to the populations under alternative A.

Cumulative Effects. In the North Unit the redesign of the Sage Creek campground would result in a minor loss or alteration of native vegetation. Park maintenance operations along roads also would continue to affect plants growing on road shoulders. On the other hand, long-term minor to moderate beneficial effects on the park's vegetation would result from continued NPS prescribed burning efforts, the reintroduction of native vegetation, and weed management efforts

Outside the North Unit, cattle grazing on surrounding private, public, and reservation lands would continue to alter the types and distribution of vegetation. Building the Lakota Heritage and Education Center, cleanup efforts at the bombing range in the South Unit, and construction of the DM&E rail line also would result in the loss and alteration of vegetation near the North Unit. The construction of the Mni Wiconi water project probably would cause negligible effects on vegetation because it would be built along roads where native vegetation already has been altered. A beneficial effect on range condition would result from increases in prescribed burning in the adjacent Buffalo Gap National Grassland, as is delineated in the *Land and Resource Management Plan for the Nebraska National Forest and Associated Units* (USFS 2001b).

Overall, when all the effects of actions in and outside the North Unit were added to

the effects from alternative A (primarily continuing effects from visitor use), the long-term adverse and beneficial cumulative effects on grassland vegetation in the area would be minor.

Conclusion. Most of the natural vegetation in Badlands National Park would not be affected under alternative A. However, minor long-term adverse effects on vegetation in local areas would continue to be caused primarily by visitor activities. Long-term cumulative minor effects on native vegetation, both beneficial and adverse, would occur in the area. The levels of these effects would not be sufficient to constitute an impairment of park resources or values.

Wildlife

Analysis. Few of the actions of alternative A would affect the park's wildlife populations or habitats. Wildlife populations and habitat already have been altered by visitors and employees, as have wildlife habits and movements, and this would continue. The use of the park by visitors is concentrated mostly in developed areas, such as along the Loop Road. Animals sensitive to human activities already avoid such areas.

The presence of hikers would continue to disturb some sensitive wildlife such as bighorn sheep occasionally, but this disturbance would be temporary and would not affect the park's populations. If visitors were to hike into the sheep lambing habitat when the sheep were lambing there would be a much greater impact, but this is not likely because access to that habitat is difficult.

Some visitors might wander into prairie dog towns, affecting the behavior of animals in the area, but any disturbance would be

temporary and the effect would be negligible to minor.

The occasional injury or death of wildlife from motor vehicles on roads would continue. Some animals probably would continue to be attracted by feeding by visitors or to areas where food and garbage are left out. However, the adverse effects on wildlife from all these activities would be local and negligible to minor, and none would substantially affect the park's populations.

Cumulative Effects. Maintenance activities in the North Unit would continue to disturb some animals temporarily.

The behavior, distribution, and movements of some wildlife would be affected by the construction of some developments outside the park, such as the Mni Wiconi water project and the DM&E railroad in those areas. When the rail line begins operating, the behavior of some wildlife would be affected and some animals could be injured or killed by collisions. Similarly, the designation of the Crazy Horse Scenic Byway could result in some animals being injured or killed by vehicles if traffic increased.

Prairie dog control efforts on lands outside the North Unit would continue, which could affect prairie dogs leaving the park. Some limited prairie dog control efforts also probably would occur within the North Unit. On the other hand, on lands in the southwestern and south central parts of the Wall Ranger District in Buffalo Gap National Grassland, which borders the park, the Forest Service's 2001 land management plan states that it will continue to manage to maintain and enhance the prairie dog colony complexes in the southwest part of the Wall District and specifically to promote the expansion of prairie dog habitat adjacent to the park

(USFS 2001b). This should be a long-term, beneficial effect on the prairie dog.

Prescribed burning in the adjacent Buffalo Gap National Grassland by the Forest Service might improve wildlife habitat.

Overall, when the effects of alternative A (primarily minor impacts due to continued visitor use) were added to other actions within and outside the North Unit, there would be a minor long-term adverse cumulative impact on area wildlife populations.

Conclusion. Negligible to minor short-term adverse effects on park wildlife populations would continue under Alternative A in local areas, primarily in developed areas, from the presence of visitors and staff. Minor long-term adverse cumulative effects would be expected on the area's wildlife populations. The level of these adverse effects would not be sufficient to constitute an impairment of park resources or values.

Special Status Species

Analysis. Alternative A would not include new developments or other changes in management or visitation that would affect the park's two special status species: black-footed ferret, and swift fox. Although visitor use levels could increase slightly in the future, those species would not be affected. Black-footed ferrets and swift foxes would be seen by few visitors, if any.

Cumulative Effects. Although some limited prairie dog control efforts likely would occur in the North Unit in the future, it is unlikely that such efforts would be permitted in areas where black-footed ferrets are known to occur, or would prevent the ferrets from using these areas.

Actions outside the North Unit could have both beneficial and adverse impacts on black-footed ferrets and their habitat. The construction of the DM&E rail line (depending on its route) could reduce some potential habitat for ferrets. In addition, prairie dog control efforts on lands outside the North Unit could affect ferrets if they occurred in these areas.

On the other hand, the Forest Service stated in its 2001 land management plan that it will continue to maintain and enhance prairie dog colony complexes in the southwestern and central parts of the Buffalo Gap National Grassland and that it will maintain black-footed ferret reintroduction habitat in this area and in the southeastern part of the Wall Ranger District (USFS 2001b). This should be a long-term beneficial effect on the ferret.

The National Park Service would continue to reintroduce swift fox into the park for another year, which would have a long-term beneficial impact on the fox population, assuming the foxes survive and breed.

Adding the above effects from actions outside the North Unit to alternative A would not result in any cumulative effects on the endangered black-footed ferret or the state-listed swift fox. This is because the alternative does not include any actions that would contribute or add to the effects of other actions in and outside the park.

Conclusion. Alternative A would not affect the endangered black-footed ferret or the state-listed swift fox. No changes in visitation or park management under this alternative would affect these populations or their habitats. No cumulative effects would result from alternative A, and the park's resources and values would not be impaired by any changes in the park's special status species.

EFFECTS ON CULTURAL RESOURCES

Historic Buildings and Other Structures

Analysis. None of the buildings or structures identified as being eligible for inclusion in the National Register of Historic Places would be impacted by continuing the current management direction.

Cumulative Effects. Several miles north of Badlands National Park, the development of the new Minuteman Missile National Historic Site would affect the historic condition of the missile control and launch facilities. The alterations could include substantial structural changes to accommodate public visitation, environmental control, and protective barriers. The long-term, adverse effects on the structures of the national historic site would range from negligible to moderate.

Since there are no actions impacting historic buildings and structures associated with implementation of the alternative, the adverse effects associated with Minuteman Missile National Historic Site would constitute the entire cumulative impact.

Conclusion. Alternative A would not result in any effects on historic buildings or other structures in Badlands National Park. Therefore, the park's cultural resources and values would not be impaired.

Section 106 Summary. This summary (like all section 106 summaries in this document) has been prepared with the use of definitions consistent with section 106 of the National Historic Preservation Act of 1966, as amended, and the regulations of the Advisory Council on Historic Preservation (36 CFR 800).

In accordance with the regulations of the Advisory Council on Historic Preservation

implementing section 106 of the National Historic preservation Act, the National Park Service finds that no historic properties would be affected (36 CFR 8004(d)(1).

Ethnographic Resources

Analysis. NPS knowledge of the locations of traditional use is limited to areas identified by American Indian tribes as containing sacred sites. The ongoing study of ethnographic resources will provide additional information. Ethnographic resources, including sacred sites and traditional cultural properties, would be identified and protected from impacts associated with the implementation of this alternative. As a result, there would be no effects on ethnographic resources from this alternative.

Alternative A would not result in any change in access by American Indians or use of ethnographic resources sacred to the tribes. The alternative would not change the agreement that guarantees tribal members unrestricted access in perpetuity and requires their written consent to affect those sites. Consultation with tribes to identify traditional use areas would precede ground-disturbing or other activities that could affect the current use, viewshed, or perception of the resource.

Cumulative Effects. Actions inside and outside the park could affect ethnographic resources, including traditional cultural properties. Excavation in the park as part of efforts to clean up the bombing range could alter vegetation patterns and landscapes, affecting the viewshed of a sacred site. Although surveys and cleanup plans would help to reduce the extent of these effects, the cleanup efforts could result in long-term moderate adverse impacts.

Traditional cultural use areas could be disturbed by construction activities associated with the proposed DM&E railroad near the South Unit or by the installation of the Mni Wiconi waterline. The waterline would be placed along existing roads, but if ethnographic resources were disturbed, long-term moderate adverse effects could be caused by installing the rail line.

Ethnographic resources could be affected by actions in the adjacent Buffalo Gap National Grassland. The construction of trails, campgrounds, or other visitor accommodations could directly affect traditional use areas, and inadvertent camping on traditional use sites and hiking across areas of eroding landforms could result in long-term adverse impacts ranging in intensity from negligible to moderate.

Outside the park, the development of coalbed methane fields by oil and gas companies that operate in northeast Wyoming could affect viewsheds, use, and tribal relationships to regional ethnographic resources. Depending on the location, the long-term cumulative adverse effects could be widespread or limited and could range from minor to moderate.

Alternative A would not contribute to the cumulative effects on ethnographic resources from other actions discussed above.

Conclusion. Implementing alternative A would result in no effects on ethnographic resources in the park.

Until the completion of inventories of ethnographic resources in the park, the National Park Service would conduct site-specific surveys and consult as appropriate with American Indians for each development action. Because there would be no

adverse impacts, the park's resources and values would not be impaired.

Section 106 Summary. There are no known traditional cultural properties in Badlands National Park. Because alternative A would not result in any effect on traditional cultural properties, the National Park Service finds that the determination of effect would be *no historic properties affected* (36 CFR 800.4(a)(2)).

In accordance with NPS policies and procedures, the park would continue to protect ethnographic resources to the greatest extent possible. The disturbance of such resources would be avoided wherever possible. In instances where avoidance or preservation could not be achieved, appropriate mitigation would be carried out in consultation with American Indian tribes identified as having a cultural affiliation with the park and, if such resources were determined to be eligible for national register listing, with the South Dakota state historic preservation officer.

EFFECTS ON VISITATION AND THE VISITOR EXPERIENCE

Access

Analysis. The overall accessibility of the park to visitors would not change under alternative A; that is, there would be no changes in the operation or location of the entrances, in the major roadways in the park, in the amount of available parking, in visitors' access to existing park facilities such as visitor centers and campgrounds, or in access to trailheads.

The Loop and Sage Creek Rim roads would continue to be the primary corridor through the park; most of 1.2 million visitors per year would use these roads. The Loop Road still would offer access to numerous existing

parking areas, to interpretive and hiking trails, and to facilities at the Cedar Pass complex. The roads in the North Unit would remain asphalt or gravel as at present and would be maintained year-round. All the current park entrances would remain open, as would all the present trailheads and waysides. The existing roads and trails would continue to meet the current levels of visitation, which has been relatively consistent for the past 20 years.

Access into the South Unit would continue to be limited. Driving and hiking access still would be limited to two-track primitive roads. The condition of the roads still would limit access primarily to high clearance vehicles.

The road to Sheep Mountain Table would remain primitive with relatively unrestricted use, but the road condition still would affect visitors by limiting access to high-clearance vehicles.

Overall, access and circulation over the existing roads and facilities in the North Unit would be adequate for the current level of visitation.

Cumulative Effects. Traffic projections indicate that a substantial increase in park visitation could result from the completion of the Heartland Expressway and the Crazy Horse Scenic Byway. The increase from these roads originating from the south and west, added to visitation projections, could alter the current visitation patterns to the park. The routes for these two road projects already exist, but typically park visitors do not use them.

Implementing alternative A would not change visitors' access to the park; therefore, despite the effects from other actions described above, there would be no cumulative effects on visitor access from this no-action alternative.

Conclusion. Alternative A would not change visitors' access to the park; access to the North Unit would continue to be adequate.

Availability of Information

Analysis. Under the no-action alternative, opportunities for visitors to get information would continue at the existing locations. The primary location for orientation, interpretation and education still would be the Ben Reifel Visitor Center in the North Unit.

The location of the Ben Reifel Visitor Center near Cedar Pass was based on the historic visitation pattern, but now visitors who enter at the park's west side must travel through much of the park before they reach that center to obtain information. The current adverse effects on the availability of information are minor, but they could be more severe if the changes in visitation patterns continued under alternative A.

Most opportunities for visitors to come in contact with NPS staff would be in the park's North Unit. Educational opportunities for schools and organized groups would continue to be limited by a lack of adequate facilities, and there still would be no access, facilities, signs, or interpretive waysides along SD Highway 44.

Cumulative Effects. When developed, the Lakota Heritage and Education Center would be another outlet that would distribute information to the public. This facility would be near the proposed Crazy Horse Scenic Byway, which is projected to lead to an increase in traffic in this area. A visitor center proposed for the Minuteman Missile National Historic Site along the Interstate Highway 90 corridor would be another new outlet for information, which, although focused primarily on the historic

site, would offer basic information about Badlands National Park. These projects would result in long-term minor to moderate beneficial effects on the availability of information.

Alternative A would result in minor long-term adverse effects on the visitor experience because the changing visitation patterns in the North Unit lead to difficulty in getting information for visitors entering the park from the west.

The adverse effects of implementing alternative A, combined with the beneficial effects from regional projects, would result in long-term minor beneficial cumulative effects on the visitor experience in Badlands National Park. The creation of two new information facilities would improve opportunities for visitors to get information about the park and the region.

Conclusion. Alternative A, the no-action alternative, would result in continued adverse effects on the visitor experience, especially for those entering the park from the west. The current effects on the visitor experience are minor; however, if the changes in visitation patterns continue, the effects could become more severe.

Range and Enjoyment of Visitor Activity

Analysis. The four most popular visitor activities in Badlands National Park are vehicle use, hiking and pack stock use, camping, and picnicking. Those four activities are discussed separately in the consequences section for each alternative.

Vehicle Use — The existing range of driving opportunities in the park would continue under alternative A. The Loop Road and the Sage Creek Rim Road would continue to be available for year-round driving and sightseeing. The experience

along the Loop Road would be highly structured, and the number of interactions with other visitors would be high. The Sage Creek Rim Road would offer a more rustic experience, with a sense of isolation and fewer interactions with other visitors. Visitors using these roads would have access to spectacular views of the Badlands.

Overall, this alternative would result in no new impacts on visitors.

Hiking and Pack Stock Use — The existing range of hiking and horseback riding would continue in alternative A, with ample opportunities for hikers and pack stock users to explore the park. The only designated and maintained hiking trails would be the Castle Trail system north of the Loop Road between Cedar Pass and Fossil Exhibit. The lack of marked trails would continue to limit the number of visitors hiking in the park.

Most of the park would be available for pack stock users to explore, but, these users would find limited facilities such as corrals and loading ramps to enhance their visits. This would cause a negligible adverse effect on pack stock users.

Camping — The existing camping opportunities in Badlands National Park would continue. The Cedar Pass campground still would be the park's main campground, offering typical facilities — restrooms, picnic tables, and potable water. The Sage Creek campground would continue as a site for a more primitive camping experience. The ongoing campground rehabilitation would continue, with the goal of retaining the campground's primitive character. The existing campgrounds typically are not filled to capacity, even during the peak season. Overall, this alternative would result in minor beneficial effects on visitors from the improvements to the Sage Creek Campground.

Picnicking — Picnicking would continue to be available at the Journey Overlook and Conata Road. A demand for picnic facilities near the Cedar Pass complex would continue. The area around the Ben Reifel Visitor Center becomes a de facto picnic area in summer, increasing congestion levels at the park's main visitor center. Adequate facilities for a high-quality picnic opportunity are unavailable in this area, which results in negligible adverse effects on the visitor experience.

Cumulative Effects. It is projected that various plans for road improvements in the region will increase opportunities for driving and sightseeing. If the Crazy Horse Scenic Byway was designated and marked by signs, it would offer an additional scenic driving opportunity in the region. The management plan for Buffalo Gap National Grassland calls for the development of a primitive campground near the park's South Unit, expanding the region's camping opportunities (USFS 2001b). These projects would result in long term benefits for visitors seeking recreational opportunities in the region.

Alternative A, the no-action alternative, would maintain the status quo, which provides a range of opportunities for visitors. However, there would be some negligible effects on park visitors seeking hiking opportunities, because the existing designated trail system is relatively small. In addition, the lack of a picnic area at the Cedar Pass complex, the major attraction in the park, causes adverse effects on the visitor experience.

The long-term benefits of the regional projects, coupled with the negligible adverse effects of implementing alternative A, would result in long-term cumulative beneficial effects on the visitor experience.

Conclusion. Implementing Alternative A would result in long-term negligible adverse effects on visitors seeking hiking or picnic opportunities, especially at the Cedar Pass complex. Pack stock users would continue to be adversely affected by the lack of facilities such as corrals and loading ramps.

Scenic Resources

Analysis. Alternative A would result in no changes to the existing facilities in the park. These facilities would continue to cause minor long-term adverse impacts on the park's scenic resources.

Cumulative Impacts. Activities outside the park boundary would have the potential to affect the viewsheds from within the park. The construction of the DM& E Railroad would result in adverse impacts on the viewshed. These adverse effects would be long-term and minor to moderate.

Developments on private lands adjacent to the park have resulted in impacts on viewsheds from the park. The construction of new buildings, signs, and communications towers has resulted in long-term minor adverse impacts on the viewshed. There is the potential that additional communications towers would be constructed within the viewshed of the park; however none are proposed at this time. If more towers were constructed, they would result in long-term adverse impacts.

The effects of the activities outside the park, combined with the effects of implementing alternative A, would result in long-term minor adverse cumulative effects on scenic resources.

Conclusion. Alternative A would continue to result in long-term minor adverse impacts on scenic resources. The existing

facilities would continue to cause minor adverse impacts on the scenic resources.

EFFECTS ON THE SOCIOECONOMIC ENVIRONMENT

Analysis. The policy and regulatory requirements for the protection of resources and the safe enjoyment of the park by the public are not all being met at present. Fiscal and staffing shortfalls have been identified in the park's major functional areas of resource protection, visitor experience and enjoyment, facility operations, maintenance, management, and administration. The presence of shortfalls means that many operations and maintenance activities have been deferred and levels of service to the public have been below what they should be. Such problems would be addressed under alternative A. Increased funding and more staff would correct these current problems and fulfill the necessary requirements for adequate resource protection and visitor enjoyment. Additional funding for park activities would more than double the existing budget and available staff. Some improvements would be made to the park infrastructure (for example, repairing and expanding the Ben Reifel Visitor Center).

Unfortunately, not all serious problems facing the park would be addressed in this alternative. Many desired or necessary capital improvements would not be accomplished, including needed park housing, new visitor facilities, and necessary road realignment at the east end of the park. Staff housing at this remotely located park would remain in short supply. There would be fewer facilities for visitor use than desired.

The east entrance road eventually would fail, and a one-way trip to enter and exit through the most popular and accessible

part of the park would no longer be possible. This would inconvenience visitors and greatly complicate the park management. Visitors would be forced to back track to their original entrance point to leave the park. The drive times for many park employees going to and from work assignments would be greatly increased because they would have to go around the failed section of the Loop Road.

Cumulative Effects. No cumulative effects on the socioeconomic environment have been identified for alternative A.

Conclusion. This alternative would achieve many necessary improvements to the park and its operations, but not all serious problems would be sufficiently addressed. For comparison purposes, the present value of the annual cost of the no-action alternative is \$30,018,000.¹

EFFECTS ON ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

With private vehicles continuing to be the primary means of transportation to and through the park, additional energy requirements (gasoline consumption and

fuel for heating and lighting visitor facilities,) would be expected only as a direct result of increased visitation. The retrofitting of existing facilities, such as the Ben Reifel Visitor Center, would result in more energy consumption; however, the projects would follow NPS policies concerning sustainability and energy conservation to minimize the overall energy requirements.

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are defined as impacts that cannot be fully mitigated or avoided. Minor adverse impacts on natural resources would be caused by human use in some areas throughout the park. Although all these impacts would be unavoidable (short of not allowing any increased human use), mitigation to reduce them would be carried out where possible.

1. The concept of *present value*, also known as discounting, allows for comparisons of different monetary benefits received at different times in the future; that is, it allows for the comparison of apples and oranges. Discounting brings the benefits of a future income stream back to the present time and allows for the comparison of alternatives, which represent varying costs spread over time. *Present value* is the amount of money that would generate a given stream of income for a given period at a given rate of interest. The concept of present value explicitly incorporates the time value of money. For this no-action alternative, the stream of income needed to support park operations is \$3,116,000 annually, the interest rate is 6.125% (federal discount rate for fiscal year 2002), and the time period is 15 years (life of the *General Management Plan*). This interest rate and time period are the same for all alternatives.

**IRRETRIEVABLE OR IRREVERSIBLE
COMMITMENTS OF RESOURCES**

Under alternative A the additional energy requirements identified above would result in an irreversible commitment of resources. There would be no permanent effects on park resources.

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

Under alternative A, most of the park would be protected in a natural state and would maintain its long-term productivity. Only a small percentage of the park would be converted to development.

EFFECTS FROM ALTERNATIVE B: EXPAND VISITOR OPPORTUNITIES (PREFERRED ALTERNATIVE)

EFFECTS ON NATURAL RESOURCES

Air Quality

Analysis. Minor changes in the park's air quality would result both from increased visitation and the construction of facilities. Under alternative B there would be short- and long-term minor local impacts from the construction and use of new visitor facilities (outdoor classrooms, education pavilions, visitor contact stations, campgrounds, trailheads), improvements to visitor facilities (picnic areas, roads, parking areas), and construction and use of new employee housing facilities. Construction of the new Loop Road segment in the Cedar Pass area would also cause minor to moderate short-term and long-term adverse impacts. All these impacts would be largely due to fumes (hydrocarbons, carbon monoxide and nitrogen oxides) and particulates emitted from construction machinery and increased dust due to the excavation of earth and in the immediate project areas. Air quality impacts would be local and the impacts would be likely to be spread out over the 15–20 year timeframe of this plan.

Constructing the new Loop Road segment in the Cedar Pass area also would require asphalt, which would result in emissions from an asphalt batch plant, a storage pile, and haul trucks. Volatile hydrocarbons and other organic compounds in the asphalt would enter the air for a short time after the road surface was completed.

The new section of the Loop Road would not increase traffic volume; however, depending on the design of the road, if vehicles had to be driven up a higher grade, emissions could increase compared to the

no-action alternative. The impact would vary depending on the level of traffic, the time of day, the season, and weather conditions, but it could range from a negligible to moderate long-term adverse impact.

An improvement of the Sheep Mountain Table road would lead to small increases in traffic, which would add negligible additional emissions into the air. The impact would vary, depending on the level of traffic, the time of day, the season, and weather conditions, but it could range from a negligible to moderate long-term adverse impact.

Cumulative Effects. As was described for the no-action alternative, several actions in and outside the North Unit would affect air quality and visibility in the park.

Construction activities, including the redesign of the Sage Creek Campground, and development of the Lakota Heritage and Education Center, would result in minor short-term local adverse effects on air quality. Periodic prescribed burns in the North Unit could cause moderate to major, short-term impacts to air quality in local areas. However, sources outside the park would add far more pollutants to the airshed. In particular, energy and industrial developments in the Powder River Basin in Wyoming could cause substantial adverse effects on air quality in the park, as was described in the no-action alternative.

Other outside actions that could affect the park's air quality are prescribed fires, wildfires, the construction and operation of the DM&E rail line and the Mni Wiconi water project, and the possible designation of the Crazy Horse Scenic Byway.

All the above actions, added to the actions of alternative B, would result in a major long-term cumulative adverse effect on the air quality in Badlands National Park. However, the actions of alternative B would add a minimal increment to this cumulative effect because the air quality effects resulting from alternative B would be short term, local, and spread out over time.

Conclusion. Alternative B would result in minor to moderate short-and long-term adverse effects on air quality in local areas, primarily from construction and use of developments. Combined with emissions from sources outside the park, this would result in a major long-term cumulative adverse effect on regional air quality, but the incremental contribution of alternative B to this impact would be minor. The level of impact that would result from alternative B would not be sufficient to constitute an impairment of park resources or values.

Soundscape

Analysis. As with the air quality, facility construction and improvement projects in alternative B would affect the park's soundscape in local areas. Construction workers and equipment would generate noise during the construction or improvement of trails, housing, education pavilions, outdoor classrooms, the Pinnacles visitor contact station, campgrounds, roads, and parking areas. In some of these areas, the noise from construction equipment would be substantial, but it would be temporary and local and would take place at different times and places through the park. Most noise from new developments would be in or near developed areas that already are exposed to noise from vehicles, park equipment, and visitors. Excluding noise from construction of the new Loop Road section, noise from the construction activities would have negligible to moderate short-term adverse

impacts on the natural soundscape in local areas, depending on the presence of other facilities and people, vegetation, wind, and time of day.

Substantial noise would come from demolition and excavation equipment (trucks, graders, bulldozers, and portable generators) constructing the new Loop Road segment, causing major long-term adverse effects during the construction period. Depending on the design of the new road alignment, vehicular noise also might increase: if the grade was higher than the current road or if there were no natural features to absorb sound; such noise could carry farther from vehicles being driven up and down the Badlands Wall. Thus, the long-term adverse effects on the soundscape in the vicinity of the new part of the Loop Road from alternative B would be moderate to major.

Noise levels would be likely to increase under alternative B in several places that have been relatively quiet in the past. More visitors and vehicles would be likely at the Conata picnic area and trailhead, the Pinnacles visitor contact station, the new Sage Creek developments, the new waysides along SD 44, and the new outdoor classrooms. Although noise levels would increase at these facilities, the effect on the soundscape would be minor because visitor numbers would not increase substantially. On a few high-use weekends, more noise would be expected, and the impact could be moderate at some locations.

A few more vehicles might be present after the improvements to the Sheep Mountain Table road but the increase in noise would be transitory and minor. Similarly, after the designation and construction or improvement of trails in the North Unit, more visitors might use the trails, affecting the soundscape, but there would not be large

numbers of hikers at any one time. Thus, the effect on the soundscape, primarily in the peak season, would be minor and long term.

Cumulative Effects. As in the no-action alternative, noise in parts of the park would increase from construction activities, the operation of machinery and vehicles, and the presence of people. There could be a cumulative long-term minor adverse noise effect in local areas from increased noise levels under alternative B (construction of facilities, greater numbers of people and vehicles in some park areas) added to actions independent of this plan such as the redesign project at the Sage Creek campground, continued commercial tour helicopter overflights, commercial traffic through the park, and the designation of the Crazy Horse Scenic Byway.

Outside the park, the construction of the Mni Wiconi water project would generate noise that would be audible in places in the North Unit. On the southwestern end of the North Unit, noise levels could increase from traffic on the scenic byway (assuming increased traffic resulted from that designation). These sounds could combine with visitor and administrative use in the park (including sounds from the construction and operation of the new orientation facility), resulting in a long-term minor adverse cumulative effect on the soundscape.

Conclusion. The soundscape in most of Badlands National Park would continue to be relatively quiet under alternative B, with few unnatural sounds. However, there would be more sources of noise in the park than in alternative A. The construction and operation of visitor facilities would cause short-term and long-term minor adverse effects on the soundscape, mostly in areas already exposed to some noise. The construction and use of a new section of the Loop Road would result in moderate to

major short-term and long-term adverse effects. There would be the potential for minor long-term adverse cumulative effects on the soundscape from the operation of new park facilities added to construction activities and increased traffic levels outside the park.

The construction and use of the new Loop Road segment would adversely affect the soundscape under alternative B, but, the park's resources and values would not be impaired. Only a small part of the park would be affected, and the National Park Service would not be prevented from conserving resources or values as needed to fulfill the park's specific purposes, as identified in the establishing legislation. The natural or cultural integrity of the park would not be compromised, nor would opportunities for visitor enjoyment.

Geologic Features, Including Soils

Analysis. Except for the new Loop Road segment in the Cedar Pass area, none of the actions of alternative B would affect the park's geologic features. Depending on the design of the new road segment, some parts of the Badlands Wall (eroding walls, cliffs, buttes) might have to be modified or removed, resulting in a long-term moderate to major local adverse effect. Soils along the new road alignment also would be permanently lost and disturbed, and even with mitigative measures, some soil would be lost to erosion. If people parked their vehicles in informal pull-offs off the side of the road, that could cause a secondary adverse effect on soils. All these changes could result in a moderate to major long-term adverse impact on soils along the route of the new road.

The soils in Badlands National Park also would be adversely affected by several other actions in alternative B. Park soils would be

affected by constructing or improving park facilities, including campgrounds, pavilions, waysides, employee housing, and the Sheep Mountain Table road and parking area. Most of these developments would be in already disturbed areas where the soils have been altered by past activities. Although some soils in these areas could be altered and erosion increased by construction, with mitigation the local adverse effects on soils in most areas would be minor.

The construction of the Pinnacles visitor contact station would be in a previously undisturbed area. Although erosion would be minimized by mitigative measures, some soil would be permanently disturbed, resulting in a moderate long-term local adverse effect.

As in alternative A, erosion on part of the Sheep Mountain Table road would continue, resulting in a long-term moderate adverse effect on soils. Even with the road improvements in this alternative, the slope of that road would allow erosion to continue. However, the improvements to the road on top of the table and below the hill would reduce erosion, a beneficial effect.

The construction or designation of new trails and routes would result in both beneficial and adverse consequences for the park's soils. New trails in the Castle Trail area would increase use in an area with fragile cryptogamic soils. Some soils would be altered by foot traffic both in and adjacent to the trail corridors, and some erosion could occur, resulting in a long-term minor to moderate adverse impact.

Soils would be compacted by increased foot traffic going into the wilderness area from the Sage Creek campground, but compared to soil compaction caused by bison, the effect would be negligible.

Designating trails or routes from the Sage Creek campground and Conata picnic area into the wilderness area and restricting hikers to those trails and Sheep Mountain Table trails would help focus use, reducing "social" trails. This would reduce erosion, bringing about a long-term minor to moderate beneficial effect on soils. Constructing boardwalks for the short interpretative trails off the Loop Road also would result in a beneficial effect on soils.

All park resources, including soils, would benefit from adding outdoor classrooms or pavilions, and visitor contact stations. Visitors could be educated about the nature of the park's soils and learn ways to avoid or minimize the impacts from foot traffic. This would result in a minor to moderate long-term beneficial effect on park soils.

Cumulative Effects. Soils would be lost or altered and erosion temporarily increased by several developments in and outside the North Unit, including the redesign of the Sage Creek campground, construction of the Lakota Heritage and Education Center, and the installation of the Mni Wiconi water project (although this would be built primarily along existing roads). Other actions that would affect soils are the development of the DM&E rail line and the bombing range cleanup. The loss and alteration of soils from these other actions, added to the potential effects from construction and improvements under alternative B and from more visitation in parts of the North Unit, would increase soil erosion and alteration in the region, resulting in a long-term minor to moderate adverse cumulative effect on area soils.

Conclusion. Most of the park's soils and geologic features would not be affected by alternative B, but constructing the new Loop Road segment could result in long-term moderate to major adverse effects on

geologic features and soils along the corridor. The alternative also would cause long-term minor to moderate beneficial and adverse local effects on park soils. The adverse soil impacts from construction and the use of new or improved trails would be mostly in developed areas. The beneficial effects on soils would result from restricting people to established trails, improving the road on Sheep Mountain Table, and adding education and interpretation (which could reduce the effects caused by visitors). When outside developments are added to new park developments, improvements, and increased use in parts of the park, the cumulative result would be a minor to moderate long-term adverse cumulative effect on area soils.

The effects on soils from alternative B would not constitute an impairment of park resources or values. Although the construction of the new Loop Road segment could result in a major adverse effect on geologic features, this would not impair park resources and values. The effect would be local, and its extent would depend on the road design (that is, whether the road would be elevated or cut through the Badlands Wall).

The loss of geologic features under alternative B would not destroy the integrity of the park relative to its geologic features. Geologic features would continue to be present throughout the park (albeit potentially in fewer numbers), and the park staff still would protect and interpret the features and provide opportunities for scientific research on the park's geology. People still could come to Badlands and enjoy the park's values, including its geologic features.

Paleontological Resources

Analysis. The paleontological resources of Badlands National Park could be adversely affected under alternative B by new developments, improved access, and more visitors. Most developments and improvements in alternative B (campgrounds, pavilions, waysides, housing, a picnic area, and trailheads) would be in already disturbed areas that are not known to be highly fossiliferous. Little additional bedrock would need to be disturbed for most of these projects, but if drilling into bedrock was necessary, some fossils could be damaged or lost. With surveys and monitoring, the potential for adverse effects on paleontological resources would be minor.

A new Pinnacles visitor contact station would be built in an area above the Badlands Wall that is thought not to be highly fossiliferous. The improvement of the Sheep Mountain Table road could cause damage or the loss of some fossils, as could the construction of the parking area. However, with surveys and monitoring, the effects probably would be minor.

Even with mitigation (surveying and monitoring), the construction of the new Loop Road segment in the Cedar Pass area would be likely to result in the loss of fossils. Fossils could be damaged or lost through a variety of actions, including drilling, demolition and excavation work, placement of fill, paving, and crushing by construction equipment being driven over areas. Erosion along the road could increase, indirectly resulting in additional fossil loss. The extent of the adverse effects on paleontological resources would depend on where the new road segment would cross through the Badlands Wall (generally, the narrower the affected section of the highly fossiliferous Wall, the fewer the impacts) and the design of the road (that is, whether it would be

elevated on piers or a cut-and-fill road). The long-term adverse effects on paleontological resources from the new road segment could range from moderate to major.

New trailheads, trails, and routes in alternative B, as well as improvements to existing trails and routes, would improve access to the wilderness area, and the Castle Trail area. It is unlikely that such improved access would affect poaching by commercial collectors in the park — poaching of fossils would continue regardless of any changes in access.

Although more efforts at visitor education, more ranger patrols, and more enforcement efforts in alternative B would help decrease illegal fossil collecting, improved access could still increase the potential for the incidental undetected removal of fossils from the park. Thus, even with mitigation efforts, the potential for the loss of fossils due to collecting would be greater in this alternative than in alternative A.

Several actions of alternative B would result in beneficial effects on paleontological resources:

- ♦ The addition of visitor contact stations and outdoor classrooms could increase visitors' awareness of the significance of the park's fossils and help reduce the potential for fossil collecting.
- ♦ Ranger patrols would be increased under alternative B.
- ♦ The boundary expansion along SD 44 would improve access for rangers, researchers and resource managers into the Badlands Wilderness Area, increasing the protection of fossils in that area.

Cumulative Effects. Like alternative A, alternative B could result in cumulative

adverse effects on the area's paleontological resources. Actions in and outside the North Unit (such as constructing the Lakota Heritage and Education Center, redesigning the Sage Creek campground, cleaning up the bombing range, the construction of the DM&E rail line and the Mni Wiconi waterline, increased use of the adjacent national grassland, and illegal fossil collecting on lands near the park) could result in the loss or vandalism of fossils.

All the impacts from other actions in and outside the North Unit, added to the impacts from new developments and more public use in parts of the park under alternative B, could result in more fossils being lost or damaged in the region, even though surveys and monitoring would be carried out. Thus, alternative B would contribute to a long-term adverse cumulative effect of unknown magnitude on the area's fossil record.

Conclusion. Alternative B would result in some minor beneficial effects on paleontological resources primarily from increased staffing and educational efforts. However, there would be a greater potential for adverse effects on paleontological resources from alternative B than alternative A, primarily from constructing the new Loop Road segment and from the potential for more illegal fossil collecting due to improved access in parts of the park. Even with mitigation efforts, alternative B could result in moderate to major long-term adverse effects on the park's paleontological resources relative to alternative A. These effects, added to those from other actions in and outside the North Unit, could result in a long-term cumulative adverse impact of unknown magnitude.

Although alternative B would have a higher potential to cause adverse effects on paleontological resources than alternative

A, this would not constitute an impairment of park resources or values. The National Park Service would continue to be able to fulfill the purposes for which Badlands National Park was established. The loss of resources under alternative B would not destroy the integrity of the park relative to its paleontological resources. Fossils would continue to be present in the park, and the park staff would continue to protect and interpret paleontological resources and to offer opportunities for scientific research on that subject. People still could come to Badlands National Park and enjoy its values, including its fossils.

Vegetation

Analysis. Vegetation would be lost or altered in local areas under alternative B, primarily from the development or improvement of facilities and visitor services. Most new developments or improvements would be placed within the existing footprint of disturbed areas in which the vegetation already has been altered; therefore, little additional loss of native vegetation would result from construction or improvements in proposed campgrounds, pavilions, the Sheep Mountain Table road and parking area, and employee housing. Given the previous vegetation disturbance in most of these areas, and with the use of appropriate mitigative measures to minimize additional impacts (such as ensuring that equipment stays within project area boundaries, re-vegetating disturbed areas, and taking steps to avoid the spread of exotic species), the adverse effects on native vegetation from these actions would be negligible to minor.

Constructing the new Cedar Pass segment of the Loop Road would cause both direct and indirect adverse effects on prairie vegetation. Native grassland vegetation would be lost or damaged both above and

below the Badlands Wall. Some rare plants could be lost, although it might be possible to locate the road to avoid those plants. Some native plants would be permanently lost because of the road footprint. Even with mitigative measures, construction equipment in the project area would result in the damage or loss of other plants.

Several indirect impacts also could result from the construction of the road segment. If erosion along the road increased, more vegetation would be lost. Nonnative plants could be introduced or spread into disturbed areas. If visitors created “informal” pull-offs by parking off the side of the road, some roadside plants might be crushed, trampled, or picked. Road maintenance also might indirectly affect roadside vegetation. Depending on the road’s location and design, the long-term adverse effects on native vegetation from the new road segment would range from minor to moderate.

The new Pinnacles visitor contact station would be built in a previously undisturbed area. Despite the use of mitigative measures to help reduce the loss of native prairie vegetation, some vegetation would be permanently disturbed or lost, resulting in a long-term, minor, adverse impact.

Vegetation also would be altered or lost through visitation in alternative B. As in alternative A, people walking over and trampling plants in and around existing facilities would result in the loss of native vegetation, a long-term minor to moderate adverse effect.

As soils would be affected, building or designating new trails and routes would cause both beneficial and adverse consequences for the park’s vegetation. Hiker and pack stock use would increase on new trails and routes in the Castle Trail area, and in the Conata picnic area, resulting in

the trampling and loss of vegetation. More erosion in any of these areas would cause the loss of some plants, and the potential for visitors or pack stock to inadvertently carry in and spread exotic species also would increase. Depending on the level of use, time of use, and the vegetation, there could be a minor to moderate long-term adverse impact on vegetation in these local areas.

Designating trails or routes into the wilderness from the Sage Creek campground and the Conata picnic area and restricting use to those routes, as well as restricting use to trails on Sheep Mountain Table would help to focus use and reduce “social” trails. This would cause a long-term, minor to moderate beneficial effect on native vegetation. Constructing boardwalks for the short interpretative trails off the Loop Road also would prevent additional “social” trails, resulting in a minor beneficial effect on vegetation.

The improvement of the Sheep Mountain Table road would reduce two-track ruts, resulting in a long-term minor to moderate local impact on vegetation, depending on the number of vehicles being used.

Adding outdoor classrooms/pavilions, waysides, interpretive trails, and visitor contact stations would benefit park vegetation by improving visitors’ education, and their appreciation of native and rare plants would be increased, so that adverse effects on vegetation would be reduced. One beneficial effect of such education would be to help avert the spread of exotic species from visitors walking in the park. Overall, the beneficial effect on park vegetation would be minor to moderate.

Surveys for rare plants would be conducted before developments were constructed in alternative B, and in most cases developments (new trails, visitor facilities) could be sited to avoid effects on these

populations. Two species of rare plants, Dakota buckwheat and sidesaddle (or Secund) bladderpod, could occur in the area where the new Cedar Pass road might be built. These plant populations might not be found in a survey because the buckwheat is an annual plant and the bladderpod is an annual or short-lived perennial; even if a survey did not find them in a given year, they might be present on a site. Even if the road was located to avoid populations of these plants, impacts still could be caused by construction equipment in the project area, and indirect impacts could result from visitors pulling off the roads or from roadside maintenance activities. On the other hand, given the environmental requirements of these plants, their ability to disperse seeds, and the relatively small populations in the park, it is unlikely that the construction of the new road would affect the park’s populations.

The boundary adjustments proposed in alternative B would result in a moderate beneficial effect on native vegetation. Although much of the land near SD 44 and on the west side of the North Unit that would be added to the park has been grazed, the protection of existing native grassland vegetation would be increased by being included in the park, and over time native vegetation would become reestablished in much of the areas.

Cumulative Effects. Other actions within and outside the park, added to the actions of alternative B, would result in a potential for cumulative adverse and beneficial effects. In the North Unit the redesign of the Sage Creek campground and park maintenance activities along roads would result in a minor loss or alteration of vegetation. Outside the North Unit, actions such as the construction of the Lakota Heritage and Education Center, cattle grazing on surrounding private, public, and

reservation lands, the construction and operation of the DM&E rail line, the designation of the Crazy Horse Scenic Byway (which could increase visitation to the park), and the construction of primitive campgrounds and trails in the national grassland adjacent to the park could alter or cause the loss of native plants. These other actions, added to the developments and improvements of alternative B and a likely increase in visitation would result in a long-term minor to moderate adverse cumulative effect on the region's native vegetation.

Some cumulative effects could be beneficial. NPS prescribed burning efforts, reintroducing native plants, and weed management efforts in Badlands could result in beneficial effects on native plants. Increases in prescribed burns in the adjacent national grassland also would cause a positive effect on native plants. Those actions, added to the effects of designating trails and routes and campsites in the park, eliminating off-road recreational vehicle use in part of the Sheep Mountain Table area and increasing educational and interpretive efforts, would result in better protection of native vegetation and its possible increase in previously disturbed areas. All these actions would result in a moderate long-term beneficial cumulative effect on the region's native vegetation.

Conclusion. Most native vegetation in Badlands National Park would continue to be protected and sustain itself under alternative B. However, this alternative would have more potential for both beneficial and adverse effects in more areas of the park than alternative A. Constructing the new Loop Road segment and a few other new developments, along with more visitors from improved trails and routes in parts of the park, would result in the loss of native plants, causing adverse effects. The

potential for the spread of exotic plants would increase in the areas mentioned. Overall, the new developments and visitor use would likely have a long-term, minor to moderate adverse impact in local areas.

The loss of native vegetation would be reduced by better protection, and native vegetation would benefit from designating campsites, trails, and routes, improving the Sheep Mountain Table road, increasing education and interpretation, and adding two areas to the park. Overall, long-term beneficial effects on native vegetation from alternative B would be minor to moderate in local areas.

The long-term cumulative effects on vegetation from this alternative and other actions in and outside the North Unit would be minor to moderate and both beneficial and adverse. The levels of these effects would not be sufficient to constitute an impairment of park resources or values.

Wildlife

Analysis. New developments, improved access, and increased visitation to parts of the park would be the primary actions affecting wildlife and their habitat under alternative B. Although a number of new developments or improvements would be made to existing facilities, most would be done in existing already disturbed areas: the additions to the Conata Road picnic area, Sheep Mountain Table road improvements, added outdoor classrooms, , and a group campsite in the bison handling facility area. Wildlife populations and their habitats have been altered by past human actions in these areas, and no more habitat would be lost. Increased noise and human activity due to construction could temporarily displace some animals such as rodents and birds, resulting in minor short-term adverse impacts on wildlife populations in local

areas. Increased visitation due to new developments in a few areas could indirectly affect some prairie dogs — some visitors might wander into prairie dog towns, affecting the behavior of animals in the area, but any disturbance would be temporary and the effect would be negligible to minor. However, most new developments would not affect bison, bighorn sheep, or prairie dog populations and habitats; therefore, the most of it in alternative B would have a negligible to minor long-term adverse impact on wildlife and habitats.

Building the new Cedar Pass segment of the Loop Road would cause the permanent loss of grassland habitat, displacing wildlife along this corridor. Clearing vegetation in that area would result in the loss of wildlife forage and shelter. Noise from construction equipment and people would displace some wildlife. Most birds, mammals, and reptiles would avoid the area during the construction period, but many would return after construction ceased. Some animals, primarily invertebrates, would be unable to move out of the construction area and would be killed. Some grazing areas for bighorn sheep above and below the Badlands Wall would be lost. The road could cut off a travel corridor used by the sheep, fragmenting their habitat. Sheep movements in the area would be altered, and whether the animals would adapt to this change is unknown. The new road segment could cause a moderate long-term adverse impact on the bighorn sheep population in this area.

The new road segment also would have indirect impacts on wildlife. Some wildlife could be hit by vehicles and injured or killed on the new road segment, resulting in adverse impacts. Maintenance activities along the road also could disturb wildlife. The extent of the effects would depend partly on the location of the road and its

design. With careful design of the road and the use of mitigative measures, the new road segment would result in a long-term minor to moderate adverse indirect effect on area wildlife.

Building the education pavilion, and a group camping area, at the bison facility handling facility area could affect the bison capture and culling efforts, which in turn would affect the general long-term health and well-being of the herd. However, these new facilities would be closed during the bison roundups or other times deemed necessary for management activities. Thus, the impact of the new facilities would be expected to have a negligible adverse impact on the bison herd.

The Pinnacles visitor contact station would be built in a previously undisturbed area, causing the permanent loss of some grassland habitat. This loss would primarily affect smaller, less mobile wildlife species and species with smaller home ranges, such as invertebrates. Some reptiles, small mammals, and birds also could be displaced. The loss of habitat would result in a long-term minor adverse effect on animals near this facility.

Visitation to parts of the park probably would be increased by improved access from developing and improving the trails to Deer Haven and the Castle Trail region and routes from the Sage Creek campground. In turn, habitat fragmentation would increase over current levels because of more visitor use of trails and routes. Some wildlife sensitive to the presence of people — pronghorn antelope, bobcat, badger, and raptors — might be displaced from areas around these corridors during the peak high use season. These actions would result in a minor to moderate short-term and long-term adverse impact on wildlife populations in local areas, depending on such factors as

the level, duration, and type of visitor use, the season of use, and the wildlife species.

Designating new routes from the Sage Creek campground also could attract more people and displace bison cows and calves, as well as deer, birds, and other wildlife, from an important watering hole (the CCC spring). This impact could be mitigated if the routes were sited to avoid this area. Even with appropriate monitoring, education of visitors, and regulation of use, there still could be a minor to moderate long-term adverse impact on wildlife populations in this area.

Several actions of alternative B would improve the protection of wildlife populations and habitats. Designating trails and routes for visitors could help lead people away from prairie dog towns. (People currently are hiking by colonies.) As with vegetation, increased educational and interpretive efforts under alternative B would generally benefit wildlife. The addition of the outdoor classrooms/pavilions, waysides, interpretive trails, and visitor contact stations would help educate visitors, increasing their appreciation of the park's wildlife and minimizing impacts they could cause such as teaching them to avoid feeding wildlife. The long-term beneficial effect on the park's wildlife would minor to moderate.

The proposed addition of land along SD Highway 44 and on the west end of the North Unit would add prairie dog towns to the park, which would give the animals more protection and help ensure their continued presence. The addition also would protect additional wildlife habitat for a variety of other species such as mule deer, bighorn sheep, pronghorn antelope, and bobcat, a long-term moderate beneficial effect.

Cumulative Effects. Several other actions outside Badlands National Park would affect area wildlife. Some deer and small mammals would be killed or displaced by the construction and operation of the DM&E rail line, and possibly more traffic attracted by the designation of the Crazy Horse Scenic Byway. The adverse effects on these wildlife populations would be minor. These effects, added to the effects of alternative B on wildlife from constructing and using new or improved facilities (trails and routes in particular) and more visitation to parts of the park, would increase the fragmentation of wildlife habitats, increase the potential for wildlife to be displaced, and reduce the number of areas where wildlife could exist without people or facilities. The long-term cumulative adverse effects of alternative B plus these other outside actions on area wildlife would be minor.

Actions within and outside the North Unit, independent of alternative B, would likely affect prairie dogs in the future. Some potential prairie dog habitat could be lost due to developments outside the North Unit, such as the DM&E rail line. In addition, prairie dog control efforts on lands outside the North Unit would continue, resulting in the loss of animals. Some limited prairie dog control efforts probably also would occur within the North Unit, which would result in the loss of animals in areas adjacent to private lands. On the other hand, lands in the Buffalo Gap National Grassland that are adjacent to the eastern part of the park would continue to be managed to maintain and enhance prairie dog complexes. This would be a long-term beneficial effect. When the beneficial and adverse impacts of actions occurring within and outside the North Unit on prairie dogs are added to the actions in alternative B, there could be a long-term, minor, adverse cumulative effect on the area's overall

prairie dog population. However, the boundary adjustments in alternative B would add a beneficial increment to this adverse cumulative impact.

Conclusion. Alternative B would not affect most wildlife populations and habitats in Badlands National Park; they would continue to be protected and would not be changed by the actions of this alternative. No actions would substantially affect areas that are known to be important for breeding, nesting, or foraging or are key migration routes. Bison and prairie dog populations in most of the park generally would not be affected, although their behavior could be affected in a few areas. Constructing the new Loop Road segment could result in long-term moderate adverse effects on the North Unit's bighorn sheep population. Most other developments of alternative B would result in long-term negligible to minor adverse effects on wildlife populations and habitats.

New or improved trails and routes would increase visitation to parts of the park, which would cause long-term minor adverse effects on wildlife. Increased educational and interpretive efforts and the proposed boundary adjustments along SD 44 and on the west end of the North Unit would result in long-term minor to moderate beneficial effects on wildlife.

The cumulative effects of alternative B added to other actions outside the park on area wildlife and their habitat would include increased habitat fragmentation, wildlife displacement, and loss of prairie dogs in localized areas, resulting in a long-term minor adverse effect. These impacts would not constitute an impairment of park resources or values.

Special Status Species

Analysis. No developments and improvements in alternative B would be in areas known to contain black-footed ferret or swift fox populations. Most areas where visitation might increase because of new or improved trails and routes would not be in areas known to support these populations.

The proposed boundary adjustments along SD 44 and the western boundary of the North Unit would add prairie dog towns to the park and thus protect additional potential black-footed ferret habitat.

Alternative B may affect, but would not be likely to adversely affect, swift fox and fox habitat in the area. The land acquisitions along SD 44 and on the west side of the North Unit would protect potential swift fox habitat that could support the fox in the future, and thus would be a beneficial impact. Most facilities proposed for alternative B, including the new Loop Road segment, would be in marginal potential fox habitat. Facilities that would be developed in the Pinnacles area would be in or near potential fox habitat, but the facilities and more people in these areas would not necessarily keep foxes from dispersing into and using the areas. The foxes, which are mostly nocturnal, would be in the areas when few people were present. It is possible that a fox might be hit by a vehicle on the new Loop Road segment, but this is unlikely because that area is not prime fox habitat, and traffic at night would be at very low levels.

Cumulative Effects. Although some limited prairie dog control efforts likely would occur in the North Unit in the future, independent of alternative B, it is unlikely that such efforts would be permitted in areas where black-footed ferrets are known to occur, or would prevent the ferrets from using these areas.

Actions outside the North Unit could have both adverse and beneficial impacts on black-footed ferret and their habitat. Some potential prairie dog and black-footed ferret habitat could be lost due to developments outside the North Unit, such as the DM&E rail line. In addition, prairie dog control efforts on lands outside the North Unit could affect black-footed ferrets if they occurred in these areas.

On the other hand, lands in the Buffalo Gap National Grassland that are adjacent to the eastern part of the park would be managed to maintain and enhance prairie dog complexes, providing additional potential black-footed ferret habitat. This would be a long-term beneficial effect.

The potential loss of prairie dogs due to the actions within and outside the North Unit, added to the actions in alternative B, could result in a long-term adverse cumulative effect on the area's existing or potential for black-footed ferret populations. However, the boundary adjustments in alternative B would add a beneficial increment to this cumulative impact.

Some potential swift fox habitat could be protected by two boundary adjustments under alternative B. When these actions are combined with efforts to reintroduce the fox, independent of alternative B, there could be a long-term, beneficial cumulative impact for swift fox in the area.

Conclusion. Before taking any action in alternative B that might affect federally listed species in the park, the National Park Service would consult with the U.S. Fish and Wildlife Service to ensure potential impacts are identified and avoided. Overall, alternative B might affect, but would not be likely to adversely affect, the populations of black-footed ferrets and swift fox in Badlands National Park. The proposed boundary adjustments would add potential

black-footed ferret and swift fox habitat, which would be a beneficial impact. Alternative B plus actions within and outside the North Unit (independent of the alternative) could result in an adverse cumulative impact on black-footed ferrets. However, alternative B would add a beneficial increment to this cumulative impact. Likewise, when the boundary adjustments under alternative B are combined with efforts to reintroduce the swift fox, independent of the alternative, there could be a long-term beneficial cumulative impact for swift fox in the area. No impairment of park resources or values would result from this the alternative.

EFFECTS ON CULTURAL RESOURCES

Historic Buildings and Other Structures

Analysis. None of the structures identified as being eligible for inclusion in the National Register of Historic Places would be affected by the implementation of alternative B.

Cumulative Effects. Several miles north of Badlands National Park, the development of the new Minuteman Missile National Historic Site would affect the historic condition of the missile control and launch facilities. The alterations could include substantial structural changes to accommodate public visitation, environmental control, and protective barriers. The long-term, adverse effects on the structures of the national historic site would range from negligible to moderate.

Since there are no actions impacting historic buildings and structures associated with implementation of alternative B, the adverse effects associated with Minuteman Missile National Historic Site would constitute the entire cumulative impact.

Conclusion. Alternative B would not result in any effects on historic buildings or other structures in Badlands National Park, and the park's resources and values would not be impaired.

Section 106 Summary. This summary (like all section 106 summaries in this document) has been prepared with the use of definitions consistent with section 106 of the National Historic Preservation Act of 1966, as amended, and the regulations of the Advisory Council on Historic Preservation (36 CFR 800).

In accordance with the regulations of the Advisory Council on Historic Preservation implementing section 106 of the National Historic preservation Act, the National Park Service finds that no historic properties would be affected (36 CFR 8004(d)(1)).

Ethnographic Resources

Analysis. NPS knowledge about the locations of traditional use is limited to areas identified by American Indian tribes as containing sacred sites. Alternative B would involve no change in the agreement that guarantees tribal members unrestricted access in perpetuity and requires their written consent to affect those sites. The identification of traditional use areas would continue on a project-by-project basis that could affect the use, viewshed, or perception of the area of potential effect of the undertaking. The National Park Service would consult with tribal officials to determine strategies for preserving ethnographic resources or mitigating any adverse impacts.

Ethnographic resources sacred to tribes, including the viewshed, can be degraded by visitor congestion and vehicular traffic. Increased visitation could result from alternative B. Vehicle noise could increase, and there could be unintentional incursion

of visitors into areas of sacred importance during periods of use. Trampling could cause erosion in traditional use areas. These short-term adverse impacts would be expected to be negligible to minor.

Cumulative Effects. Actions in and outside the park could affect ethnographic resources, including traditional cultural properties. Excavation might be required for the bombing range cleanup; this could alter vegetation patterns and landforms, affecting the viewshed of a sacred site. Surveys and cleanup plans would help to reduce the extent of these impacts, but the long-term adverse effects would be moderate.

Traditional use areas could be disturbed or destroyed by construction associated with the DM&E railroad near the south unit or the installation of the Mni Wiconi waterline. However, the waterline is being placed along existing roads, which would limit any resulting effects. The long-term adverse effects from installing the waterline would be minor; the long-term adverse effects from the railroad would be minor to moderate.

Ethnographic resources could be affected by actions in the adjacent Buffalo Gap National Grassland. The construction of trails, campgrounds, or other visitor accommodations could directly affect traditional use areas, and inadvertent camping on traditional use sites and hiking across areas of eroding landforms could result in long-term adverse impacts ranging in intensity from negligible to moderate.

Outside the park, the development of coalbed methane fields by oil and gas companies that operate in northeast Wyoming could affect viewsheds, use, and tribal relationships to regional ethnographic resources. Depending on the location, the long-term cumulative adverse effects could

be widespread or limited and could range from minor to moderate.

Implementing the actions of alternative B and cumulative actions in or outside the park would result in long-term cumulative minor adverse effects on area ethnographic resources.

Conclusion. Implementing alternative B could result in long-term, minor to moderate adverse impacts on ethnographic resources in the park. Actions of an unknown magnitude outside the park could result in cumulative long-term adverse impacts. Until inventories of ethnographic resources in the park could be completed, the park would conduct site-specific surveys and complete American Indian consultations for each development activity, as appropriate. Because alternative B would not result in any major adverse impacts, there would be no impairment of ethnographic resources or of park resources and values.

Section 106 Summary. According to NPS policies and procedures, the park would continue to protect ethnographic resources to the greatest extent possible, avoiding disturbance wherever possible. If avoidance or preservation could not be achieved, appropriate mitigation would be carried out in consultation with American Indian tribes identified as having a cultural affiliation with the park and, if the resources were eligible for national register listing, with the South Dakota state historic preservation officer. Because alternative B would result in no adverse effects on traditional cultural properties within the boundaries of Badlands National Park, the National Park Service finds that the determination of effect would be *no historic properties affected* (36 CFR 800.4 (a)(1)).

EFFECTS ON VISITATION AND THE VISITOR EXPERIENCE

Access

Analysis. The focus of alternative B would be to expand opportunities for visitors to explore and learn about Badlands National Park.

The Loop and Sage Creek Rim Roads would continue to be the primary access in the North Unit for most park visitors. Designating routes for visitors would improve access into the backcountry in the North Unit at Conata Picnic area and Sage Creek campground. If the proposed addition along SD 44 was added to the park, new access would be available from that corridor. These changes would constitute a noticeable improvement in visitor access over alternative A, a long-term, minor to moderate beneficial effect.

Cumulative Effects. Traffic projections indicate that a substantial increase in park visitation could result from the completion of the Heartland Expressway and the Crazy Horse Scenic Byway. The increase from these roads originating from the south and west, added to visitation projections, could alter the current visitation patterns to the park, improving access into the park. The routes for these two road projects already exist, but typically park visitors do not use them.

By improving access points, alternative B would result in minor to moderate beneficial effects on visitors. These actions, coupled with proposed improvements to regional roads, would result in a long-term, moderate, beneficial cumulative effect on park visitors.

Conclusion. By improving access in the North Unit, alternative B would produce a minor to moderate, long-term beneficial

effect on access. The improvement in access would come from designating hiking routes, and improving trailheads.

Availability of Information

Analysis. If the Prairie Homestead was added to Badlands National Park, the existing visitor contact building would be adaptively used to offer orientation, interpretation, and education to visitors entering at the Northeast entrance before they entered the park. More than half of the park's visitors would have this opportunity, a long-term moderate to major beneficial effect on visitors.

A new visitor contact station near the Pinnacles entrance, the second most popular entrance to the park, would offer year-round orientation and interpretation and onsite staff. This would mean that visitors entering the park from the west no longer would have to travel more than 20 miles along the Loop Road to the Ben Reifel Visitor Center before receiving information about the park. Placing a contact station in this location also would meet a goal of the "Long-range Interpretive Plan" (NPS 1999b), which recommends the development of a facility for restrooms, potable water, orientation, and interpretation in this general vicinity. This would result in moderate to major long-term beneficial effects on visitors.

A new small visitor contact station in the town of Scenic would offer orientation, interpretation, and education along SD 44, where none is available now. Rather than go 35 more miles to the Ben Reifel Visitor Center, visitors could get information at this location to decide how they would like to experience the park. This would be a minor to moderate long-term beneficial effect on visitors.

If the park boundary was expanded along SD 44, the existing ranch would be adaptively used by visitors for orientation and for direct access to the wilderness area. Park interpretation and education also would be available in this new location. This would result in a minor long-term beneficial effect on visitors.

Educational opportunities for schools and other organized groups would be available at a new education pavilion and group campsite at the bison handling facility. This would increase curriculum-based education activities and offering a new recreational opportunity. This would result in a minor long-term beneficial effect on the visitor experience.

Cumulative Effects. The Lakota Heritage and Education Center would be an additional outlet disseminating information to the public. This facility would be near the proposed Crazy Horse Scenic Byway, which, if designated, would increase traffic in this area. The visitor center that would be developed for the Minuteman Missile National Historic Site in the Interstate Highway 90 corridor would also be a new outlet for information. Although the focus of that facility would be on the historic site, it could offer regional information, including information about Badlands National Park. These projects would produce long-term moderate beneficial effects on the availability of information for visitors.

The actions of alternative B, by increasing the number of outlets for information and dispersing them throughout the park, would substantially improve the availability of information about the park. This would be a long-term major beneficial effect on the visitor experience. When this effect was combined with other improvements in the

region, long-term moderate beneficial cumulative effects would result.

Conclusion. Alternative B would result in long-term major beneficial effects on the availability of information about the park. The increase in the number of outlets where visitors could obtain information and the dispersed locations of these outlets would substantially improve the visitor experience.

Range and Enjoyment of Visitor Activity

Analysis. Vehicle use, hiking and pack stock use, camping, and picnicking are the four most popular activities.

Vehicle Use — Designating the part of SD 44 that crosses the park as part of the driving/ sightseeing zone and seeking to partner with the South Dakota Department of Transportation in constructing waysides could substantially improve the visitor experience along this section of highway. At present no park information is available to visitors passing through the park, nor is there a location to stop and view the park safely. Adding waysides would give visitors a safe place to stop along this scenic highway and get information about the park, creating long-term minor beneficial effects for visitors.

Improving the road to Sheep Mountain Table and adding a small parking lot and comfort station would provide better access for all types of vehicles, particularly passenger cars. (At present the road condition limits access for some types of vehicles.) The road improvement would make it possible for more visitors to experience Sheep Mountain Table. This would result in a minor long-term beneficial effect on visitors.

Alternative B would offer more opportunities (dispersed throughout the

park) for visitors seeking a driving/ sightseeing experience. Overall, alternative B would result in moderate to major beneficial effects on visitors seeking a driving/ sightseeing experience.

Hiking and Pack Stock Use —

Developing trailheads and designating trails in the natural area / recreation zone would substantially increase opportunities for hiking and pack stock users. Although new trails could be designated throughout the zone, the highest priority would be from existing trailheads and from proposed trailheads. Many visitors are reluctant to explore the backcountry except in areas with designated trails or routes. The designation of new routes would expand opportunities beyond the limited number of trails now in the park. Designating trails would result in minor to moderate long-term beneficial effects on the visitor experience.

Designating hiking trails from the Sage Creek Campground and from the Conata Picnic Area could increase recreational use of the wilderness area. More visitors could diminish the wilderness experience for some users seeking solitude. However, signing and marking trails would eliminate confusion and disorientation of some hikers, substantially increasing their enjoyment. Designating routes into the wilderness area would offer new opportunities for a wilderness experience. These actions would result in long-term moderate beneficial effects on visitors lacking strong backcountry skills, giving them more opportunities to explore the park.

Camping — The Cedar Pass and Sage Creek campgrounds would continue to operate as described for alternative A.

A group campground would be created at the bison handling facilities under this alternative. Its primary purpose would be to

be used for the park's education program, but it would be made available to other groups. At present groups are accommodated at the Cedar Pass or Sage Creek campgrounds, but neither of these locations has facilities designed for larger groups. The new group campground would produce long-term minor beneficial effects on visitors seeking a group camping experience.

Picnicking — This alternative would result in no changes to picnicking from Alternative A

Cumulative Effects. Various plans for road improvements in the region would increase driving/sightseeing opportunities. The Crazy Horse Scenic Byway would be a designated, signed route offering more regional scenic driving opportunities. The management plan for Buffalo Gap National Grassland (USFS 2001b) calls for the development of a primitive campground near Badlands National Park, which would expand the region's camping opportunities. These projects would bring about long term beneficial effects on visitors seeking recreational opportunities in the region.

Opportunities for visitor enjoyment would be distributed throughout the park under alternative B by creating new trailheads, and waysides.

The effects of the actions of alternative B, coupled with those of other projects in the region, would result in long-term moderate cumulative beneficial effects on visitor enjoyment.

Conclusion. There would be more opportunities throughout the park for visitors seeking a driving/sightseeing experience, creating moderate to major beneficial effects on such visitors.

The development of a group campground would result in long-term moderate benefits for visitors seeking this experience.

Scenic Resources

Analysis. Alternative B would result in no changes to the existing facilities in the park. These facilities would continue to cause minor long-term adverse effects on the park visitors.

The proposed construction of the Pinnacles visitor contact station would create a new intrusion on the landscape. This building, which would be adjacent to the Loop Road, would be visible to visitors traveling along this corridor. The building would add a new source of artificial light during the night. Since most park visitors travel along this road, there would be a long-term moderate adverse effect on scenic resources.

Cumulative Impacts. Activities outside the park boundary would have the potential to affect the viewsheds from within the park. The construction of the DM&E Railroad would affect the viewshed. These would be minor to moderate long-term adverse impacts.

Developments on private lands adjacent to the park have affected the viewsheds from the park. The construction of new buildings, signs, and communication towers has resulted in long-term minor adverse impacts on the viewshed. There is the potential that additional communications towers could be constructed within the park viewshed, but none are proposed at present. However, if additional towers were built, they would result in long-term adverse impacts.

Implementing alternative B would result in long-term moderate adverse impacts on scenic resources. Activities outside the park,

combined with the effects implementing alternative B, would result in minor to moderate long-term adverse cumulative effects on scenic resources.

Conclusion. Alternative B would result in long-term moderate adverse impacts on scenic resources from the construction of new facilities in the park. The existing facilities would continue to cause minor adverse impacts on scenic resources.

EFFECTS ON THE SOCIOECONOMIC ENVIRONMENT

Analysis. Alternative B would add to and improve the park's infrastructure and increase the resource education and maintenance staff, an improvement over the no-action alternative. More housing facilities at Pinnacles, a new campground, and new trailheads would improve the efficiency and effectiveness of park operations and offer more opportunities for visitor experiences. Capital improvements would cost \$4,418,000 in current dollars; additional staff would add an annual cost of \$450,200 to the park's operating budget.

Some additional employment opportunities would be available locally under alternative B. A few individuals would receive long-term benefits from employment opportunities with the park. A few individuals and firms (mostly in the construction industry) would receive short-term opportunities relating to capital improvements from the various improvement projects of this alternative. Although this alternative would create some short-term and long-term

economic benefits that would be important to a small number of individuals and business firms, the overall effect on the economic conditions and socioeconomic factors such as population, income, employment, and earnings of the three-county region would be minor. Overall, this alternative would result in a minor long-term beneficial effect on the socioeconomic environment.

Boundary adjustments, if achieved, would result in some one-time payments of federal monies to a few private landowners. Such acquisitions would be accomplished on a willing seller-willing buyer basis so that the landowners and the public would benefit from the transactions. Some private land would become public land, so that there would be some decrease in the local real estate tax base. Any loss of real estate taxes would be minor and perhaps could be mitigated through the payments-in-lieu-of-taxes program.²

Cumulative Effects. The additional capital improvements and extra staff would combine with the actions described for alternative A to enable the park to be managed in compliance with all applicable laws, rules, regulations, and policies governing the management and operation of Badlands National Park.

Conclusion. The present value of the annual operations cost of alternative B is \$87,184,000.³ Alternative B would require \$4,418,000 (2002 dollars) more than alternative A for capital improvements.

2. Current federal law provides for the compensation of local governments for losses to their tax bases due to the presence of most federally owned land. Local governments receive no local real-estate tax money for the publicly owned federal land within county borders. The "Payments-in-Lieu-of-Taxes" program provides some federal funds to local county governments to compensate them for the public services they provide regarding federal land (such as law enforcement and road maintenance).

3. For this preferred alternative (B), the stream of income necessary to support park operations would be \$9,191,444 annually, the interest rate would be 6.125% (federal discount rate for fiscal year 2002), and the time period would be 15 years (life of this *General Management Plan*).

For comparison purposes it is assumed that these capital costs would occur during the first year of implementation, which would make the total present value of this alternative \$91,602,000, an increase of \$8,755,000 (10.6%) over the present value of the no-action alternative.

Improvements to the park from this alternative would produce a major beneficial effect on the touring public and the tourism industry because there would be more opportunities for visitors to explore and use the park's scenic and recreational resources, which might lead to an increase in the length of the average visitor's stay in the park.

EFFECTS ON ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

Under alternative B, the National Park Service would construct and operate new facilities, and energy use by the park also would increase. To maintain, operate, and protect the facilities, NPS travel in the park also would increase, and the increased travel would increase energy consumption.

UNAVOIDABLE ADVERSE IMPACTS

Human use and the construction of new facilities under alternative B would result in minor adverse impacts on natural resources in some areas throughout the park. The impacts on wildlife, vegetation, and the visitor experience, which are discussed in detail above for the specific impact topics, would be unavoidable.

IRRETRIEVABLE OR IRREVERSIBLE COMMITMENTS OF RESOURCES

The additional energy requirements identified above would result in an irreversible commitment of resources. In addition, there would be a commitment of material used to construct new visitor facilities such as the visitor contact station in the Pinnacles area.

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

As in alternative A, most of the park would be protected in a natural state and would maintain its long-term productivity under alternative B. Only a small percentage of the park would be converted to development. In addition, more than 9,500 acres of land included in the proposed boundary adjustments would be placed under federal ownership and managed by the National Park Service. No actions of this alternative would jeopardize the long-term productivity of the environment. Short-term impacts might result from construction, such as local air and water pollution, as detailed in the analysis of specific impact topics. Noise and human activity from construction and restoration might displace some wildlife from the immediate area. However, these activities would not jeopardize the long-term productivity of the environment.

EFFECTS FROM ALTERNATIVE C: FOCUS ON RESOURCE PROTECTION AND PUBLIC EDUCATION

EFFECTS ON NATURAL RESOURCES

Air Quality

Analysis. The construction and use of developments in alternative C — a Pinnacles area visitor contact station, a visitor center above Cedar Pass, employee housing, and trailer pads at the bison handling facility, along with improving part of the Sheep Mountain Table road — would cause short- and long-term minor adverse local effects on air quality, largely from fumes (hydrocarbons, carbon monoxide and nitrogen oxides) and particulates emitted from construction machinery, as well as from dust in the immediate project areas and from excavations. The impacts from construction of these developments would occur in local areas and probably would be spread out over the 15–20 year period covered by this plan.

As in alternative B, emissions of fumes and particulates from construction equipment during the construction of the new Loop Road segment in the Cedar Pass area would cause minor to moderate short-term effects on air quality. Asphalt also would be required for the new road, which would result in emissions from an asphalt batch plant, a storage pile, and haul trucks. Volatile hydrocarbons and other organic compounds in the asphalt would enter the air for a short time after the road surface was completed.

The new section of the Loop Road probably would not increase traffic volume in the park, and thus would not likely result in increased air pollution. But ending vehicle access at the base of Sheep Mountain would decrease emissions and fugitive dust from vehicles being driven there, producing a

negligible beneficial effect on local air quality.

The Castle Trail demonstration shuttle system would probably slightly reduce vehicle traffic, with visitors using the shuttles rather than their vehicles to access trailheads. However, only a small decrease in vehicle emissions would be likely, because relatively few people would be expected to use this area. Assuming the system operates for more than one year, there would be a negligible, long-term, beneficial impact on local air quality.

Cumulative Effects. As in other alternatives, the construction of facilities like the Lakota Heritage and Education Center and prescribed burns in the park would result in short-term local adverse effects on air quality. However, sources outside the park would add far more pollutants to the park's airshed. In particular, energy and industrial developments in the Powder River Basin in Wyoming could substantially affect the park's air quality, as was mentioned for the no-action alternative. Other actions outside the park that could affect air quality in the park are prescribed fire and wildfires, the construction and operation of the DM&E railroad, the Mni Wiconi water project, and possibly the designation of the Crazy Horse Scenic Byway.

All the above actions, added to the actions in alternative C, would result in a cumulative long-term major adverse impact on park air quality. The increment added to this impact by the actions of alternative C would be minimal because those effects would be local, short-term, and spread out over time.

Conclusion. Alternative C would result in short-and long-term minor to moderate adverse effects on air quality in local areas primarily from construction and use of new developments. A cumulative long-term major adverse effect on regional air quality would result from alternative C and emissions from sources outside the park, but the incremental contribution of alternative C to this impact would be minor. These effects would not constitute an impairment of park resources or values.

Soundscape

Analysis. Building new facilities and improving facilities in alternative C would affect the park's soundscape in local areas. Noise would be generated by construction workers and their equipment when completing the improvements mentioned under "Air Quality" for this alternative. Construction noise would be substantial in some areas, but it would be temporary and would take place at different times and places. Most noise from new developments would be in or near developed areas where there is already noise from vehicles, park equipment, and visitors. Excluding noise from construction of the new Loop Road section, noise from the construction activities would result in negligible to moderate adverse effects on the natural soundscape in local areas, depending on the presence of other facilities and people, vegetation, wind, and time of day.

As in alternative B, constructing a new road segment would make substantial noise, causing long-term moderate to major adverse effects on the soundscape near the road. Noise also would come from trucks and other vehicles and from road maintenance activities, particularly during the peak use season. Thus, alternative C would result in a short-term and long-term moderate to

major adverse effect on the soundscape near the road.

Noise would be heard in a few places that have been relatively quiet in the past. More visitors and vehicles would be likely at the new visitor contact station and visitor center, and at the Prairie Homestead. Although noise would increase at these facilities, the effect on the soundscape would be long term and minor because a substantial increase in visitation would not be likely. On a few high-use weekends, more noise would be expected at the new visitor contact station and visitor center, and the impact could be moderate at some locations.

Ending the existing road at the base of Sheep Mountain would eliminate noise from vehicles being driven up the mountain and on the table, causing a long-term minor to moderate beneficial effect on the soundscape.

Cumulative Effects. As in other alternatives, noise in parts of the park would be increased by construction activities, the operation of machinery and vehicles, and the presence of people. Greater noise levels under alternative C (construction of facilities, larger numbers of people and vehicles in some park areas), added to actions independent of this plan (the redesign project at the Sage Creek campground, continued commercial tour helicopter overflights, commercial traffic through the park) could result in a cumulative long-term minor adverse noise effect in local areas.

Outside the park, the construction of the Mni Wiconi water project would generate noise that would be audible in places in the North Unit. On the southwestern end of the North Unit, noise levels could increase from traffic on the Crazy Horse Scenic Byway (assuming increased traffic resulted from

that designation). These sounds could combine with visitor and administrative use in the park, resulting in a long-term minor cumulative adverse effect on the soundscape.

Conclusion. Under alternative C, most of Badlands National Park would continue to be relatively quiet, with few unnatural sounds, but there would be more sources of noise in the park. The construction and operation of most facilities proposed in alternative C would cause short-term and long-term minor adverse effects on the soundscape, but most would be in areas where there is already some noise.

The construction and use of the new visitor contact station and visitor center would increase noise levels in these areas. The facilities would result in short-term and long-term minor adverse impacts on the soundscape. At times of high use, the use of the facilities would result in moderate short-term impacts.

The construction and use of the new Loop Road segment would cause short-term and long-term moderate to major adverse effects on the soundscape near the road, but this would not impair park resources or values. Only a small part of the park would be affected. The natural and cultural integrity of the park would not be compromised, nor would opportunities for visitor enjoyment. The National Park Service would not be prevented from conserving resources or values necessary to fulfill the park's specific purposes, as identified in the establishing legislation nor from achieving the goals of the park's *General Management Plan* or other relevant NPS planning documents.

Short-term and long-term minor adverse cumulative effects on the soundscape could be caused in other local areas by the operation of new facilities under alternative

C, added to noise from construction and more traffic outside the park. This level of impact would not impair park resources or values.

Geologic Features, Including Soils

Analysis. With the exception of the new section of the Loop Road, the actions of alternative C would not affect the park's geologic features. Park soils would be altered or lost through the construction of several facilities, including the Sheep Mountain Table parking area, the Pinnacles employee housing and visitor contact station, the trailer pads for researchers at the bison handling facility, the new Cedar Pass visitor center, and the new Loop Road segment. Soils already have been disturbed in most areas of these developments, but some soils might be altered, and erosion might be temporarily increased by construction. However, with mitigation the effects would be minor and local.

Actions in alternative C in previously undisturbed areas would be the new Cedar Pass segment of the Loop Road, the Pinnacles visitor contact station, and the Cedar Pass visitor center. Soils in those areas would be permanently disturbed or lost, resulting in a long-term, moderate to major adverse effect on soils.

Ending the road at the base of Sheep Mountain Table would curtail erosion from vehicles being driven up the steep grade and on top of the table. This action would result in a long-term moderate beneficial effect on soils in the area.

A new Pinnacles visitor contact station would benefit all the park's resources, including soils: more visitors could be educated about the nature of park soils and learn to avoid or minimize the effects of

walking in the park. This would result in a long-term, minor beneficial effect on soils.

Cumulative Effects. Soils would be lost or altered and erosion temporarily increased under alternative C by several developments in and outside the North Unit, including the construction of the Lakota Heritage and Education Center, the redesign of the Sage Creek campground, the installation of the Mni Wiconi water project (although it would be built primarily within the prism of existing roads), the development of the DM&E rail line, and the bombing range cleanup. The loss and alteration of soils from these actions, added to the potential for soil loss and alteration from the actions of alternative C would increase regional soil erosion and alteration, resulting in a cumulative long-term moderate adverse effect on area soils.

Conclusion. Most of the park's soils and geologic features would not be affected by alternative C, but constructing the new Loop Road segment could result in long-term moderate to major adverse effects on geologic features and soils along the corridor. The alternative also would cause minor to moderate long-term beneficial and adverse local effects on park soils. The adverse soil impacts from construction and the use of new facilities would take place mostly in developed areas. The beneficial effects on soils would result from ending the road at the base of Sheep Mountain Table and adding education and interpretation (which could reduce the effects caused by visitors). When outside developments were added to new park developments under alternative C, the cumulative result would be a long-term minor to moderate cumulative adverse effect on area soils.

The effects on soils from alternative C would not constitute an impairment of park resources or values. Although the construc-

tion of the new Loop Road segment could result in a major adverse effect on geologic features, this would not impair park resources and values. The effect would be local, and its extent would depend on the road design (that is, whether the road would be elevated or cut through the Badlands Wall). Even if the adverse effect was major, the National Park Service still would be able to fulfill the purposes for which Badlands National Park was established.

The loss of geologic features under alternative C would not destroy the integrity of the park relative to its geologic features. Geologic features would continue to be present throughout the park (albeit potentially in fewer numbers), and the park staff still would protect and interpret the features and provide opportunities for scientific research on the park's geology. People still could come to Badlands and enjoy the park's values, including its geologic features.

Paleontological Resources

Analysis. Most developments and improvements of alternative C would be in previously disturbed areas that are not known to be highly fossiliferous. These include the Sheep Mountain Table road and parking area, the Pinnacles employee housing and visitor contact station, and the trailer pads for researchers near the bison handling facilities. Little more bedrock disturbance would be needed in most of those areas, but if drilling into bedrock was necessary, some fossils could be damaged or lost. With surveys and monitoring, the potential for impacts in these areas would be minor.

The new Pinnacles visitor contact station would be built in an area above the Badlands Wall that is not likely to be highly fossiliferous. Some fossils could be affected

by construction and underground utility lines for the new visitor center. Careful siting of the center would help reduce the potential for such damage. Constructing the new gravel parking area near Sheep Mountain Table could cause the loss of some fossils, but in all the above cases, surveys and monitoring would keep the impacts minor.

The new Cedar Pass segment of the Loop Road probably would not be in a highly fossiliferous area, but even with surveying and monitoring, fossils would be damaged, given the extent of ground disturbance. This would result in a long-term moderate adverse impact on paleontological resources.

Some beneficial effects on paleontological resources in the park would result from alternative C, as follows:

- ♦ Closing the Sheep Mountain Table road at the base of the table would reduce erosion and the consequent loss of fossils from vehicles being driven up the table and from road maintenance.
- ♦ Adding a visitor contact station would increase some visitors' awareness of the significance of the park's fossils, reducing the potential for fossil collection.
- ♦ More visitor educational efforts and ranger patrols would help decrease fossil collecting.
- ♦ The presence of the trailers pads for researchers could encourage research that would benefit the protection and management of the park's paleontological resources.
- ♦ The boundary expansion along SD 44 would give rangers, researchers, and resource managers better access into the Badlands Wilderness, increasing fossil protection in that area.

Cumulative Effects. Like alternatives A and B, alternative C could result in cumulative adverse effects on the area's paleontological resources. Actions in and outside the North Unit (including, cleaning up the bombing range, constructing the DM&E rail line and Mni Wiconi waterline, increased use of the adjacent national grassland, and fossil collecting on lands near the park) could result in the loss or vandalism of fossils.

All the effects from other actions in and outside the park, added to the effects of new developments in alternative C, could lead to the damage of more of the region's fossils, even though surveys and monitoring would be carried out. Thus, alternative C would contribute to a long-term adverse cumulative effect of unknown magnitude on the area's fossils.

Conclusion. Alternative C would result in some beneficial effects on paleontological resources from increased staffing, educational efforts, and research and from the closure of part of the Sheep Mountain Table road. However, there would be a slightly higher potential for long-term adverse effects on park paleontological resources from alternative C than from alternative A, especially from constructing the new Loop Road segment. Even with mitigation, alternative C could cause long-term minor to moderate local adverse effects on park paleontological resources, and these effects, added to other actions inside and outside the park, could result in a long-term cumulative adverse impact of unknown magnitude.

Although alternative C would lead to adverse effects on paleontological resources, this would not constitute an impairment of park resources or values. The National Park Service still would be able to fulfill the purposes for which Badlands National Park was established. The loss of

resources under alternative C would not destroy the integrity of the park relative to its paleontological resources. Fossils still would be present in the park, and the park staff would be able to protect and interpret paleontological resources and offer opportunities for scientific research on that subject. People still could come to Badlands National Park and enjoy its values, including its fossils.

Vegetation

Analysis. Vegetation would be lost or altered in local areas under alternative C as in alternative B, primarily from the development or improvement of facilities and visitor services. Most new developments would be placed within the existing footprint of disturbed areas in which the vegetation already has been altered; therefore, little additional loss of native vegetation would result from constructing staff housing at Pinnacles, and trailer pads for researchers. Given the previous vegetation disturbance in most of these areas, and with the use of appropriate mitigative measures to minimize impacts (such as ensuring that the equipment would stay within project area boundaries, re-vegetating disturbed areas, taking steps to avoid the spread of exotic species), the adverse effects on native vegetation from these actions would be negligible to minor.

As in alternative B, constructing the new Cedar Pass segment of the Loop Road would cause the loss and alteration of native grassland vegetation. Some native plants would be lost permanently because of the road footprint. Even with mitigative measures, construction equipment in the project area would damage or cause the loss of other plants. Several indirect impacts also could result from constructing the road segment, including the introduction and spread of nonnative plants. If visitors

created “informal” pull-offs by parking off the roadside, some plants might be crushed, trampled, or picked. Road maintenance also might indirectly affect roadside vegetation. Depending on the road’s location and design, the long-term adverse local effects on native vegetation from the new road segment would range from minor to moderate.

The new Pinnacles visitor contact station and the Cedar Pass visitor center would be built in previously undisturbed areas. Despite the use of mitigative measures to help reduce the loss of native prairie vegetation, some vegetation would be permanently disturbed or lost in these areas, a long-term minor adverse impact. Building a small parking area on Sheep Mountain Table also would cause the loss of vegetation, a long-term minor adverse effect.

Vegetation also would be altered or lost through visitation in alternative C. As in alternatives A and B, people walking over and trampling plants in and around existing facilities would result in the loss of native vegetation, a long-term, minor to moderate adverse effect.

Several beneficial effects on vegetation would result from alternative C. Ending the Sheep Mountain Table road at the base of the mountain would help prevent the crushing of vegetation from vehicles driving up the table. Vegetation also could be planted along the portion of the road that would be closed to restore the area and prevent additional erosion. The long-term beneficial effects on vegetation from these actions would be minor to moderate in this area. Converting the Sage Creek campground to a day use area would reduce the presence of people and horses in that area, resulting in less trampling of native vegetation around the campground and on

nearby trails and less potential for the introduction of exotic species than in alternative A. This would be a long term, minor to moderate beneficial effect on native vegetation.

Adding the Pinnacles visitor contact station would help to increase visitors' appreciation for native and rare plants and minimize effects on vegetation caused by people, a minor beneficial effect on vegetation. The presence of the trailer pads for researchers could encourage research that could benefit the protection and management of the park's vegetation. The research efforts could result in a long-term, moderate beneficial effect, depending on the type and extent of research being conducted.

Surveys for rare plants would be conducted before developments were constructed in alternative C, and in most cases developments (new trails, visitor facilities) could be sited to avoid effects on these populations. Two species of rare plants, Easter daisy and largeflower Townsend daisy (and possibly other state-listed rare plants) can be found in the park's prairies and could occur in the area where the new Cedar Pass road might be built. It might be possible to locate the road to avoid populations of these plants, but impacts still could be caused by construction equipment in the project area, and indirect impacts could result from visitors pulling their vehicles off the roads or from roadside maintenance activities. On the other hand, given the relatively small populations of these plants in the park, it is unlikely that the new road would be constructed in the same area and affect the park's populations of these rare plants.

The boundary adjustments proposed in alternative C would result in a moderate beneficial effect on native vegetation. Although much of the land near SD 44 and

on the west side of the North Unit that would be added to the park has been grazed, the protection of existing native grassland vegetation would be increased by including these areas in the park. Over time native vegetation would become reestablished in much of the areas, and more native vegetation would be protected in the Prairie Homestead addition.

Cumulative Effects. Other actions in and outside the park, added to the actions of alternative C, would result in a potential for cumulative adverse and beneficial effects. In the North Unit the redesign of the Sage Creek campground, and park maintenance activities along roads would result in a minor loss or alteration of vegetation. Outside the North Unit actions such as the construction of the Lakota Heritage and Education Center, the bombing range cleanup, and cattle grazing on surrounding private, public, and reservation lands could alter or cause the loss of native plants (see pg 148).

The designation of the Crazy Horse Scenic Byway (which could increase visitation to the park), the construction and operation of the DM&E rail line, and the construction of primitive campgrounds and trails in the national grassland adjacent to the park could alter or cause the loss of native plants. These other actions, added to the developments of alternative, would result in a long-term, minor to moderate, adverse cumulative effect on the region's native vegetation. The increment added by alternative C to this cumulative effect would be negligible.

Some cumulative effects could be beneficial. NPS prescribed burning efforts, the reintroduction of native plants, and weed management efforts in Badlands could beneficially affect native plants. Increases in prescribed burns in the adjacent national

grassland also would beneficially affect native plants. Those actions, added to the effects of closing part of the road to Sheep Mountain Table, and encouraging more research and education, and the boundary adjustments under alternative C, would result in better protection of native vegetation and its possible increase in previously disturbed areas. The beneficial long-term cumulative effect of these actions on regional native vegetation would be minor to moderate.

Conclusion. Most native vegetation in Badlands National Park would continue to be protected and sustain itself under alternative C. Constructing the new Loop Road segment and a few other new developments, along with more visitation from improved trails and routes and general visitor use would result in the loss of native plants, causing long-term, minor to moderate adverse effects in local areas. The potential for the spread of exotic plants also would increase in these areas.

The loss of native vegetation would be reduced by better protection, and native vegetation would benefit from, closing part of the Sheep Mountain Table road, increasing education and research efforts, converting the Sage Creek campground to a day use area, and adding areas to the park. The long-term beneficial local effects on native vegetation from alternative C would be minor to moderate. The long-term cumulative effects on vegetation from this alternative and other actions in and outside the park would be minor to moderate and both beneficial and adverse. The levels of these effects would not be sufficient to constitute an impairment of park resources or values.

Wildlife

Analysis. Although several new developments would be made under alternative C, most would be done in already disturbed areas: Sheep Mountain Table road and parking area, the Pinnacles employee housing and visitor contact station, and the trailer pads for researchers at the bison handling facility. Most wildlife populations and their habitats have been altered by past human actions in these areas, and little habitat would be lost. Increased noise and human activity from construction activities could temporarily displace some animals such as rodents and birds, resulting in minor short-term adverse impacts on wildlife populations in local areas. The new developments would not affect bison or bighorn sheep populations and habitats. Prairie dogs could be affected by the new Pinnacles employee housing, but if the units are carefully sited, impacts would be avoided. Thus, the long-term adverse effects on wildlife and habitats from new developments or improvements would be negligible to minor.

As in alternative B, building the new Cedar Pass segment of the Loop Road would cause the permanent loss of grassland habitat, displacing wildlife along that corridor. Clearing vegetation in that area would result in the loss of wildlife forage and shelter. Noise from construction equipment and from vehicles on the road could fragment the North Unit's bighorn sheep herd, affecting the animals' movements and wintering areas, but their lambing area would not be affected. Slower speed limits and signs would help reduce the potential for sheep to be hit by vehicles, but even with these measures there could be some sheep road kills. The road also would cross a major deer grazing area, and more deer could be hit by vehicles, especially at dusk.

Most birds, mammals, and reptiles would avoid the area during construction, but many would return after construction ended. Some animals, primarily invertebrates, would not be able to move out of the construction area and would be killed. An indirect effect of the road would be that some wildlife could be killed by vehicles or maintenance activities. Careful siting of the road and the use of other mitigative measures would help to reduce impacts, but the long-term adverse effect on some of the North Unit's wildlife populations would be moderate.

Building trailer pads to support researchers at the bison handling site could affect bison capture and culling efforts, which in turn would affect the general long-term health and well-being of the herd. However, it is expected that relatively few researchers would be in the area at the time bison roundups occur, and if necessary the facility could be temporarily shut down for other uses to avoid impacts. Thus, the new research facility would be expected to cause a negligible adverse impact on the bison herd.

The Pinnacles visitor contact station and the Cedar Pass visitor center would be built in previously undisturbed areas, causing the permanent loss of some grassland habitat. Construction activities also would temporarily disturb and displace animals near these facilities. The species primarily affected would be some smaller, less mobile wildlife species and species with smaller home ranges, such as invertebrates. Some reptiles, small mammals, and birds would be displaced. The loss of habitat would result in a long-term minor adverse effect on these populations.

Wildlife populations and habitats in the park would be improved by several actions in alternative C, as follows:

- ♦ Ending the Sheep Mountain Table road at the base of the mountain would eliminate wildlife disturbance from vehicles being driven in that area, a beneficial effect for wildlife.
- ♦ Converting the Sage Creek campground to a day use area would reduce the presence of people and horses in that area, which in turn would reduce the disturbance and displacement of bison and other wildlife.
- ♦ Providing trailer pads at the bison handling facilities could encourage research that would benefit the protection and management of the park's wildlife.

The long-term beneficial effect of these actions would be minor.

The proposed addition of land along SD 44 and on the west end of the North Unit would add prairie dog towns to the park, which would give the animals more protection and help ensure their continued presence. The additions also would protect wildlife habitat for a variety of other species such as mule deer, bighorn sheep, pronghorn antelope, and bobcat. Thus, it is expected that the additions would have a long-term moderate beneficial effect on the park's wildlife. Some grassland wildlife habitat would be protected through the addition of the Prairie Homestead, but the need to relocate some white-tailed prairie dogs from the area would result in a negligible adverse impact.

Cumulative Effects. Several other actions in and outside Badlands National Park would affect area wildlife. Some wildlife would be killed or displaced by the construction and operation of the DM&E rail line, and possibly by more traffic if the Crazy Horse Scenic Byway were designated. These actions would cause minor adverse impacts on wildlife. Those effects, added to

the effects on wildlife from the actions of alternative C, would result in a slightly higher potential for wildlife to be displaced and would reduce the number of areas where wildlife could exist without people or facilities. The long-term cumulative adverse effects on area wildlife would be minor.

Actions within and outside the North Unit, independent of alternative C, would likely affect prairie dogs and their habitat in the future. Some potential habitat for prairie dogs could be lost due to developments outside the North Unit, such as the DM&E rail line. In addition, prairie dog control efforts on lands outside the North Unit would continue, resulting in the loss of animals. Some limited prairie dog control efforts probably also would occur within the North Unit, which would result in the loss of animals in areas adjacent to private lands. On the other hand, lands in the Buffalo Gap National Grassland that are adjacent to the eastern part of the park would continue to be managed to maintain and enhance prairie dog complexes. This would be a long-term beneficial effect. When the beneficial and adverse impacts of actions occurring within and outside the North Unit are added to the actions in alternative C there could be a long-term minor adverse cumulative effect on the area's overall prairie dog population. However, the boundary adjustments in alternative C would add a beneficial increment to this cumulative impact.

Conclusion. Alternative C would not affect most wildlife populations and habitats in Badlands National Park; they would continue to be protected and would not be changed by the actions of this alternative. The park's bison and prairie dog populations generally would not be affected by actions in the alternative, although the boundary additions would add additional prairie dogs into the park. Building the new

Cedar Pass segment of the Loop Road could result in long-term, moderate adverse effects on the North Unit's wildlife, particularly the bighorn sheep and deer populations. Most developments in the alternative would result in long-term negligible to minor adverse impacts on wildlife populations and habitats.

Closing part of the Sheep Mountain Table road, converting the Sage Creek campground to a day use area, increased research efforts, and the proposed boundary adjustments would produce long-term minor to moderate beneficial effects on wildlife. Overall, alternative C would result in long-term minor adverse and beneficial effects on the park's wildlife populations and habitats.

The cumulative effects of alternative C and actions outside the park on area wildlife and their habitat would comprise increased habitat fragmentation and wildlife displacement, and loss of prairie dogs in localized areas, resulting in a long-term minor adverse effect. None of the effects on wildlife from alternative C would impair park resources or values.

Special Status Species

Analysis. None of the proposed developments and improvements in alternative C would be in areas known to contain black-footed ferret or swift fox populations.

The proposed boundary adjustments along SD 44 and the west end of the North Unit would add prairie dog towns to the park, and thus would also protect additional potential black-footed ferret habitat.

Alternative C may affect, but would not be likely to adversely affect, swift fox and fox habitat in the area. The land acquisitions

along SD 44 and on the west side of the North Unit would protect potential swift fox habitat that could support the fox in the future, and thus would be a beneficial impact. Most facilities proposed in alternative C, including the new Loop Road segment, would be in marginal potential fox habitat. Facilities that would be developed at the bison handling facility and in the Pinnacles area would be in or near potential fox habitat, but the facilities and more people in those areas would not necessarily prevent foxes dispersing into and using the areas. Foxes, which are mostly nocturnal, would be in the areas when few people would be present. It is possible that a fox might be hit by a car on the new Loop Road segment, but that is unlikely, given the low levels of traffic in the park at night.

Cumulative Effects. Although some limited prairie dog control efforts likely would occur in the North Unit in the future, independent of alternative C, it is unlikely that such efforts would be permitted in areas where black-footed ferrets are known to occur, or would prevent the ferrets from using these areas.

Actions outside the North Unit could have both adverse and beneficial impacts on black-footed ferrets and their habitat. Some potential habitat for prairie dogs and black-footed ferrets could be lost due to developments outside the North Unit, such as the DM&E rail line. Prairie dog control efforts on lands outside the North Unit also could affect black-footed ferrets if they occur in these areas.

On the other hand, lands in the Buffalo Gap National Grassland that are adjacent to the eastern part of the park would continue to be managed to maintain and enhance prairie dog complexes, providing additional potential black-footed ferret habitat. This would be a long-term beneficial effect.

When the actions in alternative C are added to the other actions described above, there could be a potential loss of prairie dogs, which could result in a long-term adverse cumulative effect on the area's existing or potential for black-footed ferret populations. However, alternative C would add a beneficial increment to this cumulative impact, primarily due to the boundary adjustments.

Some potential swift fox habitat could be protected by two boundary adjustments under alternative C. When these actions are combined with efforts to reintroduce the fox, independent of alternative C, there could be a long-term, beneficial cumulative impact for swift fox in the area.

Conclusion. Before taking any action in alternative C that might affect federally listed species in the park, the National Park Service would consult with the U.S. Fish and Wildlife Service to ensure potential impacts are identified and avoided. Overall, alternative C might affect, but would not be likely to adversely affect, the populations of black-footed ferrets and swift fox in Badlands National Park. The proposed boundary adjustments would add potential black-footed ferret, and swift fox habitat, which would be a beneficial impact. Alternative C plus actions within and outside the North Unit (independent of alternative C) could result in an adverse cumulative impact to black-footed ferrets. However, alternative C would add a beneficial increment to this cumulative impact. Likewise, when the boundary adjustments under alternative C are combined with efforts to reintroduce the swift fox, independent of the alternative, there could be a long-term, beneficial cumulative impact for swift fox in the area. No impairment of park resources or values would result from this alternative.

EFFECTS ON CULTURAL RESOURCES

Historic Buildings and Other Structures

Analysis. This alternative calls for a boundary change that would bring the Prairie Homestead, a National Register of Historic Places listed property, into federal ownership. The Prairie Homestead consists of a single room dug into the side of a hill with an attached stacked sod addition. This site includes a modern structure that currently is used as a souvenir shop and for facility management.

Removing the Prairie Homestead visitor contact facility would contribute to the return of the homestead to its historic condition and would result in a long-term moderate beneficial effect on the site. New trails and waysides would have to be added to give visitors access. These additions would result in an indirect long-term, minor adverse effect on the homestead.

The potential level of continuing visitation to the park is unknown, but wear caused by visitation could result in long-term adverse impacts on the structure of unknown intensity. However, the structure's condition would be stabilized through more research and by continuing maintenance and repair consistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1996). These preservation actions would produce long-term minor to moderate beneficial effects. By removing the structure and restoring the immediate environs to more of a semblance of the historic conditions, an appearance would be created, resulting in a long-term moderate beneficial effect.

Including the Prairie Homestead in the park would afford it the protection of historic properties in federal ownership. The laws, regulations, and policies followed by the National Park Service mandate that specific

conditions and processes be followed for historic properties; such regulations are not required under private ownership. Therefore, bringing the property into federal ownership would lead to a long-term minor beneficial effect.

Cumulative Effects. Several miles north of Badlands National Park, the development of the new Minuteman Missile National Historic Site would affect the historic condition of the missile control and launch facilities. The alterations could include structural changes to accommodate public visitation, environmental control, and protective barriers. The long-term, adverse effects on the structures of the national historic site would range from negligible to moderate.

Bringing the Prairie Homestead within park boundaries would increase the protection and maintenance of the property which could result in a long-term, moderate beneficial impact.

While the overall cumulative impact would be slightly more adverse than beneficial, the beneficial effects of incorporating the Prairie Homestead into federal ownership under alternative C, would contribute a moderately beneficial effect to the adverse impact.

Conclusion. Bringing the Prairie Homestead into federal ownership would give the property a greater level of protection, resulting in a long-term, minor to moderate beneficial effect on the structure.

The long-term, cumulative adverse effects of alternative C on area historic structures in and outside the park would be minor to moderate. There would be no impairment of historic buildings or other structures and no impairment of park resources or values.

Section 106 Summary. The Prairie Homestead, being brought into federal

control, would receive a greater level of preservation and rehabilitation than at present. Any changes, alterations, or other preservation-related undertakings would be carried out in consultation with the South Dakota state historic preservation officer and according to the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1996).

Removing the contact station and installing walkways and waysides would be done after consultation with the South Dakota state historic preservation officer. After applying the criteria of adverse effects of the Advisory Council on Historic Preservation, the National Park Service finds that these actions would result in no adverse effect on the Prairie Homestead.

Ethnographic Resources

Analysis. NPS knowledge about the locations of traditional use is limited to areas identified by American Indian tribes as containing sacred sites. Alternative C would involve no change in the agreement that guarantees tribal members unrestricted access in perpetuity and requires their written consent to affect those sites. Before an area planned for development was disturbed, investigations would be undertaken to identify, document, and evaluate the eligibility of location for inclusion in the National Register of Historic Places. The National Park Service would consult with tribal officials to determine strategies for preserving ethnographic resources or mitigating any adverse impacts.

On the northern portions of Sheep Mountain Table, where traditional use is extensive, the proposed partial road closure would constrain parishioners access to traditional use areas by restricting road use. These limitations on vehicular use could pose a hardship on elderly or handicapped

persons because visitors would have to walk over the closed upper part of the road. The resulting long-term, adverse effect on the relationship between the site and the practitioner would be moderate.

Alternative C would result in long-term minor beneficial effects on ethnographic resources by limiting public visitation to American Indian sacred sites. This alternative would cause no effect on the viewshed of sacred and traditional use areas by implementation of this alternative.

Cumulative Effects. Actions in and outside the park could affect ethnographic resources, including traditional cultural properties.

Inside the park, excavation might be required for the bombing range cleanup; this could alter vegetation patterns and landforms, affecting the topographic relief of a viewshed of a sacred site. Surveys and cleanup plans would help to reduce the extent of these impacts, but the long-term adverse effects would be moderate.

Outside the park, the development of coalbed methane fields by oil and gas companies that operate in northeast Wyoming could affect viewsheds, use, and tribal relationships to regional ethnographic resources. Depending on the location, the long-term, cumulative adverse effects could be widespread or limited and could range from minor to moderate.

Traditional use areas could be disturbed or destroyed through construction associated with the DM&E railroad near the South Unit or the installation of the Mni Wiconi waterline. However, the waterline is being placed along existing roads, which would limit any resulting effects. The long-term, adverse effects from installing the waterline would be minor; the long-term, adverse

effects from the railroad would be moderate.

Ethnographic resources could be affected by actions in the adjacent Buffalo Gap National Grassland. The construction of trails, campgrounds, or other visitor accommodations could directly affect traditional use areas, and inadvertent camping on traditional use sites and hiking across areas of eroding landforms could result in long-term, adverse impacts ranging in intensity from negligible to moderate.

The planned development of the Minuteman Missile National Historic Site could result in the construction of a visitor facility and an administrative site. Any resulting adverse effects could be minimized by changing the location of the site, and the long-term, adverse effects would be minor.

The effects of all actions in or outside the park under alternative C, combined with the effects of continued development in the park, would result in long-term, cumulative adverse effects on area ethnographic resources ranging from minor to moderate.

The cumulative effects of all actions in or outside the park from implementing alternative C would be long-term, minor, and adverse.

Conclusion. Implementing Alternative C could result in long-term minor to moderate adverse impacts on ethnographic resources in the park. Primarily, these impacts would be caused by limiting American Indians' access by vehicle to traditional use sites for religious practices.

Cumulative impacts outside the park would be caused by changes in the viewshed and by possible harm to access. The effects would range from minor to moderate. Actions inside or outside the park, combined with the actions of alternative C,

would result in a long term moderate adverse effect on ethnographic resources. Since there would be no major impacts, park resources and values would not be impaired.

Section 106 Summary. According to NPS policies and procedures, the park would continue to protect ethnographic resources to the greatest extent possible, avoiding disturbance wherever possible. If avoidance or preservation could not be achieved, appropriate mitigation would be carried out in consultation with American Indian tribes identified as having a cultural affiliation with the park and, if the resources were eligible for national register listing, with the South Dakota state historic preservation officer. Because there are no known traditional cultural properties within the boundaries of Badlands National Park, alternative C would have no effect on such resources, and the National Park Service finds that the determination of effect would be *no historic properties affected* (36 CFR 800.4(d)(1)).

EFFECTS ON VISITATION AND THE VISITOR EXPERIENCE

Access

Analysis. The focus of alternative C would be to protect resources and manage visitor access to minimize the effects on resources from visitors.

The Loop and Sage Creek Rim Roads in the North Unit would continue to be the access routes for most park visitors. The roads accommodate most vehicle types and offer year-round access to the park. Access to the backcountry would be from the existing trailheads, although minor improvements could be made.

The road to Sheep Mountain Table would be ended at the base of the mountain, (approximately 3 miles from BIA Highway 27) and vehicles would not be permitted on the tabletop. This would mean that visitors would have to hike or use pack stock to reach the top of the table. Eliminating vehicle access to the tabletop would result in a long-term minor adverse effect on the visitor experience.

Cumulative Effects. Traffic projections indicate that a substantial increase in park visitation could result from the completion of the Heartland Expressway and the Crazy Horse Scenic Byway. The increase from these roads originating from the south and west, added to visitation projections for the Lakota Heritage and Education Center, could alter the current visitation patterns to the park.

This alternative would result in relatively little change concerning access over Alternative A. There would be long-term minor adverse impacts from eliminating vehicle access on to Sheep Mountain Table. These actions, coupled with proposed improvements to regional roads, would result in a long-term, moderate beneficial cumulative effect on park visitors.

Conclusion. Because Sheep Mountain would not be available for vehicle travel, the alternative would cause some minor adverse effects on visitor access.

Availability of Information

Analysis. Because alternative C would involve developing an orientation facility near the Pinnacles entrance station to offer year-round orientation and interpretation and onsite staff near the second most popular entrance to the park, visitors no longer would have to travel more than 20 miles along the Loop Road to the Ben Reifel

Visitor Center to get information about the park. Having NPS staff at this location also would also meet a goal of the “Long-Range Interpretative Plan,” which calls for the addition of a facility with restrooms, potable water, orientation, and interpretation in this general vicinity.

Cumulative Effects. The Lakota Heritage and Education Center would be an additional outlet disseminating information to the public. This facility would be near the proposed Crazy Horse Scenic Byway, which, if designated, would increase traffic in this area. The visitor center that would be developed for the Minuteman Missile National Historic Site in the I-90 corridor also would be a new outlet for information. Although the focus of that facility would be on the historic site, it could offer regional information, including information about Badlands National Park. These projects would produce long-term, major beneficial effects on the availability of information for visitors.

The proposed demonstration transportation system would provide a forum for visitors to obtain information about the park. Shuttle drivers would be knowledgeable about the park could give information to visitors. In addition, the shuttles could include signs to provide information for visitors. These services would be a minor benefit for visitors. The testing period for the transportation system is expected to last one to two years. If it was determined that the system met the goals of the project, the beneficial effects could be long term.

By improving the opportunity for visitors to receive information about the park and developing a facility near the second most popular entrance station, alternative C would result in a long-term, moderate beneficial effect on the visitor experience.

The long-term moderate benefits of alternative C, combined with regional improvements, would result in moderate beneficial cumulative effects on the visitor experience.

Conclusion. Alternative C would bring about long-term, moderate beneficial effects on the availability of information about the park. A new information facility at the west side of the North Unit would improve the visitor experience.

Range and Enjoyment of Visitor Activity

Analysis. Vehicle use, hiking and pack stock use, camping, and picnicking are the four most popular activities.

Vehicle Use — Designating the part of SD 44 that crosses the park as part of the driving/ sightseeing zone and seeking to partner with the South Dakota Department of Transportation in constructing waysides could substantially improve the visitor experience along this section of highway. At present no information about the park is available to visitors passing through the park, nor is there a location to stop and view the park safely. Adding waysides would give visitors a safe place to stop along this scenic highway and get information about the park, creating long-term, minor beneficial effects for visitors.

Maintaining the Sheep Mountain road to the base of the mountain and prohibiting vehicle travel on the mountain would mean a lost opportunity for some visitors, a minor to moderate adverse effect on visitors seeking driving opportunities. The loss of the opportunity to drive to this popular destination would reduce the number of visitors, but the total number affected would be a relatively small part of the total visitors to the park.

Overall, alternative C would enhance visitor experience for travelers along SD 44 by providing waysides, which would be a negligible to minor long-term beneficial effect. The elimination of vehicles on to Sheep Mountain Table would be a long-term negligible adverse impact to visitors seeking this type of driving experience.

Hiking and Pack Stock Use —

Developing trailheads and designating trails in the natural area / recreation zone on Sheep Mountain Table would lead to a small increase in opportunities for hiking and riding. Designating trails would expand opportunities for hiking beyond the current limited number of trails. Many visitors are reluctant to explore the backcountry except in areas with designated trails or routes. Designating trails would result in minor long-term beneficial effects on the visitor experience.

The proposed demonstration transportation system would allow visitors to complete through hikes on the Castle Trail complex. Hikers could use the shuttles to return to their point of origin. This would result in minor benefits for visitors. The demonstration would last one to two years; however, if the demonstration was found to meet the goals of the project, the benefits could be long term.

Camping — Camping opportunities would be the same as Alternative A. The Cedar Pass and Sage Creek Campgrounds would remain.

Picnicking — Picnicking opportunities would be the same as Alternative A.

Cumulative Effects. Various plans for road improvements in the region would increase opportunities for driving and sightseeing. The Crazy Horse Scenic Byway would be a designated, signed route offering opportunities for more regional scenic

driving. The management plan for Buffalo Gap National Grassland (USFS 2001b) calls for the development of a primitive campground near the park, which would expand opportunities for camping in the region. These projects would bring about long-term, moderate beneficial effects on visitors seeking recreational opportunities in the region.

More opportunities for visitor enjoyment would be available under alternative C. Waysides, and trailheads, would be distributed throughout the park. Some of these facilities would be in areas of the park where access is difficult at present.

The actions of alternative C, coupled with other projects in the region, would result in long-term, moderate cumulative beneficial effects on visitor enjoyment.

Conclusion. Alternative C would create more opportunities for visitors; however, this alternative would offer fewer opportunities than alternative B. The long-term, beneficial effects on the visitor experience from alternative C would be minor to moderate.

Scenic Resources

Analysis. There would be no changes to existing park facilities under alternative C. These facilities would continue to cause long-term, minor adverse impacts on park visitors.

Constructing the proposed Pinnacles orientation facility would create a new intrusion on the landscape. This building, which would be adjacent to the Loop Road, would be visible to visitors traveling along this corridor, but it would be smaller in scale than the facility proposed in alternative B. This facility would create a new source of artificial light at night. Since most park visitors travel along this road, there would

be a long-term, minor to moderate adverse effect on scenic resources.

Cumulative Impacts. Activities outside the park boundary would have the potential to affect the viewsheds from within the park. The construction of the DM&E Railroad would affect the viewshed. These adverse impacts would be long term and minor to moderate.

Developments on private lands adjacent to the park have affected the views from the park. The construction of new buildings, signs, and communications towers has resulted in long-term minor adverse impacts on the viewshed. There is the potential that additional communications towers could be constructed within the park viewshed, but none are proposed at present. However, if additional towers were built, they would cause long-term, minor adverse impacts.

Alternative C would result in long-term, minor to moderate adverse impacts on scenic resources. Activities outside the park, combined with the effects from implementing alternative C, would result in long-term, minor to moderate adverse cumulative effects on scenic resources.

Conclusion. Alternative C would result in long-term, minor to moderate adverse impacts on scenic resources. The existing facilities would continue to cause minor adverse impacts on the scenic resources.

EFFECTS ON THE SOCIOECONOMIC ENVIRONMENT

Analysis. Alternative C would add to and improve the park's infrastructure and increase the staff for resource education, resource protection, maintenance, and cultural resource management. More employee housing at Pinnacles and some road improvements would improve the

efficiency and effectiveness of park operations. Capital improvements would cost \$12,442,000 in current dollars; additional staff would add an annual cost of \$328,400 to the park's operating budget.

Capital expenditures would be mostly in the construction industry for labor and materials. These one-time short-term expenditures of funds would not happen all at one time; rather, they would occur over the lifetimes of the various development projects, thus spreading the benefits out over time and moderating their effects on the local economy.

Some additional employment opportunities would be available locally under alternative C. A few individuals would receive long-term benefits from employment opportunities with the park, and a few individuals and firms (mostly in the construction industry) would receive short-term opportunities relating to capital improvements from the various improvement projects of this alternative. Although this alternative would create some short-term and long-term economic benefits that would be important to a small number of individuals and business firms, the overall effect on the economic conditions and socioeconomic factors such as population, income, employment, and earnings of the three-county region would be minor. Overall, this alternative would result in a long-term, minor beneficial effect on the socioeconomic environment.

Boundary adjustments, if achieved, would result in some one-time payments of federal monies to a few private landowners. Such acquisitions would be accomplished on a willing seller-willing buyer basis so that the landowners and the public would benefit from the transactions. Some private land would become public land, so there would be some decrease in the local real estate tax

base. Any loss of real estate taxes would be minor and perhaps could be mitigated through the payments-in-lieu-of-taxes program.

Cumulative Effects. The additional capital improvements and extra staff would combine with the actions described for alternative A to enable the park to be managed in compliance with all applicable laws, rules, regulations, and policies governing the management and operation of Badlands National Park.

Conclusion. The present value of the annual operations cost of alternative C is \$86,011,000.⁴

Alternative C would require \$12,442,000 (2002 dollars) more than alternative A for capital improvements. For comparison purposes, it is assumed that these capital costs would occur during the first year of implementation, which would make the total present-value of this alternative \$98,453,000, an increase of \$15,606,000 (+18.8%) over the present value of the no-action alternative.

EFFECTS ON ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

In alternative C, the National Park Service would build and operate new facilities, which would increase energy use by the park. To maintain, operate, and protect the facilities, NPS travel in the park also would increase, which in turn would increase energy consumption.

UNAVOIDABLE ADVERSE IMPACTS

Human use and the construction of new facilities under alternative C would result in minor adverse impacts on natural resources in some areas throughout the park. The

impacts on wildlife, vegetation, and the visitor experience, which are discussed in detail above in the specific impact topics, would be unavoidable.

IRRETRIEVABLE OR IRREVERSIBLE COMMITMENTS OF RESOURCES

The additional energy requirements identified above would result in an irreversible commitment of resources. In addition, there would be a commitment of material used to construct new visitor facilities such as the wilderness orientation facility.

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

As in alternatives A and B, most of the park would be protected in a natural state and

would maintain its long-term productivity under alternative C. Only a small percentage of the park would be converted to development. In addition, more than 9,500 acres of land included in the proposed boundary adjustments would be placed under federal ownership and managed by the National Park Service. No actions of this alternative would jeopardize the long-term productivity of the environment. Short-term impacts might result from construction, such as local air and water pollution, as detailed in the analyses of specific impact topics. Noise and human activity from construction and restoration might displace some wildlife from the immediate area. However, these activities would not jeopardize the long-term productivity of the environment.

4. For alternative C, the stream of income necessary to support park operations would be \$9,019,744 annually, the interest rate would be 6.125% (federal discount rate for fiscal year 2002), and the time period is 15 years (life of this *General Management Plan*).

EFFECTS FROM ALTERNATIVE D: PROTECT RESOURCES AND USE RESEARCH TO FURTHER KNOWLEDGE OF THE PARK

EFFECTS ON NATURAL RESOURCES

Air Quality

Analysis. In alternative D the addition of a new collection storage facility and research support facilities would result in short-term minor local adverse effects largely from fumes (hydrocarbons, carbon monoxide, and nitrogen oxides) from particulates emitted by construction machinery, and from increased dust due to the excavation of earth and in the immediate project areas. However, any air quality impacts from this construction work would be temporary and local.

Building a new Loop Road segment in the Cedar Pass area would result in the emission of fumes and particulates by construction equipment. Emissions would be greater in this alternative than in the others because the new road would be longer. Asphalt would be needed to build the new road; this would result in emissions from an asphalt batch plant, a storage pile, and haul trucks. Volatile hydrocarbons and other organic compounds in the asphalt would enter the air for a short time after the road surface was completed. These emissions would result in short-term, moderate adverse effects on air quality.

The new section of the Loop Road would not increase traffic volume; however, depending on the design of the road, if vehicles had to be driven up a higher grade, emissions could increase compared to the no-action alternative. On this new route, drivers would have to travel farther to reach the visitor center than on the existing route; this would increase

emissions. The impact would vary, depending on the level of traffic, the time of day, the season, and weather conditions, but it could range from a negligible to moderate short-term adverse impact.

Cumulative Effects. As in the other alternatives, several actions in and outside the North Unit would affect air quality and visibility in the park. Construction activities, including the development of the Lakota Heritage and Education Center, would result in short-term local minor adverse effects on air quality. Periodic prescribed burns in the North Unit could cause moderate to major, short-term impacts to air quality in local areas. However, sources outside the park would add far more pollutants to the airshed. Energy and industrial developments in the Powder River Basin in Wyoming could cause substantial adverse effects on air quality in the park, as was described in the no-action alternative. Other actions outside the park likely to affect the park's air quality would be prescribed fires, wildfires, the construction and operation of the DM&E rail line and the Mni Wiconi water project, and the possible designation of the Crazy Horse Scenic Byway.

All the above actions, added to the actions of alternative D, would result in a cumulative long-term, major adverse effect on the air quality in Badlands National Park. However, the actions of alternative D would add a minimal increment to this cumulative effect because the air quality effects resulting from alternative D would be short term, local, and spread out over time.

Conclusion. Alternative D would result in minor to moderate short- and long-term adverse effects on air quality in local areas, primarily from construction. Combined with emissions from sources outside the park, this would result in a long-term cumulative major adverse effect on regional air quality, but the incremental contribution of alternative D to this impact would be minor. These impacts would not constitute an impairment of park resources or values.

Soundscape

Analysis. Facility construction and improvement projects in alternative D would affect the park's soundscape in local areas. Construction workers and equipment would generate noise during the construction of trails and research support facilities, a new collection storage facility, improvement of the Sheep Mountain Table road, and the new Loop Road alignment in the Cedar Pass area. However, the noise levels from construction would be temporary and would take place at different times and places through the park. Most noise from new developments would be in or near developed areas that already are exposed to noise from vehicles, park equipment, and visitors. Excluding noise from constructing the new Loop Road segment, the noise from construction would cause negligible to moderate short-term adverse impacts on the natural soundscape in local areas, depending on the presence of other facilities and people, vegetation, wind, and time of day.

Substantial noise both inside and outside the park would come from demolition and excavation equipment building the new Loop Road segment, causing temporary major short-term adverse impacts on the

soundscape during the construction period. Depending on the design of the new road alignment, vehicular noise also might increase — if the grade was higher than the current road, and if there were no natural features to absorb sound, noise could carry farther from vehicles being driven up and down the road. There would be more noise from trucks and other vehicles on the part of the road outside the park, which is now relatively quiet. Thus, the short-term adverse effects on the soundscape in the vicinity of the new part of the Loop Road from alternative D, both inside and outside the park, would be moderate to major.

Noise might increase in the Castle Trail area if additional trails were built, which would encourage more use of this area. Noise also might increase at the research support facilities. Improvements to the Sheep Mountain Table road might lead to more driving on that road. However, the adverse effects on the soundscape from these causes would be local, temporary, and minor because visitor numbers would not increase substantially.

Stopping vehicles at the bottleneck on Sheep Mountain Table (the road would end in the center of the mountain approximately 4 miles from BIA 27) would eliminate vehicle noise on part of the table, resulting in a minor, long-term beneficial effect on the soundscape.

Cumulative Effects. As in the other alternatives, noise in parts of the park would increase from construction activities, the operation of machinery and vehicles, and the presence of people. There could be a cumulative long-term minor adverse noise effect in local areas from increased noise levels under alternative D (construction of facilities, and visitor and administrative use) added to

actions independent of this plan such as the redesign project at the Sage Creek campground, continued commercial tour helicopter overflights, commercial traffic through the park, the construction of the Mni Wiconi water project, and increased traffic on the Crazy Horse Scenic Byway (assuming increased traffic resulted from that designation).

Conclusion. The soundscape in most of Badlands National Park would continue be natural under alternative D, with few unnatural sounds. The construction and operation of most new facilities would cause short-term and long-term minor adverse impacts on the soundscape in local areas. Most noise impacts would be in areas already subject to some noise. The construction and use of a new section of the Loop Road both inside and outside the park would result in moderate to major short-term and long-term adverse effects. Overall, from a parkwide perspective, this alternative would result in fewer long-term sources of noise than alternative A, but several areas in and outside the park would be noisier. There would be the potential for minor long-term adverse cumulative effects on the soundscape in local areas from the construction and operation of new park facilities added to construction activities and other noise sources outside the park.

There would be the potential for major short-and long-term adverse effects on the soundscape from the construction and use of the new Loop Road segment in alternative D, but this would not result in an impairment of park resources or values. The changes would affect only a small part of the park, and the park's natural and cultural integrity would not be compromised, nor would opportunities for visitor enjoyment. The National Park Service would not be prevented from

conserving resources or values necessary to fulfill the park's specific purposes, as identified in the establishing legislation, nor from achieving the goals in the park's *General Management Plan* or other relevant NPS planning documents.

Geologic Features, Including Soils

Analysis. Except for the new Loop Road segment, none of the actions of alternative D would affect the park's geologic features. Depending on the design of the new road segment, some parts of the Badlands Wall (eroding walls, cliffs, buttes) might have to be modified or removed, resulting in a long-term moderate to major local adverse effect. Soils along the new road alignment, both within and outside the park, also would be permanently lost and disturbed, and even with mitigative measures, some soil would be lost to erosion. If people parked their vehicles in informal pulloffs off the side of the road, that could cause a secondary adverse effect on soils. All these changes could result in a moderate to major long-term adverse impact on soils along the route of the new road.

The soils in Badlands National Park also would be affected by several other actions in alternative D. Disturbing ground or building new facilities would not be necessary for the new visitor contact station. The two research support facilities would be built in already disturbed areas where soils have been altered by past activities. Some soils in those areas might be altered, and construction there could increase erosion, but with mitigation the adverse effects on soils from these actions would be local and minor.

The construction or designation of new trails in the Castle Trail area would increase visitation in an area with fragile

cryptogamic soils. Some soils would be altered by foot traffic both in and adjacent to the trail corridors, and some erosion could occur, resulting in a long-term minor to moderate adverse impact.

Improvements to the Sheep Mountain Table road would reduce erosion from vehicles on the road below the hill and on top of the table, a long-term moderate beneficial effect.

Adding a visitor contact station in the town of Wall would benefit all the park's resources, including soils. More visitors could be educated about the park's resources and learn to avoid or minimize effects on soils caused by walking in the park. This would be a long-term, minor to moderate beneficial effect on park soils.

Cumulative Effects. Soils would be lost or altered and erosion temporarily increased by several developments in and outside the park, including the construction of the Lakota Heritage and Education Center, the redesign of the Sage Creek campground, the installation of the Mni Wiconi water project, the development of the DM&E rail line and the bombing range cleanup. That loss and alteration of soils, added to the potential effects from construction and improvements under alternative D, would increase soil erosion and alteration on more lands in the region. Thus, alternative D and other developments in and outside the park would result in a cumulative long-term, minor to moderate adverse effect on area soils.

Conclusion. Most of the park's soils and geologic features would not be affected by alternative D, but constructing the new Loop Road segment could result in long-term moderate to major adverse effects on geologic features and soils along the corridor. Adding new developments

would cause long-term minor adverse effects on soils in local areas within the North Unit. Long-term, minor to moderate adverse soil impacts could occur due to new trails and increased use in the Castle Trail area. Reducing erosion along the Sheep Mountain Table road and additional education efforts due to a new visitor contact station would result in long-term minor to moderate beneficial effects. Outside developments added to new park developments and improvements would result in long-term, minor to moderate adverse cumulative effects on area soils. The effects on soils from alternative D would not constitute an impairment of park resources or values. Although the construction of the new Loop Road segment could cause a major adverse effect on geologic features, this would not impair park resources and values. The effect would be local, and its extent would depend on the road design (that is, whether the road was elevated or cut through the Badlands Wall). Even if the adverse effect was major, the National Park Service still would be able to fulfill the purposes for which Badlands National Park was established.

The loss of geologic features under alternative D would not destroy the integrity of the park relative to its geologic features. Geologic features would continue to be present throughout the park (albeit potentially in fewer numbers), and the park staff still would protect and interpret the features and provide opportunities for scientific research on the park's geology. People still could come to Badlands and enjoy the park's values, including its geologic features.

Paleontological Resources

Analysis. With the possible exception of the new Loop Road segment, all the developments in alternative D, including the research support facility, would be placed in already disturbed areas that are not known to be highly fossiliferous. Little bedrock disturbance would be needed in most of those areas, but if drilling into bedrock was necessary, some fossils could be damaged or lost. With surveys and monitoring, the potential for impacts in these areas would be minor. The improvements to the Sheep Mountain Table road would need to be carefully surveyed and monitored to avoid affecting fossils.

In alternative D, much of the route of the new Loop Road segment outside the park would go through prairie; therefore, the construction of that segment under alternative D would not be as likely to cause the loss of fossils as in the other alternatives. But even with surveying and monitoring as mitigation, fossils probably would be lost when the road-building passed through the Badlands Wall. Fossils could be damaged through several actions: drilling, demolition, excavation, placement of fill, paving, and crushing by construction equipment. Erosion along the road could increase, indirectly causing the loss of fossils. The extent of damage to paleontological resources would depend on where the new road segment would cross through the Badlands Wall (generally, the narrower the affected section of the highly fossiliferous Wall, the fewer the adverse impacts) and the design of the road (that is, whether it would be elevated on piers or a cut-and-fill road). The long-term adverse effects on paleontological resources from the new road segment could range from moderate to major.

With new trails in the Castle Trail area, access into that part of the park would be improved, but visitation (and subsequent illegal fossil collecting by visitors) probably would not increase much. Some beneficial effects on paleontological resources in the park would result from alternative D as follows:

- ♦ Adding a visitor contact station would increase some visitors' awareness of the significance of the park's fossils, reducing the potential for fossil collecting.
- ♦ Added staffing could increase ranger patrols, which would help reduce fossil collecting.
- ♦ The presence of research zones could encourage research that would benefit the protection and management of paleontological resources in the park.
- ♦ The boundary expansion along SD 44 would give rangers, researchers, and resource managers better access into the Badlands Wilderness, increasing fossil protection in that area.

All these actions taken together would result in a long-term beneficial effect in local areas.

Cumulative Effects. Like the other alternatives, alternative D could result in cumulative adverse effects on the area's paleontological resources. Actions in and outside the North Unit (such as cleaning up the bombing range, constructing the DM&E rail line and the Mni Wiconi waterline, increased use of the adjacent national grassland, and fossil collecting on lands near the park) could result in the loss or vandalism of fossils.

All the impacts from other actions in and outside the park, added to the effects of new developments in the North Unit, could lead to the damage of more of the

region's fossils, even though surveys and monitoring would be carried out. Thus, alternative D would contribute to a long-term cumulative adverse effect of unknown magnitude on the area's fossils.

Conclusion. Alternative D would result in some long-term beneficial effects on paleontological resources from increased staffing, educational efforts, and research. However, there also would be a higher potential for long-term adverse effects on park paleontological resources in alternative D than in alternative A, primarily due to construction of the new Loop Road segment. Even with mitigation, alternative D could cause long-term moderate to major local adverse effects on park paleontological resources. In addition, minor long-term adverse impacts could result from other new developments in the North Unit. The effects of alternative D added to those from developments and uses outside the park could result in a long-term cumulative regional adverse impact of unknown magnitude.

Although alternative D would have a higher potential for affecting paleontological resources than alternative A, this would not constitute an impairment of park resources or values. The National Park Service still would be able to fulfill the purposes for which Badlands National Park was established. The loss of resources under alternative D would not destroy the park's integrity relative to its paleontological resources. Fossils still would be present in the park, and the park staff would be able to protect and interpret paleontological resources and offer opportunities for scientific research on that subject. People still could come to Badlands National Park and enjoy its values, including its fossils.

Vegetation

Analysis. As in the other alternatives, most new developments or improvements in alternative D would be placed within the footprint of disturbed areas where the vegetation already has been altered. Little additional loss of native vegetation would be caused by constructing the research support facility at the bison corral. New ground disturbance would not be necessary to build the Wall visitor contact station, so vegetation would not be affected by this project. Given the previous vegetation disturbance in the area, and with the use of appropriate mitigative measures to minimize impacts (such as ensuring that equipment would stay within project area boundaries, revegetating disturbed areas, taking steps to avoid the spread of exotic species) the adverse effects on native vegetation from these actions would be negligible to minor.

Building the new Cedar Pass segment of the Loop Road would result in the loss and alteration of native grassland vegetation, causing direct and indirect adverse impacts inside and outside the park. Of the three possible corridors, this is the longest; consequently, it would cause the greatest loss of grassland vegetation, primarily outside the park. Some native plants would be permanently lost because of the road footprint. Even with mitigative measures, construction equipment in the project area would damage or cause the loss of other plants.

Several indirect impacts also could result from constructing the road segment, such as the loss of plants from possible increased erosion along the road and the introduction and spread of nonnative plants. If visitors created "informal" pull-offs by parking off the roadside, some plants might be crushed, trampled, or

picked. Road maintenance also might indirectly affect roadside vegetation. Depending on the road's location and design, the long-term adverse local effects on native vegetation from the new road segment would range from minor to moderate.

Vegetation would be altered or lost through visitation in alternative D. As in the other alternatives, people walking over and trampling plants in and around existing campgrounds, campsites, road overlooks, picnic areas, and trailheads would cause the loss of native vegetation. These actions would result in long-term minor to moderate adverse effects on vegetation.

More hiking would result from the new trails in the Castle Trail area. This could result in the trampling and loss of vegetation along these corridors, and any increased erosion in these areas also could cause some plant loss. The potential for visitors to inadvertently carry in and spread exotic species also would increase. Depending on the level of use, the time of use, and the vegetation, there could be a minor to moderate long-term adverse impact on vegetation in this area.

Surveys for rare plants would be conducted before developments were constructed in alternative D, and new trails could be sited to avoid effects on these populations. It is not known if populations of Barr's milkvetch, Easter daisy, largeflower, and Townsend daisy (and possibly other state-listed rare plants), would be found in the route of the new Cedar Pass segment road outside the park. If they are found in the area where the new road might be built, it still might be possible to locate the road to avoid populations of these plants. Although it is considered unlikely, impacts could be

caused by construction equipment in the project area, and indirect impacts could result from visitors pulling off the roads or from roadside maintenance activities. If populations of these plants do indeed occur along the route, even with mitigation there could be minor to moderate long-term adverse effects on rare plant populations in this area, depending on the size of the populations and the extent of disturbance.

The boundary adjustments proposed in alternative D would result in a moderate long term beneficial effect on native vegetation. Although much of the land near SD 44 and the land at the west end of the North Unit that would be added to the park has been grazed, the protection of existing native grassland vegetation would be increased by including the areas in the park. Over time native vegetation would become reestablished in much of the areas.

Several other beneficial effects on vegetation would result from alternative D, as follows:

- ♦ Improving the Sheep Mountain Table road and ending vehicle access at the bottleneck would decrease the loss of native plants because there would be less driving of vehicles over plants. This action would result in a minor to moderate long-term beneficial effect on plant populations in the area, depending on the level of vehicle use.
- ♦ Adding a visitor contact station would help to increase visitors' awareness and appreciation of native and rare plants, possibly reducing vegetation damage by visitors, a minor beneficial effect on park vegetation.
- ♦ Adding a research support facility and research zones would encourage research that could benefit the protection and management of park

vegetation. The research efforts could result in a moderate long-term beneficial effect, depending on the type and extent of research conducted.

Cumulative Effects. Some other actions in and outside of the park, added to the actions of alternative D, would result in a potential for cumulative adverse and beneficial effects. In the North Unit the redesign of the Sage Creek campground and park maintenance activities along roads would result in a minor loss or alteration of vegetation. Native vegetation also could be lost or altered outside the North Unit due to such actions as the construction of the Lakota Heritage and Education Center, the bombing range cleanup, cattle grazing on surrounding private, public, and reservation lands, the designation of the Crazy Horse Scenic Byway (which could increase visitation to the park), the construction of primitive campgrounds and trails in the national grassland adjacent to the park, and the construction and operation of the DM&E rail line. These other actions, added to the developments in alternative D, and a possible increase in visitation in the Castle Trail area could result in a long-term minor adverse cumulative effect on the region's native vegetation. The increment added by alternative D to this cumulative effect would be negligible.

Some cumulative effects could be beneficial. NPS prescribed burning efforts, the reintroduction of native plants, and weed management efforts in Badlands would beneficially affect native plants. Increases in prescribed burns in the adjacent national grassland also would result in a positive effect on native plants. Those effects, added to the effects from more research efforts under alternative D, would result in better protection of native vegetation and its possible increase in

previously disturbed areas. The beneficial long-term cumulative effect of these actions on regional native vegetation would be minor to moderate.

Conclusion. Most native vegetation in Badlands National Park would continue to be protected and to sustain itself under alternative D. There would be more potential for both beneficial and adverse effects on native vegetation under alternative D than in the no-action alternative. Building the new Loop Road segment and a few other new developments, along with more hiking on new trails in the Castle Trail area, would result in the loss of native plants and more potential for the spread of exotic species in those areas, resulting in minor to moderate long-term adverse impacts in local areas.

The loss of native vegetation would be reduced by better protection, and native vegetation would benefit from improving the Sheep Mountain Table road, increasing research efforts, and adding two areas to the park. The long-term beneficial local effects on native vegetation from alternative D would be minor to moderate.

The overall long-term local effects on vegetation from alternative D and other actions in and outside of the park would be minor to moderate and both beneficial and adverse. There also could be long-term minor to moderate beneficial and adverse cumulative effects due to alternative D and other actions in and outside the park. These levels of these effects would not be sufficient to impair park resources or values.

Wildlife

Analysis. In alternative D, new developments or improvements of existing

facilities would be done in already disturbed areas: the research support facility, and the improvements to the Sheep Mountain Table road. Wildlife populations and their habitats have been altered by past human actions in these areas, and no more habitat would be lost. Increased noise and human activity from construction activities could temporarily displace some animals such as rodents and birds, resulting in minor short-term adverse impacts on wildlife populations in local areas. However, the new developments would not affect bison, prairie dog, or bighorn sheep populations and habitats. Thus, the long-term adverse effects on wildlife and habitats from the new developments or improvements would be negligible to minor.

As in alternatives B and C, building the new Cedar Pass segment of the Loop Road would cause the permanent loss of grassland habitat, displacing wildlife along this corridor. Clearing vegetation in that area would result in the loss of wildlife forage and shelter. Noise from construction equipment and from people would displace some wildlife. Most birds, mammals, and reptiles would avoid the area during construction, but many would return after construction ended. Some animals, primarily invertebrates, would not be able to move out of the construction area and would be killed. An indirect effect of the road would be that some wildlife could be disturbed by maintenance activities or could be hit and killed by vehicles.

Bison in the park would not be affected by the new road segment. The road could cut off bighorn sheep from some watering holes, but other watering holes could be provided, or it might be possible to locate the road so as to decrease the fragmentation of the habitat for forage,

escape, and lambing. If the road was designed correctly, putting traffic at one end of the park, east of Cedar Pass, the bighorn sheep population could be beneficially affected. With careful siting of the road and the use of mitigative measures, the long-term adverse effect on wildlife from adding the road segment would be minor to moderate.

As in alternative C, building trailer pads to support researchers at the bison handling site could affect the bison capture and culling efforts. However, it is expected that relatively few researchers would be in the area at the time bison roundups occur, and if necessary the facility could be temporarily shut down to other uses to avoid impacts. Thus, the impact of the new research facility would be expected to have a negligible adverse impact on the bison herd.

New trails in the Castle Trail area would improve access, probably increasing visitation to that part of the park. Most effects on wildlife from this action would be temporary displacement during the construction period. These effects would be minor. If visitation increased, the behavior of some wildlife might be affected, but the long-term effect still would be minor.

The proposed addition of land along SD 44 and on the west end of the North Unit would add prairie dog towns to the park, which would give the animals more protection and help ensure their continued presence. The additions also would protect wildlife habitat for a variety of other species such as mule deer, bighorn sheep, pronghorn antelope, and bobcat. Thus, it is expected that the boundary additions would have a long-term moderate beneficial effect on the park's wildlife.

Wildlife populations and habitats in the park would be improved by several actions in alternative D, as follows:

- ♦ Designating research zones in the North Unit would eliminate some wildlife disturbance from pack stock and hikers.
- ♦ The research support facility could encourage research that would benefit the protection and management of the park's wildlife.

The long-term beneficial effects from these actions would be minor to moderate.

Cumulative Effects. As in the previously described alternatives, several other actions in and outside of the park would affect wildlife in the region. Some deer and small mammals would be killed or displaced by the construction and operation of the DM&E rail line, and possibly by more traffic if the Crazy Horse Scenic Byway were designated. These actions would cause minor adverse impacts on these populations. Those effects, added to the effects on wildlife from the actions of alternative D, would result in a slightly higher potential for wildlife to be displaced and would reduce the number of areas where wildlife could exist without people or facilities. The long-term adverse cumulative effects of alternative D on area wildlife would be minor.

Actions within and outside the North Unit, independent of alternative D, would likely affect prairie dogs in the future. The loss of some potential habitat for prairie dogs outside the North Unit could be caused by developments such as the DM&E rail line. Prairie dog control efforts on lands outside of the North Unit would continue, resulting in the loss of animals. Some limited prairie dog control efforts

probably also would occur within the North Unit, which would result in the loss of animals in areas adjacent to private lands. On the other hand, lands in the Buffalo Gap National Grassland that are adjacent to the eastern part of the park would continue to be managed to maintain and enhance prairie dog complexes. This would be a long-term beneficial effect. When the potential loss of prairie dogs due to actions within and outside the North Unit are added to the actions in alternative D, there could be a long-term minor adverse cumulative effect on the area's overall prairie dog population. However, the boundary adjustments in alternative D would add a beneficial increment to this cumulative impact.

Conclusion. The proposed developments and improvements in alternative D would result in long-term negligible to minor adverse impacts on wildlife populations and habitats in Badlands National Park. The alternative would not affect most wildlife populations and habitats in the park; they would continue to be protected and would not be changed by the actions of this alternative. The park's overall existing prairie dog, bighorn sheep, and bison populations would not be affected, although the boundary additions would add additional prairie dogs into the park. Building the new segment of the Loop Road would cause minor to moderate adverse impacts on wildlife in and outside of the park. A few minor long-term adverse effects on some animals also could be caused by constructing other park facilities and by increased use of the Castle Trail area. None of the actions of alternative D would substantially affect key migration routes or areas known to be important for breeding, nesting, or foraging. Overall, alternative D would result in long-term minor adverse and

beneficial effects on the park's wildlife populations and habitats in local areas.

Alternative D also would have several beneficial impacts. The proposed boundary adjustments along SD 44 and on the west end of the North Unit, encouraging research, and improving the Sheep Mountain Table road would produce long-term minor to moderate beneficial effects on wildlife.

The cumulative long-term adverse effects of alternative D and other actions outside the park on the region's wildlife and their habitat would be minor, primarily from displacement of wildlife and the loss of prairie dogs in local areas. These effects would not constitute an impairment of park resources or values.

Special Status Species

Analysis. None of the proposed developments in alternative D would be in areas known to contain black-footed ferret or swift fox populations. The Castle Trail area, where new trails could result in more visitors, is not known to support these populations.

The proposed boundary adjustments along SD 44 and the west end of the North Unit would add prairie dog towns to the park, and thus would also protect additional potential black-footed ferret habitat.

Alternative D may affect, but would not be likely to adversely affect, swift fox in the area and fox habitat. The land acquisitions along SD 44 and on the west side of the North Unit would protect potential swift fox habitat that could support the fox in the future, and thus would be a beneficial impact. Most facilities proposed for alternative D, including the new Loop Road segment, would be in marginal

potential fox habitat. The facilities that would be developed at the bison handling site would be near potential fox habitat, but the facilities and more people in these areas would not necessarily keep foxes from dispersing into and using the areas. The foxes, which are mostly nocturnal, would be in the areas when few people were present.

Cumulative Effects. Although some limited prairie dog control efforts likely would occur in the North Unit in the future, independent of alternative D, it is unlikely that such efforts would be permitted in areas where black-footed ferrets are known to occur, or would prevent the ferrets from using these areas.

The loss of some potential habitat for prairie dogs and black-footed ferrets outside the North Unit could be caused by developments such as the DM&E rail line. Prairie dog control efforts on lands outside the North Unit also could affect black-footed ferrets if they occurred in these areas.

On the other hand, lands in the Buffalo Gap National Grassland that are adjacent to the eastern part of the park would continue to be managed to maintain and enhance prairie dog complexes, providing additional potential black-footed ferret habitat. This would be a long-term beneficial effect.

The potential loss of prairie dogs due to actions within and outside of the North Unit, added to the actions in alternative D, could result in a long-term adverse cumulative effect on the area's existing or potential for black-footed ferret population. However, the boundary adjustments in alternative D would add a beneficial increment to this cumulative impact.

Some potential swift fox habitat could be protected by two boundary adjustments under alternative D. When these actions are combined with efforts to reintroduce the fox, independent of alternative D, there could be a long-term, beneficial cumulative impact for swift fox in the area.

Conclusion. Before taking any action in alternative D that might affect federally listed species in the park, the National Park Service would consult with the U.S. Fish and Wildlife Service to ensure potential impacts are identified and avoided. Overall, alternative D might affect, but would not be likely to adversely affect, the populations of black-footed ferrets and swift fox in Badlands National Park. The proposed boundary adjustments would add potential black-footed ferret and swift fox habitat, which would be a beneficial impact. Alternative D plus actions within and outside the North Unit (independent of the alternative) could result in an adverse cumulative impact to black-footed ferrets. However, alternative D would add a beneficial increment to this cumulative impact. Likewise, when the boundary adjustments under alternative D are combined with efforts to reintroduce the swift fox, independent of the alternative, there could be a long-term beneficial cumulative impact for swift fox in the area. No impairment of park resources or values would result from this alternative.

EFFECTS ON CULTURAL RESOURCES

Historic Buildings and Other Structures

Analysis. None of the structures identified as being eligible for inclusion in the National Register of Historic Places would be impacted by the implementation of alternative D.

Cumulative Effects. Several miles north of Badlands National Park, the development of the new Minuteman Missile National Historic Site would affect the historic condition of the missile control and launch facilities. The alterations could include substantial structural changes to accommodate public visitation, environmental control, and protective barriers. The long-term, adverse effects on the structures of the national historic site would range from negligible to moderate.

Since there are no actions affecting historic buildings and structures associated with implementation of alternative D, the adverse effects associated with Minuteman Missile National Historic Site would constitute the entire cumulative impact.

Conclusion. Alternative D would not result in any effects on historic buildings or other structures in Badlands National Park, and the park's resources and values would not be impaired.

Section 106 Summary. This summary (like all section 106 summaries in this document) has been prepared with the use of definitions consistent with section 106 of the National Historic Preservation Act of 1966, as amended, and the regulations of the Advisory Council on Historic Preservation (36 CFR 800).

In accordance with the regulations of the Advisory Council on Historic Preservation implementing section 106 of the National Historic preservation Act, the National Park Service finds that no historic properties would be affected (36 CFR 8004(d)(1)).

Ethnographic Resources

Analysis. NPS knowledge about the locations of traditional use is limited to

areas identified by American Indian tribes as containing sacred sites. Alternative D would involve no change in the agreement that guarantees tribal members unrestricted access in perpetuity and requires their written consent to affect those sites.

Traditional use areas would continue to be identified before ground-disturbing or other activities that could affect the current use, viewshed, or perception of the locality. Investigations would be undertaken to determine whether there were any resources in the area and what would be the best ways to preserve them or to mitigate any adverse effects. The National Park Service would consult with tribal officials to determine strategies for preserving ethnographic resources or mitigating any adverse impacts.

Before an area planned for development was disturbed, investigations would be undertaken as appropriate to identify ethnographic resources and evaluate their eligibility -for inclusion in the National Register of Historic Places. Depending on the nature or severity of an impact that would result from development, alternative D would result in negligible to minor long-term adverse effects on ethnographic resources.

There would be access to the research zone would in alternative D, particularly in the South Unit. The focus in this alternative would be on resource values. Vehicle access to research sections of the park for visitors and tribal members would be restricted and limited by permit or agreement for purposes of research in the research zone. Except for researchers or individuals conducting preservation-related activities, access would be permitted only to support the safety of the researchers, for purposes of scientific research, or other well-justified special

uses. These limitations on access to traditional use areas would cause long-term major adverse effects on ethnographic resources.

Access to other areas would be limited by permit or agreement for purposes of research, tribal access to sacred and traditional use sites, or other well-justified special uses subject to existing agreements and arrangements established in the future. These limitations would cause long-term negligible adverse effects on tribal use.

Traditional use of Sheep Mountain Table is extensive. Limiting road access to this area would result in long-term moderate adverse effects on associated ethnographic resources.

Alternative D would result in a long-term minor adverse impact on the use or perception of sacred or traditional use areas by its practitioners. It would not affect the viewshed of sacred and traditional use areas. The cumulative effects of all actions in or outside of the park from implementing alternative D would be long-term, minor, and adverse.

Cumulative Effects. Actions in and outside of the park could affect ethnographic resources, including traditional cultural properties. Inside the park, excavation might be required for the bombing range cleanup; this could alter vegetation patterns and landforms, affecting the viewshed of a sacred site. Surveys and cleanup plans would reduce the extent of these impacts, but the long-term adverse effects would be moderate.

Outside of the park, traditional use areas could be disturbed or lost through construction associated with the DM&E railroad near the South Unit or the installation of the Mni Wiconi waterline.

However, the waterline is being placed along existing roads, which would limit any resulting effects. The long-term adverse effects from installing the waterline would be minor; the long-term adverse effects from the railroad would be moderate.

Ethnographic resources could be affected by actions in the adjacent Buffalo Gap National Grassland. The construction of trails, campgrounds, or other visitor accommodations could directly affect traditional use areas, and inadvertent camping on traditional use sites and hiking across areas of eroding landforms could result in long-term adverse impacts ranging in intensity from negligible to moderate.

The effects of all actions in or outside of the park under alternative D, combined with the effects of continued development in the park and use of the park by visitors, would result in long-term cumulative minor adverse effects on area ethnographic resources.

Conclusion. Implementing Alternative D could result in long-term minor to moderate adverse impacts on ethnographic resources in the park. Cumulative impacts of unknown magnitude from actions outside the park could result in long-term adverse impacts. Until inventories of the park's ethnographic resources could be completed, the National Park Service would conduct site-specific surveys and consult with American Indians for each development activity, as appropriate. Because there would be no major adverse effects on park resources or values, such resources and values would not be impaired.

Section 106 Summary. According to NPS policies and procedures, the park would

continue to protect ethnographic resources to the greatest extent possible, avoiding disturbance wherever possible. If avoidance or preservation could not be achieved, appropriate mitigation would be carried out in consultation with American Indian tribes identified as having a cultural affiliation with the park and, if the resources were eligible for national register listing, with the South Dakota state historic preservation officer. Because alternative D would result in no adverse effects on traditional cultural properties within the boundaries of Badlands National Park, the National Park Service finds that the determination of effect would be *no historic properties affected* (36 CFR 800.4 (a)(1)).

EFFECTS ON VISITATION AND THE VISITOR EXPERIENCE

Access

Analysis. The focus of alternative D would be on the research value of the park; therefore, areas of high scientific value would be placed in the research zone. Access to that zone would be limited to researchers working under approved permits or to visitors participating in NPS-led trips.

In the North Unit, the Loop and Sage Creek Rim roads would continue to be the primary access for most park visitors, accommodating the widest range of vehicle types. The existing trailheads and waysides would be retained, but part of the North Unit would be zoned for research, and those areas would be closed to visitors. Most of that area is relatively remote, so the restriction would have little effect on visitors; however, two areas in that zone are relatively popular for day trips: an area east of Cedar Pass and part of

an area near the Sage Creek campground. Since the number of visitors affected would make up a small portion of the total park visitation, the long-term adverse effect on visitor access from these restrictions would be minor to moderate.

In this alternative, as in alternative B, the road to Sheep Mountain Table would be improved and would end at the bottleneck in the center of the mountain approximately 4 miles from BIA 27. Vehicles would not be permitted beyond that point. Eliminating vehicles throughout the tabletop would result in a long-term moderate adverse effect on the visitor experience because Sheep Mountain Table is a destination for many visitors with high-clearance vehicles. However, seasonally maintaining the road would improve access for passenger vehicles, possibly increasing interest in this area of the park.

Cumulative Effects. Traffic projections indicate that a substantial increase in park visitation could result from the completion of the Heartland Expressway and the Crazy Horse Scenic Byway. The increase from these roads originating from the south and west, added to visitation projections for the Lakota Heritage and Education Center, could alter the current visitation patterns to the park. Visitors' access to the park's South Unit would be improved by the upgrading of the roads and by their being emphasized with designations. The routes for these two road projects already exist, but typically park visitors do not use them.

The actions of alternative D, coupled with proposed improvements to regional roads, would result in a long-term cumulative moderate beneficial effect on park visitors. Regional projects would improve access in the region, but alternative D would not contribute to those cumulative benefits; it

would result in a long-term minor adverse effect on visitor access.

Conclusion. Having more area in the research zone than any of the other alternatives would limit access for visitors, but because the areas affected by this zoning are little visited at present, the long-term adverse effects on visitor access from alternative D would be minor.

Availability of Information

Analysis. With a new outlet for visitors to get information about the park at a visitor contact station in the town of Wall, alternative D would result in moderate beneficial effects on visitors' ability to learn about the park.

With Wall a popular tourist destination because of the famous Wall Drug, information would be available at a major stopping point along I-90. In addition, the station would be near to the second most used park entrance. Establishing the contact station in Wall would result in a long-term, major beneficial effect on the availability of information.

Cumulative Effects. The Lakota Heritage and Education Center would be an additional outlet disseminating information to the public. This facility would be near the proposed Crazy Horse Scenic Byway, which, if designated, would bring more traffic into the area. The visitor center that would be developed for the Minuteman Missile National Historic Site in the I-90 corridor also would be a new outlet for information. Although the focus of that facility would be on the historic site, it could offer regional information, including information about Badlands National Park. These projects would produce long-term major beneficial effects

on the availability of information for visitors.

The visitor contact station in Wall would make available detailed information about the park. The station in Wall would be highly visited because the town is a major stopping point along I-90. This added source of information would produce moderate beneficial effects on the visitor experience.

The actions of alternative D, combined with other projects in the region, would result in cumulative moderate beneficial effects on the availability of information for visitors.

Conclusion. Alternative D would result in long-term moderate beneficial effects on the availability of information about the park. The benefits would come from the visitor contact station in Wall, which would have the potential to reach many regional visitors.

Range and Enjoyment of Visitor Activity

Analysis. Vehicle use, hiking and pack stock use, camping, and picnicking are the four most popular activities.

Vehicle Use — Alternative D would not involve any changes in the opportunities for visitors to drive and sightsee along established roads in the park. The Loop Road and the Sage Creek Rim Road would continue to be the major travel corridors in the North Unit.

Improving the Sheep Mountain Table road and maintaining it to the bottleneck (as in alternative B) would offer driving and sightseeing opportunities to a wider range of visitors than at present, because lower clearance vehicles would be able to travel the improved road.

Overall, alternative D would not offer new opportunities for visitors seeking a driving and sightseeing experience. The improvements at Sheep Mountain would be a long-term negligible beneficial impact to visitors.

Hiking and Pack Stock Use — More areas of the park would be closed to hiking and pack stock use in alternative D than in any of the other alternatives because of the size of the research zone in this alternative. Access in this zone would be limited to people with permits for purposes of research, American Indian traditional uses, or other well-justified special uses.

Camping — Camping opportunities in alternative D would be unchanged; camping would continue to be available at the Sage Creek and Cedar Pass campgrounds.

Picnicking — Picnicking opportunities under alternative D would be the same as in alternative A.

Cumulative Effects. Various plans for road improvements in the region would increase opportunities for driving and sightseeing. The Crazy Horse Scenic Byway would be a designated, signed route offering opportunities for more regional scenic driving. The management plan for Buffalo Gap National Grassland (USFS 2001b) calls for the development of a primitive campground near the park's South Unit, which would expand opportunities for camping in the region. These projects would bring about long-term beneficial effects on visitors seeking recreational opportunities in the region.

More areas of the park would be closed to hiking and pack stock use in alternative D than in any of the other alternatives because the research zone would be

largest in this alternative. These actions would result in long-term cumulative negligible to minor adverse effects on the range and enjoyment of visitor activity.

The actions of alternative D, coupled with other projects in the region, would result in long-term cumulative beneficial effects on the visitor experience; however, the actions of this alternative would reduce the overall benefits.

Conclusion. The actions of alternative D would diminish the areas open to hikers and pack stock users. The long-term adverse effects on the range and enjoyment of visitor activity would be negligible.

Scenic Resources

Analysis. There would be no major changes to the park's existing facilities under alternative D, and the facilities would continue to cause minor long-term adverse impacts on park visitors. This alternative would result in no new impacts on scenic resources.

Cumulative Impacts. Activities outside the park boundary would have the potential to affect the viewsheds from within the park. The construction of the DM& E Railroad would affect the viewshed. These adverse impacts would be long term and minor to moderate.

Developments on private lands adjacent to the park have affected the views from the park. The construction of new buildings, signs, and communication towers has resulted in long-term, minor adverse impacts on the viewshed. There is the potential that additional communications towers could be constructed within the park viewshed, but none are proposed at present. However, if additional towers

were built, they would result in long-term adverse impacts.

Implementing alternative D would result in no new effects on the park's scenic resources; therefore, there would be no cumulative impacts from implementing this alternative.

Conclusion. Alternative D would result in no new effects on the park's scenic resources. The existing facilities would continue to cause long-term, minor adverse impacts on the park's scenic resources.

EFFECTS ON THE SOCIOECONOMIC ENVIRONMENT

Analysis. Alternative D would make limited improvements to the park infrastructure through increased staff for resource education, resource protection, maintenance, and cultural resource management.

Capital improvements would cost \$3,334,000 in current dollars, with \$3,000,000 going toward improving Sheep Mountain Road and trailheads. Additional staff would add an annual cost of \$367,000 to the park's operating budget. Realigning the Sheep Mountain Road would ensure easy access from the Northeast entrance, solving a long-standing problem. In this alternative the use of the road as a farm-to-market route would continue, even though the average travel time might increase.

Some additional employment opportunities would be available locally under alternative D. A few individuals would receive long-term benefits from employment opportunities with the park, and a few individuals and firms (mostly in the construction industry) would receive short-term benefits from the various improvement projects of alternative D.

Although this alternative would create some short-term and long-term opportunities relating to capital improvements — economic benefits that would be important to a small number of individuals and businesses. The overall effect on the economic conditions and socioeconomic factors of the three-county region (population, income, employment, and earnings) would be minor. Overall, this alternative would result in a minor long-term beneficial effect on the socioeconomic environment.

Boundary adjustments, if achieved, would result in some one-time payments of federal monies to a few private landowners. Such acquisitions would be accomplished on a willing seller-willing buyer basis so that the landowners and the public would benefit from the transactions.

Some private land would become public land, so that there would be some decrease in the local real estate tax base. Any loss of real estate taxes would be minor and perhaps could be mitigated through the

through the payments-in-lieu-of-taxes program.

Cumulative Effects. The additional capital improvements and extra staff would combine with the actions described for alternative A to enable the park to be managed in compliance with all applicable laws, rules, regulations, and policies governing the management and operation of Badlands National Park.

Conclusion. The present value of the annual operations cost of the Alternative D is \$86,383,000.⁵ Alternative D would require \$3,344,000 (2002 dollars) more than alternative A for capital improvements. For comparison purposes it is assumed that these capital costs would occur during the first year of implementation, which would make the total present value of this alternative \$89,717,000, an increase of \$6,870,000 (+8.3%) over the present value of the no-action alternative.

5. For alternative D, the stream of income necessary to support park operations would be \$9,184,294 annually, the interest rate would be 6.125% (federal discount rate for fiscal year 2002), and the time period is 15 years (life of this *General Management Plan*)

EFFECTS ON ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

In alternative D, the National Park Service would construct and operate new facilities, which would increase energy use by the park. To maintain, operate, and protect the facilities, NPS travel in the park also would increase, and the increased travel would increase energy consumption.

UNAVOIDABLE ADVERSE IMPACTS

Human use and the construction of new facilities under alternative D would result in minor adverse effects on natural resources in some areas throughout the park. The impacts on wildlife, vegetation, and the visitor experience, which are discussed in detail above in the specific impact topics, would be unavoidable.

IRRETRIEVABLE OR IRREVERSIBLE COMMITMENTS OF RESOURCES

The additional energy requirements identified above would result in an irreversible commitment of resources. In addition, a commitment of material would

be used to construct new facilities such as the trailer pads at the bison handling facilities.

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

As in the other alternatives, most of the park would be protected in a natural state and would maintain its long-term productivity under alternative D. Only a small percentage of the park would be converted to development. In addition, more than 9,000 acres of land included in the proposed boundary adjustments would be placed under federal ownership and managed by the National Park Service. No actions of this alternative would jeopardize the long-term productivity of the environment. Short-term impacts such as local air and water pollution might result from construction, as detailed in the analyses of specific impact topics. Noise and human activity from construction and restoration might displace some wildlife from the immediate area. However, these activities would not jeopardize the long-term productivity of the environment.