Draft General Management Plan Revision / Environmental Impact Statement
Petrified Forest National Park

Navajo and Apache Counties, Arizona
February 2003

This *Draft General Management Plan Revision / Environmental Impact Statement* describes and analyzes four alternatives for managing Petrified Forest National Park. The approved plan revision will help managers make decisions about managing resources, visitation, and development for the next 15 to 20 years. Issues addressed by the plan revision relate to use of Painted Desert Inn National Historic Landmark, staff housing needs, cultural landscape values, use and treatment of Painted Desert headquarters complex, museum collections, accommodating researchers, concessions, and providing for resource protection and visitor experience/understanding in different areas of the park.

Alternative 1, the no-action alternative, would continue present management. It provides a baseline for understanding changes and impacts of the other alternatives. There would be no new construction or major changes, and the park would be operated and maintained as before. Resources would be protected as funding allows. Visitor and operational facilities would remain concentrated in the Painted Desert and Rainbow Forest areas. Some areas would be closed or access modified to address harmful resource impacts. Visitor uses would be reassessed and revised as new information about natural and cultural resource impacts becomes available. Museum collections would be stored offsite and in the park, some in substandard facilities. In alternative 2, the preferred alternative, reusing and maintaining the historic integrity of Painted Desert headquarters complex would be a priority. Visitor services at Painted Desert Inn (rehabilitated) would be expanded. Facility improvements would be made at Rainbow Forest. Park lands would be managed similar to now, but with greater protection for natural and cultural resources from increased monitoring and adapting to new information. Some trails and turnouts would be added, and visitor hours would be expanded in the north. Most park collections would be housed in a new facility at headquarters. In alternative 3, the park would be managed as a fossil resource preserve. Painted Desert Inn and the headquarters complex would be rehabilitated and adaptively reused. Improvements would be made at Rainbow Forest developed area. This alternative would provide the most protection for natural and cultural resources. Visitors would be encouraged to explore the park primarily in selected frontcountry areas. Some sensitive areas would be closed to visitor use. Backcountry access would be managed with permits and/or other methods (e.g., guided access only). Interpretive services would be expanded to increase understanding of park resources. Park collections would be reunited at the park in a new facility. In alternative 4, resources would be protected while more opportunities to experience park resources would be provided. Visitor services at Painted Desert Inn (rehabilitated) would be expanded. Painted Desert headquarters complex would be demolished and rebuilt in phases in the same location. Improvements would be made at Rainbow Forest developed area. New trails, turnouts, and other options would expand opportunities to experience and understand park resources. Visitor hours would be expanded in the north. Park collections would be moved to institutions and/or agency facilities outside the park that meet National Park Service standards.

This document includes discussion of the potential environmental consequences of each alternative. Notable impacts of alternative 1 include adverse impacts to the Painted Desert headquarters complex and historic residences near the Painted Desert Inn from continued deterioration; adverse impacts on museum collections from inadequate facilities, limited work space, and inaccuracies in recordkeeping; adverse impacts on archeological resources and petrified wood and other fossils, primarily from visitor use; adverse impacts on visitor experience and appreciation from dated interpretive materials and lack of opportunities and accessibility. Notable impacts of alternative 2 include potential adverse impacts to archeological sites and petrified wood from new trails; adverse impacts to Rainbow Forest cultural landscape from parking and walkway realignment; beneficial impacts to park collections from construction of a new collections facility; beneficial impacts on visitor experience and appreciation from new turnouts, trails, and facility improvements; beneficial impacts to park operations from improved work conditions and facilities. Impacts of alternative 3 include adverse impacts to Rainbow Forest cultural landscape from parking and walkway realignment; beneficial impacts on archeological sites and petrified wood from reducing trails and controlling backcountry use; adverse impacts to operations from new visitor programs; beneficial impacts on park operations from improved work conditions and facilities. Impacts of alternative 4 include adverse impacts to Rainbow Forest cultural landscape from parking and walkway realignment; adverse impacts to archeological sites and petrified wood from new trails and turnouts; beneficial impacts on visitor experience and appreciation from new facilities, turnouts, trails, and expanded services; beneficial impacts to park operations from new facilities and removal of deteriorating structures.

Note to Reviewers and Respondents: To comment on this Draft General Management Plan Revision / Environmental Impact Statement, please mail or e-mail comments to the address below. Our practice is to make comments, including names and home addresses of respondents, available for public review. Individual respondents may request that we withhold their name and home address from the record, which we will honor to the extent allowable by law. If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comments. We will make all submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, available for public inspection in their entirety.

Please address comments to: Superintendent; Petrified Forest National Park; PO 2217; Petrified Forest, Arizona 86028.
E-mail: pefo_superintendent@nps.gov

United States Department of the Interior ✧ National Park Service

SUMMARY

Petrified Forest National Park is located in northeastern Arizona, about 100 miles east of Flagstaff, Arizona. The park features one of the largest and most colorful concentrations of petrified wood in the world. Present day exposures of the 225-million-year-old Chinle Formation extend through the Painted Desert. Fossils preserved in this formation represent an entire ecosystem. These rare, accessible associations of animal and plant fossils make it possible to learn more about the Late Triassic period here than anywhere else in the world.

The park also contains historic structures, archeological sites, petroglyphs, wildlife, and interpretive exhibits. The Painted Desert headquarters complex, Painted Desert Inn, and Rainbow Forest areas of the park are considered key historic resources of Petrified Forest National Park. Of the park's 93,533 acres, about 54% is designated wilderness, arranged in two separate units: the Painted Desert unit in the northern segment of the park (43,020 acres), and the Rainbow Forest unit in the southeast segment of the park (7,240 acres).

The vegetation of Petrified Forest National Park is varied. Juniper stands; pinyon-juniper woodlands; grasslands, including shortgrass prairie that has recovered from over-grazing in many areas; desert plant communities; and shrublands typical of the Great Basin cool desert are supported here. The Puerco River riparian corridor has the most vegetation biodiversity in the park—40 different species (30 native to North America) can be found here.

Every unit of the national park system is required to operate under a general management plan that sets the direction for future management of that specific unit. The last comprehensive planning effort at Petrified Forest National Park was completed in 1993, with the development of a General Management Plan/Environmental Impact Statement (NPS 1993). Although much of the 1993 General Management Plan (1993 GMP) is still relevant, certain aspects need to be revised due to changing circumstances, new information, and new policies. The purpose of this General Management Plan Revision (GMP Revision) is to:

- Clearly define the resource conditions and visitor experience, understanding, and appreciation to be achiev
- ed in Petrified Forest National Park.

- Provide a framework for park managers to use when making decisions about such issues as how to best protect park resources, how to provide high-quality visitor experiences, how to manage visitor use, and what kinds of facilities, if any, to develop in the park.

- Ensure that the foundation for decision making has been developed in consultation with interested stakeholders and adopted by National Park Service (NPS) leadership after an adequate analysis of the benefits, impacts, and economic costs of alternative courses of action.

This GMP Revision will amend and supplement the 1993 GMP. It is intended to :

- confirm the purpose, significance, and mission of the park;
- determine the best mix of resource protection and visitor experience, understanding, and appreciation beyond what is prescribed by law and policy;
- define management zones that implement the desired conditions of the National Park Service and public with regard to natural and cultural resource management and protection, and visitor experience and appreciation;
- determine the areas to which the management zones should be applied to achieve the overall desired conditions and mission goals of the park;
- reexamine planning and development decisions as they relate to cultural landscapes, disturbance of new areas, potential reuse of historic structures, and reducing theft of petrified wood;
- conduct a comprehensive look at concession facilities, services, and housing in light of current policy, need, and reuse of historic structures;
- redefine the scope of research facilities within the park and determine the best location for museum collection items;
- determine whether actions proposed by the National Park Service or others are consistent with goals embodied in the approved general management plan; and
- serve as the basis for later, more detailed management documents such as five-year strategic plans and implementation plans (e.g., resource management and wilderness management plans).

This GMP Revision presents four alternatives, including the NPS preferred alternative, for future management of Petrified Forest National Park. The four alternatives are alternative 1 (the no-action alternative—continuation of existing management according to the 1993 GMP), alternative 2 (preferred alternative), alternative 3, and alternative 4. The alternatives, which are based on the park's mission, purpose, and significance, provide different ways to meet current and future needs at Petrified Forest National Park, to provide visitor experiences compatible with resource protection goals, and to improve facilities and infrastructure in the park.

ALTERNATIVE 1 (NO ACTION)

Alternative 1 describes a continuation of existing management of Petrified Forest National Park as maintained by the 1993 GMP and other approved plans. This alternative provides a baseline for evaluating changes and impacts of the other alternatives. Existing operations and visitor facilities would remain in place, concentrated in the Painted Desert and Rainbow Forest areas of the park. The Painted Desert headquarters complex (eligible for the National Register of Historic Places) and the Painted Desert Inn (listed on the National Register of Historic Places) would continue to be rehabilitated

and adaptively reused according to current plans. Paleontological, archeological, ethnographic, and historic or other cultural resources would be protected, as would the shortgrass prairie, badlands, and scenic vistas. Park managers would continue to close specific areas and otherwise modify visitor access, as necessary, to address harmful resource impacts. Visitor uses would be reassessed and revised as new information about natural and cultural resource impacts emerges. Museum collections would continue to be stored at offsite locations, some of which meet accepted standards for curation, and in substandard facilities at park headquarters. Visitor opportunities to observe and appreciate resources, with a minimum of inadvertent or intentional damage, would continue according to current plans, policies, and procedures.

Important impacts of continuing the existing management of Petrified Forest National Park would be:

- adverse impacts from the continued deterioration of residences near the Painted Desert Inn and the Painted Desert headquarters complex, in some cases causing the failure of buildings in the Painted Desert headquarters complex;
- beneficial effects to the Rainbow Forest historic landscape from reversing past modifications to structures;
- adverse impacts on park museum collections from inadequate facilities, limited work space, and inaccuracies in recordkeeping and accountability;
- adverse impacts on archeological resources, ethnographic resources, petrified wood, and other fossils, depending on the site;
- adverse impacts on visitor experience and appreciation from dated exhibits, orientation materials, and interpretive media, as well as a lack of diverse visitor opportunities and fully accessible facilities; and
- potentially adverse impacts on concessioners from eliminating petrified wood sales in shops at the park, coupled with beneficial impacts on shops outside the park.

ALTERNATIVE 2 (PREFERRED ALTERNATIVE)

In alternative 2, maintaining the historic integrity of the Painted Desert headquarters complex is a priority. In general, historic buildings would be adaptively reused for park-related purposes. Visitor services at the Painted Desert Inn could be expanded to include a trading post or limited food service, depending on the outcome of a feasibility study. At Rainbow Forest, improvements would be made to the museum to improve accessibility and expand exhibit space. Reconfiguration of the main parking lot and walkways would occur to improve vehicle and pedestrian flow. Some buildings might be added (a new fire truck building), and some would be reduced (the concessions building). Any improvements and/or construction in the Rainbow Forest area would be planned to maintain the character of the Rainbow Forest cultural landscape. Lands would be managed similarly to the way they are currently managed, but there would be greater protection for natural and cultural resources from increased emphasis on resource monitoring and adapting to new information. Certain areas might be more directly managed through permits and guided tours, for example. New trails and turnouts would be provided for visitors to promote

understanding and appreciation of the park. Early morning and evening visitor opportunities would be provided in the north segment of the park. Options for increasing education and interpretation services for bus tour groups would be considered. Park archives (including photos), most paleontological resources, natural history specimens, and historic furnishings would continue to be stored in the park in a new headquarters area collections facility. Archeological collections would continue to be stored offsite.

Important impacts that could result from implementing alternative 2 include:

- increased potential for adverse impacts from trampling of archeological sites, disturbance of resources, vandalism, and theft in areas where new trails are proposed;
- adverse impacts to the Rainbow Forest cultural landscape from proposed parking and walkway realignment;
- adverse impacts to potential archeological cultural landscapes (Puerco Pueblo, The Tepees) from proposed new trails;
- beneficial impacts to museum collections from construction of a new collections facility, and use of offsite facilities that meet NPS standards;
- adverse impacts to ethnographic resources, petrified wood, and other fossils, despite additional protection;
- beneficial impacts on visitor experience and appreciation from accessibility improvements, expanded exhibit space, new turnouts, trails, and vehicle access to a portion of old Route 66;
- adverse impacts on park operations from trail modifications and expanded services at the Painted Desert Inn;
- beneficial impacts on park operations from improved work space conditions, removing deteriorated structures, increases in available space, and improved operational efficiency for employees, visitors, and researchers/scientists; and
- potentially adverse impacts to concessioners from eliminating petrified wood sales in shops at the park, coupled with beneficial impacts to shops outside the park.

ALTERNATIVE 3

In alternative 3, Petrified Forest National Park would be managed as a resource preserve, valued primarily for its globally significant fossils. The Painted Desert Inn and associated residences would be rehabilitated, preserved, and adaptively used. The Painted Desert headquarters complex would also be rehabilitated, preserved, and adaptively used, with some additions to existing buildings or new construction to help accommodate park space needs. Plans for the Rainbow Forest area would be similar to those outlined in alternative 2. This alternative would provide the most protection to the natural and cultural resources of the park. To protect sensitive resources, visitors would be encouraged to explore the park primarily in selected frontcountry areas such as Rainbow Forest and Giant Logs. Some sensitive areas (e.g., Blue Mesa Trail) would be closed to visitor use. Backcountry access would be carefully managed with permits for day and overnight use, and/or other methods (e.g., guided tour access only) to protect sensitive resources. Visitors would gain in-depth

understanding of the significance of park resources through more tours and programs, multiple media, and interactions with researchers. Most museum specimens that are currently stored at other institutions or locations would be returned to the park and stored in an adaptively fit or newly constructed museum facility.

Important impacts associated with implementing alternative 3 include:

- continued adverse impacts on archeological resources despite additional protection;
- adverse impacts from the construction of new facilities and parking realignment at Rainbow Forest;
- beneficial effects on petrified wood and other fossils from better delineating, shortening, realigning, or closing trails;
- increasing beneficial effects and reducing adverse impacts to ethnographic resources, petrified wood, and other fossils by focusing visitor experience toward expanded interpretive programs, expanded exhibits, and new media programs;
- adverse impacts to park operations from increases in staff and maintenance requirements to accommodate new programs;
- beneficial effects on park operations from increased accessibility, better housing/working conditions, proper storage of museum collections, removal of deteriorating structures that require ongoing maintenance, more efficient maintenance operations, and closing Blue Mesa Trail; and
- potentially adverse impacts to concessioners from eliminating petrified wood sales in shops at the park, coupled with beneficial impacts on shops outside the park.

ALTERNATIVE 4

Petrified Forest National Park would offer first-hand, managed opportunities for visitors to experience park resources. The Painted Desert Inn and associated residences would be rehabilitated, preserved, and adaptively used as in alternative 1. In general, historic buildings would be adaptively used, with the exception of the Painted Desert headquarters complex. Over a period of several years, the Painted Desert headquarters complex would be demolished and rebuilt in phases in the same location. Plans for the Rainbow Forest area would be similar to those outlined in alternative 2. New trails, turnouts, and other options would expand visitor opportunities to experience and appreciate park resources. Guided tours would allow more visitors to experience remote areas of the park. Opportunities for visitors to interact with researchers would be limited, but research results would be woven into park interpretive programs. Early morning and evening visitor opportunities would be provided in the north area of the park. The museum collections would be moved outside the park to institutions and/or agency facilities that meet NPS standards. Similar specimens would be stored together, enabling scientists to examine related specimens without having to travel to different locations.

Important impacts that could result from implementing alternative 4 would be:

- adverse impacts from the construction of new facilities and

parking realignment at Rainbow Forest;

- adverse impacts to potential archeological cultural landscapes (Puerco Pueblo, The Tepees) from proposed new trails;
- adverse impacts on archeological resources, ethnographic resources, petrified wood, and other fossils, despite additional protection;
- beneficial effects on visitor experience and appreciation from accessibility improvements, expanded exhibit space, new turnouts, trails, vehicle access to a portion of old Route 66, extended park hours in the north, more visitor services at Painted Desert Inn, and more backcountry access;
- adverse impacts on park operations from new trails, trail modifications, and expanded hours/services at Painted Desert Inn;
- beneficial effects on park operations from improving work space conditions, removing deteriorated structures, increasing available space, and improving operational efficiency for employees, visitors, and researchers/scientists as a result of rebuilding the Painted Desert headquarters complex;
- potentially adverse impacts to concessioners from eliminating petrified wood sales in shops at the park, coupled with beneficial impacts on shops outside the park; and
- potentially beneficial impacts on socioeconomics from increased park-related spending, construction and improvements, and visitors spending more time in the park and local area.

The Next Steps

After the distribution of the Draft GMP Revision / Environmental Impact Statement (EIS), there will be a 60-day review and comment period. When this period ends, the NPS planning team will evaluate comments from federal agencies, tribes, organizations, businesses, and individuals regarding the draft plan. Subsequently, the team will incorporate appropriate changes into a Final GMP Revision / EIS. The final GMP Revision/EIS will include substantive comments on the draft document and NPS responses to those comments. After a 30-day no-action period, a record of decision approving a final plan will be signed by the NPS regional director. With the signing of the record of decision, the plan can then be implemented, depending on funding and staffing (a record of decision does not guarantee funds and staff for implementing the approved plan).

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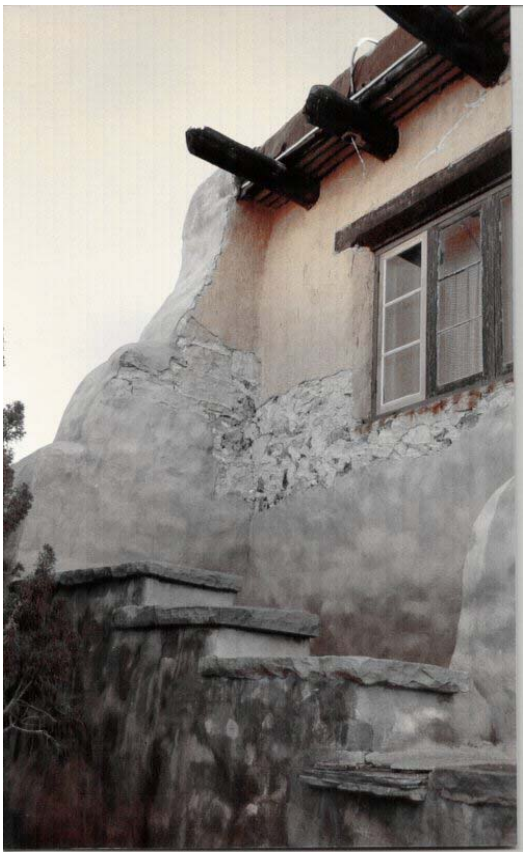


CHAPTER 1: PURPOSE OF AND NEED FOR THE PLAN

BRIEF DESCRIPTION OF THE PARK

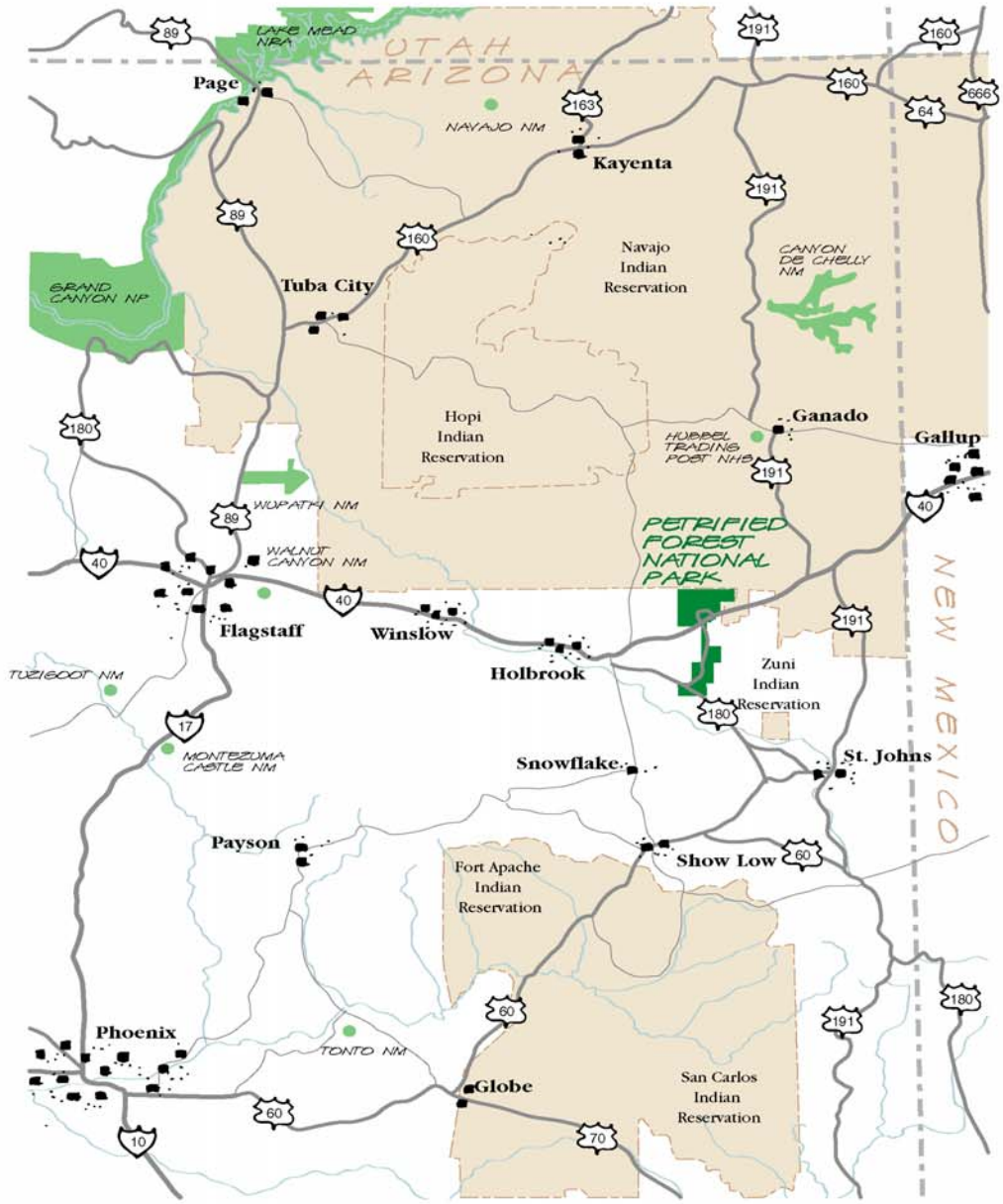
Petrified Forest National Park is located in northeastern Arizona, about 100 miles east of Flagstaff, Arizona. The park is bounded by the Navajo Indian Reservation to the north and northwest, and by private lands, state trust lands, and U.S. Bureau of Land Management (BLM) lands to the south, east, and west. Several other Indian reservations and national forests are nearby. U.S. Interstate Highway 40 (I-40) and the Burlington Northern-Santa Fe Railroad bisect the park from east to west.

The park features one of the largest and most colorful concentrations of petrified wood in the world. Present day exposures of the 225-million-year-old Chinle Formation extend through the Painted Desert. Fossils preserved in this formation appear to represent an entire ecosystem. These rare, accessible associations of animal and plant fossils make it possible to learn more about the Late Triassic period here than anywhere else in the world.

Petrified Forest National Park also contains historic structures, archeological sites, petroglyphs, wildlife, and interpretive exhibits. Of the park's 93,533 acres, about 54% is designated wilderness, arranged in two separate units: the Painted Desert unit in the northern section of the park (43,020 acres), and the Rainbow Forest unit in the southeast section of the park (7,240 acres). Air quality is usually good and provides opportunities to view scenic vistas such as mountain peaks more than 100 miles distant.

The vegetation of Petrified Forest National Park is varied. Soil and terrain conditions have resulted in a mosaic of grass and shrub communities. Sparse stands of juniper are found on rocky upper slopes and mesa caps. A stand of pinyon-juniper woodland is found on Chinde Mesa, along the park's far northern boundary. Grasslands occupy middle and upper plateau areas where soils are deeper and richer. Since grazing was eliminated from the park in 1962, the shortgrass prairie has recovered in many areas. Desert plant communities are found in the lower elevations, where soils are heavy and water availability is low. The most diverse area for plants is the Puerco River corridor—40 different species (30 native to North America) can be found here. Willows, cottonwoods, and the dominant exotic shrub, tamarisk, are typical of the Puerco River riparian zone. Shrubs typical of the Great Basin's cool desert such as big sagebrush, shadscale, greasewood, and winterfat, also occur in the park.

Park elevation averages 5,600 feet above sea level, which contributes to the cool, arid climate. Annual precipitation averages less than 10 inches, about half of which is from late summer thunderstorms. Midsummer temperatures can exceed 100 degrees Fahrenheit (38 degrees Celsius); however, the nights are surprisingly cool. Although winter nights are often colder than freezing, daytime temperatures are typically moderate.



REGION

Petrified Forest National Park, Arizona

United States Department of the Interior
National Park Service
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PURPOSE AND NEED FOR THE PLAN REVISION

GENERAL MANAGEMENT PLANNING

Park planning is a decision-making process and general management planning is the broadest level of decision making for parks. General management plans (GMPs) are required for all units in the national park system and are intended to establish the management direction of a park for the next 15 to 20 years. General management planning is the first phase of tiered planning and decision making. It focuses on why the park was established (purpose and mission), why it is special (significance), and what resource conditions and visitor experiences should be achieved and maintained (desired conditions). GMPs look years into the future and consider the park holistically, in its full ecological and cultural context and as part of a surrounding region. More detailed planning is performed in subsequent implementation plans.

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

Purpose of the Plan

The approved GMP Revision will be the basic document for managing Petrified Forest National Park for the next 15 to 20 years. The purposes of the GMP Revision are as follows:

- Clearly define the resource conditions and visitor experience, understanding, and appreciation to be achieved in Petrified Forest National Park.
- Provide a framework for park managers to use when making decisions about such issues as how to best protect park resources, how to provide high-quality visitor experiences, how to manage visitor use, and what kinds of facilities, if any, to develop in the park.
- Ensure that the foundation for decision making has been developed in consultation with interested stakeholders and adopted by NPS leadership after an adequate analysis of the benefits, impacts, and economic costs of alternative courses of action.

Need for the Plan

Petrified Forest National Park has been operating under the General Management Plan / Environmental Impact Statement that was prepared in 1993. Although much of the 1993 GMP is still applicable, certain aspects need to be revised due to changing circumstances, new information, and new policies. This includes information about the condition and status of the park's historic structures and landscapes, new information on petrified wood theft in the park, and new

NPS guidance on management zones and conservation planning, among other things. Additional information is provided in the section titled "Planning Opportunities and Issues" in this chapter.

This GMP Revision will amend and supplement the 1993 GMP. It is intended to:

- Confirm the purpose, significance, and mission of the park.
- Determine the best mix of resource protection and visitor experience, understanding, and appreciation beyond what is prescribed by law and policy. This mix is based on the mission, purpose, and significance statements for the park; natural and cultural resources in the park; range of public expectations and concerns; impact of alternatives on natural, cultural, and socioeconomic conditions; impacts on visitor use and experience; and long-term economic considerations and costs.
- Define management zones that implement the desired conditions of the National Park Service and public with regard to natural and cultural resource management and protection, and visitor experience and appreciation. Facilities that are appropriate within each management prescription are also identified.
- Determine the areas to which the management zones should be applied to achieve the overall desired conditions and mission goals of the park.
- Reexamine planning and development decisions as they relate to cultural landscapes, disturbance of new areas, potential reuse of historic structures, and reducing theft of petrified wood.
- Conduct a comprehensive look at concession facilities, services, and housing in light of current policy, need, and reuse of historic structures.
- Redefine the scope of research facilities within the park and determine the best location for museum collection items.
- Determine whether actions proposed by the National Park Service or others are consistent with goals embodied in the approved GMP.
- Serve as the basis for later, more detailed management documents such as five-year strategic plans and implementation plans (e.g., resource management and wilderness management plans).

The GMP Revision does not describe how particular programs or projects should be prioritized or implemented. Those decisions will be addressed during the more detailed planning associated with later strategic plans and implementation plans. All associated plans will be based on the goals, future conditions, and appropriate types of activities established in the approved GMP Revision.

Legislation establishing the National Park Service as an agency and governing its management provides the fundamental direction for the administration of Petrified Forest National Park (and other units of the

national park system). This GMP Revision builds on these laws and the legislation, as amended, that established Petrified Forest National Park to provide a vision for the future of the park. The "Servicewide Mandates and Policies" section of this document calls the reader's attention to topics that are important to understanding the management direction at the park. Table 1 summarizes the topic and the desired management condition. Appendix A provides more detail on the law or policy directing management actions. The alternatives in this GMP Revision address the desired future conditions that are not mandated by law and policy, are not adequately covered by the 1993 GMP, and that must be determined through a public planning process.

GUIDANCE FOR THE PLANNING EFFORT

PURPOSE, SIGNIFICANCE, AND MISSION STATEMENTS

An essential part of the planning process is understanding the purpose, significance, and mission of the park for which the plan is being prepared.

Park Purpose

Park purpose statements are based on national park legislation, legislative history, and NPS policies. The statements reaffirm the reasons for which the park was set aside as a unit of the national park system and they provide the foundation for national park management and use.

The purpose of Petrified Forest National Park is to:

- *preserve and protect Petrified Forest, its outstanding paleontologic sites and specimens, its associated ecosystems, cultural and historic resources, and scenic and wilderness values for present and future generations;*
- *provide opportunities to experience, understand, and enjoy the Petrified Forest and surrounding area in a manner that is compatible with the preservation of park resources and wilderness character;*
- *facilitate orderly, regulated, and continuing research; and*
- *promote understanding and stewardship of resources and park values by providing educational opportunities for students, scientific groups, and the public.*

Park Significance

Park significance statements capture the essence of the park's importance to the natural and cultural heritage of the United States of America. Significance statements do not inventory park resources; rather, they describe the park's distinctiveness and help place the park within the regional, national, and international context. Defining park significance helps managers make decisions that preserve the resources and values necessary to accomplish the purpose of Petrified Forest National Park.

Petrified Forest National Park is globally significant for its exposures of Chinle Formation fossils that preserve evidence of the Late Triassic period ecosystem of more than 200 million years ago. The detailed paleontologic (fossil) and stratigraphic (layered) records of the park provide outstanding opportunities to study changes in organisms and their environments in order to better understand today's environment.

Park Mission

Park purpose describes the specific reason the park was established. Park significance is the distinctive features that make the park different from any other. Together, purpose and significance lead to a concise statement—the mission of the park. Park mission statements describe conditions that exist when the legislative intent for the park is being met.

The expansive, undulating, and colorful Painted Desert reveals layers of history that

began over 200 million years ago. Life of the Late Triassic period, hardened into fossils and petrified wood, offers a globally significant mosaic of an ancient ecosystem, vastly different from today. Figures pecked into boulders, the remains of ancient homes, and well-traveled pathways speak of peoples drawn here for thousands of years. Petrified Forest preserves awe-inspiring vistas and rare opportunities for visitors and scientists to discover and wonder about the stories this land reveals—stories that are interconnected with the stories preserved in other fossil parks and across the Colorado Plateau—stories that are part of the cumulative expression of America's national heritage, represented by the national park system.

Park Mission Goals

Park mission goals are visions for the future. They describe the ideals that park managers are striving to attain in very broad terms.

Preserve Petrified Forest National Park Resources

- *Deposits of petrified wood and related fossils are identified, evaluated, preserved, and protected.*
- *Scientific research is encouraged to broaden understanding of park resources and to expand the park's database.*
- *Methods are devised to prevent both the disturbance and removal of petrified wood, related fossils, and cultural artifacts, while still allowing visitor access.*
- *Ecosystems are restored and/or maintained, where appropriate, as they existed prior to disturbance by recent human settlement and technology.*
- *Trespass and associated impacts to resources are minimized.*
- *Cultural resources are identified, evaluated, preserved, and protected.*
- *Natural resources are identified, evaluated, preserved, and protected.*
- *Eroding archeological sites are stabilized or data is recovered and preserved.*
- *Ethnographic resources are identified and managed in consultation with traditionally associated tribes.*
- *Visual quality of scenery and vistas is preserved.*
- *Air quality-related values are protected and preserved.*
- *Night skies and natural soundscapes are protected.*

Provide for Public Use and Enjoyment and Visitor Experience of Petrified Forest National Park

- *Visitors enjoy and experience the petrified wood, fossils, and archeological artifacts without disturbing or removing them.*
- *Public awareness and understanding of park resources is enhanced by communication of ongoing research, including social and behavioral research.*
- *Public awareness and understanding of paleontological resources held in trust by the National Park Service, here and at other park units, and how these collections relate to each other, is enhanced through interpretation and education.*
- *The park's significance is more effectively communicated to the public.*
- *Opportunities for compatible visitor use and stewardship are provided for their enjoyment and understanding of park resources and values (including petrified wood, other fossils, wilderness*

values, and cultural sites), and for the visitors' understanding of their roles in the park's preservation ethic.

Ensure Organizational Effectiveness of Petrified Forest National Park

- *Cooperative relationships are developed with governmental agencies and private interests in planning, management, and use of resources, which affect scenic, natural, and cultural values in and near the park.*
- *Traditionally associated tribes are consulted on a government-to-government basis.*
- *Petrified Forest partners with surrounding communities and other interested entities to accomplish common goals.*
- *Plans are developed, implemented, and updated to guide park management.*
- *Park facilities harmonize with the natural environment, do not impair significant resources, accomplish the park mission, and meet the needs of visitors.*
- *Facilities and services are fully accessible.*
- *Petrified Forest conserves energy, water, and nonrenewable resources, promotes recycling, and minimizes pollution.*
- *A quality workforce is recruited and retained.*
- *A safe and quality infrastructure is maintained for visitors, staff, and co-operators.*
- *Commercial services are viable, necessary, appropriate, and compatible with park goals and mission.*
- *The cooperating association maintains a viable business operation by providing informational materials to visitors and by supporting interpretation, education, and research in the park.*

SPECIAL MANDATES, AGREEMENTS, AND ADMINISTRATIVE CONSTRAINTS

Special mandates and administrative commitments refer to park-specific requirements. These requirements are mandated by Congress or by signed agreements with other entities. Often, but not always, such commitments are established concurrently with the creation of a unit of the national park system.

Special mandates, agreements, and administrative constraints for Petrified Forest National Park include the following:

- Petrified Forest National Wilderness Area was one of the first designated wilderness areas in the national park system. It was designated by Congress on 23 October 1970 (84 Stat. 1105). The wilderness area within Petrified Forest National Park is composed of 50,260 acres (about 54% of the park) and consists of two separate units. The Painted Desert unit in the northern segment of the park comprises 43,020 acres, and the Rainbow Forest unit in the southeast segment of the park comprises 7,240 acres.

- I-40 bisects Petrified Forest National Park from east to west and is located on national park land. The highway right-of-way is managed by the Arizona Department of Transportation under an agreement with the National Park Service.

- The Burlington Northern-Santa Fe Railroad also bisects the park; the right-of-way is owned and managed by the railroad.

- AMFAC Resorts, L.L.C. (renamed Xanterra Parks and Resorts in 2002) manages the concessions operation at Petrified Forest National Park under the Fred Harvey Company name. The Fred Harvey Company provides the following services to visitors under a contract with the National Park Service: food service (restaurant and snack bar), gift shops, and a gasoline service station. This contract expired in 1994, but has been extended several times due to a backlog in NPS concessions contracting and new NPS concessions regulations.

- The Petrified Forest Museum Association is a cooperative entity that produces and sells books and other publications related to the park and regional natural and cultural resources. This nonprofit association currently manages three sales outlets in the park. Its proceeds are applied to projects that benefit Petrified Forest National Park, including park-related scientific research and education. The museum association operates under a memorandum of agreement with the National Park Service under authority from Congress.

SERVICEWIDE MANDATES AND POLICIES

As with all units of the national park system, the management of Petrified Forest National Park is guided by the 1916 Organic Act (which created the National Park Service); the General Authorities Act of 1970; the Act of 27 March 1978, relating to the management of the national park system; and other applicable federal laws and regulations, such as the Endangered Species Act and the National Historic Preservation Act. Actions are also guided by *NPS Management Policies* (NPS 2001a). Also, see appendix C, "Legislation."

Many resource conditions and some aspects of visitor experience are prescribed by legal mandates and NPS policies. Although attaining some of these conditions has been deferred in the park because of funding or staffing limitations, the National Park Service will continue to strive to implement these requirements with or without a GMP Revision. This plan is not needed to decide, for instance, that it is appropriate to protect endangered species, control exotic species, protect archeological sites, provide for universal access, and conserve artifacts.

The conditions prescribed by laws, regulations, and policies most pertinent to the planning and management of Petrified Forest National Park are summarized in table 1 below. Adjacent to each topic are the desired conditions that park staff strives to achieve for that topic. Appendix A expands on this information.

TABLE 1. SERVICEWIDE MANDATES AND POLICIES PERTAINING TO PETRIFIED FOREST NATIONAL PARK

TOPIC	CURRENT LAWS AND POLICIES REQUIRE THAT THE FOLLOWING CONDITIONS BE ACHIEVED AT PETRIFIED FOREST NATIONAL PARK
Relations with National Park Neighbors	The park is managed as part of a greater ecological, social, economic, and cultural system. Because the park is an integral part of a larger regional environment, the National Park Service works cooperatively with others to anticipate, avoid, and resolve potential conflicts, protect national park resources, and address mutual interests in the quality of life for community residents. Regional cooperation involves federal, state, and local agencies, American Indian tribes, neighboring landowners, and all other concerned parties.
Paleontological Resources	Paleontological resources, including both organic and mineralized remains in body or trace form, are protected and preserved. Paleontological research by the academic community is encouraged and facilitated when the project cannot be conducted outside the park, involves more than simple collection of additional specimens of types already collected, and will answer an important question about the resource. Management actions are taken to prevent illegal collecting and may be taken to prevent damage from natural processes such as erosion. Protection may include construction of shelters over specimens, stabilization in the field, or collection, preparation, and placement of specimens in museum collections. The localities and geologic settings of specimens are documented when specimens are collected.
Air Quality	Air quality in the park meets ambient air quality standards (NAAQS) for specified pollutants. Activities in the park do not contribute to deterioration of air quality.
Water Resources	Surface waters and groundwaters are perpetuated as integral components of park aquatic and terrestrial ecosystems. Park managers work closely with other agencies and governing bodies, as appropriate, to maintain or restore the quality of park water resources. Consumptive use of water in parks is efficient and frugal. Park facilities and programs are maintained and operated to avoid pollution of surface waters and groundwaters. The National Park Service manages for preservation of floodplain values and minimizes potential flood hazards. The National Park Service provides leadership and takes action to prevent the destruction, loss, or degradation of wetlands; and to preserves and enhance the natural and beneficial values of wetlands. While preserving its legal remedies, the National Park Service works with state water administrators to protect park resources, and participates in negotiations to seek resolution of conflicts among multiple water claimants.
Geologic Resources	Natural geologic processes function as naturally as possible, except where special management considerations are allowable under policy.

TOPIC	CURRENT LAWS AND POLICIES REQUIRE THAT THE FOLLOWING CONDITIONS BE ACHIEVED AT PETRIFIED FOREST NATIONAL PARK
Species of Concern	Federal and state listed threatened and endangered species and their habitats are protected and sustained. Populations of native plant and animal species function in as natural a condition as possible, except where special considerations are warranted. Native species populations that have been severely reduced in or eliminated from the park are restored where feasible and sustainable. The management of populations of exotic plant and animal species, up to and including eradication, will be undertaken wherever such species threaten park resources or public health and when control is prudent and feasible.
Wilderness	Designated wilderness in Petrified Forest National Park will be managed for the use and enjoyment of the American people in such a manner as will leave the park and its resources unimpaired for future generations. Programs and information will enhance opportunities for visitors to safely use and enjoy wilderness resources. The minimum requirement concept will be applied to all administrative activities, including scientific research and the sue of equipment to ensure wilderness character is preserved.
Wild and Scenic Rivers	No actions will be taken that would adversely affect the values that qualify the Puerco River as eligible for inclusion in the National Wild and Scenic Rivers System.
Fire Management	Park fire management programs will be designed to meet resource management objectives for various areas of the park and to ensure that the safety of firefighters and the public is not compromised. Until a fire management plan is approved, all wildfires will be suppressed, taking into account the resources to be protected, safety of firefighters and the public, and cost.
Night Sky	The National Park Service cooperates with park neighbors to help minimize the intrusion of artificial light into the night sky in the park. Artificial outdoor lighting is limited to that required for safety and is shielded when possible.
Natural Soundscapes	The National Park Service preserves natural ambient soundscapes, restores degraded soundscapes to the natural condition wherever possible, and protects natural soundscapes from degradation by human-caused noise.
Archeological Resources	Archeological sites are identified and inventoried, and their significance is determined and documented. Archeological sites are protected in an undisturbed condition unless it is determined through formal processes that disturbance or natural deterioration is unavoidable. In those cases where disturbance or deterioration is unavoidable, the site is professionally documented and salvaged.

TOPIC	CURRENT LAWS AND POLICIES REQUIRE THAT THE FOLLOWING CONDITIONS BE ACHIEVED AT PETRIFIED FOREST NATIONAL PARK
Ethnographic Resources	Appropriate cultural anthropological research is conducted in cooperation with groups that are associated with the park. The National Park Service accommodates access to and ceremonial use of American Indian sacred sites by American Indian religious practitioners and avoids adversely affecting the physical integrity of these sacred sites. NPS general regulations on access to and use of natural and cultural resources in the park are applied in an informed and balanced manner that is consistent with park purposes and does not unreasonably interfere with American Indian use of traditional areas or sacred sites and does not result in the degradation of park resources. Other federal agencies, state and local governments, potentially affected American Indian tribes and other communities, interest groups, and the Arizona State Historic Preservation Office are given opportunities to become informed about and comment on anticipated NPS actions at the earliest practicable time. The National Park Service consults with tribal governments before taking actions that affect American Indian tribes. These consultations are open and candid so that all interested parties may evaluate for themselves the potential impact of relevant proposals. NPS staff regularly consult with traditionally associated American Indians regarding planning, management, and operational decisions that affect sacred sites or other ethnographic resources with which they are historically associated. The identities of consultants and information about sacred and other culturally sensitive places and practices are kept confidential. American Indian tribes and other individuals and groups linked by ties of kinship or culture to ethnically identifiable human remains are consulted when remains may be disturbed or are encountered on national park lands.
Historic Properties	Cultural resources are inventoried and their significance and integrity are evaluated under National Register of Historic Places criteria. The qualities of historic properties that contribute to actual listing or eligibility for listing on the National Register of Historic Places are protected in accordance with the *Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation*, unless it is determined through a formal process that disturbance or natural deterioration is unavoidable.
Collections	All museum objects and manuscripts are identified and inventoried, and their significance is determined and documented. Collections are protected in accordance with established standards.
Visitor Experience and Understanding	Visitor and employee safety and health are protected. Visitors understand and appreciate park values and resources and have the information necessary to adapt to the national park environments. Visitors have opportunities to enjoy the park in ways that leave resources unimpaired for future generations. Recreational uses are promoted and regulated. Basic visitor needs are met in keeping with park purposes. To the extent feasible, facilities, programs, and services in the park are accessible to and usable by all people, including those with disabilities.
Sustainable Design / Development	NPS visitor and management facilities are harmonious with park resources, compatible with natural processes, aesthetically pleasing, functional, as accessible as possible to all segments of the population, energy efficient, and cost effective.
Concessions	The sale of original objects, artifacts, or specimens of a historical, archeological, paleontological, or biological nature is prohibited in national parks.

PLANNING OPPORTUNITIES AND ISSUES

The public, park staff, and planning team members identified a number of issues facing Petrified Forest National Park. The issues generally concern the protection and management of natural and cultural resources, determining types and levels of facilities and services, and providing for visitor understanding and enjoyment of park resources and values. The GMP Revision provides a framework or strategy for addressing the following issues within the context of the purpose, significance, and mission goals of the park.

The following GMP Revision issues were identified during the scoping process:

1. The Painted Desert Inn National Historic Landmark, which has not been used for overnight lodging since the 1950s, is underused for park-related purposes and has major structural problems. The inn is a Pueblo Revival-style building that overlooks the Painted Desert.

2. Some housing units for NPS employees and concessions staff are in poor condition and do not meet NPS fire and safety standards. Housing is located within the park near the Painted Desert headquarters area and at the Rainbow Forest developed area. It is necessary to house some employees in the park to provide after-hours emergency response. Other housing is located in nearby Holbrook, Arizona, where the park owns several housing units at a former U.S. Air Force facility. Two additional structures are located near the Painted Desert Inn. Park housing units, with the exception of the housing in Holbrook, are historic structures; historic structures are best preserved through use. The National Park Service desires to reconsider questions of where housing for NPS and concessions employees should be located, the preservation of historic housing units, and how much housing should be provided.

3. The 1993 GMP/EIS did not fully recognize and consider the value of historic structures and landscapes. New information is becoming available about the significance and integrity of historic structures and cultural landscapes within the park. Cultural landscapes are areas, including both cultural and natural resources, that are associated with a historic event or activity, or that exhibit other cultural or aesthetic values.

4. Buildings in the Painted Desert visitor center / headquarters complex have structural problems. The complex, which includes nearly 20 structures and several courtyards, was built in the early 1960s. The design and construction of the complex did not adequately compensate for soil conditions at the site; walls, floors, and ceilings in many of the structures have major cracks. Despite NPS efforts to stabilize and repair the buildings, heaving and cracking continues.

Some structures are so badly damaged that they may be beyond repair. The complex has recently been recognized as a significant Mission 66 work designed by renowned architect Richard Neutra. Because of this significance, the Painted Desert visitor center / headquarters complex is potentially eligible for the National Register of Historic Places (NRHP).

5. The building that houses the museum collection does not meet NPS curatorial standards. The collection is rapidly expanding as research continues and as objects on loan to universities and other organizations are returned to the park. The collection is housed at the headquarters complex in a building that has structural problems (see issue 4 above).

6. Petrified Forest National Park offers outstanding opportunities for paleontological and other research. The park has some temporary housing available for researchers, but there are no designated living quarters for long-term researchers or researchers with families. There are no adequate indoor work areas for visiting scientists.

7. Federal law directs that any concessions in national parks must be "necessary and appropriate for the accommodation of visitors to a park." This direction needs to be considered and interpreted for Petrified Forest National Park, given the availability of and demand for services now and for the life of the GMP Revision, estimated at 15 to 20 years.

8. Opportunities for people with various physical disabilities are limited in the park.

9. The National Park Service must determine which roads should be used and maintained for park purposes, which should be managed for their historic value, and which should be closed and returned to natural conditions. There are roads in the park in addition to those associated with the main road system used by most visitors. The condition and uses of such roads varies. Some roads are maintained for park administrative purposes (e.g., resource management and utility access), and others are road traces remaining from earlier times. Some roads are occasionally used for administrative purposes even though they are not maintained.

10. Management zones in the 1993 GMP do not provide adequate direction for future management of park areas. New NPS policy and guidance for management zones were recently approved. Thus, park management zones need to be revised and updated to meet guidelines now in place. The new guidance states that management zones are a tool used to identify specific areas of the park, their significant resources, and how they will be managed in the future for resource protection and visitor experience and appreciation. They also specify, in a general way, appropriate kinds and levels of

visitor use, management activities, and facilities.

11. Visitor experience, resource protection, and development needs must be reconsidered at visitor areas (Crystal Forest and Puerco Valley, for example) along the main park road. New information about interpretive needs, cultural landscapes, utility capacities, wood theft, and other subjects has become available, and such information could mean that a change in management direction is needed for these areas.

CENTRAL QUESTIONS OF THE GMP REVISION

Decision points are the central questions to be answered by the GMP Revision. As with any decision-making process, there are key decisions that, once made, will dictate or influence the direction of subsequent decisions. Based on public comments, the issues stated above, and agency concerns for this GMP Revision, the following decision points or central questions of the plan were identified by the planning team. This GMP Revision focuses on alternative ways of addressing these decision points.

1. *To what extent should the park continue to foster and enhance scientific research in the park and make it meaningful to the public?*

2. *What is the desired condition of the resources and experiences in different areas throughout the park, and what type of use is consistent with that condition and fosters understanding?*

   - For example, what is the desired character of frontcountry, backcountry, and wilderness areas?
   - What is the best way to prevent theft of petrified wood? Should theft be prevented with increased protection staff, limiting access, ongoing research, and/or education?
   - Should sales of petrified wood at the gift shop continue?
   - What are appropriate and necessary commercial services and associated facilities?
   - What are the desired condition and use of park roads?

3. *What is the best way to care for and provide access to the museum collection?*

   - By improving park storage facilities? By consolidating storage at the park? By consolidating storage in another location?

4. *To what extent should cooperation to protect park-related resources and values (e.g., viewsheds, wildlife corridors, archeological and paleontological sites, air quality) on surrounding lands be a priority for park managers?*

5. *To what extent should the park use existing structures, especially historic structures, and/or new structures to meet park needs?*

   - How much housing should be available for park staff to rent?

SECTIONS AND DECISIONS OF THE 1993 GMP THAT REMAIN VALID

The 1993 GMP was thoroughly examined and considered by park managers to determine which decisions remain valid in light of new circumstances, information, and policy. Sections of the 1993 GMP that remain valid and will not be reconsidered in this GMP Revision, include:

- Continue development concepts for the new Puerco turnout; Crystal Forest and Jasper Forest intensive use and interpretation; new wayside exhibits at Agate Bridge, Jasper Forest, and Crystal Forest; and removal of the parking trailheads at the Flattops.
- Implement a long-term evaluation and monitoring program to determine the extent of petrified wood theft and set priorities for management.
- Continue recovery of shortgrass prairie.
- Consult with U.S. Fish and Wildlife Service to consider the feasibility of re-introducing the black-footed ferret.
- Survey for threatened and endangered species.
- Develop and implement a fire management plan.
- Assess viewshed intrusions and other impacts to wilderness.
- Establish an air quality database.
- Establish a research center, although on a smaller scale than proposed in the 1993 GMP.
- Proactively manage archeological sites in consultation with affiliated American Indian tribes.
- Request that the Western Archeological and Conservation Center oversee all archeological research until such time as the park has an archeologist.
- Develop a resource management plan to expand site evaluation and monitoring.
- Establish a permanent dialogue with American Indian tribes.
- Conduct a parkwide survey of all historic sites (including historic landscapes), structures, and objects for eligibility to the NRHP.
- Maintain approved scope of collections; the Western Archeological and Conservation Center and the park manage collection in accordance with standards.
- Prepare a paleontological research plan, scope of collections statement, and collection management plan.
- Conduct a rare plant survey.
- Prepare a hazardous materials plan.
- Prepare a wilderness management plan.
- Prepare documentation of the park's administrative history.
- Prepare an archeological research management plan, scope of collections statement, and collections management plan.
- Prepare a cultural resources management plan.
- Prepare a cultural landscape study.
- Prepare an ethnologic overview and assessment.
- Prepare a historic resource study.
- Develop a historic preservation guide for the Painted Desert Inn.
- Revise the List of Classified Structures.
- Conduct a traditional use study.

- Remove Long Logs parking lot and road and convert from vehicle to pedestrian access.
- Reuse residences at Rainbow Forest as offices; return them to their 1930s appearance.
- Re-locate Rainbow Forest ranger station to building east of residential complex.
- Improve sewer system at Painted Desert Inn.
- Protect sewage lagoons near Rainbow Forest from floods.
- Implement boundary changes for Chinle Escarpment, West Rim of the Painted Desert, Rainbow Forest Badlands, Wallace Tank Ruin, Canyon Butte Ruin, and Dead Wash Petroglyphs.

ISSUES NOT ADDRESSED IN THE GMP REVISION

Scoping Issues Eliminated from Detailed Consideration

Three GMP Revision issues were identified during initial project scoping, but were subsequently dismissed for reasons discussed below:

1. Theft of petrified wood continues to be a serious problem in the park; as much as one ton of petrified wood may be stolen or displaced by visitors each month. New *NPS Management Policies* would eliminate petrified wood sales from gift shops within the park. (The petrified wood sold in the gift shops comes from outside park boundaries.) There is concern that eliminating petrified wood sales in park gift shops might increase wood theft within the park. On the other hand, there is also concern that selling petrified wood in the park gives the wrong message to the public.

   Recently revised *NPS Management Policies* (NPS 2001) prohibit the sale of original objects, artifacts, or specimens of a historic, archeological, paleontological, or biological nature. Once a new concessions contract is awarded, petrified wood will no longer be sold at gift shops within the park. Once petrified wood sales are terminated, park managers will attempt to determine through monitoring or a special study whether theft of petrified wood increases. If such an increase occurs and is likely to be a continuing concern, park managers would consider seeking a waiver from the NPS policy banning sales of paleontological artifacts within the park. Seeking a waiver would be a last resort, and such action would be taken only if the National Park Service is convinced that banning petrified wood sales in the park had resulted in significant additional loss.

2. The 1993 GMP recommended a boundary expansion near Dead Wash Petroglyphs. The Dead Wash Petroglyphs area is located east of the park and just south of I-40. This area consists mostly of federal lands managed by the BLM, but it was thought during scoping that several parcels had recently become new Navajo Nation lands.

   Subsequent research revealed that these parcels are not Navajo lands but rather remain under the jurisdiction of the BLM. Thus, the 1993 GMP

proposal for a park boundary expansion remains valid, and these parcels no longer represent a planning issue for this GMP Revision.

3. There is concern that certain activities on surrounding lands have the potential to harm resources within the park. Petrified Forest National Park is surrounded by lands owned by the state of Arizona, the BLM, the Navajo Nation, and privately owned lands. I-40 and the Burlington Northern-Santa Fe Railroad bisect the park from east to west. A propane gas storage plant (the gas is stored in underground salt caverns) is adjacent to the western boundary, and a coal-fired electric power generating station is approximately 30 to 40 miles to the west of the park. Retail shops are located immediately outside the southern park boundary. The subdivision of adjacent lands has the potential to impact park viewsheds and wildlife habitat for species that move in and out of the park.

   The 1993 GMP identified lands that would be appropriate to include in an expansion of the park boundary, and evaluated the environmental consequences that would result. Aside from expanding the park boundary, the only real option for addressing resource concerns related to activities outside the park is to work cooperatively with park neighbors. As all park units are now mandated to work with park neighbors to protect resources related to the park (*NPS Management Policies 2001*), there was no need to investigate other alternatives for addressing such concerns.

Other Issues Eliminated from Detailed Consideration

Not all issues raised by the public were considered in this GMP Revision. Such issues were eliminated from detailed consideration because they:

- were not feasible;
- are already prescribed by law, regulation, or policy (see "Servicewide Mandates and Policies" section);
- would be in violation of laws, regulations, or polices; or
- were at a level that was too detailed for a GMP Revision and are more appropriately addressed in subsequent planning documents.

This section briefly describes these issues and the basis for excluding them from the GMP Revision.

Several suggestions were made to expand the park to include specific areas. The 1993 GMP adequately covered the issue of park boundary expansion.

A suggestion was made that if the wilderness area boundaries were expanded, there could be implications for U.S. Highway 180 (US 180). A wilderness suitability study was completed before the Petrified Forest National Wilderness Area was established in 1970. There are currently no plans to conduct another wilderness suitability study or to enlarge the wilderness area. If the park boundary were expanded as proposed in the 1993 GMP, a new study would determine the suitability of additional park lands for wilderness.

A suggestion was made that all action on GMP issues should not be postponed until the GMP Revision is approved; some fixes are needed now. Park managers will continue to manage the park according to approved plans and respond to resource issues as funds allow until the GMP Revision is approved.

A suggestion was made regarding managing pronghorn in the park. This issue is too detailed for a GMP, but the suggestion was passed on to park staff for consideration in a Petrified Forest Resource Management Plan.

RELATIONSHIP OF OTHER PLANNING EFFORTS TO THIS GENERAL MANAGEMENT PLAN REVISION

GENERAL MANAGEMENT PLAN, PETRIFIED FOREST NATIONAL PARK

Petrified Forest National Park has been operating under the GMP/EIS that was prepared in 1993. Although much of the 1993 GMP is still pertinent, certain elements need to be reconsidered due to changing circumstances, new information, and new policies. For additional information, see preceding sections titled "Need for the Plan" and "Sections of the 1993 GMP That Remain Valid."

HOUSING NEEDS ASSESSMENT, PETRIFIED FOREST NATIONAL PARK

In 1998, every national park with five or more housing units was required to perform a housing-needs assessment. A contractor was brought in to verify needs and conduct a housing market analysis of the local community. Petrified Forest park managers were required to certify units of NPS housing needed in two categories: Category 1 – NPS-paid staff who must live in the park to perform essential services or respond to emergencies, and Category 2 – NPS-paid staff who are permitted to live in the park because the park would benefit. A third category describes non-NPS staff, such as park volunteers, who are permitted to live in the park for the park's benefit. Petrified Forest certified that 28 to 31 NPS housing units are needed to accommodate Category 1, Category 2, and non-NPS occupants. Thus, alternatives in this GMP Revision assume that 28 to 31 units of NPS housing are needed.

If the park is expanded as proposed in the 1993 GMP, the need for NPS housing could increase significantly beyond the 28 to 31 units identified by the 1998 housing needs assessment.

WILDERNESS MANAGEMENT PLAN, PETRIFIED FOREST NATIONAL PARK

Petrified Forest National Park has initiated development of a wilderness management plan. According to NPS policy, wilderness management plans must do the following:

- clearly identify the boundaries of wilderness units of the park,
- identify individuals and/or organizations within the park administration responsible for wilderness preservation,
- establish an administrative process to determine "minimum requirements" for actions in wilderness; and
- establish specific management actions to guide public use and preservation of wilderness resources, including the establishment of desired future conditions. An environmental compliance document that provides the public with the opportunity to review and comment on the park's wilderness management program will accompany all wilderness management plans, consistent with the requirements of National

Environmental Protection Act (NEPA) and appropriate NPS policy guidance.

Wilderness management plans must be coordinated and integrated with other park planning documents such as a GMP that provides guidance on what resource conditions and visitor experiences should exist in the park and where those conditions and experiences generally should occur. This is done via management zoning.

Formulation of this GMP Revision included development of management zones. The zones prescribe the management approach for each part of the park, including wilderness areas. Management zones clearly define the specific resource conditions and visitor experiences that are to be achieved and maintained over time. They also establish, in a general way, the kinds and levels of visitor use, management activities, and development that are appropriate for maintaining the desired conditions. For example, a new visitor center would not be constructed in a zone designated to provide a primitive backcountry experience. Management zones direct decision making in the park, including wilderness planning, and they are the core of the GMP (or in this case, the GMP Revision).

Once management zones for wilderness areas of the park have been set in an approved GMP Revision for Petrified Forest National Park, a separate wilderness management plan will be developed using the GMP Revision as a guide.

PHOENIX RESOURCE MANAGEMENT PLAN, U.S. BUREAU OF LAND MANAGEMENT

The National Park Service consulted BLM staff in the Safford, Arizona Field Office regarding the relationship of the GMP Revision to BLM plans and programs. The BLM's *Phoenix Resource Management Plan*, which was written in the late 1980s (BLM 1988), addresses management of lands around Petrified Forest National Park and the Painted Desert. The plan states that areas adjoining the park would continue to be managed by the BLM, pending any congressional legislation adding those lands to the park. This statement is consistent with boundary expansion language in the 1993 GMP and this GMP Revision. BLM field staff also indicated that the BLM has no plans to change BLM land uses, resource management, or land management around the park. The BLM anticipates no conflicts between the GMP Revision and BLM actions, plans, or policies.

CHAPTER 2: ALTERNATIVES, INCLUDING THE PREFERRED ALTERNATIVE

INTRODUCTION

INTRODUCTION TO THE ALTERNATIVES

This Draft GMP Revision/EIS presents four alternatives, including the NPS-proposed action, for future management of Petrified Forest National Park. The four alternatives are: alternative 1 (no-action alternative or continuation of existing conditions), alternative 2 (the NPS-proposed action), alternative 3, and alternative 4.

The alternatives, which are based on the park mission, purpose, and significance, present different ways to manage resources and visitor use and improve facilities and infrastructure within the park. The no-action alternative is included as a baseline for comparing the environmental consequences of implementing each alternative.

This chapter also describes the planning process used by the planning team, and includes tables that summarize key differences between the alternatives and key differences in the expected impacts of implementing each alternative. The summary of impacts table is based on the analysis in chapter 4, "Environmental Consequences."

FORMULATION OF THE ALTERNATIVES

Many aspects of the desired future condition of Petrified Forest National Park are defined in establishing legislation; the national park mission, purpose, and significance statements; and servicewide mandates and policies described in chapter 1. Within these parameters, the National Park Service solicited input from the public, park staff, government agencies, tribal officials, and other organizations regarding issues and desired conditions for the park. The first opportunity for public comment was at the beginning of the GMP Revision project in December 2000. Twenty comments were received.

Planning team members gathered information about existing visitor use and the condition of park facilities and resources. Team members considered which areas of the park attract visitors and which have sensitive resources. Using this information, the planning team developed eight management zones for guiding the preservation, use, appreciation, and development of Petrified Forest National Park and associated resources. The management zones are applied in varying combinations and locations in the alternatives. These zones, described in the following section, form the basis of the GMP Revision alternatives.

As noted above in the "Guidance for the Planning Effort" section, the National Park Service would continue to follow existing agreements and servicewide mandates, laws, and policies, and sections of the 1993 GMP that remain valid, regardless of the alternative considered in this GMP Revision. These mandates, policies, and sections of the 1993 GMP are not repeated in this chapter. Other actions do differ among the alternatives, and these actions are discussed in this chapter.

The alternatives focus on *what* resource conditions and visitor experiences and opportunities should be at Petrified Forest rather than on details of *how* these

conditions and experiences should be achieved. Thus, the alternatives do not include details of resource or visitor use management techniques. More detailed plans or studies will be required before major modifications are made to facilities. The implementation of any alternative also depends on future funding, environmental and cultural compliance, and resource protection issues. This plan does not guarantee that funding will be forthcoming. The GMP Revision establishes a vision of the future that will guide day-to-day and year-to-year management of the park, but full implementation could take many years.

These four alternatives embody the range of what the public and the National Park Service agree should be accomplished with regard to natural resource conditions, cultural resource conditions, and visitor experience and appreciation at Petrified Forest National Park. The actual configurations and management within each alternative were developed by placing the management zones (described in the next section) on a map.

In some cases, all three action alternatives apply the same management zones to the same area. For example, the Rainbow Forest area is zoned the same for each alternative because such zones seem to be the most appropriate way to manage this area, regardless of the alternative selected.

Some of the main issues of this GMP Revision/EIS revolve around structures: Painted Desert visitor center/headquarters complex, Rainbow Forest buildings, Painted Desert Inn, and the various administrative and visitor needs. A collaborative, focused study was held during the planning process to explore alternatives for how existing and projected needs for building space for business, maintenance, administration, concessions, and employee housing could be fit into existing structures (Space Utilization Charette, Petrified Forest National Park, February – March 2001). New construction was also considered in some scenarios. This information, including general cost estimates, has been incorporated into the alternatives in this document.

MANAGEMENT ZONES

Management zones define specific resource conditions and visitor experiences to be achieved and maintained in each area of the park under each of the action alternatives, except the no-action alternative. Each zone description includes the types of activities and facilities that are appropriate in that zone. The management zones were developed as a result of this GMP Revision planning effort and, therefore, are not applied to the no-action alternative and map.

In formulating the alternatives, the management zones were placed in different locations or configurations on the map according to the overall intent (concept) of each of the alternatives. That is, the management alternatives represent different ways of applying the eight management zones to the park.

The eight management zones for Petrified Forest National Park are presented in the following section. Resource conditions, visitor experience and appreciation, and appropriate activities and facilities are described for each management zone.

In addition to the management zones, park managers would continue to use the superintendent's compendium and wilderness designations to effect limitations or closures, as necessary, to protect resources and wilderness values.

PRESERVATION EMPHASIS ZONE

Resource Condition

Natural and cultural resources are unimpaired and generally unaffected by human influences. Natural processes prevail. Evidence of recreational use is not readily apparent. Natural landscapes and soundscapes predominate. This zone may occur in wilderness or non-wilderness areas. Resource inventory and monitoring activities help to identify and protect resources.

Visitor Experience and Appreciation

Visitors explore remote areas of the park in a natural setting. Opportunities for solitude, independence, closeness to nature, and adventure are key experiences. Chance encounters with other visitors or park staff are relatively few. Self-reliance is emphasized, as these areas are without comforts or conveniences. Visitors require outdoor skills and must be self-sufficient. Limits on numbers of visitors, length of stay, and overnight use may be in place. A visitor permit system may be implemented if it is needed to protect resources.

Facilities and Activities

Common visitor activities include cross-country hiking, backpack camping, horseback riding, enjoying nature, wildlife viewing, and photography. Visitor access is by foot or horseback (bicycling is not permitted). Overnight use may be limited to certain areas.

Buried utilities, primitive and unmaintained trails, and road traces may be present, but the latter are not designated routes. Management activities include research and monitoring, occasional administrative use of primitive roads, and stabilization and restoration of natural and cultural resources. In designated wilderness, management is consistent with NPS wilderness management policies.

BACKCOUNTRY CORRIDOR

Resource Condition

These are designated routes for hiking or horseback travel in a predominantly natural setting. Disturbance to resources is generally limited to the travel corridor, but there may be some minor modifications to trailside resources for safety or to prevent secondary impacts (e.g., installation of water bars to prevent erosion).

Visitor Experience and Appreciation

Visitors have opportunities to view and explore the park from well-developed designated routes. These routes are identified on maps published for visitor use. Visitors have a sense of independence and of being in a natural landscape. Opportunities for adventure and discovery are moderate. Visitors are somewhat self-reliant and need basic outdoor skills. The likelihood of meeting other visitors and park staff is low to moderate. There may be limits on group size or numbers of people to protect resources and visitor experiences. Park vehicles may occasionally be encountered on some routes.

Facilities and Activities

Visitor activities include hiking, backpacking, and horseback riding (bicycles are not permitted). Facilities are limited to primitive maintained trails, unused administrative roads that are gradually reverting to trails, and maintained administrative roads (generally unpaved). Visitor access is by foot or horseback. Administrative road segments that are designated as backcountry corridors are zoned as backcountry corridors.

FRONTCOUNTRY CORRIDOR

Resource Condition

Areas are managed for a moderate to high degree of resource integrity. Some resources may be modified to provide for visitor use. Concentrations of significant resources for which the park was set aside may be present, but some human impacts are apparent. High quality, scenic landscapes may be viewed from this zone. Integrity of natural soundscapes and lightscapes is moderate due to concentrated visitor use.

Visitor Experience and Appreciation

These easily accessible areas focus on a connection with and appreciation of special park resources. Visitor understanding of park themes is a priority. Some structured opportunities such as guided tours are provided. There are also opportunities for independence and contemplation, depending on the time of day and season. Sights and sounds of people and vehicles are expected. Encounters with others, including park staff, are more likely than in other management zones. The only limits on numbers of people

or on group size are due to resource protection concerns or facility design capacities. Frontcountry corridors may serve as gateways to backcountry areas.

Facilities and Activities

Common visitor activities include scenic driving, viewing scenic vistas, hiking on designated trails, guided tours, photography, and picnicking. Roads, well-defined trails, interpretive wayside exhibits, overlooks, shelters, benches, toilets, and picnic areas are appropriate in this zone. Visitor support structures such as parking lots, protective barriers, signs, and solar phones may also be present. Future alternative transportation may be studied, such as a shuttle bus system to prevent wood theft. Ranger staff actively manage these areas. Management activities include protecting sensitive resources, promoting enjoyment of the setting, monitoring visitor activities, and providing safe experiences.

SPECIAL PROTECTION ZONE

Resource Condition

This zone provides maximum protection for certain exceptional or fragile resources, such as unique fossils and sensitive archeological sites. The resource condition ranges from nearly pristine to endangered. Very little disturbance from humans is tolerated. Manipulation of resources is generally not permitted unless focused on restoring natural conditions or preserving special cultural resources. This zone may occur in wilderness or non-wilderness areas.

Visitor Experience and Appreciation

Most visitors learn about and appreciate these areas from offsite, or remotely through “virtual experiences” such as videos. Visitors benefit from knowing that sensitive resources are preserved for future generations. A permit or guide is required to visit these areas. In either case, visitors are educated about the importance of protecting fragile resources and informed about ways to experience these areas responsibly. Visitors are encouraged to explore remote areas of the park in a natural setting, but they may be directed away from particularly sensitive resource areas. Opportunities for solitude, closeness to nature, and adventure are key elements. Encounters with other visitors are not expected. Self-reliance and advanced outdoor skills are emphasized. Limits on numbers of visitors, areas visited, length of stay, and overnight use are possible.

Facilities and Activities

Activities include cross-country hiking, backpack camping, horseback riding, enjoying nature, wildlife viewing, and photography. Visitor access is by foot or horseback (no bicycling is allowed). Use may be guided away from certain areas for resource protection reasons. Buried utilities, primitive and unmaintained trails, and road traces may be present, but the latter are not designated routes. Management activities include research and monitoring, occasional administrative use of primitive roads, and stabilization and restoration of natural and cultural resources. In designated wilderness, management is consistent with NPS wilderness management policies.

DEVELOPED ZONE

Resource Condition

Natural resources and processes may be modified to provide for visitor services and park operations. Integrity of natural soundscapes and lightscapes is relatively low. There are some manicured or maintained landscapes but non-native plant species are used sparingly. Efforts are made to avoid disturbing archeological sites, fossils, and other special resources when facilities are developed. Historic structures and/or cultural landscapes may be present in and around this zone.

Visitor Experience and Appreciation

The visitor experience is focused on information, orientation, education, visitor comfort, and safety. There is frequent interaction among visitors and between visitors and park staff. This structured environment is highly accessible. Opportunities to learn about and understand major park themes are provided. The only limits on numbers of people or on group size are due to resource protection concerns or facility design capacities.

Facilities and Activities

Common activities include learning about the park through contacts with park staff and media, short walks, enjoying interpretive programs, dining, and gift shopping. Orientation and interpretation facilities such as visitor centers, museum or wayside exhibits, and kiosks are appropriate. Visitor support facilities such as restrooms, snack bars, gift shops, parking, shelters, overlooks, picnic areas, and paved walks may be present. Park operational facilities such as maintenance shops, offices, supply storage, potential future transportation support, and staff housing may be present but they are visually separated from visitor areas. Management activities focus on maintaining visitor facilities, mitigating impacts from visitor use, and providing high-quality visitor experiences. Management and resource preservation activities may be evident to visitors.

HISTORIC PRESERVATION / ADAPTIVE USE ZONE

Resource Condition

The setting is predominantly historic. Integrity of historic complexes and landscapes are maintained and visitor use is supported. Most structures within historic complexes are stabilized or rehabilitated, with appropriate modifications for adaptive reuse. Some deteriorated structures may be removed and some new buildings may be constructed. Natural resources and processes may be modified to provide for visitor services and park operations. Some landscapes are manicured or maintained, but non-native plant species are used sparingly.

Visitor Experience and Appreciation

Visitors are immersed in a built environment that is rich in architectural and cultural history. The visitor experience is highly social and focused on information, orientation, education, visitor comfort, and safety. Contacts with park staff and other visitors are common. This structured environment is highly accessible. In some cases, historic

structures may need to be modified to increase accessibility and function. Opportunities to learn about and understand major park themes are provided. Learning about the vicinity's cultural history and architecture is a priority. The only limits on numbers of people or on group size are due to resource protection concerns or facility design capacities.

Facilities and Activities

Common activities include learning about the park through contacts with staff and media (e.g., brochures, and maps), short walks, enjoying interpretive programs, dining, and gift shopping. Learning about the vicinity's cultural history and architecture is a priority. Orientation and interpretation facilities and visitor support facilities are present. Operational facilities (e.g., maintenance shops and staff housing) may also be present, but they are visually separated from visitor facilities. Management activities focus on maintaining historic structures, cultural landscapes, and visitor facilities; mitigating impacts from visitor use; and providing for quality visitor experiences.

ADMINISTRATIVE ROAD OR AREA

Resource Condition

Designated routes and areas are managed for administrative purposes. Disturbance to resources is generally limited to a small area or corridor.

Visitor Experience and Appreciation

Areas are managed for administrative purposes only, although visitors traveling by foot or horseback are not expressly prohibited.

Facilities and Activities

Facilities include maintained administrative roads and utilities such as sewage treatment ponds and pump houses. Management activities are oriented toward maintenance of park infrastructure, resource monitoring and protection, and visitor safety.

TRANSPORTATION CORRIDOR

Resource Condition

These are corridors where highway or rail traffic moves across the park. Park landscapes and soundscapes may be significantly affected. The National Park Service is actively engaged in protecting wildlife and scenic vistas, managing native vegetation, and minimizing pollution and litter within the corridor.

Visitor Experience and Appreciation

These corridors are visitors' major routes of approach and access to the park. A key NPS goal is for travelers to understand park boundary locations and the significance of the park.

Facilities and Activities

Most travelers pass incidentally through the park without stopping. Onboard interpretation may be provided on some trains. Facilities include four-lane highways, railroads, embankments, bridges, ramps, signs, and culverts. NPS management activities include promoting visitor appreciation and understanding of the park, cooperating with other entities for management, mitigating harmful impacts, managing safety, and providing emergency response.

VISITOR USE AND CARRYING CAPACITY

Under the 1978 National Parks and Recreation Act (Public Law (PL) 95-625), the National Park Service is required to address the issue of carrying capacity in its GMPs. The concept of carrying capacity is intended to safeguard the quality of park resources and visitor experiences. Identifying resource conditions and visitor experiences by management zone is part of general management planning. At this level of decision making, the desired resource conditions and experiences describe carrying capacity in qualitative terms. These qualitative terms are then translated into quantitative standards over time during implementation planning.

The National Park Service would complete a carrying capacity implementation plan (possibly as part of its wilderness management plan) that would succeed this GMP Revision. This plan would identify indicators and standards, develop a monitoring strategy, and identify management actions needed to address conditions when standards are reached or exceeded. The park would subsequently implement a carrying capacity monitoring program, and it would take action, as necessary, to keep resource and visitor experience conditions within established standards.

ALTERNATIVE 1: NO ACTION

CONCEPT AND GENERAL MANAGEMENT STRATEGIES

The no-action alternative describes continuation of existing conditions at Petrified Forest National Park. It provides a baseline for evaluating the changes and impacts of the other alternatives. The National Park Service would manage the park as it is currently managed, in accordance with the 1993 GMP and other approved plans. Paleontological, archeological, ethnographic, and historic or other cultural resources would be protected, as would the shortgrass prairie, badlands, and scenic vistas. Park managers would continue to close specific areas and otherwise modify visitor access as necessary to address harmful resource impacts. Visitor uses would be reassessed and revised as new information about natural and cultural resource impacts emerges.

The park would continue to open each day about one hour after sunrise and close about one hour before sunset. No designated campgrounds would be provided within the park; however, non-NPS campgrounds are located just outside the south entrance to the park, in nearby towns, and at Homolovi State Park.

Park museum collections would continue to be stored at several offsite locations, some of which meet accepted standards for curation, and in substandard facilities at park headquarters. Park managers would continue to welcome and encourage scientists who are interested in conducting appropriate research. Facilities to support such research, such as temporary, overnight accommodations and indoor work space (for washing and preparing specimens, for example) would remain very limited.

After a new concession contract is awarded, petrified wood would no longer be sold in gift shops in Petrified Forest National Park. (Petrified wood sold in stores comes from outside the park.) Revised *NPS Management Policies* (NPS 2001) prohibit the sale of original objects, artifacts, or specimens of a historic, archeological, paleontological, or biological nature.

Existing commercial services activities would continue.

The park would continue to own 11 housing units (former U.S. Air Force housing) in Holbrook, Arizona. This housing would probably continue to be underused because the number of Petrified Forest employees authorized to reside in NPS housing was decreased by a NPS-wide assessment conducted in 1999 (NPS 1999), and due to a shortage of funds for equipment and structural repair.

Park Developed Areas and Facilities

The Painted Desert headquarters complex would remain the base for most visitor support and other park operations: visitor center, concessions (restaurant, gift shop, and service station / mini-mart), offices and associated work and storage areas for park managers, administration, resource management, museum collections, interpretation, maintenance, protection, dispatch, fee collection, and cooperating

association staff. The headquarters complex was built in the early 1960s and is eligible for the NRHP. In general, buildings and facilities in the complex do not meet current needs for space and function, do not meet NPS standards or fire and safety codes, are in fair to poor condition, and are not universally accessible. These conditions and current level of maintenance would continue. The park has requested funds to expand the existing visitor center (either a new addition of an expansion of the public use spaces within the existing footprint). When the funding is awarded, some of the complex's conditions would improve slightly. The level of improvement is undetermined because specific plans have not been formulated.

The Painted Desert Inn area (see alternative 1 map) includes the historic inn, the grounds, two associated historic residences, and the overlook east of the inn. Ongoing rehabilitation efforts at the inn (reroofing, repairing surface cracks, improving access, and providing additional exhibits) would continue. The two historic residences would also be rehabilitated and adaptively reused.

The Rainbow Forest area at the south end of the park includes a museum and visitor contact station, residences, maintenance structures, parking and picnic areas, a concessions building, and concessioner residence. Offices for interpretation and protection staff, cooperating association storage (of publications), and restrooms are located in the museum. Two additions have been added to the building, but the museum has limited space for exhibits and is not fully accessible. The concessions building has also been enlarged several times and is no longer in keeping with the historic scene because of its altered scale. NPS employees live in some of eight residential units, but several other Rainbow Forest residences are not being used. One of the maintenance buildings has been enlarged to accommodate a fire truck, but the building addition is not in keeping with the historic character of the complex. These conditions would continue.

Main Park Road and Related Areas

The Giant Logs Trail, located behind and just west of the Rainbow Forest Museum, would continue to be managed as a self-guided interpretive trail.

Long Logs proposals from the 1993 GMP would continue to be implemented. The Long Logs spur road would be converted to a pedestrian trail, the parking lot would be removed, and the Long Logs experience would be converted to a pedestrian and hiking experience. Trailhead parking would be at existing Rainbow Forest parking lots.

The Crystal Forest Trail and parking area would continue to be managed to preserve the remaining petrified wood for observation and appreciation. Park managers would continue to use features such as signs, barriers, and minor trail realignments in an effort to prevent additional loss of petrified wood from theft.

The Jasper Forest and Agate Bridge parking lot and overlook areas would continue to be managed as they are now, except that vault toilets might be installed at one of the locations. The Blue Mesa spur road and Blue Mesa interpretive trail would be managed the same. Management of the Newspaper Rock area would also remain the same; visitors would continue to view the petroglyphs from spotting scopes provided at the overlook.

Management of the Puerco Pueblo area would generally remain the same: paved trails would come close enough to allow visitors to see and learn about interesting archeological resources, while remaining far enough away that inadvertent or intentional damage is minimized. Vault toilets would be installed at the Puerco Pueblo area.

The turnouts and overlooks and the parking areas along the main park road north of I-40 would be managed the same as they are currently. Chinde Point (spur road, overlook, and picnic area) would continue to be managed as it now is, except that restrooms would be refurbished or replaced with vault toilets.

Backcountry and Wilderness Areas of the Park

Backcountry areas of the park, including the two wilderness units, would be managed as they are now. A permit would be required for overnight camping, but no permit would be required for day use unless increased use and impacts dictate a need for additional permit requirements. Details of wilderness management would be documented in a wilderness management plan.

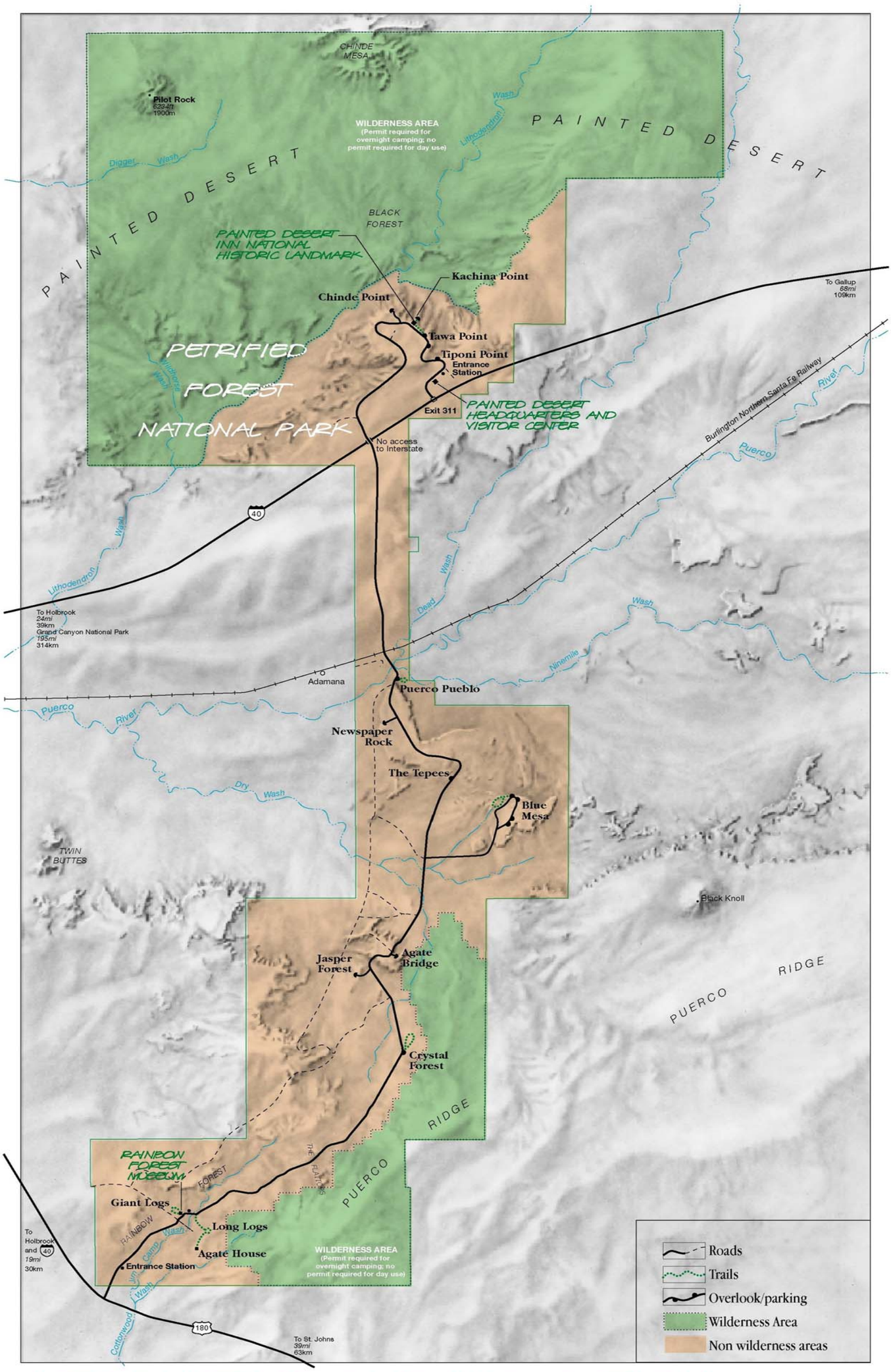
BOUNDARY ADJUSTMENTS

No boundary adjustments other than those described and evaluated in the 1993 *Petrified Forest General Management Plan / Environmental Impact Statement* would be proposed by the National Park Service under the no-action alternative.

COSTS AND IMPLEMENTATION

Costs given are for comparison to other alternatives only and are not to be used for budgeting purposes.

Capital costs for the no-action alternative are estimated to be $8,700,000. Life cycle costs over the 15 to 20 year life of the plan, which include maintenance, operations, and personnel costs (as well as capital costs), are estimated at $40,000,000.



ALTERNATIVE ONE (NO ACTION)

Petrified Forest National Park, Arizona

United States Department of the Interior
National Park Service
PEFO • October 2002 • 110 • 20,015

NORTH

0 2.5 5 MILES

ALTERNATIVE 2: PREFERRED ALTERNATIVE

CONCEPT AND GENERAL MANAGEMENT STRATEGIES

Globally significant park resources would be protected for future generations, while some additional opportunities to experience resources would be provided. Visitor services and exhibits would be expanded. New trails and turnouts would be provided for visitors to understand and appreciate the park; these and other new facilities would generally be sited in developed or disturbed areas to minimize resource impacts. Visitor hours would be extended in the frontcountry north of I-40 to allow early morning and evening activities, such as watching the sun rise or set over the Painted Desert. Options for increasing education and interpretation services for bus tour groups would be considered, with the goal of increasing visitor appreciation and understanding of park resources.

In general, historic buildings would be adaptively reused for park-related purposes. Maintaining the historic integrity of the Painted Desert headquarters complex would be a priority.

Park archives (including photos), most paleontological resources, natural history specimens, and historic furnishings would continue to be stored in the park in a new headquarters area collections facility. Archeological collections would continue to be stored at the Western Archeological and Conservation Center in Tucson and the Museum of Northern Arizona in Flagstaff. Some paleontological and other artifacts have historically been stored at other locations (e.g., universities and museums). These artifacts would remain at their traditional locations provided the facilities meet NPS collections standards or unless the storage price becomes prohibitive for the National Park Service; in either case the artifacts would be returned to the park.

The National Park Service would keep the employee housing in nearby Holbrook, Arizona, to retain flexibility in housing options and protect the government's investment. If some units are not needed to house employees, the National Park Service would investigate options for partnering with government entities to keep the Holbrook residences occupied and maintained in good condition. More generally, park staff would continue to seek partnerships to adaptively reuse historic park structures and/or provide compatible new buildings for personnel and services that benefit the National Park Service. This would include, but not be limited to, protection and emergency response services, volunteers, researchers, and seasonal employees.

Necessary and appropriate commercial services at Petrified Forest National Park would include the following:

- Concessions at the north (Painted Desert) end of the park: food and beverage service, gift shop, gas station / mini-mart. Food, fuel, and merchandise sales at the north end encourage visitors to remain and experience the park, especially during "spur-of-the-moment" visits. Visitors can eat a meal and purchase supplies like film, hats, and sunscreen before

setting off to enjoy the park. Concession services would be provided at the Painted Desert complex and/or at Painted Desert Inn. Decisions on location would be based on the following criteria: finding adaptive uses for historic structures, maintaining integrity of cultural landscapes, minimizing impacts to natural resources, providing sufficient space for visitors and vehicles, maintaining viability of concessions operations, and providing utility service and waste disposal.

- Concessions at the south end of the park (Rainbow Forest area): food and beverage service, and gift shop. Concession services at the south end allow visitors who travel through the park in either direction the option of remaining at the Rainbow Forest area to see Giant Logs and Long Logs before moving on. These services would remain in the concessions building on the south side of the main parking area unless there is a pressing future need to move them. The current location works well from space and logistics standpoints, and it maintains the historical use of the concessions building (a supporting structure in the Rainbow Forest historic designed landscape, NPS 1999b).

- Guided tours, as specified under the terms of individual incidental business permits. In particular, "step-on" bus tours and low impact, traditional activities such as guided hiking or backpacking tours would be appropriate. Such services would encourage visitors to experience the park's backcountry, help them to understand and appreciate the park's special resources, and ensure that visitor use is compatible with protecting sensitive resources.

Water conservation measures would be incorporated as new visitor and operational structures are built and as older structures are remodeled or updated. Such measures could include low volume flush toilets, water-saving fixtures, and use of rainwater runoff for landscape irrigation, for example.

As in alternative 1, petrified wood would no longer be sold in park gift shops once a new concession contract is awarded.

MANAGEMENT ZONES AND RELATED ACTIONS

The greatest proportion of the park would be managed under the preservation emphasis zone, followed in descending order by the frontcountry zone, administrative road and area zone, transportation corridor zone, historic preservation / adaptive use zone, and backcountry zone. There would be no developed zone or special protection zone in this alternative.

The remaining discussion describes how different areas of the park would be managed and what actions the National Park Service would take under alternative 2. These actions are those believed most likely to take place over the next 15 to 20 years given alternative 2's concept, management zones, the conditions that exist now in the park, and environmental constraints.

Preservation Emphasis Zone

Most of the park would be zoned preservation emphasis, including all wilderness lands (see alternative 2 map). Lands would be managed similarly to the way they are currently managed, but there would be increased emphasis on monitoring and adapting to new information. As park managers learned more about specific threats to resources, they would make adjustments, as necessary, to protect resources. Certain areas might be more directly managed through permits and guided tours, for example.

As in alternative 1, a permit would be required for overnight camping, but no permit would be required for day use. Details of wilderness management would be decided by a wilderness management plan.

Backcountry Corridor

No areas of the park would be managed as the backcountry corridor zone in alternative 2.

Frontcountry Zone

The main road system, plus access points and overlooks at many significant features, would be zoned frontcountry. These features are discussed below, from the south end of the park moving northward.

Giant Logs Trail and Crystal Forest Trail would be managed as frontcountry. These trails would be modified for improved accessibility and resource protection, particularly protection of petrified wood. Modifications could include shortening the trails, better defining the trail edges, or making portions accessible by means of guided tours only (leaving other portions for self-guided tours). Changes to the trails would be made with consideration of possible impacts to cultural landscapes. Park staff would continue to use signs and patrols, as necessary, to prevent disturbance or removal of petrified wood.

The Jasper Forest and Agate Bridge parking lot and overlook areas would be zoned frontcountry, as would the Blue Mesa spur road, associated overlooks, and the Blue Mesa interpretive trail. No significant management changes would be expected for these areas, but vault toilets would be installed near Agate Bridge.

A new universally accessible frontcountry trail would be provided near “The Tepees” badland formation. From a new turnout on the east side of the main park road, the trail would head east along an old roadbed for about one mile. Visitors would retrace their paths to return to their starting point. The trail would provide views of the surrounding landscape, including The Tepees and Blue Mesa.

Several small, informal (gravel) turnouts would be provided adjacent to the main park road. These would serve as backcountry access points where visitors can park to hike into backcountry areas. Park staff would identify sites for the turnouts considering resource sensitivity, existing disturbed areas, and scenic considerations. An information pamphlet would be developed to inform visitors of hiking options (untrailed) from the turnouts. These parking areas would be monitored and changed (e.g., closed or locations changed) as necessary on the basis of resource considerations.

The overlook and parking area at Newspaper Rock and the parking area and trail at Puerco Pueblo would be zoned frontcountry. A new frontcountry loop trail would be provided near the Puerco River. The trail would provide opportunities for birdwatching and learning about the Puerco River system. Parking for the trail would be at the existing Puerco Pueblo lot. As in the no-action alternative, vault toilets would be installed near Puerco Pueblo.

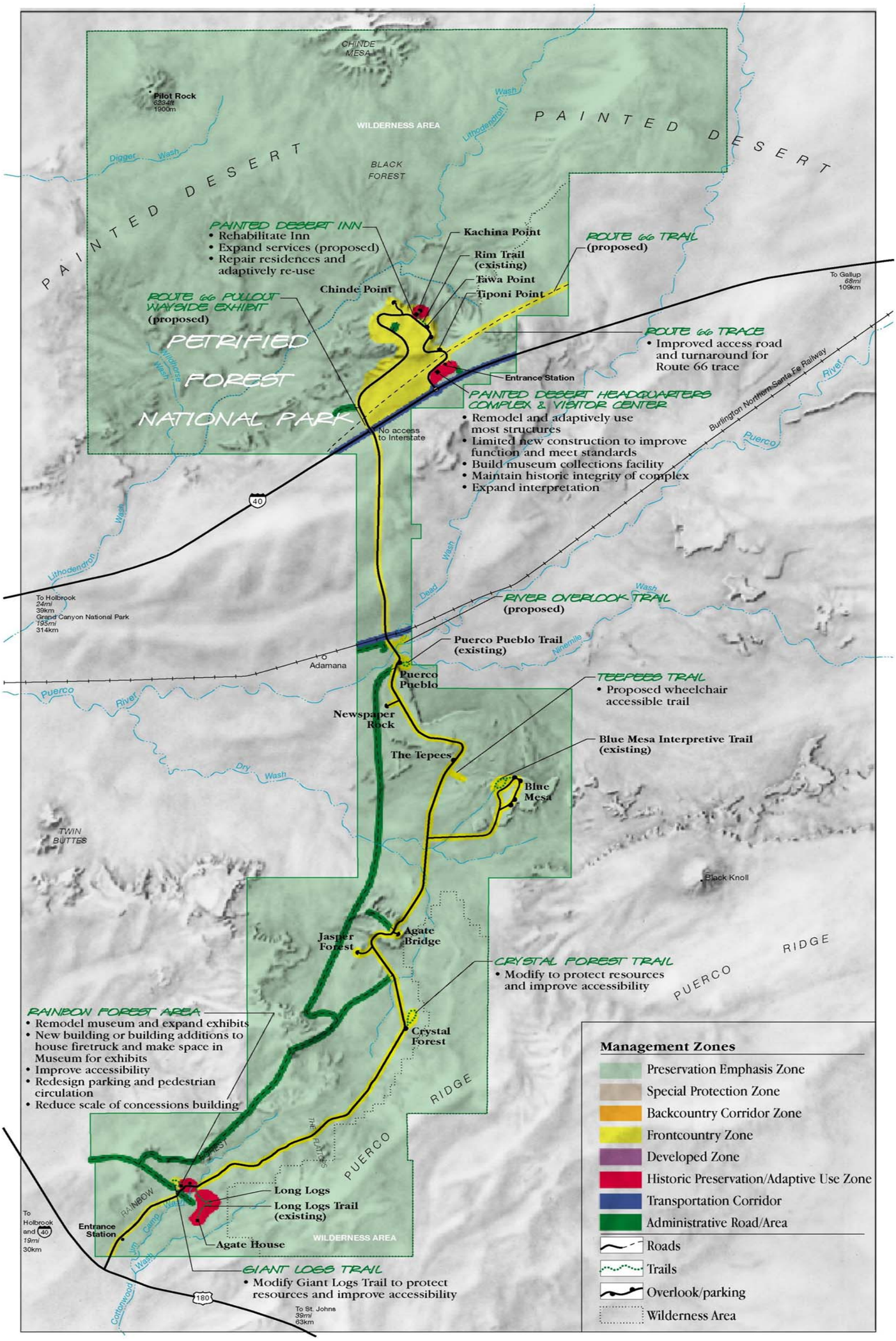
The turnouts / overlooks and parking areas along the main park road north of I-40 would be zoned frontcountry. These areas would generally be managed the same as they are now; the only anticipated change is construction of a turnout with wayside exhibits and an overlook to interpret historic Route 66, located just north of where the park road passes over I-40. Chinde Point (spur road, overlook, and picnic area) would be managed as frontcountry, and the restrooms would be refurbished or replaced with vault toilets, as in the no-action alternative. The portion of the park that is north of I-40 and within the loop formed by the park road would also be zoned frontcountry (see map). This area is relatively free of sensitive resources, e.g., petrified wood, archeological sites, and important wildlife habitat.

Northeast of the headquarters area, a short segment of old Route 66 that is currently used for administrative purposes would be improved and zoned frontcountry. This change would allow visitors to drive to an intact section of Route 66 within the park. This frontcountry road would end at an overlook and parking area with wayside exhibits describing the historic transportation route. The overlook and parking area would also serve as trailhead parking for users of the Route 66 frontcountry trail.

In addition, a new frontcountry trail would follow the Route 66 road trace northeast from the new Route 66 overlook and parking area (located northeast of the visitor center / headquarters). This trail would provide a longer hike for visitors who would like to see more of the park, especially those interested in old Route 66 and vistas of the Painted Desert to the north. The trail, about two miles in length, would end near the eastern boundary of the park. Visitors can hike into the backcountry or wilderness area from this point or return to the parking lot along the same route. Alternative transportation may be studied for future consideration. While there is not present or foreseeable crowding and congestion to warrant alternative transportation, a shuttle bus system may be an effective tool for further prevention of wood theft.

Special Protection Zone

No areas would be zoned special protection in this alternative.



ALTERNATIVE TWO (PREFERRED ALTERNATIVE)

Petrified Forest National Park, Arizona

United States Department of the Interior
National Park Service
PEFO • October 2002 • 110 • 20,016

NORTH

0 2.5 5 MILES

Developed Zone

No areas would be zoned developed in this alternative.

Historic Preservation / Adaptive Use Zone

Three areas would be zoned for historic preservation and adaptive use: the Rainbow Forest complex (including Long Logs Trail) in the south, and the park headquarters complex and Painted Desert Inn in the north.

A few changes would be implemented at the Rainbow Forest area, which includes the museum, residences, maintenance structures, parking and picnic areas, and a concessions building (and small outbuilding). The Rainbow Forest Museum would be remodeled to improve accessibility and provide space for expanded exhibits. To make room for expanded exhibits and universally accessible restrooms, ranger staff offices would be moved out of the museum into a nearby adaptively remodeled structure such as a residence or the old fire truck garage.

A new fire truck garage would be built at the north end of the Rainbow Forest area, where it would be inconspicuous from visitor areas like the museum, concessions building, and main parking area. The building that currently houses the fire truck is also located in the north end of the Rainbow Forest area. The building was enlarged to accommodate the fire truck, but it has insufficient room to meet safety standards and the building addition is not consistent with the character of the original structure.

Most of the residential structures at Rainbow Forest would be used for housing NPS or other support staff such as volunteers. Residential structures not needed for housing would be used for other park-related purposes.

The main parking lot and walkways at Rainbow Forest would be redesigned to improve vehicle and pedestrian flow and reduce potential conflicts between autos and pedestrians. The concessions building, which includes a gift shop and snack bar, would be reduced in scale to appear more similar to its original size and more in keeping with the character of other buildings in the Rainbow Forest area. In general, any new buildings or modifications in the Rainbow Forest area would be sited and designed with the intention of maintaining both the integrity of the area's cultural landscape and separating public uses from residential and operational uses.

The Long Logs Trail area is part of the Rainbow Forest cultural landscape and would be zoned historic preservation / adaptive use. Long Logs proposals from the 1993 GMP are being implemented, as in the no-action alternative. These proposals include converting the Long Logs spur road to a trail, removing the parking lot, and encouraging better understanding of the area by means of a pedestrian / hiking experience.

The Painted Desert headquarters complex, which includes the visitor center, would be zoned historic preservation / adaptive use. Interpretation, including exhibits, would be expanded at the visitor center to improve appreciation and understanding of park resources. Most historic structures in the

complex would be kept, remodeled, and adaptively reused to help meet the need for better function, safety, and accessibility. There is insufficient space (and the wrong kinds of space) in the headquarters complex to fully accommodate park needs. Therefore, additions to buildings and/or some new structures would be constructed. A new collections storage facility that meets NPS standards and includes laboratory work space and a curator's office is one such example.

A charette workshop conducted in February and March 2001 (e^2M 2001) identified several options for improving the Painted Desert headquarters complex while maintaining its historic integrity. Subsequent analyses (see appendix D) indicated that headquarters options with more new construction, but that still preserve the complex's historic integrity, provide the best value (benefits per dollar expended). Thus, in addition to a museum collections facility, new construction could include a maintenance facility, staff offices and work space, and residences, all within the "footprint" of the existing headquarters complex. Additional maintenance and construction projects would be planned and implemented to correct structural problems, stabilize buildings, improve accessibility, and address code deficiencies. Some non-visitor oriented structures (e.g., three employee residences that are in poor condition, maintenance structures, and the large mobile home pad located east of the three-bedroom residences) may be removed. Consideration would also be given to reversing some past structural modifications to restore the original design intent for the complex.

A comprehensive design plan for the headquarters complex would decide the details and phasing for headquarters improvements, including building stabilization, new construction, and other improvements. In any case, modifications to existing structures and new buildings would be planned, sited, designed, and constructed to maintain the historic integrity of the complex.

The Painted Desert Inn area would be managed as historic preservation / adaptive use. Rehabilitation of the inn would continue, as in the no-action alternative. Rehabilitation plans included reroofing the inn, repairing surface cracks, improving universal access, and providing additional exhibits. Services at the Painted Desert Inn might be expanded. A feasibility study would be conducted to find out whether services such as a trading post or limited food service (both are historical uses) could reasonably be provided by a concessioner. Visitor hours at the inn could also be extended, as the north end of the park would open earlier in the morning and close later in the evening in this alternative. The two historic residences near the inn would be repaired and used as residences or offices. If a future alternative transportation system is studied and determine feasible, parking and support would be integrated into the three histories complexes in a manner consistent with their character.

Administrative Road or Area

Several road corridors and associated areas would be managed as administrative roads, but this designation would mean little change from current management. In the south end of the park, the stretch of old US 180 between Rainbow Forest and the west park boundary would be zoned administrative; the NPS materials storage area and horse corrals near the west park boundary would be included.

The Rainbow Forest sewage lagoons and associated access road would be zoned administrative. Portions of the waterline access road in the south of the park would be zoned administrative (see alternative 4 map); visitor use of these road segments would not be encouraged. The small spur road northwest of Agate Bridge would also be zoned administrative.

The sewage lagoon and well area west of Puerco Pueblo and another well and access road adjacent to the railroad would be zoned administrative. At the north end of the park, the NPS target range and its access road, the water storage tank and its access road, the materials storage yard and its spur road, and the sewage lagoons and their access road would be zoned administrative.

Transportation Corridor

Two corridors would be zoned transportation corridors: the I-40 right-of-way and the Burlington Northern-Santa Fe Railroad right-of-way.

BOUNDARY ADJUSTMENTS

No boundary adjustments other than those described and evaluated in the 1993 *Petrified Forest General Management Plan / Environmental Impact Statement* would be proposed under alternative 2.

COSTS AND IMPLEMENTATION

Costs given are for comparison to other alternatives only and are not to be used for budgeting purposes.

Capital costs for alternative 2 are estimated at $25,200,000. Life cycle costs over the 15 to 20 year life of the plan, which include maintenance, operations, and personnel costs (as well as capital costs), are estimated at $65,700,000.

To best protect resources and provide for visitor enjoyment and appreciation, alternative 2 would adaptively use the Painted Desert headquarters complex, rehabilitating the most significant and intact structures, and replacing the most deteriorated structures. The cost of adaptively reusing the headquarters complex as proposed in alternative 2 is very high (about $16,990,000 in life-cycle costs over the next 25 years). Yet alternative 2 would not significantly enlarge visitor or management functions (except for a museum collections and curatorial facility) over their present size. Replacing the Painted Desert headquarters complex, as in alternative 4, would have a similar high cost (about $15,370,000 in life cycle costs). With the backlog of maintenance needed on existing structures in the complex, even alternative 1 (no action) would have a substantial cost (about $11,010,000 in life cycle costs).

The cost estimates prepared for this project are very general at this time. They will become more detailed as more information is collected regarding the condition of the structures and as there are more specifics about their future adaptive use. When more detailed plans and designs are developed, value analysis studies will be included. Value analysis is part of the decision-making process that closely examines the value received for dollars expended. The National Park Service uses these studies to find significant savings and ensure sound projects

of real value. This process will likely yield savings as the project proceeds.

Rehabilitation of the headquarters complex will be difficult to fund in its entirety through finite NPS funding sources. During the GMP planning process, park staff members met with representatives of the Arizona State Historic Preservation Office and the Trust for Historic Preservation to explore the potential for developing partnerships in support of rehabilitating the Painted Desert headquarters complex. During those discussions the significance of the complex and its uniqueness were recurring themes, as was ongoing loss of modern architecture in America. One conclusion from the consultations was that there are indeed potential partners who would be advocates and would help to increase public awareness of the significance of this property and the need for its preservation and rehabilitation. Participants also recognized that some portions of the rehabilitation would, in the future, be eligible to compete for funding from certain grant sources. Participants suggested that a fundraising feasibility study could help determine what level of funding could be raised from non-federal sources. Even so, the general conclusion was that some level of federal appropriations would be needed to undertake and complete the rehabilitation project, as envisioned in alternative 2.

If efforts to fund rehabilitation of the headquarters complex are not successful, alternative 1 (no-action alternative) will be implemented by default. In this case, the National Park Service would continue to maintain the complex to the best of its ability, given limited funding and competing resource priorities in the park. The park would continue to seek funds to complete the most critical needs for maintaining and adaptively reusing the complex.

ALTERNATIVE 3

CONCEPT AND GENERAL MANAGEMENT STRATEGIES

The park would be managed as a resource preserve, valued primarily for its globally significant fossils. Visitor use and understanding would be encouraged, while providing for increased resource protection and visitor safety. To protect sensitive resources, visitors would be encouraged to explore the park primarily in selected frontcountry areas such as Rainbow Forest and Giant Logs. Some sensitive areas would be closed to visitor use. Backcountry access would be carefully managed with permits and/or other methods to protect sensitive resources. Visitors would gain in-depth understanding of the significance of park resources through more tours and programs, multiple media, and interactions with researchers. The value of the park as an outdoor classroom would be emphasized.

The park would open to visitors each day about one hour after sunrise and close about one hour before sunset, as in the no-action alternative.

Park managers would encourage neighbors and partners to develop additional and diverse camping opportunities outside the park. As in the no-action alternative, there would be no campgrounds within the park.

A new museum collections facility would be constructed or adaptively fit into an existing structure at park headquarters. Most museum specimens that are currently stored at other institutions or locations would be returned to the park and stored in the new facility. The facility would include a small park-related research library and a small laboratory with work space for researchers. The park would continue to welcome and encourage scientists who are interested in conducting appropriate research in the park. Additional overnight accommodations for temporary stays would be provided.

The park would divest itself of the 11 staff residences in nearby Holbrook, Arizona. Historic buildings within the park would be used to the greatest possible extent for staff housing or other park purposes and the Holbrook residences would no longer be used.

Necessary and appropriate commercial services at Petrified Forest would include the following (see alternative 2 for additional details):

- concessions at the north (Painted Desert) end of the park: food and beverage service, gift shop, gas station / mini-mart,
- concessions at the south end of the park (Rainbow Forest area): food and beverage service, gift shop, and
- guided tours, as specified under the terms of individual incidental business permits.

As in the no-action alternative, petrified wood would no longer be sold in gift shops in Petrified Forest National Park once a new concession contract is awarded.

MANAGEMENT ZONES AND RELATED ACTIONS

The greatest proportion of the park would be managed under the special protection zone, followed by the preservation emphasis zone, frontcountry zone, administrative road and area zone, transportation corridor zone, historic preservation / adaptive use zone, and backcountry zone. There would be no developed zone in this alternative.

The remaining discussion describes how different areas of the park would be managed and what actions the National Park Service would take under alternative 3. These actions are those believed most likely to take place over the next 15 to 20 years given alternative 3's overall concept, management zones, the conditions that now exist in the park, and environmental constraints.

Preservation Emphasis Zone

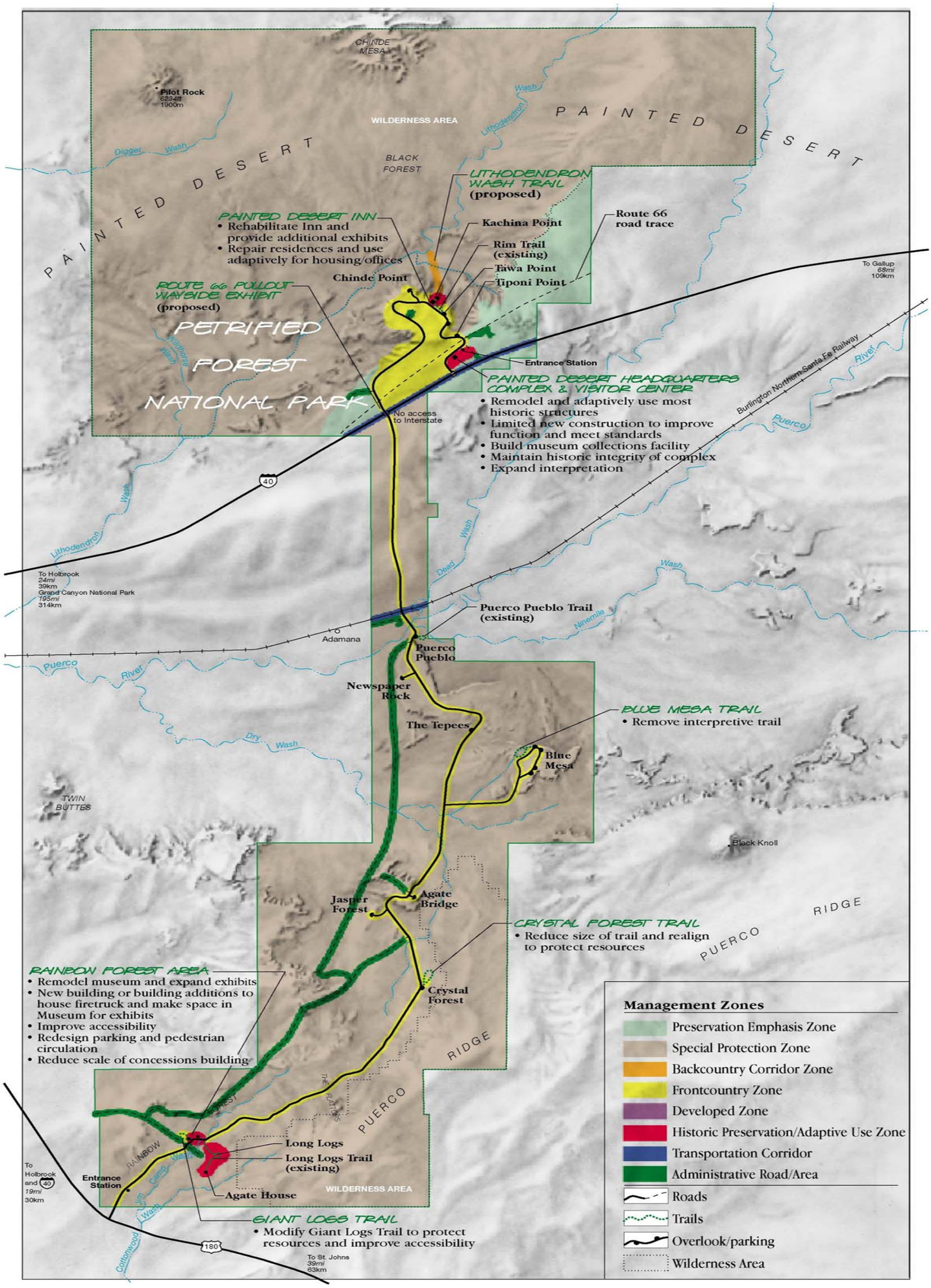
A portion of the park immediately north of I-40 would be zoned preservation emphasis (see alternative 3 map). This area includes a portion of the Route 66 road trace.

Backcountry Corridor

One area in the north part of the park would be zoned as a backcountry corridor in this alternative—the trail from Kachina Point to Lithodendron Wash (see alternative 3 map). The existing trail leads from the Painted Desert Inn down the steep rim face via a series of switchbacks. Once at the desert floor, the trail gradually becomes faint, then disappears. In this alternative, the trail would be better delineated to encourage users to stay on the trail, allowing visitors to experience the Painted Desert badlands without fear of becoming lost, and better protecting fossils and other resources near the trail.

Frontcountry Zone

Access points and overlooks at many of the park's significant features would be zoned frontcountry, as would the main park road system that provides access. These features are discussed below, from the south end of the park moving northward. The Giant Logs Trail, located just west of Rainbow Forest Museum, would be managed to discourage theft of petrified wood and improve accessibility. The trail section adjacent to and visible from the museum would be realigned and made universally accessible. Visitors could continue to use this portion of the trail on their own. The western section of the trail (the portion not visible from the museum) is more difficult to monitor for wood theft, so access would require a guide. A schedule of guided tours would be developed. Other management options could be tried if this solution did not prove effective.



ALTERNATIVE THREE

Petrified Forest National Park, Arizona

United States Department of the Interior
National Park Service
PEFO • October 2002 • 110 • 20,017

At Crystal Forest, the trail area would be shortened and the trail realigned to better protect concentrations of petrified wood. Items such as signs, benches, and barriers could also be installed to encourage people to stay on the trail and off petrified wood. The Jasper Forest and Agate Bridge parking lot and overlook areas would also be zoned frontcountry, and vault toilets would be installed at Agate Bridge or Jasper Forest overlook, but no major changes to these areas would be anticipated.

The Blue Mesa spur road and associated overlooks would be zoned frontcountry. The Blue Mesa interpretive loop trail, which winds off the mesa to the desert floor and back, would be closed and rehabilitated to prevent additional loss of fossils and petrified wood. Barriers would be placed, as necessary, to reduce social trails created by visitors who wander from the overlooks.

The overlook and parking area at Newspaper Rock and the parking area and trail at Puerco Pueblo would be zoned frontcountry; no major changes are anticipated for these sites. As in the no-action alternative, vault toilets would be installed at Puerco Pueblo.

The turnouts and overlooks and the parking areas along the main park road north of I-40 would be zoned frontcountry. These areas would generally be managed the same as they are now. The only anticipated change is construction of a turnout with wayside exhibits and an overlook to interpret historic Route 66, just north of where the park road passes over I-40. Chinde Point (spur road, overlook, and picnic area) would be managed as frontcountry, and the restrooms would be refurbished or replaced with vault toilets, as in the no-action alternative. The portion of the park that is north of I-40 and within the loop formed by the park road would also be zoned frontcountry (see map). This area is relatively free of sensitive resources, e.g., petrified wood, archeological sites, and important wildlife habitat. Alternative transportation may be studied for future consideration. While there is no present or foreseeable crowding and congestion to warrant alternative transportation, a shuttle bus system may be an effective tool for further prevention of wood theft.

Special Protection Zone

Most of the remainder of the park would be managed as a special protection zone because these large areas contain sensitive or special resources (e.g., fossils, archeological sites, and wildlife breeding areas) that are difficult to monitor and protect. Some sensitive and special resources are scattered over the landscape, and others are clustered or associated with particular geographic features. Although visitor use and understanding would be encouraged, visitor use would be highly regulated to protect special resources. Visitors would be required to obtain a permit for day or overnight use or to visit the area as part of a guided tour. They also may be directed away from certain resource areas.

North of I-40, the special protection zone would extend from the rim, where the terrain starts to drop away to the desert floor, north to the park boundary. The zone would include all of the Painted Desert wilderness lands. South of I-40, the special protection zone would include all park lands that are not managed for other purposes, including the Rainbow Forest wilderness lands (see map).

Details of wilderness management would be decided by a wilderness management plan, as in the no-action alternative.

Developed Zone

No areas in the park would be managed as the developed zone under this alternative.

Historic Preservation / Adaptive Use Zone

Three areas would be zoned for historic preservation / adaptive use: the Rainbow Forest complex (including Long Logs Trail) in the south, and the park headquarters complex and Painted Desert Inn in the north.

Several minor changes would be anticipated in the Rainbow Forest area, which includes the museum, residences, maintenance structures, parking and picnic areas, and a concessions building (and concessioner's residence). Offices for ranger staff would be moved from the museum to a nearby residence and/or maintenance building, which would be adapted to accommodate this use. The museum would be remodeled to improve accessibility and provide for expanded exhibits. Some limited new construction (e.g., a fire truck garage) might also be needed to improve accessibility and operations. Accessible restrooms would be provided, either in the remodeled museum or in a new structure. Most of the residential structures would be used for NPS employee housing. If not needed for housing, some structures would be used for other park-related purposes.

The main parking lot and walkways at Rainbow Forest would be redesigned to improve vehicle and pedestrian flow and reduce confusion. The concessions building (gift shop and snack bar) would be modified to reduce its scale and make it more consistent with the cultural scene. In general, any new facilities or facility modifications would be carefully sited and designed to maintain the integrity of the Rainbow Forest cultural landscape.

The Long Logs Trail area is part of the Rainbow Forest cultural landscape and would be zoned historic preservation / adaptive use. Long Logs proposals from the 1993 GMP are being implemented, as in the no-action alternative. These proposals include converting the Long Logs spur road to a trail, removing the parking lot, and encouraging better appreciation of the area by means of a pedestrian or hiking experience.

The Painted Desert Inn area in the north of the park includes the inn and its grounds, two associated historic residences, and the overlook east of the inn. This area would be managed as historic preservation / adaptive use. Rehabilitation of the inn would continue, as in the no-action alternative. Rehabilitation plans include reroofing the inn, repairing surface cracks, improving access, and providing additional exhibits. The two residences would be repaired and used for housing or offices. No other changes to the Painted Desert Inn area are anticipated under this alternative.

The Painted Desert headquarters complex would be zoned historic preservation / adaptive use. Most historic structures in the headquarters complex would be kept and adaptively reused to help meet the need for increased space and improved accessibility. A recent study (e^2M 2001) compared current park space needs with existing space and

found that there is insufficient space (and inappropriate types of space) in the headquarters complex to fully accommodate park needs. Therefore, additions to buildings and/or new structures would also be constructed. In this alternative, a new museum collections facility that meets NPS standards would be built for most items in the collection. It would include laboratory work space for researchers, curator work space, and a small library for park-related publications. A few structures that are not in visitor use areas (e.g., three employee residences that are in poor condition, maintenance structures, and the large mobile home pad east of the three-bedroom residences) may be removed.

In keeping with the management emphasis for the headquarters complex in this alternative, any modifications to existing structures or new buildings would be sited, designed, and constructed to maintain the historic integrity of the complex. To reinforce the original architectural intent, consideration would be given to reversing some modifications to structures that have been made in the past. Additional maintenance and construction projects would be planned and implemented to correct structural problems, stabilize buildings, and address code deficiencies.

Interpretation would be expanded at the Painted Desert visitor center to improve visitor appreciation of park resources and to complement the special protection zone. Expanded interpretation could include "virtual visits" to special backcountry resource areas, multimedia presentations, additional ranger-led programs, and the like. If a future alternative transportation system is studied and determined feasible, parking and support would be integrated into the three historic complexes in a manner consistent with their character.

Administrative Road or Area

Several road corridors and associated areas would be managed as administrative roads; there would be essentially no change from current management. In the south end of the park, the stretch of old US 180 between Rainbow Forest and the west park boundary would be zoned administrative; the NPS materials storage area and horse corrals adjacent to the road near the west park boundary would be included in this zone. The Rainbow Forest sewage lagoons and associated access road would be zoned administrative. The waterline road, which runs roughly parallel to and west of the main park road in the south, and Agate Mesa Road (the small spur road northwest of Agate Bridge) would also be managed as administrative roads.

Near the Puerco River, the sewage lagoon and well area west of Puerco Pueblo, another well, and Adamana Road adjacent to the Burlington Northern-Santa Fe Railroad would be zoned administrative. In the north (Painted Desert) end of the park, the NPS firing range and access road, the water storage tank and access road, the materials storage yard and access road, and the sewage lagoons and access road would be zoned administrative.

Transportation Corridor

Two corridors would be zoned transportation corridors: the I-40 right-of-way and the Burlington Northern-Santa Fe Railroad right-of-way.

BOUNDARY ADJUSTMENTS

No boundary adjustments other than those described and evaluated in the 1993 *Petrified Forest General Management Plan / Environmental Impact Statement* would be proposed under alternative 3.

COSTS AND IMPLEMENTATION

Costs given are for comparison to other alternatives only and are not to be used for budgeting purposes.

Capital costs for alternative 3 are estimated at $20,200,000 to $28,200,000, depending on the scenario for adaptive use and limited new construction at the Painted Desert headquarters complex. Life cycle costs over the 15 to 20 year life of the plan, which include maintenance, operations, and personnel costs (as well as capital costs), are estimated at $62,000,000 to $69,000,000.

ALTERNATIVE 4

CONCEPT AND GENERAL MANAGEMENT STRATEGIES

Globally significant park resources would be protected for future generations, while diverse opportunities for visitors to experience resources would also be provided. Expanded visitor services and exhibits would be provided at existing developed areas. Existing and several new trails would provide a first-hand experience that is highly managed to protect resources. Guided tours would allow more visitors to experience remote areas of the park. Opportunities for visitors to interact with researchers would be limited, but research results would be woven into park interpretive programs. Early morning and evening visitor opportunities would be provided in the north part of the park.

Visitor hours would be expanded in the frontcountry, north of I-40, to provide opportunities for early morning and evening activities, including watching the sun rise or set over the Painted Desert.

Park staff would encourage neighbors and partners to develop additional and diverse camping opportunities outside park boundaries. As in the no-action alternative, there would be no campgrounds within the park.

The museum collections would be moved outside the park to institutions and/or agency facilities that meet NPS standards. Similar specimens would be stored together, enabling scientists to examine related specimens without having to travel to different locations. The park would continue to welcome and encourage scientists who are interested in conducting appropriate research in the park. Additional overnight accommodations for temporary stays and a small laboratory work space would be provided in the park.

Historic structures would be adaptively used for park-related purposes to the greatest extent possible, except in the case of structures in the Painted Desert headquarters complex (see "Developed Area" section below).

The park would keep the 11 units of employee housing in nearby Holbrook, Arizona. If some of the units are not needed to house park employees, the National Park Service would investigate options for partnering with the city of Holbrook and/or the Holbrook School District to make sure that all units are occupied and maintained in good condition.

Necessary and appropriate commercial services at Petrified Forest would include the following (see "Alternative 2" for additional details):

- concessions at the north (Painted Desert) end of the park: food and beverage service, gift shop, gas station / mini-mart
- concessions at the south end of the park (Rainbow Forest area): food and beverage service, gift shop
- guided tours, as specified under the terms of individual incidental business permits

As in the no-action alternative, petrified wood would no longer be sold in gift shops in Petrified Forest National Park once a new concessions contract is awarded.

MANAGEMENT ZONES AND RELATED ACTIONS

The greatest proportion of the park would be managed as the preservation emphasis zone, followed in descending order by the frontcountry zone, backcountry corridor zone, administrative road and area zone, transportation corridor zone, historic preservation / adaptive use zone, and the developed zone. There would be no special protection zone in this alternative.

The remaining discussion describes how different areas of the park would be managed and what actions the National Park Service would take under alternative 4. These actions are those believed most likely to take place over the next 15 to 20 years given alternative 4's overall concept, management zones, the conditions that exist in the park, and environmental constraints.

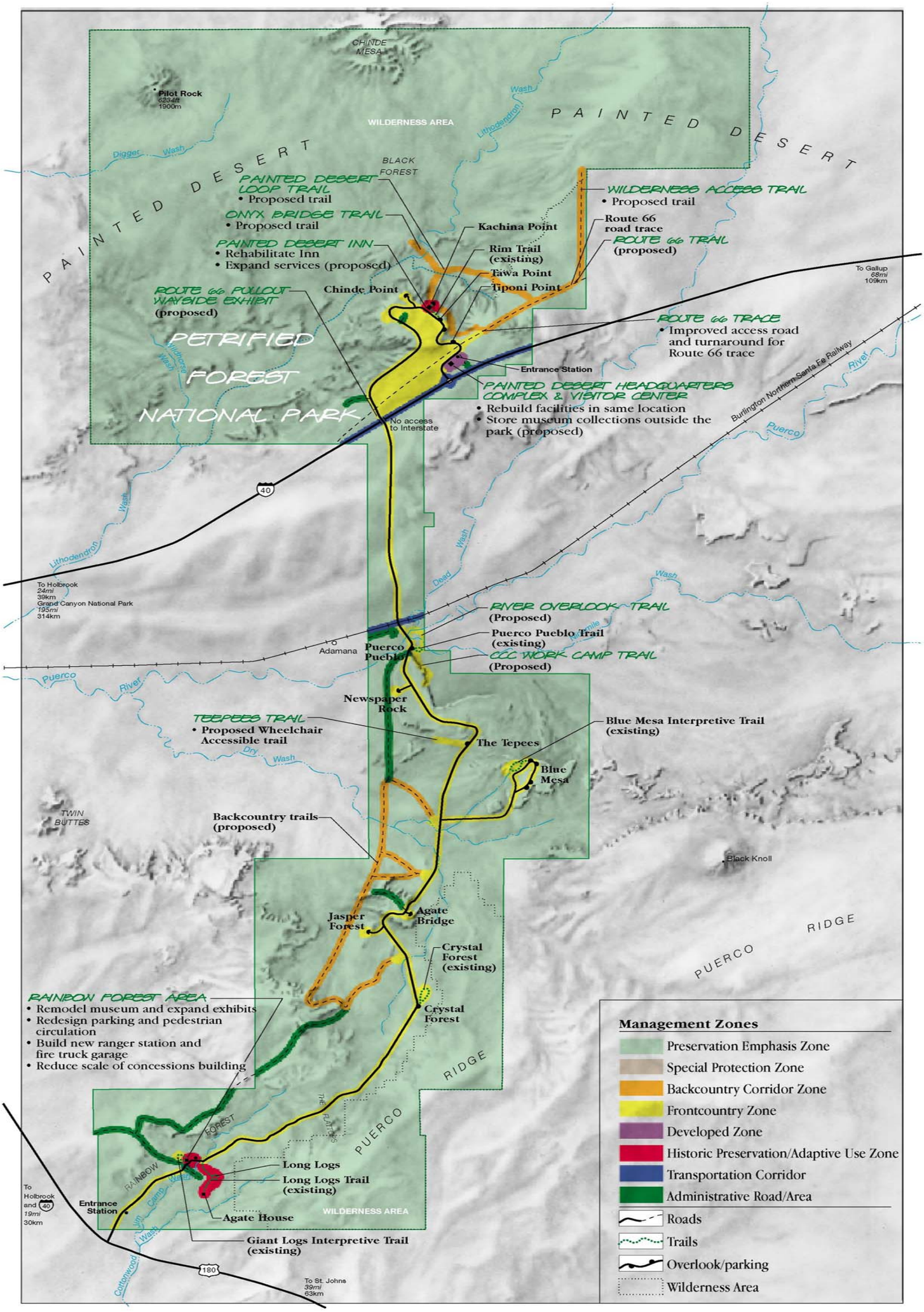
Preservation Emphasis Zone

Most of the park would be zoned preservation emphasis, including all wilderness lands (see alternative 4 map). This designation would mean essentially no change from the way these lands are currently managed. As in the no-action alternative, a permit would be required for overnight camping, but no permit would be required for day use unless increased use and impacts dictate a need for additional permit requirements. Details of wilderness management would be decided by a wilderness management plan.

Backcountry Corridor

In keeping with the alternative concept, several areas would be zoned as backcountry corridors. Designated routes would be illustrated on park maps provided to visitors, and visitors would be encouraged to stay on the trails to minimize inadvertent damage to backcountry resources. These routes would allow visitors to experience less visited areas of the park without fear of becoming lost.

In the southern portion of the park, several unpaved road segments occasionally used for administrative purposes would be zoned backcountry corridor. These include part of the waterline road and shorter segments that connect the waterline road with the main park road. These backcountry corridors provide interesting, moderate-length trail options. Several small trailhead parking areas, located adjacent to the main park road, would be provided for access to these backcountry corridors (see frontcountry zone discussion).



ALTERNATIVE FOUR

Petrified Forest National Park, Arizona

United States Department of the Interior
National Park Service
PEFO • October 2002 • 110 • 20,018

NORTH

0 2.5 5 MILES

In the northern (Painted Desert) portion of the park, there would be several additional backcountry corridors. A new loop trail would lead from Kachina Point (Painted Desert Inn parking area) down into the Painted Desert in a northerly direction. The trail would loop back to the east, where it would connect with the Route 66 road trace. From there visitors could turn southeast and hike along old Route 66, then return to Kachina Point via a new trail segment on the Painted Desert floor. A new spur trail would lead from the loop trail to an interesting geologic feature—Onyx Bridge. Another backcountry corridor trail would provide a designated route for wilderness access. It would follow the Route 66 trace eastward to near the park boundary, then turn north and follow an unmaintained administrative road to the wilderness boundary.

Frontcountry Zone

Access points and overlooks at many significant features would be zoned frontcountry, as would the main park road system providing access. These features are discussed below, from the south end of the park moving northward.

Giant Logs Trail and Crystal Forest Trail would be managed as frontcountry. As in the no-action alternative, park staff would continue to use signs, patrols, and trail barriers, as necessary, to prevent disturbance or removal of petrified wood. Between Crystal Forest and Blue Mesa spur road, several areas near the main park road would be zoned frontcountry to allow small trailhead parking areas for backcountry corridor users. The Jasper Forest and Agate Bridge parking lot and overlook areas would be zoned frontcountry, as would the Blue Mesa spur road, associated overlooks, and the Blue Mesa interpretive trail. No significant management changes would be expected for these areas, but vault toilets would be installed at Agate Bridge or Jasper Forest Overlook.

A new frontcountry trail to the badland formation known as The Tepees would be provided. The Tepees Trail would be universally accessible. Because there are sensitive resources in the vicinity, this trail would be sited, designed, and constructed to minimize resource impacts. The Newspaper Rock overlook and parking area would be zoned frontcountry, but no changes are anticipated there.

Two new frontcountry interpretive trails would be provided in the vicinity of Puerco Pueblo. The first would follow an old road trace east of Puerco Pueblo; it would interpret an old Civilian Conservation Corps (CCC) work camp. The second, a short loop trail, would interpret the Puerco River system and its resources. Trailhead parking for these trails would be at the existing Puerco Pueblo parking area. As in the no-action alternative, vault toilets would be installed at Puerco Pueblo.

The turnouts and overlooks and parking areas along the main park road north of I-40 would be zoned frontcountry. These areas would generally be managed the same as they are now; the only anticipated change is construction of a turnout with wayside exhibits and an overlook to interpret the Route 66 road trace, just north of where the park road passes over I-40. Chinde Point (spur road, overlook, and picnic area) would be managed as frontcountry and the

restrooms would be refurbished or replaced with vault toilets, as in the no-action alternative. The portion of the park that is north of I-40 and within the loop formed by the park road would also be zoned frontcountry (see map). This area is relatively free of sensitive resources like petrified wood, archeological sites, and important wildlife habitat.

Northeast of the headquarters area, a short segment of old Route 66 that is currently used for administrative purposes would be improved and zoned frontcountry. This would allow visitors to drive to an intact section of Route 66 within the park. This frontcountry road would end at an overlook and parking area that would include wayside exhibits that interpret this historic transportation route. The overlook and parking area would also serve as trailhead parking for users of nearby backcountry corridor trails. Alternative transportation may be studied for future consideration. While there is no present or foreseeable crowding and congestion to warrant alternative transportation, a shuttle bus system may be an effective tool for further prevention of wood theft.

Special Protection Zone

No areas would be zoned special protection in this alternative.

Developed Zone

The Painted Desert headquarters complex would be managed as a developed zone. Over a period of several years, the entire complex would be demolished and rebuilt in the same location. New facilities would be designed to accommodate current and anticipated future needs for space, as determined by a 2001 study (e^2M 2001) or more current information, as appropriate. New facilities would be built to current NPS standards and to fire and safety codes, and would be accessible to those with limited mobility. Demolition and construction would be phased, and temporary buildings would be used, as needed, to ensure that park operations were disrupted as little as possible during demolition and construction.

Functions that would be accommodated in the new headquarters complex include a visitor center with exhibit space, concessions (restaurant, gift shop, and service station), and offices and associated work and storage areas for park managers and for administration, resource management, interpretation, maintenance, protection, dispatch, fee collection, and cooperating association staff. Approximately ten employee residences would be built, and adaptable living quarters for seasonal employees, researchers, and park volunteers would be constructed. A small laboratory and work area for researchers would also be provided. If a future alternative transportation system is studied and determined feasible, parking and support would be integrated into the new complex.

Most of the museum collections would be moved outside the park to institutions and/or agency facilities that meet NPS standards.

Historic Preservation / Adaptive Use Zone

Two areas would be zoned for historic preservation / adaptive use: the Rainbow Forest complex (including Long Logs Trail)

in the south and Painted Desert Inn in the north.

At the Rainbow Forest area, the following changes would be anticipated: offices for protection staff would be moved from the museum to a new building located on the north side of the main parking area. This new building would also include a fire truck garage and public restrooms. The building would be sited, designed, and constructed to reinforce historic emphasis on the view to the museum from the Jim Camp Wash bridge and entrance. It would partially screen the Rainbow Forest residential area from the main parking lot. Most of the residential structures would be used for NPS employee housing.

The museum would be remodeled to improve accessibility and provide for expanded exhibits. Offices for interpretation staff and cooperating association storage (i.e., publications) would remain in the museum building.

The main parking lot and walkways at Rainbow Forest would be redesigned to improve vehicle and pedestrian flow and reduce confusion. The concessions building (gift shop and snack bar) would be modified to reduce its scale and make it more consistent with the cultural scene. In general, any new facilities or facility modifications would be carefully sited and designed to maintain the integrity of the Rainbow Forest cultural landscape.

The Long Logs Trail area is part of the Rainbow Forest cultural landscape and would be zoned historic preservation / adaptive use. Long Logs proposals from the 1993 GMP are being implemented, as in the no-action alternative. These proposals include converting the Long Logs spur road to a trail, removing the parking lot, and encouraging better understanding of the area by means of a pedestrian and hiking experience.

The Painted Desert Inn area, north of the park, includes the inn and its grounds, two associated historic residences, and the overlook east of the inn. This area would be managed as historic preservation / adaptive use. Rehabilitation of the inn would continue, as in the no-action alternative. Rehabilitation plans include reroofing the inn, repairing surface cracks, improving access for those with limited mobility, and providing additional exhibits.

Services at the Painted Desert Inn would be expanded. This could include providing limited food service or a trading post—both are historical uses. Visitor hours at the inn could also be extended, as the north end of the park would open earlier in the morning and close later in the evening in alternative 4. The two historic residences near the inn would be repaired and adaptively reused for offices.

Administrative Road or Area

Several road corridors and associated areas would be managed as administrative roads, but this designation would mean little change from current management. In the south end of the park, the stretch of old US 180 between Rainbow Forest and the west park boundary would be zoned administrative; the NPS materials storage area and horse corrals adjacent to the road near the west park boundary would be included in this zone. The Rainbow Forest sewage lagoons and associated access road would be zoned

administrative. Portions of the waterline road in the southern segment of the park would be zoned administrative (see alternative 4 map); visitor use of these road segments would not be encouraged. The Agate Bridge storage road would also be zoned administrative.

Near the Puerco River, the sewage lagoon and well area west of Puerco Pueblo and another well and Adamana Road adjacent to the railroad would be zoned administrative. In the north (Painted Desert) end of the park, the NPS firing range and its access road, the water storage tank and its access road, the materials storage yard and its spur road, and the sewage lagoons and their access road would be zoned administrative.

Transportation Corridor

Two corridors would be zoned transportation corridor: the I-40 right-of-way and the Burlington Northern-Santa Fe Railroad right-of-way.

BOUNDARY ADJUSTMENTS

No boundary adjustments other than those described and evaluated in the 1993 *Petrified Forest General Management Plan / Environmental Impact Statement* would be proposed under alternative 4.

COSTS AND IMPLEMENTATION

Costs given are for comparison to other alternatives only and are not to be used for budgeting purposes.

Capital costs for alternative 4 are estimated to be $25,500,000. Life cycle costs over the 15 to 20 year life of the plan, which include maintenance, operations, and personnel costs (as well as capital costs), are estimated at $64,300,000.

MITIGATION MEASURES COMMON TO ALL ACTION ALTERNATIVES

In the legislation that created the National Park Service, Congress charged the agency with managing lands under its stewardship "in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (NPS Organic Act, 16 United States Code [USC]). As a result, the National Park Service routinely considers and implements mitigation measures whenever activities that could adversely affect the sustainability of resources or systems are anticipated.

A common set of mitigation measures would be applied to the action alternatives in this GMP Revision. The National Park Service would avoid, minimize, and mitigate adverse impacts whenever practicable.

NATURAL RESOURCES

New facilities would be sited in disturbed areas whenever feasible to avoid causing new impacts to resources. Boardwalks, fences, signs, and similar measures would be used to route people off of or away from sensitive resources such as petrified wood and other fossils, while still permitting access to important viewpoints.

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

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

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

Wetlands and riparian habitats would be delineated by qualified specialists and clearly marked before construction work, and these areas would be avoided.

Following completion of construction activities, all areas of disturbed soils and vegetation would be regraded and revegetated as soon as possible. Natural topographic features would be restored to the extent possible using excavated soils from park projects, and native species would be used in all revegetation efforts. Rocks would be used to reestablish surface roughness and to blend the disturbed areas into the landscape. Permeon (or a similar approved treatment method) could be used to match

local soil colors to reduce visibility of the impacts to visitors.

To maximize restoration efforts after completion of construction activities, the following measures would be implemented:

- salvage topsoil from construction for reuse during restoration on disturbed areas to ensure proper revegetation;
- salvage native vegetation for subsequent replanting in the disturbed area; and
- monitor revegetation success for three years following construction, implement remedial and control measures as needed.

Undesirable species such as tamarisk (salt-cedar) (*Tamarix ramosissima*), would be controlled in high-priority areas. Other undesirable species would be monitored and control strategies initiated if these species occur. To prevent the introduction of and to minimize the spread of exotic vegetation and noxious weeds, the following measures would be implemented:

- minimize soil disturbance;
- pressure wash all construction equipment before it is brought into the park;
- limit vehicle parking to existing roads, parking lots, or previously disturbed areas;
- obtain all fill, rock, or additional topsoil from the project area;
- initiate revegetation of a disturbed site immediately following construction activities by spreading desert soil with its associated seed bank; and
- monitor all disturbed areas for two to three years following construction to identify noxious weeds or exotic vegetation.

SPECIES OF CONCERN

Mitigation actions would occur prior to construction to minimize immediate and long-term impacts to rare, threatened, and endangered species. Surveys would be conducted for such species as warranted. Facilities would be sited and designed so as to avoid adverse effects on rare, threatened, and endangered species whenever possible. If avoidance is infeasible, adverse effects would be minimized and compensated for, as appropriate, and in consultation with appropriate resource agencies.

CULTURAL RESOURCES

Efforts would be made to avoid adverse impacts through use of the *Secretary of the Interior's Standards for Archeology and Historic Preservation*, and by using visual screens and/or sensitive designs that are compatible with historic resources.

Mitigation measures, based on consultation with the Arizona State Historic Preservation Office (SHPO), may include documentation according to standards of the Historic American Buildings Survey / Historic American Engineering Record (HABS/HAER). The thoroughness of this documentation, which includes photography, archeological data recovery, and/or a narrative history, would depend on significance (national, state, or local) and individual attributes. When demolition of a historic structure is proposed, architectural elements and objects may be salvaged for reuse in rehabilitating similar structures, or

they may be added to the museum collection. In addition, demolished historic resources may be interpreted for park visitors.

If, during construction, any previously unknown archeological resources are discovered, all work in the immediate vicinity of the discovery would be halted until the resources could be identified and documented and an appropriate mitigation strategy developed in consultation with the Arizona SHPO and other consulting parties.

All proposed documentation, recordation, and mitigation measures for archeological, historical, and ethnographic resources would be stipulated in a memorandum of agreement between Petrified Forest National Park and the Arizona SHPO (and/or, as necessary, the Advisory Council on Historic Preservation). In the event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act (25 USC 3001) (NAGPRA) of 1990, would be followed.

Petrified Forest National Park will consult with associated American Indian tribes (Navajo Nation, Hopi Tribe, Zuni Pueblo, and White Mountain Apache Tribe) to develop and accomplish the programs of the park in a way that respects the beliefs, traditions, and other cultural values of the American Indian tribes who have ancestral ties to park lands. The park will maintain government-to-government relations with associated tribes to ensure a collaborative working relationship, and it will consult regularly with them before taking actions that would affect natural and cultural resources that are of interest and concern to them. The park will accommodate access to, and ceremonial use of, American Indian sacred sites by American Indian religious practitioners in a manner that is consistent with park purposes and applicable law, regulation, and policy.

In compliance with the NAGPRA, the National Park Service would also notify and consult concerned tribal representatives for the proper treatment of human remains and of funerary and sacred objects should these be discovered during the course of projects involving ground disturbance.

SUSTAINABILITY

The National Park Service has adopted the concept of sustainable design as a guiding principle of facility planning and development. The objectives of sustainability are to design NPS facilities to:

- minimize adverse effects on natural and cultural values,
- reflect their environmental setting,
- maintain and encourage biodiversity,
- construct and retrofit facilities using energy-efficient materials and building techniques,
- operate and maintain facilities to promote their sustainability, and
- illustrate and promote conservation principles and practices through the sustainable design and ecologically sensitive use.

Essentially, “sustainability” is living within the environment with the least impact on the ecosystem. Alternative 2 subscribes to and supports the practice of sustainable planning, design, and use of the park and associated public and administrative facilities.

New facilities (e.g., buildings, utilities, roads, and trails) or modified facilities would be designed to fit into their surroundings to the extent practicable, whether those surroundings are historic districts or natural landscapes.

Projects would be sustainable whenever possible, by recycling and reusing materials, by minimizing materials, and by minimizing energy consumption. Facilities would be designed, sited, and constructed to avoid or minimize adverse effects on natural plant and animal communities and visual intrusion into the natural landscape.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

According to Council on Environmental Quality regulations implementing NEPA, and the National Park Service NEPA guidelines (Director's Order–12), an environmentally preferred alternative must be identified in environmental documents. In order for an alternative to be environmentally preferred, it must meet the criteria established in section 101(b) of NEPA and subsequently adopted by the National Park Service:

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;
3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
4. Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;
5. Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The environmentally preferred alternative in this GMP Revision/EIS is NPS alternative 2, the National Park Service preferred alternative. Alternative 2 was chosen as the environmentally preferred alternative because a Choosing By Advantages workshop (see appendix D) and other impact analyses (see "Environmental Consequences" section) indicated that it best met the six criteria listed above.

Alternative 2 places priority on maintenance of the historic integrity of the Painted Desert headquarters complex. In general, historic buildings would be remodeled and adaptively reused for park-related purposes. Visitor services at the Painted Desert Inn would be expanded. At Rainbow Forest, improvements would be made to the museum to improve accessibility and expand exhibit space. Lands would be managed similarly to the way they are currently managed, but there would be greater protection for natural and cultural resources from increased emphasis on resource monitoring and adapting to new information. Certain areas might be more directly managed through permits and guided tours. New trails and turnouts would be provided for visitors to understand and appreciate the park. Early morning and evening visitor opportunities would be provided in the north part of the park. Options for increasing education and interpretation services for bus tour groups would be considered. Park archives, most paleontological resources, natural history specimens, and historic furnishings would be stored in a new headquarters area collections facility. Archeological collections would continue to be stored offsite. Compared to alternative 1 and alternative 3, alternative 2 better accomplishes goals 3 and 5 by providing more diverse visitor experiences. Alternative 2 better meets goals 4 and 6

(protection of natural and cultural resources) than do alternatives 1 (no action) and 4. Alternative 2 best realizes the set of goals in section 101 of NEPA. Therefore, NPS alternative 2 is also the environmentally preferred alternative.

Alternative 1, the no-action alternative, represents continuation of existing management of Petrified Forest National Park by means of the 1993 GMP and other approved plans. Existing operations and visitor facilities would remain in place, concentrated in the Painted Desert and Rainbow Forest areas of the park. Paleontological, archeological, ethnographic, and historic or other cultural resources would be protected, as would the shortgrass prairie, badlands, and most scenic vistas. Park managers would continue to close specific areas and otherwise modify visitor access, as necessary, to address harmful resource impacts. Museum collections would continue to be stored at offsite locations, some of which meet accepted standards for curation, and in substandard facilities at park headquarters. Visitor opportunities to observe and appreciate resources with a minimum of inadvertent or intentional damage would continue, according to current plans, policies, and procedures of resource management personnel at Petrified Forest National Park. Alternative 1 (the no-action alternative) does not fully realize provisions criteria 3, 4, 5, and 6. Alternative 2 and alternative 4 provide for a better, more varied, visitor experience, and alternative 3 provides the greatest level of resource protection.

In alternative 3, Petrified Forest National Park would be managed as a resource preserve, valued primarily for its globally significant fossils. The Painted Desert Inn and associated residences would be rehabilitated, preserved, and adaptively used. The Painted Desert headquarters complex would also be rehabilitated, preserved, and adaptively used, with some additions to existing buildings or new construction to help accommodate park space needs. Plans for the Rainbow Forest area would be similar to those outlined in alternative 2. This alternative would provide the most protection to the natural and cultural resources of the park. To protect sensitive resources, visitors would be encouraged to explore the park, primarily in selected frontcountry areas such as Rainbow Forest and Giant Logs. Some sensitive areas (e.g., Blue Mesa Trail) would be closed to visitor use. Backcountry access would be carefully managed with permits for day and overnight use and/or other methods (e.g., guided tour access only) to protect sensitive resources. Visitors would gain in-depth understanding of the significance of park resources through more tours and programs, multiple media, and interactions with researchers. Most museum specimens currently stored at other institutions or locations would be returned to the park and stored in an adaptively fit or newly constructed museum facility. Alternative 3 best meets goal 4 (protection of cultural and natural resources) compared to the other alternatives, but only partially meets goals 2, 3, and 5.

Alternative 4 would offer first-hand, managed opportunities for visitors to experience park resources. The Painted Desert Inn and associated residences would be rehabilitated, preserved, and adaptively used as in the no-action alternative. In general, historic buildings would be adaptively used, with the exception of the Painted Desert headquarters complex. Over a period of several years, the headquarters complex would be demolished

and rebuilt in the same location. Plans for the Rainbow Forest area would be similar for alternative 2. New trails, turnouts, and other options would expand visitor opportunities to experience and appreciate park resources. Guided tours would allow more visitors to experience remote areas of the park. Opportunities for visitors to interact with researchers would be limited, but research results would be woven into park interpretive programs. Early morning and evening visitor opportunities would be provided in the north part of the park. The museum collections would be moved outside the park to institutions and/or agency facilities that meet NPS standards. Alternative 4 best accomplishes goals 3 and 5 and partially meets goals 2 and 6.

TABLE 2. SUMMARY OF THE MANAGEMENT ALTERNATIVES

	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: PREFERRED ACTION	ALTERNATIVE 3	ALTERNATIVE 4
Alternative Concept	This alternative describes continuation of existing conditions at Petrified Forest National Park. It provides a baseline for evaluating the changes and impacts of the other alternatives. The National Park Service would manage the park as it is currently managed, in accordance with the 1993 GMP and other approved plans. Paleontological, archeological, ethnographic, and historic or other cultural resources would be protected, as would the shortgrass prairie, badlands, and scenic vistas. Park managers would continue to close specific areas and otherwise modify visitor access, as necessary, to address harmful resource impacts. Visitor uses would be reassessed and revised as new information about natural and cultural resource impacts emerges.	Globally significant park resources would be protected for future generations, while some additional opportunities to experience resources would be provided. Visitor services and exhibits would be expanded. New trails and turnouts would be provided for visitors to understand and appreciate the park; these and other new facilities would generally be sited in developed or disturbed areas to minimize resource impacts. Visitor hours would be extended in the frontcountry north of I-40 to allow early morning and evening activities, like watching the sun rise or set over the Painted Desert. Options for increasing education and interpretation services for bus tour groups would be considered, with the goal of increasing visitor appreciation and understanding of park resources.	The park would be managed as a resource preserve, valued primarily for its globally significant fossils. Visitor use and understanding would be encouraged, while providing for increased resource protection and visitor safety. To protect sensitive resources, visitors would be encouraged to explore the park primarily in selected frontcountry areas such as Rainbow Forest and Giant Logs. Some sensitive areas would be closed to visitor use. Backcountry access would be carefully managed with permits and/or other methods to protect sensitive resources. Visitors would gain in-depth understanding about the significance of park resources through more tours and programs, multiple media, and interactions with researchers. The value of the park as an outdoor classroom would be emphasized.	Globally significant park resources would be protected for future generations, while diverse opportunities for visitors to experience resources would also be provided. Expanded visitor services and exhibits would be provided at existing developed areas. Existing and several new trails would provide a first-hand experience that is highly managed to protect resources. Guided tours would allow more visitors to experience remote areas of the park. Opportunities for visitors to interact with researchers would be limited, but research results would be woven into park interpretive programs. Early morning and evening visitor opportunities would be provided in the north part of the park.
Management Zones *Note: Percentages are Approximate*				
Preservation Emphasis	N/A	92%	6%	91%
Backcountry	N/A	N/A	1%	2%
Frontcountry	N/A	4%	3%	3%
Special Protection	N/A	N/A	86%	N/A
Developed	N/A	N/A	N/A	1%
Historic Preservation / Adaptive Use	N/A	2%	2%	2%
Administrative Road or Area	N/A	2%	2%	1%
Transportation Corridor	N/A	4.25 miles	4.25 miles	4.25 miles
Cultural Resources	• Continue to rehabilitate and adaptively use the NRHP-listed Painted Desert Inn and two associated residences according to current plans. • Manage structures in the Rainbow Forest cultural landscape as they are currently. • Continue to allow recovery of the Route 66 road trace to a natural environment. • Continue to manage for the protection of cultural resources (e.g., archeological, ethnographic, and historic resources) while making them available for appropriate visitor use.	• Continue to rehabilitate and adaptively use the Painted Desert Inn as in the no-action alternative. A feasibility study would be conducted to determine if expanded services (e.g., a trading post or limited food service) could reasonably be provided by a concessioner. • Repair the two historic residences at the Painted Desert Inn for use as residences or offices. • At Rainbow Forest, remodel the museum to improve accessibility and expand exhibit space; adaptively use a residence or the old fire truck garage for ranger offices; construct a new fire truck building inconspicuous from visitor areas like the museum, concessions building, and main parking area; use residential structures not needed for housing NPS or support staff for other park-related purposes; redesign the main parking lot and walkways to improve vehicle and pedestrian flow; and reduce the scale of the concessions building to keep with the character of other buildings in the Rainbow Forest cultural landscape. • Provide additional protection to cultural resources (e.g., archeological, ethnographic, and other resources) by applying the preservation emphasis zone to most of the park, requiring permits and guides in certain areas.	• Continue to rehabilitate and adaptively use the NRHP-listed Painted Desert Inn and two associated residences as in the no-action alternative. • At Rainbow Forest, remodel the museum to improve accessibility and expand exhibit space; adaptively use a residence or the maintenance building for ranger offices; use residential structures not needed for housing NPS or support staff for other park-related purposes; construct a new fire truck building and/or accessible comfort station; redesign the main parking lot and walkways to improve vehicle and pedestrian flow; and reduce the scale of the concessions building to keep with the character of other buildings in the Rainbow Forest cultural landscape. • Provide the most protection to cultural resources (e.g., archeological, ethnographic, and other resources) by applying the special protection zone to most of the park. Options for accessing all of this zone include permits for day or overnight use, or as part of a guided tour.	• Continue to rehabilitate and adaptively use the NRHP-listed Painted Desert Inn and two associated residences as in the no-action alternative. A feasibility study would be conducted to determine if expanded services (e.g., a trading post or limited food service) could reasonably be provided by a concessioner. • At Rainbow Forest, remodel the museum to improve accessibility and expand exhibit space; construct a new building for protection staff, a fire truck garage, and public restrooms; use residential structures for NPS housing; redesign the main parking lot and walkways to improve vehicle and pedestrian flow; and reduce the scale of the concessions building to keep with the character of other buildings in the Rainbow Forest cultural landscape. • Provide additional protection to cultural resources (e.g., archeological, ethnographic, and other resources) by applying the preservation emphasis zone to most of the park, requiring permits and guides in certain areas.
Management of the Painted Desert Headquarters Complex	• As limited funds allow, continue to make cosmetic repairs and repairs related to safety at the NRHP-eligible Painted Desert headquarters complex.	• Continue to rehabilitate, preserve, and adaptively use the NRHP-eligible Painted Desert headquarters complex. Maintaining the historic integrity of the complex is a priority. Some additions to existing buildings or new construction helps accommodate park space needs.	• Continue to rehabilitate, preserve, and adaptively use the NRHP-eligible Painted Desert headquarters complex. Maintaining the historic integrity of the complex is a priority. Some additions to existing buildings or new construction helps accommodate park space needs.	• Over a period of several years, demolish and rebuild the complex in phases in the same location.

	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: PREFERRED ACTION	ALTERNATIVE 3	ALTERNATIVE 4
Natural Resources	• Continue to manage natural resources (e.g., paleontological resources, shortgrass prairie, badlands, and scenic vistas) for the perpetuation and protection of the natural environment while making them available for appropriate public use.	• Provide additional protection to natural resources (e.g., paleontological resources, shortgrass prairie, badlands, and scenic vistas) by applying the preservation emphasis zone to most of the park, requiring permits and guides in certain areas. • Modify trails (e.g., shorten them, better define trail edges, or make portions accessible only via guided tours) at Giant Logs and Crystal Forest for enhanced resource protection, particularly petrified wood protection.	• Provide the most protection to natural resources (e.g., paleontological resources, shortgrass prairie, badlands, and scenic vistas) by applying the special protection zone to most of the park. Options for accessing this zone include permits for day or overnight use, or as part of a guided tour. • Modify trails (e.g., shorten them, better define trail edges, or make portions accessible only via guided tours) at Giant Logs and Crystal Forest for enhanced resource protection, particularly petrified wood protection. • Close and rehabilitate the Blue Mesa interpretive loop trail to prevent additional loss of fossils and petrified wood.	• Provide additional protection to natural resources (e.g., paleontological resources, shortgrass prairie, badlands, and scenic vistas) by applying the preservation emphasis zone to most of the park, requiring permits and guides in certain areas as necessary.
Museum Collections	• Continue to store museum collections at several offsite locations, some of which meet accepted standards for curation, and in substandard facilities at park headquarters.	• Store park archives, most paleontological resources, natural history specimens, and historic furnishings at the park in a new headquarters area collections facility. Paleontological resources stored at other locations would remain there provided the facilities meet NPS collection standards, or unless the storage price becomes prohibitive. • Archeological collections would continue to be stored offsite.	• Construct a new museum collections facility or adaptively fit one into an existing structure at park headquarters. • Store most museum collections currently offsite in the new facility.	• Museum collections would be moved outside the park to institutions and/or agency facilities that meet NPS standards. • Similar specimens would be stored together, enabling scientists to examine related specimens without traveling to different locations.
Visitor Experience Appreciation	• Continue to open the park each day about one hour after sunrise and close it about one hour before sunset. • Continue to manage the Giant Logs, Crystal Forest, Blue Mesa, and Puerco Pueblo Trails to allow visitors to observe and appreciate resources with a minimum of inadvertent or intentional damage.	• Extend hours in the frontcountry north of I-40 to allow early morning and evening activities, like watching the sunrise or sunset. • Provide new opportunities for visitor experience/appreciation: a new universally accessible trail near The Tepees formation; small, informal turnouts adjacent to the park road that would serve as backcountry access points; a new frontcountry loop trail at Puerco River for birdwatching and learning about the river system; a new frontcountry driving experience, overlook parking area, and wayside exhibits at the Route 66 road trace. • Consider options for increasing education and interpretation services for bus tour groups.	• Continue to open the park each day about one hour after sunrise and close it about one hour before sunset, as in alternative 1. • Provide a better delineated trail from Kachina Point to the Painted Desert floor to allow visitors to experience the badlands without the fear of becoming lost. • Manage a portion of the Giant Logs Trail to improve universal accessibility. • Expand interpretation at the Painted Desert Visitor Center to include virtual visits, multimedia presentations, additional ranger-led programs, and the like. • Close the Blue Mesa interpretive loop trail to prevent additional loss of fossils and petrified wood.	• Extend hours in the frontcountry north of I-40 to allow early morning and evening activities, like watching the sunrise or sunset. • Provide new opportunities for visitor experience appreciation. These include: converting unpaved road segments to backcountry trail options in the southern part of the park with informal trailhead turnouts; a new loop trail from Kachina Point, including a segment of the Route 66 road trace, and a spur trail to Onyx Bridge; and a new backcountry trail along the Route 66 road trace to the boundary of the park and northward towards the wilderness area; a new universally accessible trail near The Tepees formation; two new frontcountry trails near Puerco River; and a new frontcountry driving experience, overlook parking area, wayside exhibits, and backcountry trailhead at the Route 66 road trace.
Holbrook Housing	• Keep the 11 housing units in Holbrook, Arizona. Some would likely remain unused and continue to deteriorate.	• Keep the 11 housing units in Holbrook, Arizona. If some units are not needed, the National Park Service would investigate options for partnering with government entities to keep the Holbrook residences occupied and maintained in good condition.	• The park would divest itself of the 11 housing units in Holbrook, Arizona.	• Keep the 11 housing units in Holbrook, Arizona. If some units are not needed, the National Park Service would investigate options for partnering with government entities to keep the Holbrook residences occupied and maintained in good condition.
Estimated Costs Over the 15-Year Life of the Plan	$40,000,000	$65,700,000	$62,000,000 to $69,000,000	$64,300,000

TABLE 3. SUMMARY OF THE IMPACTS OF THE ALTERNATIVES

IMPACT TOPIC	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: PREFERRED ALTERNATIVE	ALTERNATIVE 3	ALTERNATIVE 4
Archeological Resources	Localized archeological impacts from visitor use, livestock trespass, park operations and facilities, and natural processes would be long term, adverse, and range from minor to major, depending on the archeological site.	There would be increased potential for trampling of archeological sites, disturbance of resources, vandalism, and theft in areas where new trails are proposed (near Route 66, Puerco River, east of The Teepees). Impacts would be long term, minor to moderate, and site-specific. Other actions related to changes to a portion of old Route 66 and new turnouts along the main park road would have minor, localized, long-term impacts on subsurface archeological resources. Trail modifications at Crystal Forest and Giant Logs would benefit archeological sites; impacts would be long term, localized, and minor. Impacts to archeological resources from a new fire truck garage at Rainbow Forest, and other facilities at the headquarters complex would be localized, long term, negligible, and adverse. Other impacts would be the same as for alternative 1.	Implementation of the special protection zone could contribute to less trampling, moving, vandalism, and theft of archeological resources. However, overall impacts from visitor use would remain long term, adverse, and minor to major, depending on the site. Trail reductions at Crystal Forest and Giant Logs would have long-term, localized, and minor, beneficial impacts. Potential impacts from construction of a new museum collections facility would be localized, long term, negligible, and adverse. Other impacts would be the same as for alternative 1.	Alternative 4 would allow for increased impacts near Route 66, the Puerco River, and new backcountry corridor trails. Parkwide, there would be minimal change (from alternative 1) in impacts from trampling, moving, vandalism, and theft of resources. Potential impacts from reconstruction of the Painted Desert headquarters complex would be localized, long term, negligible, and adverse.
Historic Structures	Two residence structures near Painted Desert Inn would continue to deteriorate, potentially resulting in a long-term, site-specific, minor, adverse impact. Without major stabilization and renovation, the Painted Desert headquarter complex would continue to deteriorate, and in some cases, fail. Depending on the building, this could constitute a moderate to major, long-term, adverse impact to the historic Painted Desert headquarters complex.	Impacts to the Painted Desert Inn would be the same as in alternative 1. Rehabilitation of residences near Painted Desert Inn would result in a long-term, site-specific, minor, beneficial impact. Modifications to buildings at Painted Desert headquarters complex for adaptive reuse, plus addition of a few new structures to accommodate current and future space need, would further change character-defining features of the complex if not properly designed, resulting in a long-term, site-specific, moderate to major, adverse impact.	Same as alternative 2.	Impacts to the Painted Desert Inn would be the same as for alternative 1. Demolishing and rebuilding the Painted Desert headquarters complex would result in a regional, long-term, major, adverse impact to the resource.
Cultural Landscapes	Reversing some past modifications to historic structures at Rainbow Forest would have a site-specific, long-term, minor to moderate, beneficial effect to the Rainbow Forest historic landscape. Continued high use at Crystal Forest would result in loss of petrified wood and degradation of the visual quality, a site-specific, long-term, minor, adverse impact to the Crystal Forest cultural landscape. Continued high use of Puerco Pueblo would result in degradation of the character-defining features, such as damage to archeological resources, resulting in a long-term, negligible to minor, adverse impact to the cultural landscape.	Changes at Rainbow Forest would create mixed impacts on the cultural landscape. Reducing the scale of the concessions building would have a long-term, negligible or minor, beneficial effect. Proposed parking and walkway realignment would have a long-term, minor to moderate, adverse impact. Addition of new structures would result in a long-term, moderate, adverse impact, and reconfiguration of the Giant Logs Trail would have a long-term, minor, adverse impact. At Crystal Forest, shortening and realigning the trail at Crystal Forest would have a long-term, minor, adverse impact to the cultural landscape. Proposed new trails near Puerco Pueblo and The Tepees would have long-term, minor to moderate, adverse impacts on a potential archeological cultural landscape.	Reconfiguration of Giant Logs and Crystal Forest Trails would have long-term, minor, adverse impacts on the Rainbow Forest and Crystal Forest cultural landscape. Reducing the scale of the concessions building would have a long-term, negligible or minor, beneficial effect to the historic landscape. Other new facilities at Rainbow Forest have long-term, minor to moderate, adverse impacts to the historic landscape. The proposed parking realignment would have a long-term, minor to moderate, adverse impact to the historic landscape. Impacts associated with the Puerco River and Painted Desert Inn would be the same as for alternative 1.	Changes at Rainbow Forest would have mixed impacts on the cultural landscape. Reducing the scale of the Rainbow Forest concessions building would have a long-term, negligible or minor, beneficial effect. Proposed parking and walkway realignment would have a long-term, minor to moderate, adverse impact. Adding a new structure on the north side of the parking lot at Rainbow Forest could have a long-term, moderate, adverse impact. Proposed new trails near Puerco Pueblo and The Tepees would have long-term, minor to moderate, adverse impacts on a potential archeological cultural landscape. Proposed trail changes below Painted Desert Inn would have a long-term, negligible to minor, adverse impact if determined to be a cultural landscape. Impacts associated with proposed actions for Crystal Forest would be the same as for alternative 1: site-specific, long-term, minor, adverse impact to this landscape.
Ethnographic Resources	Ethnographic resource impacts related to visitor use would be long term, adverse, and minor to major depending on the resource. Impacts from park operations would be long term, minor, localized, and adverse. Impacts from natural processes would be long term, adverse, and minor to major depending on the site.	Same as alternative 1.	Fewer visitors would come into contact with sensitive ethnographic resources in the special protection zone, which would lead to less trampling, moving, vandalism, and theft of resources. Overall impacts from visitor use would remain minor to major, depending on the resource. Impacts from park operations would be long term, minor, localized, and adverse. Impacts from natural processes would be long term, adverse, and minor to major, depending on the site.	Same as alternative 1.
Museum Collections	Museum collections are threatened by environmental factors and lack of space. Museum collections would continue to suffer long-term, adverse, moderate impacts from facility shortcomings and long-term, minor to moderate, adverse impacts from inaccuracies in recordkeeping and accountability, and from limited work space.	The new museum collections facility at Painted Desert headquarters complex would have a long-term, major, beneficial impact. Offsite collections would be stored only at facilities that meet NPS standards, a long-term, negligible to moderate, beneficial effect. No cumulative impacts to museum collections would be expected.	Construction of a new museum collections facility would have a long-term, major, beneficial impact. Consolidating collections at the park would make all items accessible in one location for study and protection, a long-term, moderate, and beneficial impact. Better recordkeeping and accountability associated with consolidated collections would have a long-term, minor to moderate, beneficial impact, depending on whether a full-time curator is hired. Some researchers could be inconvenienced by having to travel to the relatively remote park to access the park museum collection.	Benefits from moving museum collections to facilities where they would receive better protection would be long term, moderate, and beneficial. Offsite researchers would be able to access certain aspects of collections more easily and gain information from the items, a long-term, minor, beneficial impact. Better recordkeeping and accountability would have a long-term, minor, beneficial impact. Offsite storage at more than one location could have a minor, long-term, adverse impact on the park staff's ability to gain a complete picture of the collections. No cumulative impacts would be expected.

IMPACT TOPIC	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: PREFERRED ALTERNATIVE	ALTERNATIVE 3	ALTERNATIVE 4
Petrified Wood and Other Fossils	Long-term, major, adverse impacts would be anticipated at Crystal Forest, Giant Logs, Jasper Forest, and Blue Mesa from continued disturbance and theft of paleontological resources. Long-term, minor to moderate, adverse impacts would be expected in the backcountry, depending on the site.	Long-term, negligible to moderate, adverse impacts from theft and displacement of petrified wood would be expected to continue at Jasper Forest, Agate Bridge, and Blue Mesa. Modifications to trails and trail management at Crystal Forest and Giant Logs would have short-term, negligible to moderate, beneficial effects on petrified wood, but long-term, major, adverse impacts to petrified wood near the Crystal Forest parking area would probably continue. Impacts would be long term, negligible to minor, and adverse over the rest of Crystal Forest and Giant Logs areas. Long-term, minor, adverse impacts would be expected from construction of the roadbed trail near The Tepees. Long-term, minor to moderate, adverse impacts (depending on the site) would be expected to continue in the backcountry.	Despite benefits from rezoning most of the park as a special protection zone, long-term, negligible, adverse impacts would be likely to continue. Better delineating the trail from Kachina Point to Lithodendron Wash, and shortening and realigning the trail at Crystal Forest would result in short-term, negligible to moderate, beneficial effects. Changes in management of Blue Mesa Trail (which would be closed), and Giant Logs Trail would have long-term, minor to moderate, beneficial impacts on petrified wood and other fossils.	Impacts to high-use frontcountry areas like Giant Logs, Blue Mesa, Crystal Forest, Jasper Forest, Agate Bridge, and Long Logs would be the same as for alternative 1. Impacts from building a new frontcountry trail near The Tepees would have a long-term, minor, adverse impact. New backcountry corridor routes in the Painted Desert area would have long-term, moderate, adverse impacts to petrified wood in this part of the park.
Vegetation	Hikers trampling vegetation in the wilderness areas of the park result in local, long-term, negligible to minor, adverse impacts to vegetation.	Negligible to minor, localized, adverse impacts would be anticipated from increased backcountry hiking opportunities that could result in increased trampling of vegetation in the wilderness areas. However, negligible to minor, localized, beneficial effects could result from better delineating the trail from Kachina Point to Lithodendron Wash. Negligible to minor, long-term, local, adverse impacts on vegetation resources at the park would occur from construction of several small informal turnouts adjacent to the main park road for backcountry access; construction of the turnout and wayside exhibit interpreting Route 66; improvements to the Route 66 road trace; construction of a Puerco River overlook trail; and construction of a parking area / universally accessible trail near The Tepees. Some beneficial effects could occur from construction of the Puerco River overlook trail (as a result of removing tamarisk, if necessary), and from encouraging concessioners to provide low-impact, guided hiking and backcountry experiences. These effects would be negligible to moderate, local, short- and long-term, beneficial impacts.	Despite efforts to reduce trampling of vegetation, long-term, localized, negligible, adverse impacts to vegetation resources would be anticipated to occur from off-trail hiking. Construction of the turnout and wayside exhibit interpreting Route 66 would constitute a negligible, localized, long-term, adverse impact on vegetation resources.	Localized, negligible to minor, adverse impacts on vegetation resources would be expected from construction of small trailhead parking areas and several new backcountry trails; off-trail hiking in these areas; construction of the turnout and wayside exhibit interpreting Route 66; improvements to the Route 66 road trace; construction of a Puerco River overlook trail; construction of a CCC work camp trail; and construction of a parking area/universally accessible trail near The Tepees. Some beneficial effects could occur from construction of the Puerco River overlook trail (as a result of removing tamarisk, if necessary), and from encouraging concessioners to provide low-impact, guided hiking and backcountry experiences. These effects would be negligible to moderate, local, short- and long-term, beneficial impacts.
Soils	Impacts to soils, including cryptobiotic soils, that result from off-trail hiking in the wilderness areas would constitute negligible to minor, somewhat localized, adverse impacts to soils.	Increased backcountry hiking opportunities could increase soil disturbances in the wilderness areas resulting in negligible to minor, localized, adverse impacts. Negligible, site-specific, long-term, adverse impacts on soils would be expected from construction of several small informal turnouts adjacent to the main park road for backcountry access, and construction of the turnout and wayside exhibit interpreting Route 66. Improvements to the Route 66 road trace, construction of a Puerco River overlook trail, and construction of a parking area / universally accessible trail near The Tepees would result in negligible to moderate, short- and long-term, site-specific, adverse impacts on soils at the park. Negligible, local, adverse impacts to cryptobiotic soils would continue as a result of off-trail hiking. Negligible to moderate, site-specific, beneficial effects would be anticipated for cryptobiotic and highly erosive soils as a result of guided hikes and backcountry trips compatible with this alternative. Some negligible to moderate, site-specific, short-term, adverse impacts to soils would result from construction workers and the use/storage of equipment.	Impacts to soils in the backcountry would be expected to be the same as in alternative 1, as a result of off-trail hiking in the wilderness areas of the park. Minor, site-specific, long-term, beneficial effects on cryptobiotic and highly erosive soils could occur from careful management of the backcountry, including closing certain areas, providing guided tours, and/or directing visitors away from such soils. Negligible, long-term, site-specific, beneficial effects to soils would also result from closing the Blue Mesa Trail and reducing the footprint of the trail at Crystal Forest. Long-term, negligible, site-specific, adverse impacts on soils would be anticipated from construction of a turnout with wayside exhibits and an overlook to interpret historic Route 66. Minor, localized, adverse impacts to cryptobiotic soils would occur due to off-trail hiking in the wilderness areas of the park; however, the extent of impact is unknown. Negligible to moderate, site-specific, short-term, adverse impacts to soils would result from construction workers and the use/storage of equipment.	Construction of small trailhead parking areas would have long-term, site-specific, negligible, adverse impacts on soils. Off-trail hiking could have long-term, somewhat local, minor to moderate, adverse impacts on soils. Construction of turnouts and wayside exhibits would constitute a negligible, site-specific, long-term, adverse impact on soils. Improvements to the Route 66 road trace, trail construction, and construction of a parking area/universally accessible trail near The Tepees would result in negligible to minor, long-term, local or site-specific, adverse impacts on soils at the park. Some negligible to moderate, site-specific, short-term, adverse impacts to soils would result from construction workers and the use/storage of equipment.
Visitor Experience and Appreciation	Long-term, moderate, adverse, impacts would be expected from dated exhibits, orientation materials, and interpretive media. Lack of diverse visitor opportunities and fully accessible facilities would also have long-term, moderate, adverse impacts. Discontinuation of petrified wood sales in gift shops in the park would have a long-term, minor, adverse impact on visitor experience and appreciation.	Various accessibility improvements and additional space at Painted Desert headquarters complex and Rainbow Forest Museum for improved exhibits would have long-term, moderate, beneficial impacts. Parking and walkway improvements at Rainbow Forest, and new turnouts, trails, and vehicle access to a portion of old Route 66 would have long-term, minor to moderate impacts. However, certain new trails and turnouts could have a long-term, minor, adverse impact on visitors desiring unmarred views of the Painted Desert and a remote backcountry experience. Extended hours and the potential for expanded visitor services at the Painted Desert Inn would have long-term, minor to moderate, beneficial impacts on visitor experience and appreciation. Development of an information pamphlet to inform visitors about off-trail hiking options would have a long-term, beneficial, minor impact.	Visitors would experience minor, long-term, adverse impacts from trail closures and reductions, and by the permit requirement for independent entrance into the special protection zone. Minor, long-term, beneficial impacts would result from the availability of guided trips into the special protection zone, the Route 66 turnout and wayside exhibit, and the opportunity to interact with researchers. Parking and walkway improvements at Rainbow Forest would produce a long-term, minor to moderate, beneficial impact. Universal accessibility improvements at Giant Logs Trail, Rainbow Forest Museum, and Painted Desert headquarters complex would have a minor to moderate, beneficial impact. Expansion of interpretive programs would have a moderate, long-term, beneficial impact. Creation of more space for better exhibits and media at Rainbow Forest Museum and Painted Desert headquarters complex would constitute a long-term, beneficial, major impact.	New trails and turnouts would have a long-term, minor, adverse impact on views of natural scenery (Painted Desert) and on visitors seeking remote backcountry experiences. Minor, long-term, beneficial impacts would result from the new Route 66 turnout and wayside exhibit, and new vehicle access to a portion of Route 66. Moderate, long-term, beneficial impacts would result from extended park hours in the northern portion of the park, more visitor services at the Painted Desert Inn, new trails, more backcountry access, and more turnouts. Major, long-term, beneficial impacts would also be expected from improved accessibility.

IMPACT TOPIC	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: PREFERRED ALTERNATIVE	ALTERNATIVE 3	ALTERNATIVE 4
National Park Operations	General Operations: Painted Desert headquarters complex facility problems (e.g., limited space, deteriorating structures, health and safety concerns) have long-term, minor to major, adverse impacts on park operations. Energy Requirements and Conservation Potential: Implementing this alternative would not affect energy requirements at Petrified Forest National Park. Energy conservation potential is limited under this alternative. Few energy conservation techniques could be implemented without incurring significant costs. Long-term, minor, adverse impacts to energy conservation potential would be expected.	General Operations: Long-term, moderate, adverse, impacts to park operations would be expected from trail modifications at Giant Logs and Crystal Forest and expanded interpretation at Rainbow Forest and the Painted Desert headquarters complex. Long-term, moderate, beneficial effects on park operations would be expected from improved work space conditions, removing deteriorated structures, increases in available space, and improved operational efficiency for employees, visitors, and researchers and scientists. Expanded services at the Painted Desert Inn and extended park hours in the north would have long-term, minor to moderate, adverse impacts on park operations. Energy Requirements and Conservation Potential: Long-term, negligible, adverse impacts to energy requirements at the park would continue. Incorporation of sustainable development technologies in a few new structures would have negligible, long-term, beneficial effects on the potential to conserve energy.	General Operations: Long-term, moderate, adverse impacts to park operations would result from providing guided access only to the western portion of Giant Logs; increased interpretation throughout the park; maintenance associated with new interpretive technologies and monitoring systems; maintaining the Kachina Point to Lithodendron Wash Trail; and administering and monitoring an expanded permit program. These adverse impacts would be due to increases in staff to accommodate new interpretive programs, maintenance, and monitoring, as well as new maintenance responsibilities. Beneficial effects of implementing alternative 3 would result from increased accessibility to facilities; better housing and working conditions; proper storage of museum collections; removal of deteriorating structures that require ongoing maintenance; more efficient maintenance operations; and closing Blue Mesa Trail. Morale would be enhanced as a result of better housing and working conditions. Less maintenance would be required for inadequate structures such as residences. Renovating and reusing structures would alleviate some health and safety concerns. Long-term, beneficial impacts would range from minor to moderate in intensity. Energy Requirements and Conservation Potential: Long-term, negligible, adverse impacts to energy requirements at the park would continue. Incorporation of sustainable development technologies in a few new structures would have negligible, long-term, beneficial effects on the potential to conserve energy.	General Operations: Operations would become more complex and intensive, requiring more resources, equipment, and time. New trails and trailheads would require additional maintenance, and expand needs for resource protection, resulting in long-term, moderate to major, adverse impacts on park operations. Expanded hours and expanded interpretation and concession services at the Painted Desert Inn would have long-term, major, adverse impacts to park operations. Long-term, minor to major, beneficial effects would be expected from phased demolition and reconstruction of the Painted Desert headquarters complex. Employee housing and workspace would be sufficient and appropriate. Museum collection storage facilities would be appropriate, meet applicable standards, and be more accessible to park staff and researchers. Health and safety concerns that impact park operations would be alleviated by demolishing existing buildings and replacing them with buildings that meet standards. Short-term, minor, adverse impacts would be expected to occur during demolition and reconstruction, as certain functions would be temporarily relocated and interrupted. Energy Requirements and Conservation Potential: Demolishing and reconstructing the Painted Desert headquarters complex would eliminate energy inefficiencies and allow incorporation of sustainable technologies that reduce energy requirements. This reconstructed complex would result in long-term, minor to moderate, beneficial effects for energy requirements at the park. As some new materials would have to be consumed, energy required to produce and transport these materials increase, a short-term, negligible, adverse impact to energy requirements. Short-term, negligible, adverse impacts would also result from building a somewhat larger complex than exists presently; but these impacts would be mitigated in the long term by the benefits of sustainable technologies. As energy conservation would be considered during siting, design, construction, and furnishing, long-term, minor to moderate, beneficial effects would result for conservation potential.
Socioeconomic Resources	Current beneficial economic effects from the park from Payments in Lieu of Taxes and from park-related spending would be expected to continue. Impacts would be long term and beneficial, and would range from minor to moderate. Eliminating petrified wood sales within the park would potentially have a long-term, major, adverse impact on the concessioner and a long-term, moderate, beneficial impact on shops that sell petrified wood outside the park. Renovations to the Painted Desert Inn would have minor, temporary, beneficial effects on employment opportunities and revenue for local businesses. Closure of the inn during renovation would have a short-term, adverse, minor to moderate impact on cooperating association sales.	Beneficial effects from park-related spending would increase; benefits would be greater than for alternative 1, but still long term, beneficial, and moderate. Elimination of petrified wood sales within the park would have a long-term, major, adverse impact on the concessioner's business, but local businesses would realize a moderate, long-term, benefit. Potential benefits from new construction and improvements to existing facilities would be short term, beneficial, and minor in intensity. Negligible to minor, long-term, beneficial impacts would result if proposed actions result in visitors spending more time at the park and in the local area.	Beneficial effects from park-related spending would increase; benefits would be greater than for alternative 1, but still long term, beneficial, and moderate. Elimination of petrified wood sales within the park would have a long-term, major, adverse impact on the concessioner's business, but local businesses would realize a moderate, long-term benefit. Potential benefits from new construction and improvements to existing facilities would be short term, beneficial, and minor in intensity.	Beneficial effects from park-related spending would increase; benefits would be greater than for alternative 1, but still long term, beneficial, and moderate. Elimination of petrified wood sales within the park would have a long-term, major, adverse impact on the concessioner's business, but local businesses would realize a moderate, long-term benefit. Potential benefits from new construction and improvements would be long term, beneficial, and moderate. Minor to moderate impacts would result if proposed actions result in visitors spending more time in the park and in the local area.

CHAPTER 3: THE AFFECTED ENVIRONMENT

THE AFFECTED ENVIRONMENT

INTRODUCTION

The "Affected Environment" section describes the existing environment of Petrified Forest National Park. The focus is on key park resources, visitor experiences, socioeconomic characteristics, and park operations that could be affected by the alternatives should they be implemented. These topics were selected on the basis of federal law, regulations, executive orders, NPS expertise, and concerns expressed by other agencies or members of the public during project scoping. The conditions described establish the baseline for the analysis of effects in the "Environmental Consequences" section.

The "Affected Environment" section first identifies impact topics the planning team chose to analyze and discuss in this document, followed by topics the team chose not to discuss and the rationale for making these decisions.

IMPACT TOPICS CONSIDERED IN THIS ENVIRONMENTAL IMPACT STATEMENT

- Archeological Resources
- Historic Structures
- Cultural Landscapes
- Ethnographic Resources
- Museum Collections
- Paleontological Resources
  - Petrified Wood
  - Other Fossils
- Vegetation
- Soils
- Visitor Experience and Appreciation
- National Park Operations
  - General Operations
  - Energy Requirements and Conservation Potential
- Socioeconomic Resources

IMPACT TOPICS CONSIDERED BUT NOT ANALYZED IN DETAIL

Ecologically Critical Areas and Wild and Scenic Rivers

No areas within the park have been designated as ecologically critical. The segment of the Puerco River within the national park has been found eligible and suitable for designation as a scenic river area (see appendix F: Wild and Scenic River Evaluation). However, the segment is not recommended for designation at this time. None of the alternatives would affect the qualities that make the Puerco River segment eligible and suitable for designation as a scenic river. Therefore, this topic was dismissed from detailed analysis.

Threatened and Endangered Species, and Species of Special Concern

The Endangered Species Act of 1973, as amended, requires that federal agencies consult with the United States Fish and Wildlife Service before taking any action that could jeopardize the continued existence of any federally listed threatened or endangered plant or animal (vertebrate or invertebrate) species. Agencies must consider potential effects the proposed action may have on the

species. NPS policy also requires the examination of impacts on federal candidate species, as well as state listed threatened, endangered, candidate, rare, declining, and sensitive species.

In a letter dated 14 February 2001, the U.S. Fish and Wildlife Service provided an inventory of threatened or endangered species, or those proposed to be listed as such under the Endangered Species Act of 1973, as amended, that may potentially exist in Apache and Navajo Counties (see appendix E). The Arizona Department of Game and Fish, through the Arizona Natural Heritage Program, was also consulted to provide input on state-listed species that may occur at Petrified Forest National Park. To date, the Department of Game and Fish has not responded formally to this request for consultation despite repeated contacts.

The following table was prepared to identify state and federally threatened or endangered species, candidate species, and state species of special concern that may exist within park boundaries. This list includes species known to occur in the park, those that may winter in the area (bald eagle), those that have likely been extirpated (black-footed ferret), and those that have been reintroduced (gray wolf, California condor). This list does not include species identified by the United States Fish and Wildlife Service or Arizona Department of Game and Fish whose habitat is not supported in Petrified Forest National Park.

Two known state species of special concern are found in the park: the gladiator milkvetch and the paper-spined cactus. Gladiator milkvetch occurs in 15 populations in the north and south areas of Petrified Forest National Park. A 1988/1989 inventory recorded a total of approximately 5,000 plants (NPS 1992). The gladiator milkvetch is known to occur in some areas of the park that could be impacted by development; however, that development would not occur if this species could not be avoided. In any case, such development would be covered under a separate NEPA compliance effort.

The paper-spined cactus is found at the park's higher elevations and populations are located in remote areas well away from any present or proposed development. Two other species of concern, the Springerville pocket mouse and giant sand treader cricket, are believed to occur within the park, but no populations have been identified thus far (NPS 1992).

The topic of threatened and endangered species and species of special concern was dismissed as an impact topic because (1) none of the federally listed threatened or endangered species have been observed in any of the project areas proposed in the alternatives; (2) no critical habitat for federally listed threatened or endangered species or species of special concern has been identified; and (3) suitable habitat for migrating birds is found throughout the park and escape cover is available elsewhere; therefore, they would not be adversely affected by the activities proposed in the alternatives. In addition, the alternatives would seek to better protect these species, resulting in beneficial effects.

TABLE 4. THREATENED AND ENDANGERED SPECIES POTENTIALLY FOUND IN NAVAJO AND APACHE COUNTIES

Common Name	Scientific Name	Status	Habitat
Bald Eagle	*Haliaeetus leucocephalus*	Threatened	Large trees or cliffs near water
Black-footed Ferret	*Mustela nigripes*	Endangered	Grassland plains often associated with prairie dogs
California Condor	*Gymnops californianus*	Endangered	High desert canyonlands and plateaus
Chiricahua Leopard Frog	*Rana chiricahuensis*	Proposed threatened	Streams, ponds, and stock tanks that are free of introduced fish and bullfrogs
Giant Sand Treader Cricket	*Daihinibaenetes arizonensis*	Species of special concern	Sand dunes in Petrified Forest area
Gladiator Milkvetch	*Astragalus xiphoides*	Species of special concern	Broken sandstone and clay bluffs in the valley of the Little Colorado River
Mexican Gray Wolf	*Canis lupus baileyi*	Endangered	Chaparral, woodland, and forested areas—may cross desert
Mexican Spotted Owl	*Strix occidentalis lucida*	Threatened	Canyons and dense forest
Mountain Plover	*Charadruis montanus*	Proposed threatened	Open arid plains, shortgrass prairie
Navajo Sedge	*Carex specuicola*	Threatened	Silty soil near springs and seeps
Paper-spined Cactus	*Pediocactus papyracanthus*	Species of special concern	Northern Arizona and New Mexico; associated with blue gramma grass
Peebles Navajo Cactus	*Pediocactus peeblesianus var. peeblesianus*	Endangered	Gravely soils in the Shinurump conglomerate of the Chinle Formation
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	Endangered	Cottonwood, willow, and tamarisk habitat along streams
Springerville Pocket Mouse	*Perognathus flavus goodpasteri*	Species of special concern	Shortgrass prairie north of Springerville, Arizona
Zuni Fleabane	*Erigeron rhizomatus*	Threatened	Selenium rich soils derived from the Chinle and Baca Formations

General Wildlife

The management zones and specific actions associated with each alternative have been evaluated with regard to effects on common wildlife species within the park. Consulting biologists have determined that there would be little if any effect on common wildlife species. No dramatic changes on habitat, resident or migratory populations, or the diversity of wildlife in general within the park would be expected. To a large degree, this lack of change is due to the fact that impacts to wildlife were considered and avoided as the alternatives were developed. Consistent with the regulations implementing NEPA, this topic was not included because the effects would be negligible.

Geologic Hazards

There are no specific geologic hazards such as earthquakes, volcanoes, or landslides in Petrified Forest National Park. None of the actions analyzed in this GMP Revision would affect geologic hazards. This topic was therefore dismissed from further discussion.

Air Quality

The 1963 Clean Air Act, as amended (42 USC 7401 *et seq.*), requires land managers to protect air quality. Section 118 of the Clean Air Act requires parks to meet all state, federal, and local air pollution standards. *NPS Management Policies* (2001) addresses the need to analyze potential impacts to air quality during park planning. Petrified Forest National Park is classified as a Class I air quality area under the Clean Air Act, as amended. The Clean Air Act also states that the federal land manager has an affirmative responsibility to protect park air quality-related values from adverse air pollution impacts.

Regional air quality and visibility would not be affected by the alternatives. Air pollution from sources outside the park would be addressed through Clean Air Act authorities and through cooperative efforts between the National Park Service and other entities. Construction activities proposed in some alternatives could result in short-term, negligible, localized effects from dust and emissions, but these effects would be controlled and mitigated, and no long-term change in air quality would be expected. Air quality was therefore dismissed from detailed analysis.

Water Resources (Wetlands, Floodplains, and Water Quality)

There are ten named surface water drainages in Petrified Forest National Park. The largest are the Puerco River and Lithodendron, Dry, Cottonwood, and Jim Camp washes. These streams flow with snowmelt (in the case of the Puerco River) and rain in the spring, and sometimes flash flood during the summer monsoon rainy season. Streams flowing through the park ultimately flow into the Little Colorado, a tributary of the Colorado River. Surface water is also intermittently available in small pools and seeps. The park has access to groundwater resources in an alluvial aquifer (the Puerco River Alluvial Aquifer) and a deep, more saline, regional aquifer (the Coconino Regional Aquifer). The park's drinking water supply has been provided by the Utility Authority of the neighboring Navajo Nation since 1997. More detailed information on the water resources

of Petrified Forest National Park can be found in Whealan et al. (in preparation).

Executive Order 11990, *Protection of Wetlands*, requires federal agencies to avoid, where possible, impacts on wetlands. Wetland areas within Petrified Forest National Park are few and are generally associated with rivers or washes. The management zones and specific actions associated with each alternative have been evaluated with regard to potential effects on wetlands. New trails could cross or be located near rivers or washes, but the trails would not adversely affect wetlands. Trail activity would be limited to light foot traffic on coarse sand or gravel soils, which are resilient to such activities. Nonetheless, areas proposed for trails would be carefully evaluated before any ground-disturbing activities are initiated to ensure that wetland impacts are avoided.

Executive Order 11988, *Floodplain Management*, requires federal agencies to avoid construction within floodplains unless no other practical alternative exists. A new riparian trail would be constructed in or near the Puerco River floodplain in some alternatives, but foot trails constructed outside of high hazard areas are excepted actions (National Park Service *Floodplain Management Guidelines* 1993, Excepted Actions). No other actions proposed in any alternative would be within the regulatory floodplain.

The 1972 Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977, is a national policy to restore and maintain the chemical, physical, and biological integrity of the nation's waters; to enhance the quality of water resources; and to prevent, control, and abate water pollution. The 2001 *NPS Management Policies* provides direction for the preservation, use, and quality of water in national parks. Impacts to water quality from implementation of the alternatives in this document would generally be avoided, except for some temporary, negligible impacts related to construction. Potential impacts would be minimized or avoided by using best management practices and other mitigation measures.

Because there would be no impacts to wetlands, floodplains, or water quality, water resources was dismissed as an impact topic.

Soundscape and Lightscape Management

In accordance with *NPS Management Policies* (2001) and Director's Order–47, *Sound Preservation and Noise Management*, an important part of the NPS mission is preservation of natural soundscapes associated with national park units. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is an aggregate of all the natural sounds that occur in park units, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials. The frequencies, magnitudes, and durations of human-caused sound considered acceptable varies among NPS units, as well as potentially throughout each park unit, and it is generally greater in developed areas and less in undeveloped areas.

Effects of the alternatives on vehicle traffic or other sources of human-caused noise would

be negligible. Noise associated with construction would be short term, localized, and scheduled so as to minimize effects on visitor experiences.

In accordance with *NPS Management Policies*, the National Park Service strives to preserve natural ambient landscapes that are natural resources and values that exist in the absence of human-caused light.

New or remodeled facilities or buildings would require some night time lighting, but the National Park Service would minimize effects on natural lightscapes by limiting lighting to that required for safety and by using light shields and styles that project light downward rather than upward and outward. Overall, actions proposed in the alternatives would have a negligible, positive effect on the natural lightscapes of the area.

Soundscape and lightscape management were dismissed from detailed consideration.

Prime and/or Unique Farmland

In August 1980, the Council on Environmental Quality directed that federal agencies must assess the effects of their actions on farmland soils classified by the U.S. Natural Resource Conservation Service as prime or unique. Prime farmland is defined as soil that produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. There are no prime or unique farmlands within the park, so this topic was dismissed from further analysis.

American Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by Department of the Interior agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes.

There are no Indian trust resources in Petrified Forest National Park. The lands comprising the park are not held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Therefore, Indian trust resources was dismissed as an impact topic.

Environmental Justice

Executive Order 12898 requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of federal programs and policies on minority and low-income populations and communities. None of the actions proposed in this GMP Revision would have disproportionate or adverse impacts on minorities or economically disadvantaged populations. Therefore, this topic is not discussed in detail.

Executive Order 13045 requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of federal programs and policies on children. None of

the actions proposed in this GMP Revision would have disproportionate or adverse impacts on children. Therefore, this topic is not discussed in detail.

CULTURAL RESOURCES

Historic Overview

In Arizona, archeologists and historians define the period of time between approximately 12,000 years ago and the first contact by people of European, Asian, or African descent with the region as the *prehistoric era* and the period after contact as the *historic era*.

The narratives below are summaries of the views held by most archeologists and historians. The National Park Service does realize that there are various interpretations of human history.

Prehistory

Paleoindian Period. There is limited evidence that the first people to inhabit the Colorado Plateau were in the area approximately 11,000 years ago. Geologically, the region looked much as it does now, but temperatures were 5°–10° Fahrenheit cooler than current averages and moisture was plentiful and dependable. The mobile, dispersed population of Paleoindians pursued mammoths, ancient horses, camels, lions, giant bison, great bears, and other animals that lived on the savanna-like Colorado Plateau. Eventually, the populations of large animals the residents depended upon declined from a combination of environmental factors and pressure from hunting. As the large animals disappeared, the Paleoindians modified their hunting styles to enable them to catch more agile animals such as deer, bighorn sheep, and smaller, quicker, animals.

The Paleoindians left little evidence of their passing. Abandoned campsites, stone tools (lithics), and other scattered remains are the only resources archeologists can study to understand the Paleoindian inhabitants of the Colorado Plateau. Pieces of Paleoindian tools (for example, a point made from local petrified wood) have been found in the park (Stewart 1980).

Archaic Period. The Archaic period began about 8,000 years ago. Local inhabitants lived in a more desert-like environment than their predecessors, yet population increased as groups moved into the region from the Basin and Range province. The hunting of bison and small- to medium-sized game dominated life. It was during this period that the atlatl (spear thrower) came into widespread use. As the years went by, people in the area began to eat more plant foods as is evident in the appearance of metates (basins) and manos (hand-held grinding or pounding stones) for the processing of seeds and grains. They also began using plant products for clothing (woven sandals) and other items.

Land now designated as Petrified Forest National Park was visited by Archaic hunters who left chipped stone artifacts on ridges and mesa tops. Corn associated with the Archaic period has also been found in the park, but it is not clear if it was cultivated here or brought in from elsewhere (NPS Rev. 1996).

Basketmaker Period. Life 1,800 years ago, while Archaic traditions continued, was markedly different than the Archaic period. People still hunted fauna and gathered flora, but they also lived in relatively permanent

settlements and practiced agriculture. It was during this period that people began growing maize (corn) in the region that became Petrified Forest National Park. Items that set Basketmakers apart from earlier cultures were cradleboards with soft headrests, square-toed sandals, woven bags, subterranean slab-lined storage facilities, intricate baskets, and curved throwing sticks for hunting game.

Petrified Forest was an active place throughout the Basketmaker period. Archeologists have discovered the remains of pit houses, single- and multi-room dwellings, petroglyphs, and artifact scatters associated with this period throughout the park.

Pueblo Period. The Pueblo period (1,300 to 600 years ago) was a time of transition and activity around Petrified Forest. The Petrified Forest region suffered through a drought during the first 250 years of this period. Residents of the area built small settlements (pueblos) on terraces near watercourses and arable land.

Approximately 1,050 years ago, the climate became more amenable, thus enabling greater population densities and more stable settlements. The Petrified Forest region was not only an important agricultural area, it was also a trade center involving Western Pueblo, Mogollon, and Sinagua cultures.

The prosperity of the region during these years is clearly represented in over 200 sites recorded by archeologists working in the park. Sites include single- and multi-room pueblos with kivas (ceremonial pithouses), artifact scatters, lithic scatters, pithouse structures, rock shelters, extensive petroglyphs, and an agricultural site (Wells 1988). Puerco Pueblo and Agate House were built during this time period.

A dramatic change occurred in the Southwest approximately 800 years ago that included the Petrified Forest region. Prosperity of the past suffered severe setbacks due to changed climactic conditions, specifically drought. The population became less stable as people struggled to survive. New population alignments arose. Residents moved into larger, more centralized settlements in the Rio Grande area, Acoma and Zuni country, the Hopi mesas, Verde Valley and Tonto Basin, the White Mountains, southeastern Arizona, northwestern Chihuahua, the Hohokam area, and Petrified Forest (Stewart 1980).

The number of sites discovered in Petrified Forest National Park that represent this period is quite small compared with earlier periods. Sixteen sites representing the late phase of the Pueblo Period are scattered throughout the park with the greatest concentration within one mile of Puerco Pueblo. The majority of these sites appear to have been abandoned by the 15th century. While it is not clear where the residents went, it can be surmised that they were incorporated into some of the larger regional pueblos (for example, Hopi and Zuni).

Navajo Period. In the 16th century (1500s), the Navajo moved into the area from the north, and as a nomadic tribe, they relied on hunting for sustenance. Eventually, they incorporated limited farming into their livelihoods and by the early 1700s began the practice of livestock herding, which they learned from the Spanish (Stewart 1980). Today, the Navajo Tribe continues to inhabit much of the land north of the park, while a

few scattered sites associated with the Navajo remain within park boundaries (NPS 1998a).

History

Exploration. The first European Americans to see the Painted Desert were probably Spaniards in search of riches. In July 1540, Francisco Vasquez de Coronado and his entourage were searching for the fabled Seven Cities of Cibola. Evidence that they viewed the Painted Desert appears in a brief journal account that mentions the *Desierto Pintado* (Lubick 1996).

It was not until after Arizona became a United States Territory in 1848 that the region once again received attention. The U.S. Army Corps of Topographical Engineers dispatched expeditions into the region. The first of these groups to encounter the Petrified Forest was a contingent under the command of Captain Lorenzo L. Sitgreaves. In September 1851, Sitgreaves traveled from Zuni Pueblo in New Mexico to the Little Colorado River. On 28 September, he decided to abandon the muddy stream for higher ground where he and his men came across areas covered with petrified wood stumps and ancient fallen trees (Sitgreaves 1853). Sitgreaves and his men did not tarry, however, returning to the river and the appointed task—exploration of the Colorado and Little Colorado Rivers.

On 8 November 1853, Lieutenant Amiel Weeks Whipple and a group of scientists left Albuquerque with orders to survey a potential rail line along the 35th parallel (Lubick 1996). On the first day of December they crossed the Puerco River. The next evening the party stopped for the night at a wash the lieutenant named Lithodendron Creek. A number of abandoned pueblos and "quite a forest of petrified trees" captivated the men. The party explored the area more extensively than Sitgreaves had (Whipple 1856). However, they too had orders and before conducting more than cursory surveys the men continued west.

The most unusual expedition to visit the Petrified Forest was led by Lieutenant Edward F. Beale. In 1858, he led the ill-fated U.S. Camel Corps across the Southwest. His route approximated Whipple's through the Petrified Forest (Lubick 1996). However, official exploration in the area ground to a halt with the coming of the Civil War.

Early Tourism. Settlement began in the region after the Civil War when Spanish-speaking sheepherders and cattle ranchers entered the area that became the park. Shortly thereafter, Mormons moved into the area and began ranching in the Little Colorado River Valley. By the 1880s, workers in Arizona were laying track for the Atlantic and Pacific Railroad Company (eventually the Atchison, Topeka, and Santa Fe) along the 35th parallel. Towns such as Winslow, Holbrook, and Adamana sprouted along the railroad right-of-way (Lubick 1996).

Before long, people began envisioning ways to make a profit from what many considered an oddity of nature—petrified wood. Various groups began to claim the deposits of petrified wood, shipping vast quantities to processing plants in Chicago, San Francisco, and other areas. This activity sparked a movement to protect the unique landscape. Will C. Barnes, a resident of Holbrook, introduced a petition in the Eighteenth Territorial Legislature that called for the removal of all lands covered by petrified forests from settlement until a determination could be made by the general land office as to

whether they deserved federal protection as a national park or preserve. That determination occurred 1 February 1895. By 15 December, two townships containing petrified wood were withdrawn from settlement. Four years later, the amount of land closed to settlement had doubled (Lubick 1996).

National Monument to National Park. By the turn of the century, concern for the well-being of American antiquities was increasing. In 1900, Congressman John F. Lacey of Iowa launched legislative efforts to create Petrified Forest National Park. His bills were defeated in 1900 and again in 1902. Proponents for protection were undaunted, and Lacey, working closely with Edgar L. Hewett of the Bureau of Ethnology, drafted a bill calling for the protection of American antiquities. Theodore Roosevelt signed An Act for the Preservation of American Antiquities into law on 8 June 1906 (Lubick 1996), which granted U.S. presidents the authority to create national monuments. Roosevelt established Petrified Forest National Monument on 8 December 1906.

The new designation was important, but in reality it did little to safeguard park resources. There was no National Park Service or funding to ensure the park's protection. Vandalism and wood theft were already a pressing problem and continued to be so. When the National Park Service was created in 1916, Petrified Forest fell under the agency's management and was granted an annual budget of $166 (Lubick 1996).

The same year the National Park Service came into existence, legislation was introduced to establish a national highway system. It took nine years for the government to accept and begin execution of a plan for such a system of roads. In 1926, one of the routes, a roughly diagonal path from Chicago to Los Angeles that traversed Petrified Forest National Monument, was designated "66." By 1938, the entire length of the road was paved. Eventually, historic Route 66 became outdated and was replaced by the new interstate highway system developed in the late 1950s (National Historic Route 66 Federation 1995).

The 1930s was an important decade for Petrified Forest National Monument:

- The monument expanded to the north with the addition of Herbert D. Lore's Painted Desert property.
- Roads and trails were expanded and improved through New Deal funds and programs (specifically the CCC).
- New structures were built and older ones, associated with park headquarters at Rainbow Forest and facilities such as Painted Desert Inn, received required repairs.
- The Fred Harvey Company began offering tours through the park (Lubick 1996).

Through the 1950s and 1960s, the monument experienced many changes. On 8 February 1956, National Park Service Director, Conrad Wirth, announced a new program intended to modernize the national parks and monuments and help NPS properties better serve visitors. Known as Mission 66, it encompassed hundreds of construction and renovation projects (Sellars 1997). New structures were built at the park and others renovated (such as the concessions building at Rainbow Forest). Richard J. Neutra designed the Painted Desert headquarters complex, which was completed in 1960. Shortly thereafter, on 9 December 1962, through an act of Congress (72 Stat. 69),

Petrified Forest National Monument became Petrified Forest National Park.

Historic Property Definitions

Historic properties, under 36 CFR Part 800, are defined as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the [National Register of Historic Places]." The phrase "eligible for inclusion in the National Register of Historic Places" includes both the properties formally determined as such by the National Park Service on behalf of the Secretary of the Interior and all other properties that meet NRHP listing criteria.

National Park Service guidelines regarding the definition of buildings, sites, structures, objects, districts, and landscapes are listed below.

- A building is created principally to shelter any form of human activity such as a barn, house, church, or hotel.

- A site is the location of a significant event; a prehistoric or historic occupation or activity; or a building or structure, whether standing, ruined, or vanished, where the location itself possesses historic, cultural, or archeological value regardless of the value of the existing structure.

- A structure is a functional construction usually made for purposes other than creating human shelter, such as tunnels, bridges, dams, and fire towers.

- An object is primarily artistic in nature or is relatively small in scale and simply constructed. Although an object may be movable by nature or design, it is associated with a specific setting or environment. Examples include sculpture, boundary markers, and statues.

- A district possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development, such as a college campus, central business district, large fort, or rural village.

- A landscape is associated with events, persons, design styles, or ways of life that are significant in American history, landscape architecture, archeology, engineering, or culture.

ARCHEOLOGICAL RESOURCES

Prehistoric resources are extensive in Petrified Forest National Park. Over 600 recorded sites representing Paleoindian, Archaic, Basketmaker, Puebloan, and Navajo cultures exist within the park. Pit houses, campsites, multi-room pueblos, projectile points, ceramics, and other resources comprise the park's archeological record. Pictographs are rare, but large concentrations of petroglyphs are etched into the desert varnish that forms on the sandstone that abounds in the park. There is evidence that Petrified Forest National Park has numerous unrecorded sites within its boundaries. Twelve of the 600 recorded sites have been excavated. The others form a regionally

significant "data bank" of future scientific information (NPS Rev. 1996).

Historic archeological resources are also located throughout the park. The central portion of the park contains widespread evidence of historic use and travel. The 35th parallel route followed by Whipple and Beale crosses the park near the Painted Desert headquarters, as does the Prescott and Santa Fe mail route. Later, the Santa Fe Railroad and Route 66 crossed the park. Other areas of Petrified Forest National Park hold archeological sites representing the expanse of the park's history, from the 19th century to the 1950s.

The 35th parallel route / Beale Wagon Road was one of three major immigrant routes to California prior to the Civil War that brought large numbers of people through northern Arizona. It was surveyed and constructed between 1857 and 1859 by Lieutenant Edward F. Beale, who commanded the Army's experimental camel corps in Arizona. The Beale Road was a precursor to the 1882 transcontinental Atlantic and Pacific Railroad (Santa Fe). Until the railroad arrived, the Beale Road was one of the most important roads in Arizona. It continued to be used until the 1940s. Traces of the route are still visible in the park and are listed on the NRHP (NPS 1998a).

Route 66 once extended for 2,000 miles from Chicago, Illinois, to Santa Monica, California. It played a major role in the westward migration of Americans fleeing the Dust Bowl, in the boom in tourist travel following World War II, and in other aspects of 20th century American history. A portion of the abandoned Route 66 roadbed and some associated structures (telephone poles) are still visible cutting across the northern portion of the park. There is the potential for subsurface historical archeological resources along the road corridor. The roadbed itself was evaluated for inclusion on the NRHP in 1995 and deemed ineligible. However, park staff understands the historic importance of the old highway and will continue to interpret it.

HISTORIC STRUCTURES AND DISTRICTS

Agate Bridge Comfort Station

The building was constructed as a combination checking station and comfort station in 1935 by Olds Lumber Company of Winslow, Arizona. It is a one-story, pueblo-style building with deep narrow windows. Originally, the two rooms of the structure were connected by a covered breezeway that is now filled in with rockwork. The original flagstone floor and walkway are now concrete. Currently, a portion of the building is still used as a comfort station and the rest is used for storage. Although the structure is not eligible for the NRHP, the park's List of Classified Structures (LCS) states that the building (#56686 on the LCS) should be preserved and maintained.

Painted Desert Inn

The Painted Desert Inn, a former trading post and inn on the rim of the Painted Desert, has been designated as a national historic landmark in recognition of its historic and aesthetic qualities. It also has regional significance as a product and symbol of New Deal work relief programs. Originally constructed in 1924, the petrified wood and stone structure was gutted and rebuilt

between 1937 and 1940 by the CCC using local materials, including some petrified wood. The resulting Pueblo Revival structure is two stories, but it is banked into the hillside so it exposes a low profile to the Painted Desert. The thick stone walls are covered with earth-toned stucco. Interior spaces are finished with log vigas, carved posts, flagstone floors, and wood-framed casement windows. A painted glass skylight of Hopi pottery motifs designed by Lyle Bennet in 1937 and murals by Hopi artist Fred Kabotie painted in 1947 enhance the building's combination of architecture and design. The 28 rooms were originally used for public information, restrooms, park offices, dining rooms, soda fountain, bar, trading post, and six sleeping rooms. Over time, the inn has badly deteriorated. During the late 1960s and early 1970s, the building's condition was so poor it was closed to the public. It was reopened in 1976 for the Bicentennial and has closed only temporarily since for repairs. Today it is minimally used for information and orientation, book sales, building tours, restrooms, and a few display cases.

Two historic residences across the road from the Painted Desert Inn are included in the impacts analysis of this resource because proposals in the GMP Revision alternatives involve these two structures.

Painted Desert Headquarters Complex

The Painted Desert headquarters complex was constructed as part of the NPS Mission 66 initiative. Mission 66 was a major program for national park improvements from 1956 through 1966. The complex, designed by Richard Neutra, was conceived as a planned community combining public space, workspace, concession buildings, school, post office, library, and housing. Neutra's designs are becoming increasingly recognized as representative examples of modern architecture. The complex has been recognized as a significant example of Mission 66 Program architecture (NPS 1997a). Recently it was included in a study of Mission 66 architecture throughout the National Park Service (NPS 2000a) The visitor center / headquarters complex is considered significant by the Arizona SHPO, and potentially eligible for the NRHP. Park managers intend to seek funds to have a Determination of Eligibility conducted for the complex as soon as possible.

The complex consists of

- administrative building with offices, library, visitor center, theater, and collection storage
- apartment wing with 8 one-bedroom units
- six triplex residence wings (18 three-bedroom units)
- two 1-bedroom teacher residences
- school building and post office
- community building
- concessions building with service station
- maintenance building
- maintenance vehicle storage building
- trailer storage building
- public courtyard
- private residence courtyards
- residence carports
- mobile trailer pads
- concessioner's house (not a Mission 66 design)
- parking lots, sidewalks, roads, and driveways
- restroom facilities (part of the visitor center)

- entrance station (replacement for the original Mission 66 structure)
- gate house

The condition of buildings in the Painted Desert headquarters complex is discussed in the "National Park Operations, Facilities" section of this chapter.

CULTURAL LANDSCAPES

According to National Park Service *Cultural Resources Management Guideline* (Director's Order–28), a cultural landscape is:

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

Thus, cultural landscapes are the result of the long interaction between people and the land: the influence of human beliefs and actions over time upon the natural landscape. Shaped through time by historical land use and management practices, as well as by politics and property laws, levels of technology, and economic conditions, cultural landscapes provide a living record of an area's past. The dynamic nature of modern human life, however, contributes to the continual reshaping of cultural landscapes, making them a good source of information about specific times and places, but at the same time rendering their long-term preservation a challenge.

Rainbow Forest Historic Landscape

Rainbow Forest Historic Landscape, which encompasses the Jim Camp Wash bridge; parking plaza and access road; housing complex; museum; concessions building and outbuildings; picnic area; connecting walks; planting islands; Giant Logs Trail; and the Long Logs road, trails, and parking area, has been determined eligible by the Keeper of the National Register for listing on the NRHP as a historic designed landscape. The Rainbow Forest historic landscape was planned and designed by the National Park Service and, for the most part, constructed by the CCC during the 1930s. When constructed, it was the visitor contact area and headquarters for the park (NPS 1999b).

While the Rainbow Forest area has changed over time, the overall cultural landscape retains many of its original design characteristics, including:

- Visitor area at Rainbow Forest designed with a straight sight line between the museum and Jim Camp Wash bridge / entry road.
- Use of naturalistic principles of national park design—rustic design style, use of vernacular materials (particularly stone) on both buildings and landscape elements, and the relatively small scale of the single-story buildings and structures that make up the building complexes.
- General harmonizing of development with the natural setting, with buildings subordinate to the natural topography.

- Public access and visitor use areas arranged around the main parking area, with housing and other non-visitor use areas situated in clusters to the side of the main parking area.
- Primary circulation substantially intact, although the northern circulation loop to the maintenance area was modified, and the original one-way loop was modified to two-way in the 1960s.
- Unity between architecture and landscape architecture, through the use of similar material in buildings and landscape elements.

Rainbow Forest Historic Landscape Associated Historic Structures

Table 5 lists the historic structures identified as contributing elements of the Rainbow Forest Historic Landscape that are also listed on the park's List of Classified Structures. The List of Classified Structures is an evaluated inventory of all historic and prehistoric structures of architectural or engineering significance.

Most of the structures in table 5 are listed on the NRHP as contributing elements to the Rainbow Forest Historic Landscape (only Agate House is independently eligible). The Mather plaque is considered ineligible for the NRHP.

A number of other features were called out as elements that contribute to the cultural landscape. These elements include the culverts along Long Logs and Giant Logs Trails and along Petroglyph Road, areas landscaped with native species, the cottonwoods in front of residences, the approach to Rainbow Forest from Jim Camp Wash, Long Logs Road, the original trailhead, pedestrian circulation areas, the spur road to the CCC camp, Long Logs and Giant Logs Trail layouts, and various views of and from Rainbow Forest (NPS 1999b).

Most of the structures identified as elements that contribute to the Rainbow Forest historic landscape date from the 1930s, and were built under the New Deal-era work programs, including the CCC. The visitor center / museum, residences, and maintenance building are all rustic sandstone structures. They are low and flat roofed, in the southwestern tradition, and the residences are oriented around a central patio, further evincing the Southwest theme (NPS 2001b).

The buildings were evaluated for eligibility for listing on the NRHP separately as historic structures and found by the Arizona SHPO to be ineligible because their integrity of design, materials, and workmanship has been diminished by significant exterior and interior modification (AZ SHPO 1989). The concessions building, which is the oldest structure on the site, has been drastically altered and no longer resembles the other structures. Architecturally incompatible modifications, including room additions, changes in interior layout, and the addition of pipes, fences, antennas, solar panels, and other amenities of modern living, have also been made to several residences and to the rear of the visitor center / museum building. In finding the buildings ineligible, however, the Arizona SHPO concluded that alterations to buildings 51 and 52 (the west, north, and east buildings surrounding the courtyard) could be reversed and recommended a number of actions to bring the structures back into eligibility status. A National Park Service historic architect evaluated the

buildings in detail and concurred that the structures could be restored to their 1930s appearance (NPS 2001b).

TABLE 5. LIST OF CLASSIFIED STRUCTURES CONTRIBUTING TO RAINBOW FOREST HISTORIC LANDSCAPE

Structure	Management Decision/date	LCS No.	Structure	Management Decision/date	LCS No.
Rainbow Forest Employee Residence (51-A1)	Should be preserved 04-01-2001	56679	Rainbow Forest Employee Residence (50)	Should be preserved 04-01-2001	217273
Rainbow Forest Employee Residence (52-B)	Should be preserved 04-01-2001	56682	Rainbow Forest Employee Garage	Should be preserved 04-01-2001	56675
Rainbow Forest Employee Residence (52-C)	Should be preserved 04-01-2001	56683	Rainbow Forest Gas and Oil Building	May be preserved 04-01-2001	56677
Rainbow Forest Employee Residence (52-A)	Should be preserved 04-01-2001	56681	Rainbow Forest Fitness Center	May be preserved 04-01-2001	56673
Rainbow Forest Employee Residence (51-A)	Should be preserved 04-01-2001	56678	Rainbow Forest Storeroom	May be preserved 04-01-2001	56674
Rainbow Forest Employee Residence (53)	May be preserved 04-01-2001	56690	Rainbow Forest Warehouse and Shop	May be preserved 04-01-2001	56676
Rainbow Forest Employee Residence (51-A2)	Should be preserved 04-01-2001	56680	Long Logs Parking Area	May be disposed of, altered, or destroyed 04-01-2001	217319
Rainbow Forest Visitor Center / Museum	Should be preserved 04-01-2001	56672	Rainbow Forest Connecting Wall / Fencing Built Before 1943	Should be preserved 04-01-2001	56684
Jim Camp Wash Bridge	May be disposed of, altered, or destroyed 04-01-2001	216005	Rainbow Forest Plaza and Features	Should be preserved 04-01-2001	216008
Agate House	Must be preserved 04-01-2001	1217	Mather Plaque	Must be preserved 04-01-2001	56689

Source: List of Classified Structures, Petrified Forest National Park, October 2001.

Crystal Forest Cultural Landscape

Tourists began visiting this site long before Petrified Forest became an NPS property. In the 19th and early 20th centuries, homesteaders set up ranches and various entrepreneurs came to the area to commercially exploit petrified wood and tourism. Scientists also began to take an interest in the ancient landscape. During this time, a railroad stop was established in the adjacent town of Adamana.

Crystal Forest has a large concentration of petrified wood coupled with remarkable views. The trail and parking area at Crystal Forest were installed during early park development. They were planned according to the principles of naturalistic design that dominated the landscape profession in the early part of the 20th century. The designed landscape of Crystal Forest offers visitors an opportunity to examine specimens of petrified wood and enjoy the beauty of the natural landscape with relatively little visual intrusion from the built environment (NPS 2000b).

The Crystal Forest cultural landscape is an excellent example of NPS design principles and philosophies of the 1920s to the 1940s. During this time, the National Park Service developed and implemented design guidelines that emphasized harmonious construction that allowed for visitor enjoyment and edification without compromising the natural features, resources, and views that made the site unique (NPS 2000b).

The original design of the Crystal Forest parking area and trail system was subdued and sparse. There were few features that interfered with the visitors' experience of the landscape with its dramatic views, varied topography, and colorful specimens of petrified wood. Although there have been some changes to the parking lot and trail system since its installation in 1933, the current landscape continues to reflect the intentions of the earlier design. The main contributing features include:

- all views and vistas from the trail,
- layout and circulation in the parking area,
- view of the "Battleship" rock formation from the road and trail,
- remaining curbing and retaining walls along the trail, and
- sandstone culvert faces along the trail.

The Crystal Forest cultural landscape was evaluated for NRHP eligibility and was deemed eligible as a historic designed landscape by the Arizona SHPO (2000d).

Potential Cultural Landscapes

Additional cultural landscapes may exist within the park, but to date they have not been formally evaluated. These areas are associated with proposals in the GMP Revision alternatives and are summarized below:

Puerco Cultural Landscape

In the early 1930s, the area containing the Puerco Pueblo became part of the park. During the early park years, the poor condition of internal roads curtailed travel. With the completion of the Petrified Forest

Highway (the main north-south park road) in 1932, many of these problems were mitigated and year-round travel became a reality. Bridges were installed over all major washes, including the Puerco River.

With the boundary and road changes, the Puerco River area became the park entrance for visitors traveling Route 66. Initially, only limited development was undertaken to support this new function. In 1933, a small checking station was built of canvas on a wood frame, stone shelter / restroom, and a parking lot laid out behind it.

Between 1934 and 1942, the CCC undertook major improvements throughout the park that included:

- digging the Puerco well and a well at headquarters (then Rainbow Forest),
- renovating and improving the Painted Desert Inn,
- completing a water pipeline from Puerco pump house to both Rainbow Forest headquarters and Painted Desert Inn (the longest pipeline constructed by the CCC in any national park),
- cleaning and improving roads in the park, and
- developing foot trails for viewing petrified forests.

The first CCC camp in the park, consisting primarily of canvas tents, was located on the south side of the Puerco River, west of the bridge. Workers focused their efforts in this area at the time. The duration of this camp was short, from July to October 1934. The second camp, from October 1934 to August 1938, was located at Rainbow Forest headquarters. In 1938, the third CCC camp was established at the base of the mesa, about one-half mile south of Puerco Pueblo. This site offered more space and was closer to work sites than the Rainbow Forest location.

The Puerco River cultural landscape was evaluated for eligibility for the NRHP, but was determined not to be eligible by the SHPO (NPS 2000c). However, the archeological landscape (prehistoric) has not been fully evaluated. Table 6 lists classified structures located at the Puerco River cultural landscape.

TABLE 6. LIST OF CLASSIFIED STRUCTURES: PUERCO RIVER CULTURAL LANDSCAPE

Structure	Management Decision Date	List of Classified Structures No.
Puerco Pueblo	Must be preserved 04-01-2001	5573
Rio Puerco Comfort Station	Should be preserved 04-01-2001	56687
Rio Puerco Pump House	Should be preserved 04-01-2001	56775

Source: List of Classified Structures, Petrified Forest National Park, October 2001.

Painted Desert Headquarters Complex

The Painted Desert headquarters complex is potentially eligible for the NRHP as a historic district, and it is summarized in the "Historic Structures" section of the "Affected Environment." The complex may also qualify as a cultural landscape, which would encompass associated natural features, circulation patterns, and views. This area has not been evaluated as a cultural landscape.

Painted Desert Inn

The Painted Desert Inn is a national historic landmark. The inn is summarized in the "Historic Structures" section of the document. The inn may also qualify as a cultural landscape, which would encompass associated natural features and views and the two residences across the street from the inn. This landscape is considered potentially eligible for listing on the NRHP; evaluation is not yet complete (J. Cowley, pers. comm., June 2002).

Ethnographic Landscapes

An ethnographic landscape study of the park has not been initiated, and therefore there are no known ethnographic landscapes. The northern boundary of the park is the southern boundary of the Navajo Reservation. The reservations for the Hopi, Zuni, and White Mountain Apache are all located within 150 miles of the park. The cultures of these people are bound to the lands once occupied by their ancestors, and certain sites within the park may be important in their ceremonial life (NPS 1993).

ETHNOGRAPHIC RESOURCES

Ethnographic resources are objects, plants, animals, and landscape features of traditional significance to contemporary peoples and communities. The identified contemporary communities with ethnographic ties to Petrified Forest National Park are the Hopi Tribe, Navajo Nation, Zuni Pueblo, and White Mountain Apache Tribe. The archeological, historical, and ethnographic records reveal a long history of human use of the park area for these cultures, spanning from the Paleoindian period to the present.

The park is adjacent to the Navajo Reservation, and the White Mountain Apache, Hopi, and Zuni Reservations are all within an 80-mile radius. These peoples' cultures are inextricably bound with the lands once occupied by their ancestors. They view much of the park landscape as spiritually active, containing sites vital to the continuation of their lifeways. While some of these ethnographically significant resources are shared by more than one American Indian ethnic group, most are unique to specific tribes. The park considers such sites significant and is committed to their preservation, protection, and confidentiality.

The park has drafted an ethnographic overview and assessment, but has not conducted a detailed analysis or evaluation of sites to determine which sites are purely archeological in nature and which are ethnographic. Through consultation, a number of ethnographic resources have been identified within the park. These resources occur in areas affected by alternatives in this document. Therefore, ethnographic resources will be considered in the EIS.

MUSEUM COLLECTIONS

The park's museum collections contain nearly 128,000 cataloged items—paleontological and other natural history specimens, and archeological, historical, and ethnological objects. Some items are stored offsite.

At this time, over 55,000 items have not been cataloged. The majority of these items are paleontological and archeological and are housed offsite, primarily at the Western Archeological Conservation Center, the Museum of Northern Arizona, and the Museum of Paleontology at the University of California, Berkeley (NPS Rev. 1996).

Onsite collections are housed in the administration building of the Painted Desert headquarters complex. The building does not meet structural and safety standards. For example, fire detection and suppression systems are non-existent (or not operational), the electrical system is overloaded, exterior walls are cracking, the heating and boiler system is malfunctioning, and the building has no security system.

The collections storage area includes a small work area with work tables, a darkroom, a curator's office, and three large rooms filled with storage cabinets.

Currently, the onsite collections are housed in a 1,400-square foot storage area in the headquarters building. The park needs an additional 3,600-square feet of storage area to adequately store existing specimens and foreseeable future acquisitions (e^2M 2001).

Items in the collections storage area are stored in protective cabinets. Flammable objects are stored in fire-resistant cabinets.

Some items from the museum collections are exhibited at the Painted Desert Inn, Painted Desert visitor center, and Rainbow Forest Museum.

PALEONTOLOGICAL RESOURCES

Though the primary resource of the park is petrified wood, large quantities of other fossils including leaves and seeds, as well as vertebrate, invertebrate, and trace fossils also occur there. All of the fossils occur in the Chinle Formation of Late Triassic age. Sediments that now make up Chinle rocks were deposited by meandering rivers and streams in lakes and swamps and in floodplains on the floor of a broad basin about 225 million years ago. In the park, the Chinle Formation is about 300-meters thick and consists mainly of thick beds of brightly colored mudstone and thinner beds of relatively dull sandstone and conglomerate.

Paleontological research began in the park when the Whipple Expedition discovered some of the wood preserved there in 1853. In 1953, after a century of research, the remains of only about 30 species of plants and the remains of several amphibians and reptiles from the park had been described. Since then, many new discoveries have been made at Petrified Forest National Park in what is now considered one of the most important and easily accessible exposures of Late Triassic terrestrial strata in the world. To date, over 200 fossilized plant species and 60 animal species have been described from the Chinle Formation in the park (NPS 1998a).

Petrified Wood

Seven species of trees have been described from Petrified Forest National Park. However, approximately 99% of the park's petrified wood is derived from trees that belong to the species *Araucarioxylon arizonicum*. Much of the petrified wood in the park that contains the bright, vivid array of colors and the quartz crystals is derived from this species. Two other unusual types of petrified wood that have been described from the Black Forest are classified as the genera *Woodworthia* and *Schilderia* (NPS 1996). This wood is generally black. The other species, consisting of lycopods, tree-ferns, and cycads, are represented by only a few specimens, but are just as important to note.

Some of the largest concentrations of petrified wood are located south of I-40 in Jasper, Crystal, and Rainbow Forests. However, north of the interstate in the Painted Desert badlands are vast exposures of wood that include the Black Forest. Easily accessible trails at Giant Logs, Long Logs, and Crystal Forest offer visitors the opportunity to walk through major concentrations of petrified logs, while the Black Forest is accessible only to the more adventurous. At Crystal Forest, named for the brilliantly colored petrified logs that contain cavities filled with crystals of clear quartz, smoky quartz, and amethyst (Petrified Forest National Park 2000), visitors can observe the impact that petrified wood theft has had on the primary resource of the park. Here, the areas adjacent to the Crystal Forest parking lot and trails have been picked clean of small pieces of petrified wood.

Petrified wood theft has been a problem at Petrified Forest National Park since 1906, when the Petrified Forest National Monument was established. Reportedly, an estimated 12 tons of petrified wood is stolen from or displaced within the park each year (NPS 1986). Estimates have been made (NPS 1994) of the volume and percent cover of petrified wood at five high-use areas within the park for the purposes of monitoring the amount of wood lost (table 7). These include Giant Logs, Long Logs, Crystal Forest, Jasper Forest, and Blue Mesa, which as noted above, have some of the highest concentrations of petrified wood in the park. However, it should be emphasized that actual figures for wood theft are hard to determine since in many cases, pieces of wood are simply picked up by visitors to be examined and then dropped back to the ground in a different position. Visual monitoring of specific sources of petrified wood cannot distinguish whether these pieces were actually stolen or simply displaced.

A small portion of the petrified wood stolen from the park is returned by mail each year, and even more is recovered from along park roadsides each month, especially near park exits. Petrified wood is also recovered when law enforcement officers apprehend visitors who steal it. It is the policy of Petrified Forest National Park not to put these pieces back in the park because they have been removed from their original context; it is impossible to tell where they came from, and therefore, what the context was originally. Instead, the pieces are kept in undisclosed locations and used by interpreters and in displays, including those aimed at deterring petrified wood theft.

TABLE 7. TOTAL 1993 INVENTORY PERCENT COVER AND VOLUME ESTIMATES FOR HIGH USE AREAS AT PETRIFIED FOREST NATIONAL PARK

	Size Class 1	Size Class 2	Size Class 3
Blue Mesa			
Percent Cover	6.61	7.73	4.55
Volume (ft^3)	9,605	33,312	411,390
Crystal Forest			
Percent Cover	7.71	5.91	3.64
Volume (ft^3)	9,246	10,775	82,939
Giant Logs			
Percent Cover	4.52	5.33	6.27
Volume (ft^3)	13,010	36,080	163,454
Jasper Forest			
Percent Cover	13.75	4.28	7.77
Volume (ft^3)	21,787	51,458	626,081
Long Logs			
Percent Cover	6.15	5.94	9.82
Volume (ft^3)	12,070	32,944	217,944

SOURCE: Adapted from "Assessing Petrified Wood Change in Petrified Forest National Park" by Nicholas S. Monkevich, Timothy G. Gregoire, and Joseph W. Roggenbuck, December 1994.
NOTES: Size Class 1 (0.25 inches to 1.0 inches in length), Size Class 2 (1.0 inches to 5.0 inches in length), and Size Class 3 (greater than 5.0 inches in length).

In the past, various intervention methods have been employed in an attempt to reduce wood theft at the park. They include giving free samples (purchased from commercial vendors) to visitors as they leave the park; stationing uniformed rangers at high-theft sites, patrolling by foot or horseback; searching vehicles; exhibiting letters in the visitor center from people who took wood and returned it; placing fences along trails to keep visitors away from the resource; discussing the problem in interpretation programs; and charging heavy fines to people caught stealing petrified wood. There is a minimum fine of $275 for anyone convicted of stealing petrified wood, rocks, fossils, living plants, or animals.

In 1997, Virginia Polytechnic and State University completed a study of wood theft and its prevention, which found that uniformed personnel and interpretive signs were most useful for deterring petrified wood theft. The majority of thefts (70%) were found to occur in zones close to parking lots and trails, and the majority of incidents occurred within ten feet of a trail.

Approximately 90% of visitors surveyed for this study stated that they refrained from stealing wood out of concern for protecting

park resources. A smaller percentage of visitors stated that they refrained out of fear of being caught by rangers or fear of being fined.

Other Fossils

Fossil Plants

Nearly 200 fossilized species of plants have been discovered in the Chinle Formation at Petrified Forest National Park, 40 of which were described from fossilized leaves, stems, and seeds. The others were described from fossil spores and pollen. These fossils represent species from most of the major plant groups, excluding flowering plants.

Horsetails (relatively primitive plants) and ferns are abundant in the Chinle Formation at Petrified Forest National Park. These fossils show that some of the horsetails in the Petrified Forest during the Late Triassic grew much larger than modern representatives of these species. The stems of some of these tall giants were nearly 2-feet in diameter and probably 30-feet tall or taller. Cycads, which can be found in tropical areas of the world today, were also abundant in the park where they are represented by three species. Bennittitales, which are distant extinct relatives of the cycads, have been described from compressed leaf fossils at the park. Many of the plant species found in Petrified Forest National Park are closely related to modern species, although some of them represent species that are now extinct (NPS 1998a).

Fossil Animals

Reptiles, amphibians, insects, and aquatic invertebrates have been described from Petrified Forest National Park. The most abundant reptile fossils are the phytosaurs, large, crocodile-like animals, that were dominant predators during the Late Triassic. Other crocodile-like reptiles have been described from fossils at the park, including herbivorous forms such as aetosaurs and fearsome predators such as *Postosuchus*. Metoposaurs were giant, flat-headed amphibians that were approximately 10-feet long and probably weighed over 1,000 pounds. The dimensions of this animal are one indicator that quite a few Triassic reptiles and amphibians attained sizes much greater than most modern forms.

The Late Triassic period has been called the "Dawn of the Dinosaurs"—these animals formed an uncommonly large portion of the ancient fauna at Petrified Forest National Park. These early dinosaurs were much smaller than latter types common during the Late Mesozoic, and included *Coelophysis*, *Revueltosaurus*, and possibly *Chindesaurus*.

Although only a few fossil beetles have been found in Petrified Forest National Park, much other evidence indicates the presence of insects here during the Late Triassic period. This evidence consists of several types of borings and trails in petrified wood and bite marks on the edges of leaves. Aquatic invertebrates identified in the park include crayfish, horseshoe crabs, snails, clams, and clam-shrimp. In addition, several fossilized forms of fish, including fresh water sharks, have also been collected (NPS 1998a).

In the badlands areas of Petrified Forest National Park, such as the Painted Desert, The Tepees, Blue Mesa, and Rainbow Forest areas, fossil resources are regularly and continually exposed and destroyed by wind and water. Theft of plant and animal fossils is also a problem in some areas of the park. The

resource management staff has implemented procedures to monitor and protect these fossil resources through a paleontological site inventory project funded under the Fee Demonstration Program. This project involves monitoring known fossil sites, collecting locality data, tying archival and collection information to the site, photo-documenting and mapping sites, and collecting some representative specimens for park collections. A second fee demonstration project has been authorized to extend the inventory project for another two years.

VEGETATION

A preliminary vegetation classification has been prepared by Thomas, Hansen, and Seger (2002), for Petrified Forest National Park. Although preliminary, this classification identified seven shrubland alliances, three dwarf-shrubland alliances, five herbaceous alliances, one dwarf shrubland herbaceous alliance, two shrubland-herbaceous alliances, one sparse vegetation alliance, as well as unvegetated areas, that characterize the plant communities of the park. None of the sampling efforts for this classification identified a community with enough tree cover to be considered a woodland or forest (NPS 2002a).

Bigelow's Sagebrush Dwarf-Shrubland Alliance

Plant communities characterized by this alliance support Bigelow's sagebrush (*Artemisia bigelovii*) as the dominant shrub (3% to 14% cover). Other shrubs that could be present include cliffrose (*Purshia stansburniana*) (0% to 8% cover), crispleaf buckwheat (*Eriogonum corymbosum*) (0% to 10% cover), dunebroom (*Parryella filifolia*) (0% to 10% cover), shadscale (*Atriplex confertifolia*) (0% to 4% cover), snakeweed (*Gutierrezia sarothrae*) (0% to 13% cover), and Torrey's joint-fir (*Ephedra torreyana*) (0% to 8% cover). Galleta (*Pleuraphis jamesii*) is the most prevalent herbaceous (grass) species supported in this alliance (0% to 7% cover) (Thomas, Hansen, and Seger 2002). Drummond Goldenweed Dwarf-Shrubland Alliance.

This alliance is dominated by Drummond goldenweed (*Isocoma drummondii*) (20% to 22% cover), but is also characterized by the presence of herbaceous species. Alkali sacaton (*Sporobolus airoides*) and galleta (12% to 15% and 5% to 8% cover, respectively) are both supported in this alliance at Petrified Forest National Park. Other shrub species that could be present with less cover are New Mexico saltbush (*Atriplex obovata*), shadscale, and snakeweed (NPS 2002a).

Dunebroom Shrubland Alliance

Dunebroom is the dominant shrub supported by this alliance at the park (7% to 23% cover). Other shrubs present include rubber rabbitbrush (*Ericameria nauseosa*) (0% to 8% cover), and snakeweed (0% to 5% cover). Grasses present include alkali sacaton (5% to 15% cover) and galleta (0% to 7% cover). Plant communities at Petrified Forest National Park that support dunebroom are not classified in this alliance if Bigelow's sagebrush occurs as an indicator species as well. Instead they are classified in the Bigelow's Sagebrush Dwarf-Shrubland Alliance. Forb cover is low (1% to 4%), while one plant community has 4% tree cover (NPS 2002a).

Four-Wing Saltbush Shrubland Alliance

The plant communities in this alliance are characterized by the presence of at least 19% four-wing saltbush (*Atriplex canescens*) cover (19% to 30%). Galleta and alkali sacaton are supported consistently (5% to 28% and 5% to 37% cover, respectively) as the most prevalent grass species. Other shrubs that are common included Bigelow's sagebrush (0% to 6% cover) and/or snakeweed (0% to 5% cover). Little forb and no tree cover was measured (NPS 2002a).

New Mexico Saltbush Dwarf-Shrubland Alliance

This alliance is dominated by New Mexico saltbush (9% to 49% cover), which contributes to at least one-third of the total cover in any plant community characterized in the New Mexico Saltbush Dwarf-Shrubland Alliance. Alkali sacaton (0% to 25% cover) and galleta (0% to 7% cover) was the most common herbaceous species. Forb cover was noted as slight (0% to 1%) in this alliance, and no trees are present (NPS 2002a).

Rubber Rabbitbrush Shrubland Alliance

The plant communities characterized in this alliance are dominated by at least 6% rubber rabbitbrush cover (6% to 17%), an indicator of grassland deterioration. They also support several other shrubs including buckwheat (*Eriogonum* spp.) (0% to 12% cover), New Mexico saltbush (0% to 5% cover), sandsage (0% to 5% cover), and snakeweed (0% to 10% cover). The grasses alkali sacaton (2% to 20% cover), blue grama (*Bouteloua gracilis*) (0% to 10% cover), galleta (0% to 15% cover), and sandhill muhly (*Muhlenbergia pungens*) (0% to 7% cover) are common. Forbs are sparse (0% to 2% cover), while no tree cover was measured (NPS 2002a).

Sandsage Shrubland Alliance

The plant communities in this alliance are characterized by at least 10% sandsage cover (10% to 30%). Other shrubs that can be present include buckwheat (0% to 10% cover), four-wing saltbush (0% to 3% cover), rubber rabbitbrush (0% to 10% cover), and snakeweed (0% to 8% cover). Herbaceous species commonly present include blue grama (0% to 25% cover), hairy grama (*Bouteloua hirsuta*) (0% to 20% cover), Indian ricegrass (*Oryzopsis hymenoides*) (0% to 25% cover), and sandhill muhly (0% to 10% cover). Little forb cover (0% to 1.5%) and no tree cover was measured (NPS 2002a).

Snakeweed Dwarf-Shrubland Alliance

Plant communities characterized in this alliance are dominated by dwarf-shrub snakeweed (4% to 32% cover), which constitutes half of the shrub cover. Grass species commonly supported in these communities include alkali sacaton (0% to 10% cover), blue grama (0% to 40% cover), and Indian ricegrass (0% to 10% cover) (NPS 2002a).

Tamarisk Semi-Natural Temporarily Flooded Shrubland Alliance

Tamarisk (*Tamarix* spp.), an invasive exotic species found throughout the Puerco River

corridor at Petrified Forest National Park, is identified in only one sampling location used for this vegetation classification. The plant community has low total vegetation cover (10%), half of which is provided by tamarisk (NPS 2002a).

Wild-Privet Temporarily Flooded Shrubland Alliance

One plant community sampled along the Puerco River drainage, is characterized as this alliance and has 12% cover of wild-privet. Other shrub species supported are four-wing saltbush (7% cover) and rubber rabbitbrush (14% cover). Alkali sacaton (18% cover) is the dominant grass species present (NPS 2002a).

Alkali Sacaton Herbaceous Alliance

Alkali sacaton is the dominant grass in these plant communities (10% to 36% cover). Blue grama and galleta could co-occur, but always with lower cover (0% to 9% and 0% to 6%, respectively), while hairy grama (15% cover) or sandhill muhly (20% cover) is also supported. Indian ricegrass is an associate in some of the plant communities (0% to 7% cover). Shrubs are supported in this alliance and include Drummond goldenweed (0% to 10% cover), shadscale (0% to 13% cover), or snakeweed (0% to 7% cover) (NPS 2002a).

Alkali Sacaton Sod Herbaceous Alliance

Plant communities characterized in this alliance have high total cover greater than 50%, and a high cover of alkali sacaton (up to 35%). Alkali sacaton cover should be twice as much as galleta (0% to 20% cover) and blue grama (15% to 40% cover), hence forming a sod. Sand dropseed (*Sporobolus cryptandrus*) provides 25% cover in one plant community characterized as the Alkali Sacaton Sod Herbaceous Alliance at Petrified Forest National Park (NPS 2002a).

Blue Grama Herbaceous Alliance

To be included in this alliance, blue grama must contribute at least 10% of the grass cover. Blue grama cover ranges from 9% to 70% in these plant communities, while galleta and alkali sacaton provide 0% to 28% and 0% to 15% cover, respectively. Other grass species could co-occur with blue grama including hairy grama (0% to 15% cover), Indian ricegrass (0% to 7% cover), needle-and-thread (*Heterostipa comata*) (0% to 8% cover), and red three-awn (*Aristida purpurea*) (0% to 15% cover). Shrub species commonly supported by this alliance include four-wing saltbush (0% to 7% cover), New Mexico saltbush (0% to 8% cover), and snakeweed (0% to 7% cover). Little forb and no tree cover was measured. Generally, the presence of 10% or more of shrubs distinguishes this type from the Blue Grama Dwarf-Shrub Herbaceous Alliance described next (NPS 2002a).

Blue Grama Dwarf-Shrub Herbaceous Alliance

These plant communities are characterized by the presence of blue grama (9% to 50% cover). Other grass species could co-occur such as alkali sacaton (0% to 25% cover), galleta (0% to 15% cover), Indian ricegrass (0% to 12% cover), needle-and-thread (0% to 20% cover), and wildrye (*Elymus* spp.) (0% to 10% cover). In addition, an unidentified needle-and-thread (*Heterostipa*

spp.) occurs in three plant communities characterized in this alliance, with up to 15% cover. A suite of shrubs could be supported including four-wing saltbush (0% to 12% cover), Bigelow's sagebrush (0% to 8% cover), Mormon tea (*Ephedra viridis*) (0% to 6% cover), New Mexico saltbush (0% to 10% cover), sandsage (0% to 13% cover), snakeweed (0% to 15% cover), Torrey's joint-fir (0% to 6% cover), and winterfat (*Kraschenninikovia lanata*) (0% to 5% cover). Little forb and no tree cover was measured (NPS 2002a).

Galleta Herbaceous Alliance

This alliance is characterized by the presence of at least 2% galleta (2% to 30% cover). Blue grama is present but with less than 10% cover (0% to 9%). Alkali sacaton also commonly occurs in these plant communities (0% to 15% cover), but with no more than twice the cover as galleta. An unidentified needle-and-thread is present in one community with 25% cover. Shrubs that are commonly supported in this alliance at the park include New Mexico saltbush (0% to 7% cover), and shadscale (0% to 4% cover) (NPS 2002a).

Galleta Shrub Herbaceous Alliance

The presence of at least 1% galleta (1% to 51% cover), less than 10% blue grama, and alkali sacaton cover no more than twice the cover of galleta characterize this alliance at Petrified Forest National Park. These plant communities have greater shrub cover and more shrub species than the Galleta Herbaceous Alliance described above. Shrubs supported include Bigelow's sagebrush (0% to 4% cover), Drummond goldenweed (0% to 4% cover), dunebroom (0% to 8% cover), New Mexico saltbush (0% to 12% cover), shadscale (0% to 5% cover) and snakeweed (0% to 11% cover). Little forb cover and no tree cover was measured (NPS 2002a).

Hairy Grama Herbaceous Alliance

Although 14 species are identified in the single plant community characterized in this alliance at Petrified Forest National Park, it is clearly dominated by hairy grama at 50% total cover. Total grass cover measures 62.5%, while shrub cover measures 11% (NPS 2002a).

Indian Ricegrass Shrub Herbaceous Alliance

Plant communities in this alliance are characterized by at least 10% Indian ricegrass cover (10% to 27%). Other grasses that may be found are alkali sacaton (0% to 8% cover), galleta (0% to 10% cover), sandhill muhly (0% to 15% cover), and in some cases trace amounts of blue grama. Common shrubs are dunebroom (0% to 15% cover), rubber rabbitbrush (0% to 6% cover), snakeweed (1% to 10% cover), and Torrey's joint-fir (0% to 6% cover). Little forb and tree cover (both 0% to 4%) is supported in all of these plant communities (NPS 2002a).

Painted Desert Sparse Vegetation

Typically, sparsely vegetated alliances have at least 2%, but less than 10%, total cover. Grass cover is 0% to 4% while shrub cover is 0% to 10% in this alliance at Petrified Forest National Park. Grasses typical of the Colorado Plateau, including alkali sacaton, blue grama, galleta, and Indian ricegrass, are supported by this alliance, with galleta and

alkali sacaton occurring most frequently. Shrubs that are commonly supported include Arizona siltbush (*Zuckia brandegeei* var. *arizonica*), buckwheat, Drummond goldenweed, New Mexico saltbush, shadscale, and snakeweed, with New Mexico saltbush and Arizona siltbush occurring most frequently (NPS 2002a).

Unvegetated Surfaces

Many areas throughout the park will likely meet the criteria of less than 2% cover used to distinguish unvegetated from sparsely vegetated areas.

SOILS

The soils of Petrified Forest National Park are generally characterized by four soil associations: the Moenkopie-Sandstone rock land association, the Tours-Jocity association, the Badland-Claysprings association, and the Clovis-Palma-Hubert association (USDA, SCS 1975). The Moenkopie-Sandstone rock land association is characterized by well-drained, shallow and very shallow, nearly level to moderately sloping loamy sands formed in material eroded from sandstone and sandstone rock outcrops. The Tours-Jocity association consists of well-drained, deep, nearly level to gently sloping clay loams and sandy clay loams formed in alluvium (stream sediments). The Badland-Claysprings association is characterized by barren, eroded land and well-drained, undulating clays formed in material eroded from clayey shales. Finally, the Clovis-Palma-Hubert association consists of well-drained, deep, nearly level to undulating loamy sands and gravelly loams formed in eolian (wind-blown) sands and alluvium (USDA, SCS 1975).

Numerous soil types have been identified as occurring within the boundaries of Petrified Forest National Park. However, as the GMP Revision does not recommend actions that could impact all of these soil types, only those potentially affected by implementing any one of the alternatives will be described. Table 8 summarizes these soil types.

In addition to recognized soils, cryptobiotic soils also occur within the park. In more arid regions, vegetative cover is generally sparse. Open spaces may be covered by these soils, which are a highly specialized community of cyanobacteria, mosses, and lichens. Cryptobiotic soils, also known as biological soil crusts, are formed by these living organisms and their by-products, creating a surface crust of soil particles bound together by organic materials (BLM, NPS, and USGS 1999). Mature cryptobiotic soils in the Colorado Plateau are usually darker than the surrounding soil. This is due in part to the density of the organisms, and to the often dark color of the cyanobacteria, lichens, and mosses that comprise these soils (BLM, NPS, and USGS 1999).

TABLE 8. PROPERTIES OF SOIL TYPES IDENTIFIED IN PETRIFIED FOREST NATIONAL PARK

Soil Name	Properties
Badland (BA)	Severely eroded, hilly to extremely steep, almost barren land that is dissected by intermittent drainageways. Mainly soft shale of the Chinle Formation, containing numerous large pieces of petrified wood. Erosion hazard is high.
Claysprings clay, 0% to 8% slopes (CDB)	Undulating soil found on clayey shale plains. Formed in material derived from clayey shale on plains near the breaks to well defined drainageways. Erosion hazard is moderate.
Clovis loamy sand, 0% to 8% slopes (CLB)	Nearly level to undulating soil on broad plains. Formed in eolian sand and alluvium derived from quartzite, gneiss, schist, sandstone, and limestone. Erosion hazard is slight.
Clovis-Palma association, undulating (CTB)	This association is dominated by 65% Clovis loamy sand, 0% to 8% slopes, and 30% Palma loamy sand, 0% to 8% slopes. Both were formed in eolian sand and alluvium derived from quartzite, gneiss, schist, sandstone, and limestone. Erosion hazard is slight for both.
Jocity sandy clay loam (JR)	Nearly level soil on broad, extensive alluvial fans and floodplains. Formed in alluvium derived mainly from shale and shaley sandstone. Erosion hazard is moderate.
Jocity-Claysprings complex (JS)	This complex is dominated by 60% Jocity sandy clay loam, 25% Claysprings clay, and 10% shale outcrop. The Jocity sandy clay loam formed in alluvium derived mainly from shale and shaley sandstone, while the Claysprings clay formed in material derived from clayey shale on plains near the breaks to well defined drainageways. Erosion hazard is moderate for both soils in the complex.
Moenkopie loamy sand, 0% to 8% slopes (MKB)	Found on hills and broad plains. Formed in material weathered from hard sandstone on hills and broad plains. Erosion hazard is moderate.
Navajo clay (NC)	Nearly level soil found mainly on broad, smooth floodplains (associated with Nine-Mile Wash at Petrified Forest National Park). Formed in alluvium derived from shale, sandstone, and basalt. Erosion hazard is slight.
Riverwash (RH)	Nearly level soil consisting of finely stratified soil material that is subject to frequent overflow and to modification resulting from the overflow. Found on floodplains (associated with Puerco River at Petrified Forest National Park).
Rough broken land (RO)	Consists of shallow and very shallow soil material, mostly loam and sandy loam, over shale. It is steep on dissected terrace breaks, and shale outcrops are prominent. Parent material are mostly shales of the Chinle Formation. Erosion hazard is very high, and geologic erosion is active.
Sandstone Rock Land (SA)	Found on mesa caps and breaks. Parent rock is of the Moenkopi, Chinle, or Dakota Formations. It is approximately 50% sandstone rock, 35% very shallow or shallow, coarse/moderately coarse textured soils underlain by sandstone, 7% Rough broken land, 5% Badland, and 3% Tours soils. Erosion hazard is moderate.
Sheppard loamy sand, 0% to 8% slopes (SMB)	Undulating soil found on dunes and broad plains. Formed in eolian sand on dunes and broad, undulating plains. Water erosion hazard is slight, but wind erosion hazard is high.
Tours clay loam (TO)	Nearly level soil found on broad floodplains and alluvial fans. Formed in alluvium derived from sandstone, shale, and basalt. Erosion hazard is slight.

Source: USDA, SCS 1975.

Cryptobiotic soils contribute to a number of ecological functions in the environment. The filamentous growths generated by the cyanobacteria, lichens, and mosses bind the soil particles together, providing soil stability and resistance to wind and water erosion. Studies have shown that cryptobiotic soils increase both surface roughness and water infiltration. Where such soils do not significantly increase surface roughness, infiltration is generally reduced due to the presence of cyanobacteria filaments (BLM, USGS, NPS 1999).

Cryptobiotic soils also have an effect on plant germination and growth in arid environments like those found at Petrified Forest National Park. Increased surface relief provided by these soils is presumed to provide a suitable site for germination, while the darker surface color increases soil temperatures required for germination earlier in the season, coinciding with spring water availability (BLM, NPS, and USGS 1999). However, large-seeded plants and native seeds require burial for germination, either by self-drilling mechanisms or caching by rodents. Cryptobiotic soils reduce soil movement, and this may limit passive burial and germinations of large-seed exotic plants (BLM, NPS, and USGS 1999). These soils also appear to enhance the ability of a plant species to survive in arid environments. Many studies have shown increases in plant survival and/or nutrient content in plants growing in cryptobiotic soil-covered environments, as opposed to bare soil (BLM, NPS, and USGS 1999).

VISITOR EXPERIENCE AND APPRECIATION

Annual park visitation from 1991 to 2000 ranged from 605,312 to 935,185 visitors. Visitation was relatively high in the early 1990s, peaked in 1995, and declined each year since then. Some general trends in park visitation are summarized below.

Monthly visitation peaks in July, but visitor numbers are high throughout the summer months. An increase in visitation is usually noted from mid-December until mid-January as people travel during the holidays. During spring and autumn months seniors and school groups increase.

A study of petrified wood theft (Roggenbuck et al. 1997) and a recent visitor study (Delost and Lee 2001) provide some information about visitor characteristics. Park visitors tend to be highly educated and have relatively high incomes. Most visitors come in family groups that include children or adolescents. Average group size is just over three people. About one-quarter of groups include a member over 65 years of age. About three-quarters of all visitors are visiting the park for the first time. Average length of stay in the park is 2.4 hours. About 10% of visitors are Arizona residents, with California the next most common state of residence.

Petrified Forest National Park is not the primary trip destination for most visitors. Other sites on visitor itineraries commonly include Grand Canyon National Park, Wupatki National Monument, Sunset Crater Volcano National Monument, Walnut Canyon National Monument, Hubbell Trading Post National Historic Site, Canyon

de Chelly National Monument, Meteor Crater National Landmark, and the Navajo and Hopi Reservations.

Seeing petrified wood and viewing the Painted Desert are the two most common reasons people give for visiting the park. Eighty-five percent of visitors stop at Painted Desert overlooks. More than half also stop to enjoy the following park locations: Painted Desert Inn, Painted Desert visitor center, Puerco Pueblo, Newspaper Rock, Jasper Forest, Blue Mesa, Rainbow Forest Museum, Crystal Forest, Giant Logs, and Long Logs (Delost and Lee 2001).

A wide variety of visitor experiences are available in the park's frontcountry including day hiking on established trails; picnicking; viewing scenic vistas, historic properties and wildlife; auto touring; and informational and interpretive (educational) opportunities. The latter are discussed in detail below.

Backcountry experiences tend to be less diverse due to the nature of the resource. Much of the backcountry is managed as wilderness and there are few maintained trails, no reliable water sources, and summer temperatures can soar to over 100º F. Thunderstorms can turn dry washes into rushing torrents. For these reasons, relatively few visitors venture into the backcountry. Day hiking and overnight backpacking are the most common types of backcountry experience. Horseback riding is allowed in the backcountry and the area is accessed in this manner by a few visitors.

Information and interpretation is a critical aspect of visitor experience and appreciation. At Petrified Forest, information and interpretation is provided at information desks, ranger-led walks, museum exhibits at Painted Desert visitor center, Rainbow Forest and Painted Desert Inn, and commercial bus tours. In addition, the National Park Service provides educational programs for school groups, a junior ranger program, an orientation film (shown at the Painted Desert visitor center), wayside exhibits, and several self-guided nature trails.

A variety of visitor services are provided within the park. The nonprofit Petrified Forest Museum Association operates bookstores at three locations—Painted Desert Inn, Rainbow Forest Museum, and the Painted Desert visitor center. AMFAC Resorts, L.L.C., operates a gift shop, café, gas station / mini-mart at the Painted Desert headquarters, and a gift shop and snack bar at Rainbow Forest. These concession services are provided under a contract with the National Park Service.

About half of all visitors purchase at least one item at park gift shops. About 21% of visitors purchase petrified wood inside the park (this wood is collected *outside* the park) at concession-run gift shops. About 22% purchase petrified wood outside the park. *NPS Management Policies* (2001) prohibits the sale of original fossil specimens within the park, so petrified wood sales within the park will be discontinued once the current concession contract expires.

Opportunities for limited-mobility visitors are few. Portions of every public building in the park are inaccessible to those with limited physical abilities. However, most visitor-oriented areas (e.g., visitor centers, gift shops, and restrooms) of the buildings are accessible. Most scenic viewpoints are accessible, but there are no accessible trails. Petrified Forest National Park is aware of this deficiency and is currently conducting a trail

accessibility survey. In general, accessibility improvements are made as buildings are rehabilitated or renovated, according to the Americans with Disabilities Act of 1990.

NATIONAL PARK OPERATIONS

Operations

Petrified Forest National Park is administered by a superintendent and several division chiefs. Operations are managed out of the Painted Desert headquarters area, where most staff is located. Further assignments of staff are made from headquarters to fulfill other park operational requirements.

Management of Petrified Forest National Park is organized into the following main functions.

Administration

Administration provides coordination, guidance, and is responsible for the park budget and fiscal and real property management activities. All contracting and purchasing for the park is conducted through this division. It also has responsibility for human resources, information management, and housing administration in the park.

Interpretation and Education

Interpretation and Education is responsible for the interpretation of identified park themes, education services for diverse audiences, and providing information and orientation for park visitors through personal and non-personal services such as the park Web site, publications, exhibits, and Volunteer-In-The-Parks program. This function manages the Rainbow Forest Museum, Painted Desert visitor center, and Painted Desert Inn in close cooperation with the Petrified Forest Museum Association.

Protection

Protection is responsible for visitor and employee safety, resource protection, emergency response, park and facility patrols, security, emergency medical services, search and rescue, structural and wildland fire, law enforcement, air operations, resource protection education, dispatch, and concession operations in the park. The Protection function also provides emergency and law enforcement response and aid to local, county, and state agencies through cooperative agreements.

Fee Collection

Fee Collection is associated with the protection division and is responsible for revenue management, greeting visitors, visitor safety, and dissemination of the resource protection messages.

Maintenance

Maintenance is responsible for the operation and maintenance of all park facilities and equipment including: utilities (water, wastewater, power, and solid waste), structures and grounds, frontcountry and backcountry visitor use areas, trail systems, picnic areas, roads, park signs, and vehicles.

Resource Management

Resource Management is responsible for management of natural and cultural resources. It also oversees the research program; consults with outside experts, agencies and associated tribes; plans for

future research and management needs; monitors and protects resources; ensures that management has pertinent scientific information on which to base decisions; and provides information for staff and visitor education.

Museum Collections Management

Resource Management and Interpretation and Education share museum collections management and library management responsibilities. The park's museum collection includes natural objects (fossils, floral and faunal specimens) and cultural objects (pottery and other material culture), archives and photographs.

Facilities

Facilities at Petrified Forest National Park were recently inventoried (e^2M 2001), and existing spaces and current park space needs were compared. The study examined facilities in three areas within the park (Rainbow Forest, Painted Desert Inn, and Painted Desert headquarters complex). Holbrook housing was considered in this study only as available residential units and not included in the square footage analysis. The space-needs assessment concluded that approximately 70,000-square feet of space is being used at the park. Additional space needs were identified totaling approximately 16,700-square feet. The total amount of square feet of the three park locations equals approximately 102,000-square feet. Although adequate space exists to house needed uses, structure integrity, space type (office vs. storage building), and functional relationship (physical relationship to other related functions) prevent the space from being used.

A Condition Assessment and Preservation Plan (NPS 2001b) is also underway for various structures at Rainbow Forest and the Painted Desert headquarters complex. The plan will assist the park with understanding the condition of its historic structures, and outlines general recommendations for the maintenance and preservation of these structures. The buildings were surveyed and assessed for architectural, structural, life safety, mechanical, and electrical condition.

Rainbow Forest

Eight units originally designed as residences are located in this part of the park. Two residences are currently occupied by NPS employees, another is available as a temporary residence, four are not being used, and one (a studio unit) is used as a break room for interpretive and protection staff based in the museum. A picnic pavilion for residents and visitors alike is located east of the residences at Rainbow Forest.

The Rainbow Forest Museum / visitor contact station and the concessions building are the only two visitor service facilities in this area. The museum, which is not fully accessible, has interpretive exhibits, a bookstore, offices for interpretation and protection staff, cooperating association storage (publications), and restrooms. The concessions building, which has been greatly enlarged over the years through several additions, offers food services, a gift shop, and restrooms. The freestanding duplex has been converted to a single residence for a concessions staff member.

Maintenance facilities include an oil and hazardous materials storage building (where evidence and other materials are also stored)

and a long garage structure where the park fire truck is kept.

Overall, the buildings at Rainbow Forest are listed in fair condition. A complete list of deficiencies and recommendations are included in the condition assessment report, and include:

- exterior shows signs of weathering,
- interior walls do not provide adequate fire ratings,
- buildings are not universally accessible,
- buildings do not have fire detection, fire alarms, and fire suppression systems,
- site drainage is causing flooding of building interiors, and
- roofs need to be replaced.

Painted Desert Inn

The Painted Desert Inn area in the north section of the park includes the historic inn and its grounds and two associated historic residences. Currently, the inn is used for interpretive purposes, with exhibits, bookstore, and publications storage. The historic residences are not currently being used.

The conditions of the buildings at the Painted Desert Inn range from fair to poor. Poor construction and inadequate repairs have resulted in major structural problems at the inn, including significant cracks in interior and exterior walls. Because the historic residences are not being used, they are also deteriorating.

The Painted Desert Inn will undergo major rehabilitation in 2003; this work is part of all alternatives in this GMP Revision.

Painted Desert Headquarters Complex

The Painted Desert headquarters complex includes park housing units, visitor services, park maintenance, and park administration, with a central courtyard. Residential units include 18 three-bedroom units (6 triplexes) with detached carports, 8 one-bedroom apartments connected to the visitor center, and 2 one-bedroom units configured in a duplex. The apartments are used for housing and adaptively for offices. Three of the three-bedroom units are unsafe due to structural deterioration. Several other units are also vacant, some due to maintenance problems that require additional funding to repair.

The Painted Desert visitor center is the primary location for visitor information and orientation at Petrified Forest National Park. It consists of a bookstore, very limited exhibit space, cooperating association storage, auditorium, and museum collections office and storage. The adjacent concessions building includes a gift shop, food services, restrooms, concessions offices, and a gasoline service station / mini-mart.

The Painted Desert headquarters complex also includes most of the maintenance facilities for the park. These facilities include carpenter, automotive, sign, electrical, welding, and plumbing shops; and storage areas for the snow plow, fire and rescue cache, oil and hazardous materials, vehicles, dry storage, and offices. An outside storage yard for large materials (“bone yard”) is located northeast of the headquarters complex.

Park administration and management offices are generally located on the second floor of the visitor center in the headquarters area. This area also includes a small conference

room, two small libraries, and a supply storage area. Petrified Forest National Park interpretive staff occupies the former park school building, which is used for audiovisual equipment storage, workstations, and interpretive staff offices. The U.S. Postal Service also manages a small post office in the building.

A community building is located in the Painted Desert headquarters complex and is used for visitor and/or park staff functions that must accommodate large groups such as training or special presentations.

There is a trailer parking area east of the complex that is used by concessions and Arizona Department of Public Safety personnel who live at the park. Associated with this area is a trailer storage building that is used for resource management, interpretation, maintenance, fitness center, and Petrified Forest Museum Association dry storage. East of this area is a house occupied by one of the concessions staff members.

The buildings at the Painted Desert headquarters complex are listed in poor to good condition (table 9) (NPS 2001b). Some structures have major structural problems as a result of poor construction, inadequate repairs, and altered stormwater drainage patterns. Roofs leak, frequently damaging walls, floors, equipment, and supplies. Many interior and exterior walls have significant cracks. Rainwater and snowmelt drip from roof edges to form pools on sidewalks and cause an ice safety hazard in freezing weather. The roofs of two maintenance buildings, the school house, apartment wing, and a covered walkway in the headquarters complex have recently been replaced. In addition, the roofs of structures 207, 208, and 209 (three-bedroom residences) were recently replaced. Funding has been requested to address the remainder of the roofing situation.

Deficiencies for Painted Desert headquarters complex buildings are much more extensive due to improper soil preparation and poor construction (lack of structural reinforcing), and they are further complicated by building modifications. In addition to having structural problems, the buildings are not universally accessible; they lack fire detection, fire alarms, and fire suppression systems; heating, ventilation, and air conditioning systems are not working properly; and fire exits are too few and too far apart. Table 9 summarizes the condition of major NPS-owned buildings in the Painted Desert headquarters complex. This information is taken from the draft condition assessment report (NPS 2001b).

TABLE 9. BUILDING CONDITION ASSESSMENT SUMMARY – PAINTED DESERT HEADQUARTERS COMPLEX

Building	Condition	Major Issues
Visitor Center / Administration	Fair to good	▪ Structure is not stable—settlement of the floor slab, foundations, cracking and settlement of the walls in the one-story section of the building. ▪ The interior floor slab in the southwest corner of the building has settled approximately 2 inches. ▪ The courtyard wall has settled and pulled away from the southwest corner of the building. ▪ Settlement, cracking, and separation of the walls in the area of the boiler room, transformer room, and at the transition from the visitor center to the maintenance building. Wall has displaced an inch or more laterally. The east end of the south wall (outside of the boiler room) is also severely cracked. If settlement and cracking continues to occur, a portion of either of these walls could collapse, leading to failure of the roof.
Maintenance Building	Fair	▪ Of serious concern is the settlement, cracking, and separation of the walls where this building joins the one story wing of the visitor center / administration building.
Apartments	Fair to good	▪ Structural settlement and cracking. ▪ Damage from past roof leaks. ▪ One unit uninhabitable.
Community Building	Fair	▪ Serious cracking and settlement problems with the walls. The expansion control joint on the west wall has separated and displaced. ▪ Longitudinal exterior masonry walls appear to have rotated away from the transverse walls. This has caused cracking in the transverse walls. This rotation may be due to poor footing design, or lack of reinforcing in the corners. While the roof may be restraining this movement, movement does appear to be getting worse. If this rotation continues, the walls could fail by falling “out” of the building.
School Building	Fair	▪ Most obvious problems are the condition of the exterior walls, doors and windows, and the problems in the mechanical room. The building looks worn, neglected, and dirty.
201–203, 3-Bedroom Residences	Fair to good	▪ The most pressing problems are structural concerns and roofing. In several of the units there are serious cracking and settlement problems along interior and exterior walls, courtyard walls, and floor slabs. Cracks reappear soon after they are repaired, indicating still-active settlement. In some cases, where cracks go completely through the concrete walls, no reinforcing is visible inside of the walls. In other cases, it is possible to see that the masonry walls are not built directly over the foundations; in several places the vertical steel reinforcing comes up outside of the surface of the walls. ▪ Past roof leaks have contributed to the structural damage, as well as damaging nonstructural materials and interior and exterior finishes. Damage also creates a health and safety problem by allowing water into the electrical system and fixtures, as well as into the heating and cooling systems; and moisture in the structure and building materials contributes to the growth of mold and mildew, threatening user health.

Building	Condition	Major Issues
Buildings 204–209, 3-Bedroom Residences	Fair to good	▪ The most pressing problems are structural concerns and roofing. In several of the units, there are serious cracking and settlement problems along interior and exterior walls, courtyard walls, and floor slabs. Cracks reappear soon after they are repaired, indicating still-active settlement. In some cases, where cracks go completely through the concrete walls, no reinforcing is visible inside of the walls. In other cases, it is possible to see that the masonry walls are not built directly over the foundations; in several places the vertical steel reinforcing comes up outside of the surface of the walls. ▪ One particularly bad area is located at the southeast corner of unit 207—the walls have been bolted together to keep them from falling down.
Building 210–215, 3-Bedroom Residences	Fair to good	▪ The most pressing problems are structural concerns and roofing. In several of the units, there are serious cracking and settlement problems. Along interior and exterior walls, courtyard walls, and floor slabs. Cracks reappear soon after they are repaired, indicating still-active settlement. In some cases, where cracks go completely through the concrete walls, no reinforcing is visible inside of the walls. In other cases, it is possible to see that the masonry walls are not built directly over the foundations. In several places the vertical steel reinforcing comes up outside of the surface of the walls.
Buildings 216–218, 3-Bedroom Residences	Poor	▪ These buildings are not being occupied and are uninhabitable due to their poor condition.
Buildings J and K "Teachers Residences"	Fair to good	▪ Past roof leaks have damaged wood framing, nonstructural materials, and interior and exterior finishes. ▪ One portion of the ceiling in unit J has collapsed and there is quite a bit of damage to the walls in the living room. Damage creates a safety problem by allowing water into the electrical system and fixtures, as well as into the heating and cooling systems; and the presence of moisture in the structure and building materials contributes to the growth of mold and mildew, threatening user health.

Holbrook Housing

The National Park Service owns 11 two- and three-bedroom houses in Holbrook, Arizona. Currently, eight of these units are in use.

Trails and Roads

Trails are located at the following park features: Long Logs / Agate House, Giant Logs, Tawa Point (Rim Trail), Crystal Forest, Blue Mesa, Puerco Pueblo, and Kachina Point. There are no backcountry campgrounds at Petrified Forest National Park, and the trail from Kachina Point that leads down the steep rim face to the Painted Desert gradually disappears.

Vehicle access to Petrified Forest National Park is provided by I-40 (north end of the park) and US 180 (the south end of the park); approximately 65% of all vehicles enter through the I-40 entrance. The Burlington Northern-Santa Fe Railroad also passes through the park. Vehicle access through the park is limited to the main park road and its associated spur roads. An unmaintained trace

of historic Route 66 passes through the park north of I-40.

Campgrounds

Backcountry camping is allowed by permit, but there are no designated campgrounds within the park. Campgrounds are available, however, just outside the south park entrance, in Holbrook, and near I-40 between the park and Holbrook.

Operational Efficiency

The operational efficiency of the park is not optimal. All park operations are located in historic or potentially historic structures, many of which are being adaptively reused and are deteriorating. Office and storage space is limited, and most buildings are not universally accessible. Several structures, including residences, lack proper fire suppression, are not large enough to meet their intended needs, and represent health and safety risks. Because all administrative functions are located in the headquarters area, communication between staff is good.

Emergency response time in the park is good throughout. Because protection personnel are available at both ends of the park, routine emergencies are generally easily handled.

Administrative Access to Museum Collection

Some paleontological artifacts excavated from Petrified Forest National Park are stored offsite at various institutions. Convenient access to these collections is not optimal for onsite park staff.

Onsite storage facilities for museum collections do not meet current NPS curatorial standards and are often shared with other functions. The collection, which is rapidly expanding, is housed in the headquarters complex in an inadequate room in a building that has major environmental and structural problems. The building also lacks adequate security systems. There is convenient access to the collection by park staff and onsite researchers.

Energy Requirements and Conservation Potential

Petrified Forest National Park receives most of its electrical energy from conventional sources such as coal-fired power plants. Solar energy is used to power small pieces of equipment, including park gates and emergency telephones. In general, energy consumed by the park is used to heat, cool, and light buildings, provide power to facilities such as maintenance shops and park residences, run a network of computers, and provide interpretive programs (e.g., the visitor center audiovisual program). The park has requested technical and financial assistance from the Department of Energy to help establish a fuel cell / solar electrical backup system for the Painted Desert visitor complex. This system would provide emergency and operational electrical backup power and would constitute a test program for efficiency, sustainability, suitability, and future potential of fuel cell technology.

At the Rainbow Forest and Painted Desert Inn, energy requirements and conservation potential would not be affected sufficiently by implementing any alternative to warrant further consideration in this document. A few small, new structures would be built at

Rainbow Forest and none at the Painted Desert Inn; general operations would remain the same in both areas. Thus, the environment at Rainbow Forest and the Painted Desert Inn is not anticipated to change in regard to energy requirements and conservation potential. In contrast, energy requirements and conservation potential at the Painted Desert headquarters complex would be affected and is therefore addressed as follows.

The Painted Desert headquarters complex was built during the early 1960s, at a time when energy costs were low and few energy-saving methods were employed. Buildings were constructed with minimal insulation, and windows were typically single-pane with no insulating qualities. As a result, heating and cooling efficiency is limited in these buildings, and energy requirements are higher than those for a complex built with state-of-the-art technologies and materials.

SOCIOECONOMIC RESOURCES

Regional Setting

Petrified Forest National Park is located in a remote, arid, and sparsely populated area of northeast Arizona, about 27 miles east of Holbrook, and 15 miles west of Navajo. Most of the park, approximately 70,493 acres, including the Painted Desert headquarters complex, is in Apache County and the remainder in Navajo County.

The Navajo Reservation abuts the northern and northeastern boundary of the park. The remaining adjacent land is a checkerboard of public and private lands alternating in square-mile sections. Most of the land has been managed as part of large cattle ranches for the past 120 years. I-40 passes through the northern segment of the park and is the primary highway access to Petrified Forest National Park. US 180 provides access from the south into Rainbow Forest.

Existing conditions for the affected socioeconomic environment are described below. Based on the location of the park, highway networks, distances to nearby communities, and residency patterns of park staff, the region of influence encompasses adjacent portions of Apache and Navajo Counties and includes the city of Holbrook.

Population

Apache County encompasses about 11,205-square miles and has a population of 69,423. St. Johns is the county seat and home to approximately 6% of county residents. Eagar is the largest town and has 7%, and Springerville has 3% of the population (2000 Census). The remaining 84% live in smaller communities or on the White Mountain Apache and Navajo Reservations. Apache County's population increased by 12.7% from 1990 to 2000.

Neighboring Navajo County covers 9,953-square miles and has a population of 97,470. Holbrook is the county seat and home to approximately 6% of county residents. Twelve percent live in Winslow, the largest town in the area (2000 Census). Thirty percent of Navajo County residents live on the White Mountain Apache, Hopi, and Navajo Reservations. Navajo County population increased by 25.5% from 1990 to 2000.

Economic Conditions

During 1999, employment in Apache County totaled 21,315 full- and part-time jobs, and employment in Navajo County totaled 33,660 jobs. Table 10 illustrates changes in employment during the past 20 years.

TABLE 10. TOTAL COUNTY EMPLOYMENT, 1979 TO 1999

Year	Apache County	Navajo County
1979	16,535	21,977
1989	18,452	26,062
1999	21,315	33,660
Percent Change	29%	53%

Source: U.S. Department of Commerce, Bureau of Economic Analysis, May 2001.

Unemployment in the region for calendar year 1998 averaged 16.0% in Apache County and 14.0% in Navajo County (Arizona Department of Commerce 2001). Unemployment in Holbrook was 7.1% in 1998 and grew to 7.3% in 1999 (Arizona Department of Commerce 2001a). These averages compare to statewide averages of 4.7% for Arizona in 1998.

In Apache County, the two largest private, non-farm industries are retail trade (17% or 2,525 of the total employment) and services (56% or 8,073 of the total employment). In Navajo County the two largest private non-farm industries are also retail trade (25% or 6,624 of the total employment) and services (39% or 10,137 of the total employment).

Local employment in the retail trade and services industries is supported in part by the needs of travelers through the area. Originating with stagecoach travel, such needs evolved over time to highway-oriented travel served by clusters of gas stations, cafés, and small motels dotting the landscape along the highways. Due to changing economic conditions, many of those establishments are now closed. Many travelers are tourists visiting Petrified Forest National Park on their way to Flagstaff and other attractions. Consequently, highway travel-oriented services are dispersed along I-40. Overnight lodging is available in Holbrook and Chambers.

Table 11 categorizes regional employment. Private, non-farm employment for this region consists of mining, construction, manufacturing, transportation and public utilities, wholesale trade, retail trade, finance, insurance, real estate, and services.

Personal Income

Total and per capita personal income trends over time in the two counties mirror differences in their dependency on travel and tourism. As shown in table 12 and table 13, total personal and per capita income in the two counties has risen over time and is slightly higher in Navajo County.

During the 1990s, total personal income growth ranged from 79% to 80% in Apache and Navajo Counties. Apache County registered total personal income of about $904,550 in 1999, while personal income in Navajo County totaled $1,321,505. Some of the growth in total personal income can be attributed to increases in local employment combined with higher wages. However, growth was dampened by slowing tourism.

TABLE 11. EMPLOYMENT BY MAJOR CATEGORY, 1999

	Apache County	Navajo County	Arizona Statewide
Employment by Major Category			
Farm	293	574	20,149
Private Nonfarm	14,470	26,109	2,352,466
Government and Government Enterprises	6,552	6,977	352,019
	21,315	33,660	2,724,634
Distribution by Major Category			
Farm	1%	2%	1%
Private Nonfarm	68%	77%	86%
Government and Government Enterprises	31%	21%	13%
	100%	100%	100%

Source: U.S. Department of Commerce, Bureau of Economic Analysis, May 2001.

TABLE 12. PERSONAL INCOME

	1989	1999	Change (%)
Apache County	$501,338	$904,550	80
Navajo County	$739,495	$1,321,505	79
Arizona	$60,010,740	$120,287,327	200

Below-average personal incomes translate into local poverty percentages ("poverty level" is generally used for an income cutoff) that are substantially above the national average. According to the U.S. Census Bureau, 13.3% of the nation's population lived in poverty in 1997. This figure is higher in Apache and Navajo Counties: 39.7% and 28.4%, respectively. The percentage for Apache County is more than double the Arizona statewide average of 15.5% for the same period.

As a result of weak economic conditions, per capita personal incomes in the region have persistently lagged behind state and national averages. Per capita personal income ranged from $13,193 in Apache County to $13,440 in Navajo County, compared with the national average of $28,546 (table 13).

TABLE13. PER CAPITA PERSONAL INCOME

Geographic Area	1989	1999	Percent of 1999 US
US	$18,566	$28,546	100%
Arizona – Statewide	$16,568	$25,173	88%
Apache County	$8,242	$13,193	46%
Navajo County	$9,657	$13,440	47%

Source: US Department of Commerce, Bureau of Economic Analysis, May 2001.

The historically low per capita personal income is an indication of a depressed economy.

Housing

Housing stock and availability in the region reflects the size and distribution of the corresponding population base in each county. Thus, most of the housing is concentrated in or near key communities in each county and many of the remaining units are associated with local ranch and farm operations dispersed throughout rural portions of the county.

Total housing stock from Census 2000 numbered 31,621 units in Apache County and 47,413 units in Navajo County. Overall vacancy rates were high in the region, ranging from 36.8% in Apache County to 36.6% in Navajo County, but most of these units are listed as seasonal, recreational, or occasional-use units. Rental vacancy for Apache and Navajo Counties are 13.5% and 9.6%, respectively.

TABLE 14. HOUSING UNITS

Area	Total Housing Units	Occupied Units	Vacant Units	Percent Vacant	Vacant Units Listed for Seasonal, Recreational, or Occasional Use	Homeowner Vacancy Rate	Rental Vacancy Rate
Apache County	31,621	19,971	11,650	36.8	6,530	2.0	13.5
Navajo County	47,413	30,043	17,370	36.6	13,007	2.8	9.6
Holbrook	1,906	1,626	280	14.7	16	3.1	20.8

Source: U.S. Commerce Department, Bureau of the Census, July 2001.

The concentration of homes nearest Petrified Forest National Park is in Holbrook, Arizona. Only a few privately owned homes are located close to the park such as farm residences adjacent to the park in Apache and Navajo Counties.

The park has 31 housing units on its official inventory. Including 11 units in Holbrook, there are a total of 50 units that were built as residences. However, seven units are being adaptively reused for other purposes, three are unstable, and 11 are not on the inventory due to maintenance deficiencies or safety concerns.

The average commute time for employees living in Holbrook is approximately 30 minutes each way. Employees who live in the park have a similar commute to Holbrook for groceries and other necessities.

Nearby Communities

Petrified Forest National Park's key visitor facilities and onsite staff housing are all located more than 25 miles from nearby communities. Consequently, the park is self-sufficient in many respects. For example, the park operates its own wastewater treatment systems, waterlines, water storage tanks, and fire equipment; and the U.S. Postal Service manages a small post office in the park. However, the park buys water from the Navajo Tribal Utilities Authority. Other important economic, social, and public service links also exist between the park and nearby communities.

The strongest such link exists with Holbrook, Arizona (population 4,917). Holbrook provides essential retail and service functions for residents of the town and surrounding region, including Petrified Forest National Park employees and their families. These functions include churches, schools, community college, the newspaper, grocery store, cafés, automotive shops, and hotels. Holbrook has two elementary schools, one junior high, and one high school. The park's link to Holbrook is strengthened by the fact that about 22 permanent park employees live in Holbrook and its outskirts (including Woodruff), either in private homes or park-owned housing. The park acquired 11 units in Holbrook in 1996 when the U.S. Air Force conveyed the housing complex and property to the National Park Service, as authorized by 1995 legislation (PL 103-337). In addition, seasonal staff is commonly hired from the Holbrook community. The park cooperating association and concessions hire staff from Holbrook as well as other areas.

Other socioeconomic ties to Petrified Forest National Park include temporary housing at the park for Arizona Department of Public Safety and concessions employees.

Baseline Socioeconomic Factors Related to Petrified Forest National Park

Visitors to Petrified Forest National Park, park staff, and their households are integral parts of the region's economic and social structure. Some of the key dimensions of the park's role within the affected environment are described below.

Staffing at Petrified Forest National Park has risen over time as visitation has increased and visitor facilities, trails, and other improvements have been planned and completed. Authorized staffing at Petrified Forest National Park is presently 45 full-time

equivalent employees. In addition, construction contractors, seasonal employees, researchers, cooperators, and volunteers supplement park staff.

Another measure of Petrified Forest National Park's economic role is the stimulus provided by ongoing operating and capital expenditures. The budget for fiscal year 2001 was $2,449,295. The largest share of Petrified Forest National Park's annual operating budget is salaries (wages and benefits paid to park staff). In fiscal year 2001, for example, 81% of the operating budget was devoted to personnel costs. The remainder was allocated to facility and vehicle maintenance, utilities, miscellaneous supplies, travel, and the like. Substantial portions of annual expenditures circulate through the regional economy in the form of consumer and business purchases, yielding indirect economic impacts.

Under current law, federal landholders are expected to compensate local governments for losses to their tax base that federal ownership implies. The most common compensation program is known as Payments in Lieu of Taxes, or PILT. Payments are calculated following a complex formula that takes into account the population of the county, change in Consumer Price Index, previous payments under other compensation programs, and state pass-through laws (requiring payments to pass from counties to local communities rather than staying with the county government). Recent PILT payments from federal agencies to Navajo and Apache Counties are listed in table 15.

TABLE 15. PILT PAYMENTS BY ALL FEDERAL AGENCIES IN APACHE AND NAVAJO COUNTIES

	1999	2000	2001
Apache County			
Acres	680,968 (63,866 NPS)	680,968 (63,866 NPS)	680,968 (63,866 NPS)
Payments	$ 489,540.00	$ 523,885.00	$ 745,100.00
Navajo County			
Acres	597,161 (18,904 NPS)	596,483 (18,904 NPS)	596,483 (18,904 NPS)
Payments	$ 415,070.00	$ 435,596.00	$ 641, 880.00

In addition to the direct stimulus attributable to the park, spending by visitors to Petrified Forest National Park contributes (significantly) to the local economy. Trends in visitation are most likely attributable to regional travel trends, gas prices, demographics, and the like. Annual park visitation from 1991 to 2000 ranged from 605,312 to 935,185 visitors. Visitation was relatively high in the early 1990s. It peaked in 1995 and has declined each year since then.

The direct population associated with Petrified Forest National Park, that is, NPS employees, their spouses, and children living at home, presently numbers approximately 75. The cooperating association and concession population associated with the

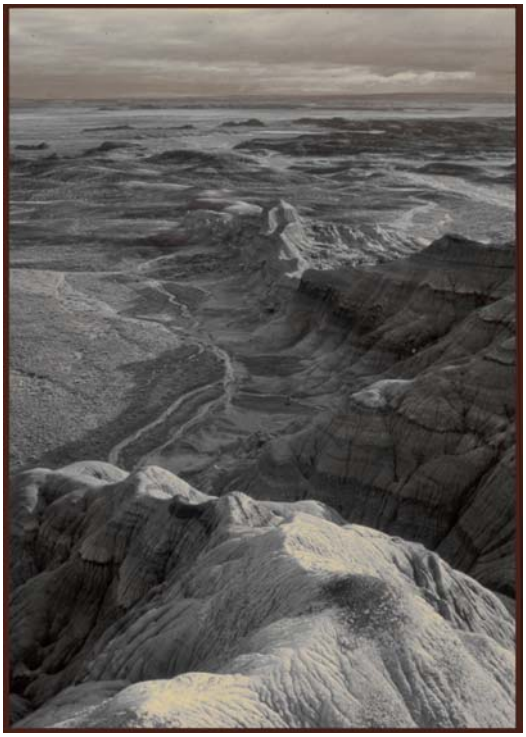
park is about 36 and 132 individuals, respectively. Because of the distance from the park to local schools in Holbrook, some park staff families with school-age children choose to live in Holbrook for convenience. Others home school their children.

Concessions

The park currently has a concession contract with AMFAC Resorts, L.L.C. (under the Fred Harvey Company name) for a gasoline station / mini-mart services at park headquarters, and food services and gift shops at headquarters and Rainbow Forest. *National Park Service Management Policies* (2001) stipulate that original paleontological objects will not be sold at national parks. Thus, when the current concession contract expires, petrified wood will no longer be sold in the park. In a 1997 study, 75 (of 178 visitors surveyed) spent an average of $14.91 purchasing petrified wood that is legally collected on lands outside the park at park concession facilities. Figures were approximately the same for wood purchased outside the park (Roggenbuck et al. 1997).

Cooperating Association

The Petrified Forest Museum Association was established and approved in 1941 by the Secretary of the Interior. The association is a nonprofit, non-governmental organization whose principal objective is to aid preservation and interpretation of the park. The association operates three book sales outlets in the park at the Painted Desert visitor center, Painted Desert Inn, and Rainbow Forest Museum. It also publishes park-specific books for sale and prints free informational materials such as the park newspaper, brochures, flyers, and site bulletins. Proceeds from the sale of publications are used to support educational and interpretive activities and research in the park.



CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

NEPA mandates that environmental impact statements disclose the environmental impacts of a proposed federal action. In this case, the proposed federal action is the implementation of the GMP Revision for Petrified Forest National Park. This chapter analyzes the potential effects of the management alternatives on cultural resources, natural resources, socioeconomic resources, visitor experience and appreciation, and park operations.

The alternatives in this document provide broad management direction. Because of the general, conceptual nature of their potential consequences, the alternatives can only be analyzed in general terms. Thus, this EIS should be considered a programmatic document. Prior to undertaking specific actions as a result of the GMP Revision, park managers will determine whether or not more detailed environmental documents will need to be prepared, consistent with provisions of NEPA.

The first part of this chapter discusses policy and terminology related to cumulative impacts and impairment of park resources. The next section discusses methods that the planning team used to identify impacts and includes definitions of terms. The alternatives are then analyzed in the order they appear in chapter 2, "Alternatives." Each impact topic includes a description of the positive and negative effects of the alternative, a discussion of cumulative effects, and a conclusion.

At the end of the discussion for each alternative, there is a brief discussion of unavoidable adverse effects, effects from short-term uses and long-term productivity, and irreversible and irretrievable commitments of resources.

Note that aside from evaluating the cumulative impacts for certain impact topics, the planning team did not reexamine consequences of valid decisions from the 1993 GMP. For additional information, see chapter 1, "Sections and Decisions of the 1993 GMP that Remain Valid."

CUMULATIVE IMPACTS

The Council on Environmental Quality regulations, which implement NEPA, require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as follows:

> The impact on the environment which results from the incremental impacts 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 (40 CFR 1508.7).

Cumulative impacts are considered for both the no-action and action alternatives. To determine potential cumulative impacts, the planning team considered past actions by the National Park Service and others, and it consulted agencies and governments. Development and industrial activities that have occurred in the recent past, are now underway, or would be implemented in the reasonably foreseeable future were included.

These projects or actions were evaluated in combination with the impacts of each GMP Revision alternative to determine if any cumulative effects on natural, cultural, socioeconomic resources, visitor experience and appreciation, or park operations would be expected. Because most of these cumulative actions are in the early planning stages, evaluation of cumulative impacts was based on a general description of projects or actions.

Park buildings that are now considered historic have undergone alterations in the past that were designed to improve their function. For example, exterior surfaces and new rooms have been added to the restaurant / gift shop building at the park headquarters complex. Some historic structures have deteriorated from deferred maintenance or from actions that were well-intentioned but had unexpected results, i.e., changes to gutters and surface drains were made gradually over the years and are believed to have caused damage to foundations and walls.

Specific deposits of Petrified Forest's petrified wood resources have significantly diminished since Petrified Forest National Monument was established in 1906. Despite signs and information on park maps, visitors to the park continue to displace or steal petrified wood. Petrified wood theft is prosecuted to the fullest extent, but as much as one ton of petrified wood is displaced or stolen by visitors each month.

Outside the park, where petrified wood is found on private lands, it has been harvested for many years, and the harvesting continues today. The wood is then sold in many forms: raw, polished, fashioned into jewelry, bookends, furniture, and the like.

Many other types of fossils have also gradually disappeared from the park. This is due to a combination of factors including natural erosion, visitor use, the lack of an active inventory and monitoring program, and, to a lesser extent, theft. Fossil loss is particularly acute in areas where trails and other visitor facilities are close to fossil concentrations.

Archeological sites inside and outside the park have been vandalized by pot hunters and others. This problem continues today; in fact, vandals destroyed a major archeological site located just outside the park in early 2001.

Semi-tractor trailer drivers frequently use the I-40 interchange ramps near the north entrance to the park as a parking / rest area. Some drivers throw bottles, cans, and other litter onto the highway right-of-way, creating a significant visual and natural resource problem. In cooperation with the National Park Service, the Arizona Department of Transportation reconfigured the I-40 interchange, in part to reduce this problem.

A new truck stop is planned for lands adjacent to I-40 and just east of the park. New businesses and new residences are being built on lands near the park and a residential

development of about 20 houses is planned for Navajo lands just east of the park. Grazing livestock may accompany the new residents.

Numerous helium and carbon dioxide wells are planned for the area between the town of St. Johns (located about 40 miles southeast of the park) and the New Mexico border. Park managers are not sure what the resource implications of these wells might be.

Coal-powered, energy generating stations operate near Joseph City, about 30 miles west of the park, and near St. Johns, about 40 miles southeast of the park. Other coal-powered energy generating stations operate near Springerville and Page, and several additional coal-fired power plants have been proposed for the region.

Specific projects that have recently been carried out or might be carried out by the National Park Service within the foreseeable future include:

- replacement of Jim Camp Wash bridge at Rainbow Forest (2002),
- conversion of Long Logs Road to a pedestrian trail (2002),
- reroofing and rehabilitation of Painted Desert Inn (2002–2004),
- conversion of a water-based system to vault or pit toilets at Agate Bridge / Jasper Forest (2003),
- address failing septic / leach field systems at Chinde Point picnic area and Painted Desert Inn (2005),
- conversion of 1930s structures at Agate Bridge and Puerco Pueblo from restroom use to interpretive / shade structures (more in keeping with original use (2005),
- replacement of sewer system lines at Painted Desert complex and Rainbow Forest (2003), and
- removal of Puerco sewage lagoons (2003).

IMPAIRMENT OF NATIONAL PARK RESOURCES

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

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

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

- necessary to fulfill specific park purposes identified in the establishing legislation or proclamation of the park,
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, and
- identified as a goal in the park's GMP or other relevant NPS planning documents.

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. A determination concerning impairment is made in the conclusion section of each impact topic.

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

In this EIS, impacts to historic structures and districts and archeological resources are described in terms of type, context, duration, and intensity, as described above, which is consistent with the regulations of the Council on Environmental Quality that implement NEPA. These impact analyses are intended, however, to comply with the requirements of both NEPA and section 106 of the National Historic Preservation Act. In accordance with the Advisory Council on Historic Preservation's regulations implementing section 106 of the National Historic Preservation Act (36 CFR Part 800, Protection of Historic Properties), impacts to historic structures and districts and archeological resources were identified and evaluated by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that were either listed in or eligible to be listed in the NRHP; (3) applying the criteria of adverse effect to affected cultural resources, either listed in or eligible to be listed in the NRHP; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

Under the Advisory Council's regulations, a determination of either adverse effect or no adverse effect must also be made for affected cultural resources eligible for the NRHP. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualify it for inclusion in the NRHP, e.g., diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by alternative 2 that would occur later in time, be farther removed in distance, or be cumulative (36 CFR Part 800.5, Assessment of Adverse Effects). A determination of no adverse effect means there is an effect, but the effect would not diminish in any way the characteristics of the cultural resource that qualify it for inclusion in the NRHP.

The Council on Environmental Quality regulations and the National Park Service's *Conservation Planning, Environmental Impact Analysis and Decision-making* (Director's Order–12) also 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, e.g., reducing the intensity of an impact from major to moderate or minor. Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect as defined by section 106 is similarly reduced. Although adverse effects under section 106 may be mitigated, the effect remains adverse.

A section 106 summary is included in the impact analysis sections for historic structures and archeological resources under alternative 2 and alternatives 3 and 4. The section 106 summary is intended to meet the requirements of section 106 and is an assessment of the effect of the undertaking (implementation of the alternative) on cultural resources, based upon the criterion of effect and criteria of adverse effect found in Advisory Council regulations.

METHODS AND ASSUMPTIONS FOR ANALYZING IMPACTS

This section presents the methods used to conduct the environmental impact analyses. Each resource topic area includes a discussion of impacts, including the intensity, duration, and type of impact. Impact intensity considers whether the impact would be negligible, minor, moderate, or major. Impact duration considers whether the impact would occur in the short term or long term. Short-term impacts are those that, within a short period of time, would no longer be detectable as the resource returns to its predisturbance condition or appearance, generally less than five years. Long-term impacts refer to a change in a resource or its condition that is expected to persist for five or more years. The type of impact refers to whether the impact on the environment would be beneficial or adverse.

The impact analyses for alternative 1 compare resource conditions 15 to 20 years in the future with existing conditions today. The impact analyses for the action alternatives (alternative 2, 3, and 4) compare conditions 15 to 20 years in the future under the action alternative with conditions 15 to 20 years in the future under alternative 1. In other words, the impacts of the action alternatives describe the difference between implementing alternative 1 and implementing the action alternative. To understand the consequences of any action alternative, the reader must also consider what would happen if no action were taken.

CULTURAL RESOURCES

Archeology

Certain important research questions about human history can only be answered by the actual physical material of cultural resources. Archeological resources have the potential to answer, in whole or in part, such research questions. An archeological site can be eligible to be listed in the NRHP if the site has yielded, or may be likely to yield, information important in prehistory or history.

All available information on archeological resources was compiled from planning documents, research reports, and consultation with park resource specialists.

Impacts are described in terms of duration (short term or long term), type (beneficial or adverse), context (site specific, local, or regional), and intensity (negligible, minor, moderate, or major). The thresholds of change for the intensity of an impact are defined as follows:

> Negligible: The impact is at the lowest levels of detection—barely perceptible and not measurable.
>
> Minor: The impact is measurable or perceptible, but slight and localized within a relatively small area of a site or group of sites. The impact does not affect the character-defining features of a NRHP eligible or listed archeological site and would not have a permanent effect on the integrity of any archeological sites.
>
> Moderate: The impact is measurable and perceptible. The impact changes one or more character-defining feature of an archeological resource but does not diminish the integrity of the resource to the extent that its NRHP eligibility is jeopardized.
>
> Major: The impact is substantial, noticeable, and permanent. The impact is severe or of exceptional benefit. For NRHP eligible or listed sites, the impact changes one or more character-defining feature, diminishing the integrity of the resource to the extent that it is no longer eligible for listing on the NRHP.

Historic Structures

All available information on historic structures was compiled from planning documents, research reports, surveys, and consultation with park resource specialists.

Impacts are described in terms of duration (short term or long term), type (beneficial or adverse), context (site specific, local, or regional), and intensity (negligible, minor, moderate, or major). The thresholds of change for the intensity of an impact are defined as follows:

> Negligible: The impact is at the lowest levels of detection—barely perceptible and not measurable.
>
> Minor: The impact does not affect the character-defining features of a NRHP eligible or listed building, structure, or district.
>
> Moderate: For a NRHP eligible or listed building, structure, or district, the impact changes a character-defining feature(s) of the resource, but does not diminish the integrity of the resource to the extent that its NRHP eligibility is jeopardized.
>
> Major: For a NRHP eligible or listed building, structure, or district, the impact changes a character-defining feature(s) of the resource, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed on the NRHP.

Cultural Landscapes

All available information on cultural landscapes was compiled from planning documents, research reports, surveys, and consultation with park resource specialists.

Impacts are described in terms of duration (short term or long term), type (beneficial or adverse), context (site specific, local, or regional), and intensity (negligible, minor, moderate, or major). The thresholds of change for the intensity of an impact are defined as follows:

Negligible: The impact is at the lowest levels of detection—barely perceptible and not measurable.

Minor: The impact does not affect the character-defining features of a NRHP eligible or listed cultural landscape.

Moderate: For a NRHP eligible or listed cultural landscape, the impact changes a character-defining feature(s) of the landscape, but does not diminish the integrity of the resource to the extent that its NRHP eligibility is jeopardized.

Major: For a NRHP-eligible or listed cultural landscape, the impact changes a character-defining feature(s) of the landscape, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed on the NRHP.

ETHNOGRAPHIC RESOURCES

Ethnographic resources are those cultural and natural resources to which park-associated communities ascribe cultural significance and that continue to play a role in a community's identity and way of life. Only members of the communities to whom the resources hold cultural value can determine ethnographic resources and potential impacts to them. Information about ethnographic resources and impacts was determined in consultation with the Navajo Nation, Hopi Tribe, Zuni Pueblo, and the White Mountain Apache Tribe.

Impacts are described in terms of duration (short term or long term), type (beneficial or adverse), context (site specific, local, or regional), and intensity (negligible, minor, moderate, or major). Thresholds of change for the intensity of an impact are defined as follows:

Negligible: The impact is barely detectable.

Minor: The impact is slight, but detectable.

Moderate: The impact is readily apparent.

Major: The impact is severe or of exceptional benefit.

MUSEUM COLLECTIONS

All available information on the museum collections was compiled from existing planning documents, research reports, and consultation with park resource specialists.

Impacts are described in terms of duration (short term or long term), type (beneficial or adverse), context (site specific, local, or regional), and intensity (negligible, minor, moderate, or major). The thresholds of change for the intensity of an impact are defined as follows:

Negligible: The impact is at the lowest levels of detection—barely perceptible and not measurable.

Minor: The impact is slight, but detectable.

Moderate: The impact is readily apparent.

Major: The impact is severe or of exceptional benefit.

PALEONTOLOGICAL RESOURCES

This section covers paleontological resources. Other natural resource areas were dismissed as impact topics.

All available information on paleontological resources was compiled from existing planning documents, research reports, surveys, and consultation with park resource specialists.

Impacts are described in terms of duration (short term or long term), type (beneficial or adverse), context (site specific, local, or regional), and intensity (negligible, minor, moderate, or major). For paleontological resources, the thresholds of change for the intensity of an impact are distinct for petrified wood versus other fossils. They are defined as follows:

Petrified Wood

Negligible: The impact to a site with concentrations of petrified wood is at its lowest levels of detection—barely perceptible and not measurable.

Minor: The impact to a site with concentrations of petrified wood is slight but detectable, or the impact to a special site (one with dense concentrations or special kinds of petrified wood) is barely perceptible and difficult to measure.

Moderate: The impact to a site with concentrations of petrified wood is apparent, or the impact to a special site (one with dense concentrations or special kinds of petrified wood) is detectable.

Major: The impact to a site with concentrations of petrified wood is severe or of exceptional benefit, or the impact to a special site (one with dense concentrations or special kinds of petrified wood) is readily apparent.

Other Fossils

Negligible: The impact to the site(s) or fossiliferous (has the potential to contain fossils) layer is at its lowest level of detection—barely perceptible and not measurable.

Minor: The impact to the site(s) or fossiliferous layer is slight but detectable. The impact affects a paleontological site(s) with modest data potential.

Moderate: The impact to the site(s) or fossiliferous layer is readily apparent. The impact affects a paleontological site(s) with high data potential.

Major: The impact to the site(s) or fossiliferous layer is severe or of exceptional benefit. The impact affects a paleontological site with exceptional data potential (e.g., a particular sediment layer known to contain significant concentrations of fossils or unique fossils).

VEGETATION

All available information on vegetation was compiled from existing planning documents, research reports, and consultation with park specialists.

Impacts are described in terms of duration (short term or long term), type (beneficial or adverse), context (site specific, local, or regional), and intensity (negligible, minor, moderate, or major). The thresholds of change for the intensity of an impact are defined as follows:

Negligible: The impact is barely detectable and/or would affect a minimal area of vegetation.

Minor: The impact is slight, but detectable, and/or would affect a small area of vegetation.

Moderate: The impact is readily apparent and/or would affect a large area of vegetation.

Major: The impact is severely adverse or exceptionally beneficial and/or would affect a substantial area of vegetation.

SOILS

All available information on soils was compiled from existing planning documents, research reports, and consultation with park specialists.

Impacts are described in terms of duration (short term or long term), type (beneficial or adverse), context (site specific, local, or regional), and intensity (negligible, minor, moderate, or major). The thresholds of change for the intensity of an impact are defined as follows:

Negligible: The impact is barely detectable and/or would affect a relatively minimal area of soil or soils with slight erosion hazards.

Minor: The impact is slight, but detectable, and/or would affect a relatively small area of soil or soils with moderate erosion hazards.

Moderate: The impact is readily apparent and/or would affect a relatively large area of soil or soils with a high or very high erosion hazard.

Major: The impact is severely adverse or exceptionally beneficial and/or would affect a substantial area of soil with a very high erosion hazard.

VISITOR EXPERIENCE AND APPRECIATION

All available information on visitor experience and appreciation was compiled from existing planning documents, research reports, and consultation with park specialists.

Impacts are described in terms of duration (short term or long term), type (beneficial or adverse), context (site specific, local, or regional), and intensity (negligible, minor, moderate, or major). The thresholds of change for the intensity of an impact are defined as follows:

Negligible: The impact is barely detectable and/or would affect few visitors.

Minor: The impact is slight, but detectable, and/or would affect some visitors.

Moderate: The impact is readily apparent and/or would affect many visitors.

Major: The impact is severely adverse or exceptionally beneficial and/or would affect the majority of visitors.

NATIONAL PARK OPERATIONS

General Operations

All available information on park operations was compiled from planning documents, research reports, surveys, and consultation with park resource specialists.

Impacts are described in terms of duration (short term or long term), type (beneficial or adverse), context (site specific, local, or regional), and intensity (negligible, minor, moderate, or major). The thresholds of change for the intensity of an impact are defined as follows:

Negligible: An action that could change the operations of the park, but the change would be so small that it would not be of any measurable or perceptible consequence.

Minor: An action that could change the operations of the park, but the change would be slight and localized with few measurable consequences.

Moderate: An action that would result in readily apparent changes to park operations with measurable consequences.

Major: A severely adverse or exceptionally beneficial change in park operations would result.

Energy Requirements and Conservation Potential

Information on park operations was compiled from existing planning documents, research reports, surveys, and consultation with park resource specialists.

Impacts are described in terms of duration (short term or long term), type (beneficial or adverse), context (site specific, local, or regional), and intensity (negligible, minor, moderate, or major). The thresholds of change for the intensity of an impact are defined as follows:

Negligible: An action that could change the energy requirements and conservation potential of the park, but the change would be so small that it would not be of any measurable or perceptible consequence.

Minor: An action that could change the energy requirements and conservation potential of the park, but the change would be slight and localized with few measurable consequences.

Moderate: An action that would result in readily apparent changes to the energy requirements and conservation potential at the park, with measurable consequences.

Major: A severely adverse or exceptionally beneficial change in park energy requirements and conservation potential.

SOCIOECONOMIC RESOURCES

Issues were identified through the scoping process. This section includes effects on adjacent landowners, nearby communities, concessioners, incidental business permit holders, and cooperators (for example, the Petrified Forest Museum Association, the Arizona Department of Public Safety, and universities and museums that hold park museum specimens). The economic contribution of the park to local economies, traditional land uses external to the park boundaries, and possible conflicts between the local, state, or Indian tribal land use plans, policies, or controls were also analyzed.

Impacts are described in terms of duration (short term or long term), type (beneficial or adverse), context (site specific, local, or regional), and intensity (negligible, minor, moderate, or major). The thresholds of change for the intensity of an impact are defined as follows:

Negligible: The impact is barely detectable and/or would not affect adjacent landowners, nearby communities, concessioners, incidental business permit holders, and cooperators.

Minor: The impact is slight, but detectable, and/or would affect a minority of adjacent landowners, nearby communities, concessioners, incidental business permit holders, and cooperators.

Moderate: The impact is readily apparent and/or would affect many adjacent landowners, nearby communities, concessioners, incidental business permit holders, and cooperators.

Major: The impact is severely adverse or of exceptional benefit and/or would affect the majority of adjacent landowners, nearby communities, concessioners, incidental business permit holders, and cooperators.

IMPACTS OF ALTERNATIVE 1 (NO ACTION)

ARCHEOLOGICAL RESOURCES

Current management policies and impacts would continue under alternative 1. Visitor use in areas of archeological sensitivity results in inadvertent trampling of sites and moving of resources. More deliberate visitor impacts such as vandalism and theft also affect archeological resources. Because the park contains a wealth of archeological sites, potential adverse impacts tend to be widespread. Site-specific impacts are long term, adverse, and range from minor to major (depending on the site). Frontcountry areas are much more likely to be affected than those in the backcountry due to the numbers of visitors that the frontcounty attracts compared with the backcountry.

Livestock trespass (trampling) is a localized impact. Typically, impacts are concentrated on the periphery of the park near drainages and washes where it is easiest for livestock to cross over or under fences. Impacts to archeological sites are long term, adverse, and minor to major depending on the site.

Park operations affect archeological sites in various ways. Adverse impacts from maintenance operations (e.g., grading roads) and park facilities (e.g., water drainage systems) are long term, localized, and minor to moderate. Other activities such as minor trail realignments and the installation of vault toilets constitute long-term, minor, localized, adverse impacts to archeological resources.

Many known archeological resources are located on mesa tops and in other exposed areas. It has been demonstrated that natural processes such as wind and water erosion can move, damage, or destroy these resources. Park staff monitor sites for potential impacts from natural processes. If a resource were in imminent danger, it would be recorded and recovered (whenever possible). This recovery would be performed in consultation with the Arizona SHPO. The impacts from natural processes are long term, localized, adverse, and minor to major depending on the site.

The Route 66 roadbed and the 35th Parallel / Beale Camel Trail are currently not managed as archeological sites. Without active management, these landscapes continue to degrade through use and/or natural processes, resulting in potential loss of contributing elements that reflect their period of significance, resulting in minor to moderate, long-term, adverse impacts. As funding and staffing permit, these sites would be evaluated to determine eligibility and appropriate management.

Cumulative Impacts. Archeological resources within Petrified Forest National Park are subject to damage from a variety of natural events and human activities. Development, park maintenance, vandalism, theft, traditional visitor use, and natural processes all pose a threat to resources. Past development has resulted in disturbance to, and loss of, some archeological resources. Vandalism of sites and theft of resources has occurred in the past, both within and outside park boundaries. Resources have been directly and indirectly damaged through visitor use and natural processes. Reasonably foreseeable future park management and visitor use activities could pose a threat to archeological resources. For example, minor

trail realignments and installation of facilities such as wayside exhibits and vault toilets have the potential to affect archeological resources. If archeological sites cannot be avoided, the data they possess regarding prehistoric and/or historic lifeways would be recorded and recovered. This recovery would be done in consultation with the Arizona SHPO.

In some areas, lithics are scattered among petrified wood. Theft and displacement of petrified wood can lead to theft and displacement of archeological resources. Cattle trespass has impacted archeological resources in the past and would continue to do so in the future unless park managers can find more effective ways of keeping livestock from crossing fences. A cluster community of 20 houses is planned on Navajo land just east of the park, north of I-40. Grazing livestock (sheep and cattle) are expected to accompany the residents. Therefore, there may be increased impacts from grazing animals in the future.

Cumulative impacts to archeological resources would be long term, adverse and range from minor to major depending on the scope, type, and location of the activity.

Mitigation. The park boundary is monitored for signs of livestock trespass. Damaged fences are repaired as soon as practicable after they are discovered.

If archeological sites cannot be avoided during minor trail realignment projects and installation of facilities like wayside exhibits and vault toilets, the data they possess regarding prehistoric and/or historic lifeways would be recorded and recovered. This would be performed in consultation with the Arizona SHPO.

If an archeological resource is endangered by natural processes or visitor use (e.g., trail erosion), park staff would stabilize the site and, if necessary, data would be recorded and the resource recovered in consultation with the Arizona SHPO and interested federally recognized American Indian tribes.

If previously unknown archeological resources are discovered during park maintenance or construction activities (including minor trail realignments and vault toilet installation), all work in the immediate area of the discovery would cease until the resources could be identified and documented. Work could resume only after an appropriate mitigation strategy is developed in consultation with the Arizona SHPO and archeological clearances are obtained.

All proposed documentation / recordation and mitigation measures for archeological resources would be stipulated in a Memorandum of Agreement between Petrified Forest National Park and the Arizona SHPO (and/or, as necessary, the Advisory Council on Historic Preservation).

Conclusion. Localized archeological impacts from visitor use, livestock trespass, park operations and facilities, and natural processes would be long term, adverse, and range from minor to major, depending on the archeological site. Cumulative impacts would be long term, adverse, and range from minor to major, depending on the scope, type, and location of the activity.

Although major, adverse impacts to archeological resources would be possible, such impacts would not occur throughout the park. They would be confined instead to individual sites. Most archeological resources

in the park would remain well protected. Thus, there would *be no impairment of archeological resources* from this alternative (see specific definition of impairment in "Impairment of National Park Resources Section" above).

HISTORIC STRUCTURES

Rehabilitation plans for the Painted Desert Inn and nearby residences are being addressed under a separate NEPA compliance process. The projects would have a long-term, site-specific, minor, beneficial effect due to stabilization of the structure (Arizona State Parks 1996). These plans would not alter the characteristics of the structures. Studies to address geotechnical instability associated with the construction of the inn on bentonite soil are also being conducted, and following their completion, appropriate repairs would be implemented.

Two residence structures near the inn are currently not in use and are deteriorating due to lack of use, potentially resulting in a long-term, site-specific, minor, adverse impact.

Maintenance and repair projects for Painted Desert headquarters complex are being addressed in a separate NEPA compliance process. Projects include resurfacing flat roofs and patching and repairing cracked walls. These plans would not alter the characteristics of the buildings or complex. The projects would have a long-term, site-specific, negligible beneficial effect due to repair of damaging leaks. However, repairs to the roof will not correct damage already done or the structural deficiencies of the original construction.

Funds for major renovation projects are not readily available within the National Park Service. All park units must compete for the limited amount of funds available each year. It can also take one or more years for authorization to carry out a particular project due to backlogs in the system. Without major stabilization and renovation, the Painted Desert complex buildings would continue to deteriorate, and in some cases, fail.

Once a building reaches the point that the cost to repair greatly exceeds the cost to replace (and also considering long-term maintenance or life-cycle costs), a building is more likely to be demolished than renovated. Depending on the building, this could constitute a moderate to major, long-term, adverse impact to the historic Painted Desert headquarters complex.

Cumulative Impacts. Past repair and maintenance projects have been insufficient to keep pace with the deterioration of the Painted Desert Inn. Recent projects have opened portions of the structure to visitors while other portions remain closed to the public. Planned projects under alternative 1 would address the most serious of these problems resulting in a cumulative, minor, long-term, beneficial effect to the resource.

Modifications of the Painted Desert headquarters complex over the past 30 years have compromised the historic integrity of some of the buildings. For example, a noticeable roof addition over the visitor center and modifications to the concessions building facade have altered the character of the plaza. The visitor center entry has been altered. Roofing projects have changed drainage patterns around buildings, which has exacerbated building movement and settling. Repair and maintenance projects

have also been insufficient to keep pace with the deterioration caused by initial construction on uncompacted soils. The proposed project in alternative 1 would address some of these problems, resulting in a beneficial effect to the structures. However, the proposed projects would not address past modifications, nor building stabilization, so potential cumulative effects would be long term, site specific, moderate to major, and adverse.

Mitigation. Mitigation would be proposed through consultation with the Arizona SHPO and additional NEPA compliance, as necessary. Mitigation measures are developed to reduce potential effects when cultural resources cannot be avoided. Mitigation measures may include limiting the magnitude of the proposed project; modifying the proposed project; repairing, rehabilitating, or restoring affected resources; documenting resources that must be destroyed; or recovering and recording archeological information.

Conclusion. Two residence structures near Painted Desert Inn would continue to deteriorate, potentially resulting in a long-term, site-specific, minor to moderate, adverse impact. Planned improvements to Painted Desert Inn would have a cumulative, minor, long-term, beneficial effect to this resource. Without major stabilization and renovation, the Painted Desert headquarters complex buildings would continue to deteriorate, and in some cases, fail. Depending on the building, this deterioration could constitute a moderate to major, long-term, adverse impact to the historic Painted Desert headquarters complex. However, the proposed projects would not address past modifications or building stabilization at the Painted Desert headquarters complex, so potential cumulative effects would be long term, site specific, moderate to major, and adverse.

Major, adverse impacts to historic structures from continued deterioration at the Painted Desert headquarters complex would be possible under this alternative. Conservation of the complex is not (1) necessary to fulfill specific park purposes identified in the establishing legislation or proclamation of the park, or (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park. Although preservation of cultural resources has been identified as a mission goal in this GMP Revision, the fundamental purpose of the park (protecting paleontologic sites) could still be accomplished without preserving the Painted Desert headquarters complex. Furthermore, the park could still compete for renovation funding under the current GMP, so there are still management options that could be taken to avoid loss of the complex. Thus, there would be *no impairment of historic structures* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

CULTURAL LANDSCAPES

At Rainbow Forest, replacement of the Jim Camp Wash bridge and conversion of Long Logs spur road to a trail will soon be completed. This action is addressed in a previous environmental assessment / assessment of effect, as well as in a Memorandum of Agreement negotiated between the park and the Arizona SHPO. Mitigation includes Historic American Engineering Record documentation (NPS 2001b). As funding and staffing permit, some past modifications to historic structures at

Rainbow Forest would be reversed (e.g., solar panels removed) to bring the structures back into NRHP eligibility status These modifications would result in a site-specific, long-term, minor to moderate, beneficial effect to the Rainbow Forest historic landscape.

At Crystal Forest, current management practices would continue, including using signs, minor trail realignments, patrols, and trail barriers to prevent moving, damage to, and removal of petrified wood. Continued high use of this site would potentially result in the loss of petrified wood and degradation of the visual quality of this cultural landscape, resulting in a site-specific, long-term, minor, adverse impact.

At Puerco Pueblo, plans include the construction of a new vault toilet. This project will be addressed as a separate environmental assessment / assessment of effect and is likely to result in a negligible adverse effect. Current management practices would continue, including signage, patrols, and trail barriers to prevent moving, damage to, and removal of cultural resources. Continued high use of this site would result in the degradation of the character-defining features, such as damage to archeological resources, resulting in a long-term, negligible to minor, adverse impact to the site.

Cumulative Impacts. Past and ongoing modifications to the roads, bridge, and parking areas would result in a minor to moderate, long-term, adverse impact to Rainbow Forest. Proposed reversal of past modifications to historic structures under alternative 1 would have a long-term, minor, beneficial effect.

At Crystal Forest, past and present high use of the area by visitors has resulted in a noticeable loss of petrified wood (a component of the visual quality of the landscape), rendering the area nearest the parking lot almost barren of petrified wood. Past projects involving modifications to trails and addition of a sun shelter have also had a minor, adverse impact to the cultural landscape. Continued high use of the area would result in further loss of wood and degradation of the visual quality, resulting in a long-term, minor, adverse impact to the landscape (primarily around the parking lot).

Rehabilitation of the south waterline from Puerco River to Rainbow Forest is also in process. This action is addressed in a separate environmental assessment / assessment of effect. The rehabilitation project includes the replacement of the water distribution system within the Rainbow Forest cultural landscape and the installation of fire suppression systems in most of the buildings. The assessment concluded that the replacement of the distribution system would not have long-term, adverse impacts to the landscape or structures. The fire suppression system would offer a slight benefit to the protection of the cultural resources. A Memorandum of Agreement will be negotiated between the park and the Arizona SHPO.

Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would be long-term, minor to moderate, adverse effects on the Rainbow Forest cultural landscape, and long-term, minor adverse impacts to the Crystal Forest cultural landscape.

Mitigation. Mitigation would be proposed through consultation with the Arizona SHPO and additional NEPA compliance, as

necessary. Mitigation measures are developed to reduce potential effects when cultural resources cannot be avoided. Mitigation measures may include limiting the magnitude of the proposed project; modifying the proposed project; repairing, rehabilitating, or restoring affected resources; documenting resources that must be destroyed; or recovering and recording archeological information.

Conclusion. Reversing some past modifications to historic structures at Rainbow Forest would have a site-specific, long-term, minor to moderate, beneficial effect to the Rainbow Forest historic landscape. Continued high use at Crystal Forest would result in loss of petrified wood and degradation of the visual quality, a site-specific, long-term, minor, adverse impact to the Crystal Forest cultural landscape. Continued high use of Puerco Pueblo would result in degradation of the character-defining features, such as damage to archeological resources, resulting in a long-term, negligible to minor, adverse impact to the cultural landscape. Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would have long-term, minor to moderate, adverse effects on the Rainbow Forest cultural landscape, and long-term, minor adverse impacts to the Crystal Forest cultural landscape.

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

ETHNOGRAPHIC RESOURCES

Current management policies and impacts would continue under alternative 1. Visitor use in areas of ethnographic sensitivity results in the inadvertent trampling of sites and moving of resources. More deliberate visitor impacts such as vandalism and theft also affect ethnographic resources. Because the park contains a wealth of ethnographic resources, impacts tend to be widespread. Areas along the main park road are much more likely to be affected than those in the wilderness areas due to the large number of visitors in these areas. Impacts would be resource-specific and long term and would range from minor to major (depending on the resource).

Impacts from park operations, such as minor trail realignments and the installation of vault toilets, constitute a long-term, minor, localized, adverse impact to ethnographic resources.

It has been demonstrated that natural processes such as wind and water erosion can move, damage, or destroy ethnographic resources (specifically traditional cultural properties). The park staff monitors sites for damage from natural processes. If a resource were in imminent danger, the area would be closed and stabilized. These actions would be performed in consultation with the Arizona SHPO and interested American Indian tribes. The impacts from natural processes would be long term, adverse, and minor to major depending on the site.

Cumulative Impacts. Ethnographic resources have been directly and indirectly damaged through visitor use and natural processes. Reasonably foreseeable future

park management and visitor use activities could pose a threat to ethnographic resources. For example, the minor trail realignments and installation of facilities like wayside exhibits and vault toilets have the potential to affect ethnographic resources. Cumulative impacts to ethnographic resources would be long term and adverse and would range from minor to major depending on the scope, type, and location of the activity.

Mitigation. The park has initiated consultation with interested American Indian tribes to determine issues and concerns and how to protect and preserve ethnographic resources.

Conclusion. Ethnographic resource impacts related to visitor use would be long term, adverse, and minor to major depending on the resource. Impacts from park operations would have long-term, minor, localized, adverse impacts. Impacts from natural processes would be long term, adverse, and minor to major depending on the site. Cumulative impacts to ethnographic resources would be long term and adverse, and they would range from minor to major depending on the scope, type, and location of the activity.

Although major, adverse impacts to ethnographic resources would be possible, such impacts would not occur throughout the park. They would be confined instead to individual sites. Most ethnographic resources in the park would remain well protected. Thus, there would *be no impairment of ethnographic resources* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

MUSEUM COLLECTIONS

Current management policies and impacts would continue under alternative 1. Under this alternative, the physical storage (e.g., fire resistant storage cabinets) of materials is adequate, but space is inadequate and the facility (building) does not meet NPS curation standards for ultraviolet and visible light, fire safety, humidity, temperature, or security. Items exhibited at the Painted Desert Inn, Painted Desert visitor center, and Rainbow Forest Museum are threatened by many of the same problems as items in storage (Rainbow Forest Museum does have ultraviolet filters on the windows), but they do not have the advantage of storage cabinets that minimize the impacts of environmental threats. Thus some of the materials in the collections are subject to deterioration and are vulnerable to theft and fire. The impact of alternative 1 on collections would be long term, adverse, and moderate.

Indoor workspace is limited. This lack of workspace constitutes a minor impact because it limits the staff's and researchers' ability to study and protect the material and interpret the information contained in the collections.

Portions of the collections are stored at various institutions across the United States. Some of these repositories may not meet NPS standards for curation, and some objects may be susceptible to accelerated deterioration. This constitutes a long-term, minor, adverse impact. In the past, due to the lack of good curatorial practices, some of the offsite collections and, to a lesser extent, onsite collections suffered from inadequate record-keeping and accountability and some items stored offsite (and to a lesser extent onsite)

were lost. The impacts from these two situations are minor and moderate, respectively, because without adequate recordkeeping and accountability it is difficult to gain an overall view of the museum collections and information that may have been extracted from the lost items.

Cumulative Impacts. No past, ongoing, or reasonably foreseeable future actions by others would be expected to combine with these actions and result in a cumulative impact on the museum collections under alternative 1.

Mitigation. Housekeeping and emergency plans are in place to provide guidance to park staff (both curatorial and others) in the care of museum property. The plans include cleaning, maintenance, and monitoring procedures. The collections storage area is cleaned and monitored for evidence of mold and insect and rodent infestations on an ongoing basis. As part of the housekeeping plan, a data logger and lux-meter are used to record environmental factors (relative humidity, temperature, and the visible spectrum of light) on a regular basis to provide an accurate and complete picture of environmental changes over time. Many of these tasks are performed in order to give the park staff early indications of problems. When problems are found, the park staff is able to minimize them by placing traps, moving items out of potentially dangerous locations, repairing leaks, adjusting room temperature, and so forth.

Recordkeeping and accountability is part of a redundant system, minimizing the risk of lost or incomplete records.

Conclusion. Under current conditions, the museum collections are threatened by environmental factors and lack of space. Museum collections would continue to suffer long-term, adverse, moderate impacts from facility shortcomings and long-term, minor to moderate, adverse impacts from inaccuracies in recordkeeping and accountability, and from limited work space. No cumulative impacts to museum collections would be expected under alternative 1.

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

PALEONTOLOGICAL RESOURCES

Petrified Wood

Current management policies would continue under alternative 1. The Comprehensive Interpretive Plan for Petrified Forest National Park seeks to educate visitors about the importance of protecting paleontological resources, especially petrified wood, as well as addressing other interpretive issues. Implementation of this plan, including educating visitors on the importance of leaving petrified wood where it is found, would have long-term, minor to moderate, beneficial effects for petrified wood at the park. As new NPS policies mandate, sale of petrified wood (and other fossils) would be discontinued at all gift shops in the park. The impact that this directive would have on petrified wood theft is unknown, but there is concern that it could result in additional wood theft in the park.

Long-term, minor to major, adverse impacts would be expected to continue in the Giant Logs, Jasper Forest, Crystal Forest, and Blue

Mesa areas. Visitors tend to concentrate at these areas because of the opportunity to leave their vehicles and access the unique and/or extensive petrified wood deposits. At Crystal Forest, signage, patrols, and trail barriers would continue to be used to help prevent moving, damage to, and removal of petrified wood. Long-term, adverse impacts to petrified wood in proximity to the parking pull-off at Crystal Forest, which sustains the highest use, would continue to be locally major. Long-term, negligible to minor, adverse impacts would potentially occur over the rest of Crystal Forest.

In general, the backcountry experience at Petrified Forest National Park is not "advertised," meaning that few visitors are encouraged to use these areas and that petrified wood theft and vandalism is probably fairly low. Under alternative 1, long-term, minor to moderate, adverse impacts would be expected in the backcountry, depending on the site. It is difficult to determine how many people damage, steal, or relocate, petrified wood in these areas of the park, so the impacts could be more or less severe. Impacts to petrified wood probably decrease the farther one travels into the backcountry because fewer visitors reach these areas.

Other Fossils

Many of the same impacts discussed for petrified wood under this alternative would result for other paleontological resources (fossils). However, most visitors typically have a harder time identifying plant and animal fossils than petrified wood; therefore, the impacts tend to be less severe for these fossils. Fossil loss occurs in areas where visitors are concentrated and leave their vehicles to experience park resources first hand. For most of these sites, long-term, minor, adverse impacts result, with the exception of one known site (location undisclosed) where the impacts are major. It is expected that, under alternative 1, these minor to major impacts would continue.

As discussed for petrified wood, implementation of the Comprehensive Interpretive Plan would result in long-term, minor to moderate, beneficial effects for plant and animal fossils. The lack of advertising for backcountry use would also result in long-term, minor, adverse impacts that probably decrease in intensity the deeper one gets into the backcountry. Installation of vault toilets at Puerco Pueblo and Agate Bridge / Jasper Forest would also result in long-term, negligible, adverse impacts to fossil resources.

Cumulative Impacts. Despite the best efforts of the park staff, petrified wood theft at the park continues to be a serious problem. The cumulative effect of past and ongoing wood theft is obvious. For example, Crystal Forest has been picked clean of petrified wood in the areas surrounding the parking lot and trail. Continued theft and disturbance of wood in the future would continue to decimate this resource at Crystal Forest and in other park areas where petrified wood is found near high visitor use areas. As sources of petrified wood on private and public lands surrounding the park are depleted, the potential for theft of this resource from backcountry areas may increase. Petrified wood harvesting for commercial purposes occurs legally on private lands outside the park and is unregulated, further adding to the loss of this resource and cumulative effects. Cumulative effects on petrified wood would

be localized, moderate to major, long term, and adverse.

At Long Logs, another high use area with major concentrations of petrified wood, the spur road is being converted to a pedestrian trail and the parking lot removed. These changes could reduce visitation in the Long Longs / Agate House area, and reduce petrified wood theft, and visitors would be farther from their vehicles. These changes would result in a long-term, moderate, beneficial impact to petrified wood and other fossils in these areas.

The cumulative effect of alternative 1 on petrified wood and other fossils, in combination with other past, present, and reasonably foreseeable future actions, would be localized, moderate to major, long term, and adverse.

Mitigation. Proposed changes to Long Logs Trail, trailhead, and parking area would mitigate some of the impacts to paleontological resources within park boundaries. Other mitigation measures would include increased interpretation to communicate the significance of these resources to visitors, signage, ranger patrols, and trail barriers.

Conclusion. Long-term, major, adverse impacts would be anticipated at Crystal Forest, Giant Logs, Jasper Forest, and Blue Mesa from continued disturbance and theft of paleontological resources. Long-term, minor to moderate, adverse impacts would be expected in the backcountry, depending on the site. The cumulative effect of alternative 1 on petrified wood and other fossils, in combination with other past, present, and reasonably foreseeable future actions, would be localized, moderate to major, long term, and adverse.

Although major, adverse impacts to petrified wood would be expected, such impacts would not be spread throughout the park. They would be confined instead to high visitor use areas located near concentrations of petrified wood. Most significant deposits of petrified wood in the park would remain well protected. Thus, there would be *no impairment of petrified wood or other fossils* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

VEGETATION

Current management policies and impacts would continue under alternative 1. In general, the backcountry experience at Petrified Forest National Park is not advertised and few take the opportunity to use these areas. The Kachina Point Trail currently disappears before reaching the Lithodendron Wash in the Painted Desert Wilderness area. Evidence of resource damage due to off-trail hiking along the trail is readily apparent, including trampling of vegetation. Once beyond the wash, hikers travel cross-country in a somewhat random fashion, as there are no defined trails. Most hikers are attempting to locate Onyx Bridge; however, most do not, but rather spend their time crisscrossing the same areas. This results in additional trampling of vegetation. This has long-term, negligible to minor, local, adverse impacts on the vegetation resources of the park. Impacts to vegetation also occur in the wilderness area in the southern section of the park. There are no defined trails here, so hikers who use this wilderness area are trampling vegetation as they traverse the area.

Because use of this area is limited, the impacts to vegetation resources are expected to be negligible, local, and adverse.

Cumulative Impacts. Past and ongoing trampling of vegetation in the backcountry of Petrified Forest National Park would result in long-term, minor, adverse impacts to vegetation. Replacement of sewer system lines at the Painted Desert headquarters complex and Rainbow Forest, as well as removal of the Puerco sewage lagoons, are planned activities that would have short-term, local, negligible to minor, adverse impacts on vegetation resources of Petrified Forest National Park. Current plans to replace restroom facilities at Jasper Forest and Agate Bridge would have local, negligible, long-term, adverse impacts. Removal of the parking trailheads in the vicinity of the Flattops would result in local, minor, long-term, beneficial impacts on vegetation resources, as these areas would be reverted back to native landscapes.

Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would be long-term, negligible to minor, adverse effects on the vegetation resources of Petrified Forest National Park.

Mitigation. Revegetation plantings would seek to reconstruct the natural spacing, abundance, and diversity of native species. All disturbed areas associated with construction activities would be restored as nearly as possible to pre-construction conditions during and/or as soon as practicable following construction. The principal goal is to avoid interfering with natural processes and to minimize erosion caused by construction related activities. Efficient planting and staging, as well as careful machine work, would be emphasized.

Conclusion. Impacts to vegetation resources are predominantly localized and associated with use of trails and the lack of trails in the backcountry. Hikers trampling vegetation in the wilderness areas of the park result in local, long-term, negligible to minor, adverse impacts to vegetation. Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would have long-term, negligible to minor, adverse effects on vegetation resources of Petrified Forest National Park.

There would be *no impairment of vegetation resources* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

SOILS

Current management policies and impacts would continue under alternative 1. In general, the backcountry experience at Petrified Forest National Park is not advertised, meaning that few visitors are encouraged to use these areas, and few take the opportunity to do so. Impacts to soils occur in both wilderness areas of the park, as there are no defined trails. Therefore, hikers who use these wilderness areas could be disturbing soils, potentially including cryptobiotic soils, as they traverse the area. The soils in the wilderness areas range from having slight to very high erosion hazards. However, as visitor use of these areas is limited, the impacts to soils are not as severe as would be expected. Therefore, the impacts to soils are anticipated to be negligible to moderate, somewhat localized, and adverse due to off-trail hiking.

Although cryptobiotic soils exist at Petrified Forest National Park, resource staff do not manage for these soils, and their exact locations are generally unknown. These soils do not respond well to human disturbances such as compaction associated with off-trail hiking. Therefore, it would be anticipated that some negligible to minor, localized, adverse impacts to cryptobiotic soils would occur due to off-trail hiking in the wilderness areas of the park; however, the extent of impact is unknown.

Cumulative Impacts. The erosive action of wind and water are readily apparent throughout Petrified Forest National Park. These natural processes have long-term, moderate, adverse impacts on soils, including cryptobiotic soils. Past and ongoing soil disturbances from off-trail hiking in the backcountry of Petrified Forest National Park would result in long-term, negligible to moderate, adverse impacts to soils, including cryptobiotic soils. Replacement of sewer system lines at the Painted Desert headquarters complex and Rainbow Forest, as well as removal of the Puerco sewage lagoons, are planned activities that would have short-term, site-specific, negligible to minor, adverse impacts on soils of Petrified Forest National Park. Current plans to replace restroom facilities at Jasper Forest and Agate Bridge would have negligible to moderate, site-specific, long-term, adverse impacts on soils. Removal of the parking trailheads in the vicinity of the Flattops would result in site-specific, minor, long-term, beneficial impacts on soils, as these areas would be returned to native landscapes.

Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would be long-term, negligible to moderate, adverse effects on the soils of Petrified Forest National Park.

Mitigation. All proposed construction activities would be located, to the extent possible, to avoid impacts to cryptobiotic and highly erosive soils. All disturbed areas associated with construction activities would be restored during and/or as soon as practicable following construction. The principal goal is to avoid interfering with natural processes. Efficient planning and staging, as well as careful machine work, would be emphasized.

Conclusion. Currently, the greatest threat to soils, including cryptobiotic soils, at Petrified Forest National Park result from off-trail hiking in the wilderness areas. This activity is anticipated to constitute negligible to moderate, somewhat localized, adverse impacts to soils in the wilderness. Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would have long-term, negligible to moderate, adverse effects on soils of Petrified Forest National Park.

There would be *no impairment of soils* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

VISITOR EXPERIENCE AND APPRECIATION

Visitor-oriented portions of some park buildings (the Rainbow Forest Museum, Painted Desert visitor center, and concessions structures, for example) are partially accessible to people with limited mobility. Plans for accessibility improvements at the Painted Desert Inn will soon be

implemented. In contrast, most other buildings in the park are not universally accessible. These buildings include several administrative, management, maintenance, and residential structures at park headquarters. Thus, the National Park Service cannot effectively recruit and retain staff with limited physical abilities, nor can individuals with limited mobility visit or conduct business in most park buildings. There are also no universally accessible trails in the park. Overall, impacts to visitors and others with physical limitations would constitute a moderate, negative, long-term impact under alternative 1.

Visitors to Petrified Forest National Park generally do not benefit from in-depth park experiences. Instead, most visitors see the park from their vehicles and briefly stop at a few to several park features, short trails, and visitor areas. This pattern is due in part to a lack of diverse visitor opportunities in the park. This negative, moderate impact on visitor experience and appreciation would continue over the long term in alternative 1.

There are limited orientation materials and inadequate or dated exhibits and interpretive media at the park. This lack of interpretive materials produces a moderate, adverse impact on visitor experience and appreciation at Petrified Forest National Park because visitors are unable to obtain current, comprehensive information about resources (partly due to lack of space). New wayside exhibits are proposed in the park's Comprehensive Interpretive Plan. Implementation of this plan would improve visitor experience and appreciation to some extent, because exhibits and orientation materials would be updated and expanded. Also, Petrified Forest staff and the Petrified Forest Museum Association would work together to update and distribute various other forms of information and orientation materials.

Discontinuation of petrified wood sales at the park could disappoint some visitors who wish to purchase this type of souvenir. The impact on visitor experience and appreciation from the discontinuation of wood sales would be minor because petrified wood would still be available for purchase outside the park.

Cumulative Impacts. Visitor experience and appreciation would be affected by the planned Jim Camp Wash bridge replacement and Long Logs area changes. These actions are covered under a separate environmental assessment. Vehicle access is being eliminated from Long Logs, adversely affecting people who are unable to walk far or who do not have time to visit Long Logs on foot. However, those who prefer to walk will benefit from the conversion of the access road to a trail. The impact is expected to be minor to moderate and long term for both groups.

Interstate 40 bisects the park and primary vehicle access is from Exit 311. The Arizona Department of Transportation is planning to improve this interchange. During construction, visitors would potentially experience minor inconveniences and the construction would have a short-term, minor, adverse impact on their introduction to the park. However, once completed, the improved interchange would likely have a minor, long-term, beneficial impact.

The lack of designated campgrounds within the park constitutes a long-term, minor impact on visitor experience and appreciation. (Backpack camping is the only camping option available within the park.) Campers may stay at nearby non-NPS

campgrounds outside the park. Under this alternative, the camping situation is not expected to change in the foreseeable future.

Cumulative effects of alternative 1, in combination with other past, present, and foreseeable future actions, would include both long-term, minor to moderate, adverse effects, and minor beneficial effects.

Mitigation. The lack of universally accessible facilities is addressed as facilities are renovated or rehabilitated. Planned renovations at the Painted Desert Inn and changes to the Long Logs area include modifications that will allow for greater accessibility. Any future renovations would include similar provisions.

Conclusion. Long-term, moderate, adverse impacts would be expected from dated exhibits, orientation materials, and interpretive media. Lack of diverse visitor opportunities and fully accessible facilities would also have long-term, moderate adverse impacts. Discontinuation of petrified wood sales in gift shops in the park would have a long-term, minor, adverse impact on visitor experience and appreciation. Cumulative effects on visitor experience and appreciation, in combination with other past, present, and foreseeable future actions, would include both long-term, minor to moderate, adverse effects, and long-term, minor, beneficial effects.

NATIONAL PARK OPERATIONS

General Operations

In this alternative, the Painted Desert headquarters complex would remain the base for most visitor support and park operations. In general, buildings and facilities in the complex do not meet current needs for space and function, do not meet NPS standards or fire and safety codes, are in fair condition, and are not universally accessible. Although there is plenty of housing available in this complex, many units are only in fair condition, which lowers employee morale, increases maintenance operations (maintenance personnel must continually attend to the deteriorating structures because of problems like water leaks), and limits the opportunities for housing visiting researchers and scientists. Other units are not in use and would require major renovations in order to make them livable. Such facility problems have long-term, moderate, adverse impacts on park operations.

As with the residences, there is plenty of available work space in the headquarters complex; however, this space is inadequate for other reasons. Most work areas are adaptively reused and the appropriate types of spaces and associated equipment are not available for the type of work being performed (as in the facilities used to house the park's museum collection). Electrical outlets and restrooms are outdated. In addition, some work spaces are in poor condition. Work space for visiting researchers and scientists is also very limited. The lack of decent, appropriate work space for employees and visiting researchers and scientists has a long-term, moderate impact on the operational efficiency of the park. Frequent maintenance is required to stabilize and rehabilitate structures in the Painted Desert headquarters complex. Other maintenance and construction projects often have to be put off or forgone so that emergency repairs can be made. For example, the staff has had to patch roofs and walls,

taking time away from scheduled maintenance activities. The cost of this maintenance has long-term, moderate, adverse impact on park operations as a result.

The headquarters complex was built during the 1960s when asbestos and lead-based paints were still in use. Health and safety concerns arise from exposure to asbestos and lead-based paint, insufficient fire suppression and alarm systems (with the exception of the Painted Desert Inn), and code violations. Hantavirus is also a health concern for employees, especially for those working in structures that have remained unused for long periods. Some trails and grounds are in poor condition due to erosion and pose a safety concern for visitors, park employees, and others. These concerns represent major long-term, adverse impacts to park operations.

Cumulative Impacts. Ongoing rehabilitation and stabilization of the Painted Desert headquarters complex would be required for the life of the structures. At the current level of maintenance and repair over the next 20 years, some buildings will structurally fail or, at a minimum, become structurally unfit to occupy. This will exacerbate current space needs. Additional maintenance and repair would be necessary to keep buildings from deterioration and possible failure and to address safety concerns. This increasing level of maintenance would require funding, staff time, and equipment to preserve the integrity of these potentially historic structures and continue to route funding away from other needed repair and resource management. As a result, park operations would sustain long-term, moderate to major, adverse cumulative impacts.

Mitigation. Trail studies could be performed to identify potential and existing erosion problems, and where necessary, erosion and sedimentation control measures would be implemented. Asbestos and lead-based paint remediation would occur in areas where workers are exposed to friable asbestos and where children are exposed to lead-based paint, in accordance with applicable regulations. The areas of concern for hantavirus would be sampled for the virus and cleaned up as necessary.

Conclusion. Painted Desert headquarters complex facility problems (e.g., limited space, deteriorating structures, and health and safety concerns) have long-term, moderate to major adverse impacts on park operations. Cumulative impacts related to continuing maintenance of deteriorating structures at the Painted Desert complex would be long term, moderate to major, and adverse.

Energy Requirements and Conservation Potential

In this alternative, the Painted Desert headquarters complex would remain the base for most visitor support and other park operations. There would be no new construction or changes in operations that would significantly affect energy requirements.

Energy conservation potential is limited under this alternative. The buildings of the park are old (built between the 1930s and 1960s), and are not energy efficient due to a lack of insulation in walls, ceilings, and windows. Few energy conservation techniques could be implemented in these buildings without incurring significant costs. As a result, long-term, minor, adverse impacts

to energy conservation potential would be expected.

Cumulative Impacts. No cumulative impacts are anticipated to energy requirements and conservation potential at the park would be anticipated.

Mitigation. Mitigating measures would be implemented to reduce the energy requirements of Petrified Forest National Park, most of which are related to energy efficiency. Where incandescent light bulbs are in use, they should be replaced by regular and compact fluorescent lighting. Fluorescent bulbs use 75% less electricity than incandescent bulbs. Lighting, ventilation, and other devices or systems can be controlled by sensors that reduce electricity consumption and, therefore, energy requirements.

Conclusion. Implementing this alternative would not affect energy requirements at Petrified Forest National Park. Energy conservation potential is limited under this alternative. Few energy conservation techniques could be implemented without incurring significant costs. Long-term, minor, adverse impacts to energy conservation potential would be expected. No cumulative impacts would be expected.

SOCIOECONOMIC RESOURCES

Current management policies and impacts would continue under alternative 1. No substantive changes to population, community character, employee commutes, or housing would be expected.

Current beneficial economic effects from the park would be expected to continue. PILT from the federal government to Navajo and Apache Counties would continue. PILT is based on a government-wide formula that considers the number of acres withdrawn from county tax rolls when park lands were acquired by the federal government. The potential impacts would be long term, minor, and beneficial.

Life cycle costs over the 15 to 20 year life of this alternative, which include maintenance, operations, and personnel costs (as well as capital costs), are estimated at $40,000,000. Park expenditures and spending by park employees would have a long-term, moderate, beneficial impact to the economy of Apache and Navajo Counties.

Eliminating petrified wood sales within the park would potentially have a long-term, major, adverse impact on the concessioner. Shops selling petrified wood outside the park would benefit from the new policy because visitors hoping to purchase petrified wood would probably patronize these businesses. The benefit would be moderate and long term.

Renovation of the Painted Desert Inn would result in a temporary increase in opportunities for the local construction work force and a modest increase in potential revenue for local businesses generated by construction activities and workers. The benefits would be minor and temporary. The inn will be closed during the renovation and this closure would produce a short-term, adverse, minor to moderate impact on cooperating association sales.

Cumulative Impacts. The Long Logs / Jim Camp Wash bridge project has resulted in a temporary increase in opportunities for the local construction work force and a modest increase in potential revenue for local

businesses generated by construction activities and workers. The benefits will be minor and short term.

A construction project to install a leak detection system along 13 miles of waterline is being carried out. NEPA compliance for this project is being covered separately. This project is expected to result in a temporary increase in opportunities for the local construction work force and a modest increase in potential revenue for local businesses. Any benefits are likely to be minor and short term.

Other foreseeable actions (including those proposed in the 1993 GMP) such as construction of new trails, turnouts, wayside exhibits, and comfort stations could encourage visitors to remain in the park and/or local area longer. These actions could result in a minimal increase in visitor expenditures at the concession and cooperator facilities, as well as locally in Holbrook and at nearby campgrounds. These actions would result in a minor, long-term, cumulative, beneficial impact.

Overall, cumulative impacts to socioeconomic resources would be minor, beneficial, and both short and long term.

Conclusion. Current beneficial economic effects from the park from PILT and from park-related spending would be expected to continue. Impacts would be long term, beneficial, and range from minor to moderate. Eliminating petrified wood sales within the park would potentially have a long-term, major, adverse impact on the concessioner and a long-term, moderate, beneficial impact on shops that sell petrified wood outside the park. Renovations to the Painted Desert Inn would have minor, temporary, beneficial effects on employment opportunities and revenue for local businesses. Closure of the inn during renovation would have a short-term, adverse, minor to moderate impact on cooperating association sales. Cumulative impacts to socioeconomic resources would be minor, beneficial, and both short and long term.

UNAVOIDABLE ADVERSE IMPACTS

There would be unavoidable, moderate to major, adverse impacts on archeological resources under alternative 1. Despite the best efforts of resource protection staff, some visitors or vandals would still remove artifacts or associated resources from archeological sites, compromising the value of the sites. These impacts would be avoided only if human use were not allowed in the park. Disturbance to archeological resources from wind and water erosion would also be unavoidable. Mitigation measures would be taken when possible to reduce these impacts.

Moderate to major, adverse impacts on certain natural resources would also be unavoidable. Although the Petrified Forest staff has made great strides in stemming the loss of petrified wood and other fossils from the park, some people still steal or disturb these resources. Because the National Park Service does not intend to close the park to visitor use, such impacts would continue. The cumulative effect of continued loss and disturbance of petrified wood and other fossils would be an unavoidable, major, adverse impact.

Long-term, major, adverse impacts on the concessioner's business would be unavoidable when petrified wood sales in park gift shops are discontinued, as required

by *NPS Management Policies*. Businesses outside the park would benefit to the extent that visitors buy petrified wood there instead.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible impacts are those effects that cannot be changed over the long term or are permanent. An irretrievable commitment of resources refers to the effects to resources that, once gone, cannot be replaced.

Archeological resources, petrified wood, or other fossils that are stolen or vandalized are irretrievably lost. Even moving or disturbing these resources constitutes an irreversible commitment of resources because information is lost if the context (location and condition) of the resources is changed, even inadvertently. Thus, there would be some irreversible loss or commitment of archeological resources, petrified wood, and other fossils in alternative 1, as discussed in the "Unavoidable Adverse Impacts" section above.

In alternative 1, portions of the museum collections would remain stored in various locations, some of which do not meet NPS standards for curation. Deterioration and loss of museum artifacts due to inadequate record-keeping and accountability and inadequate environmental controls would constitute an irretrievable commitment of resources.

Limited amounts of non-renewable resources would be used for construction projects and park operations, including energy and materials. These resources would be essentially irretrievable once they were committed.

RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

This section discusses effects of the short-term use of resources on the long-term productivity of resources.

There would be no adverse effects on biological, agricultural, or economic productivity associated with implementing alternative 1.

IMPACTS OF ALTERNATIVE 2 (PREFERRED ALTERNATIVE)

ARCHEOLOGICAL RESOURCES

New trails proposed under alternative 2 may allow more visitors to come into contact with sensitive sites near Route 66, Puerco River, and frontcountry trails (Route 66 and east of The Tepees). There would be potential for trampling of sites, moving of resources, vandalism, and theft in these areas. Impacts would be long term, minor to moderate, and site specific.

Widening the Route 66 access road, construction of several small informal turnouts adjacent to the main park road, and construction of the turnout and wayside exhibit interpreting Route 66 would constitute a minor, localized, long-term impact on potential subsurface archeological resources.

Crystal Forest and Giant Logs are archeologically sensitive areas. Trail modifications in these areas would benefit archeological sites because visitors would be encouraged to not enter the areas and come in contact with the sensitive resources contained therein. The potential beneficial impact would be long term, localized, and minor. However, any new ground disturbance associated with trail modification could have the potential for damage to archeological resources.

The new fire truck garage at Rainbow Forest and other facilities at the headquarters complex would be built in previously disturbed areas with low archeological sensitivity. The potential impacts from these projects would be localized, long term, negligible, and adverse.

Other impacts would be the same as in alternative 1.

Cumulative Impacts. Development, park maintenance, vandalism, theft, traditional visitor use, and natural processes all pose a threat to resources. Past development has resulted in disturbance to, and loss of, some archeological resources. Vandalism and theft of resources has occurred in the past, both within and outside park boundaries. Resources have been directly and indirectly damaged through visitor use and natural processes. Reasonably foreseeable changes to facilities and visitor use activities could pose a threat to archeological resources.

In some areas, lithics are scattered among petrified wood. Theft and displacement of petrified wood can lead to theft and displacement of archeological resources. Cattle trespass has damaged archeological resources in the past and would continue to do so in the future unless park managers can find more effective ways of keeping livestock from crossing fences.

The cumulative effect of alternative 2, in combination with other past, present, and reasonably foreseeable future actions, would be long term, adverse, and range from minor to major depending on the scope, type, and location of the activity.

Mitigation. Archeological surveys would be conducted, as necessary, prior to any ground-disturbing activities on the Route 66 roadbed, Giant Logs, Crystal Forest, Puerco River, or

near the frontcountry trails. If archeological resources cannot be avoided, the data they possess regarding prehistoric and/or historical lifeways would be recorded and recovered. Recordation and recovery would be performed in consultation with the Arizona SHPO.

Potential impacts associated with construction of the new museum collections facility and other projects at the Painted Desert headquarters complex would be mitigated as above.

Impacts from visitor use would be partially mitigated by locating new frontcountry trails on old roadbeds.

Other mitigation measures would be the same as in alternative 1.

Section 106 Summary. After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5), the National Park Service determined there is the potential for adverse effects to the Route 66, Puerco River, Crystal Forest, Giant Logs, and new the trail in The Tepees area. At a minimum, consultation would be required.

After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5), the National Park Service determined that there would be an adverse effect at Rainbow Forest and the headquarters complex, consultation and mitigation would be required.

Conclusion. There would be increased potential for trampling of archeological sites, disturbance of resources, vandalism, and theft in areas where new trails are proposed (near Route 66, Puerco River, east of The Tepees). Impacts would be long term, minor to moderate, and site specific. Other actions related to changes to a portion of old Route 66 and a new I-40 turnout along the main park road would have minor, localized, long-term impacts on subsurface archeological resources. Trail modifications at Crystal Forest and Giant Logs would benefit archeological sites; impacts would be long term, localized, and minor. Impacts to archeological resources from a new fire truck garage at Rainbow Forest and other facilities at the headquarters complex would be localized, long term, negligible, and adverse. Other impacts would be the same as in alternative 1. The cumulative effect of alternative 2, in combination with other past, present, and reasonably foreseeable future actions, would be long term and adverse and would range from minor to major depending on the scope, type, and location of the activity.

Although major, adverse impacts to archeological resources would be possible, such impacts would not occur throughout the park. They would be confined instead to individual sites. Most archeological resources in the park would remain well protected. Thus, there would be *no impairment of archeological resources* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

HISTORIC STRUCTURES

Proposed rehabilitation plans and associated potential impacts for the Painted Desert Inn would be the same as in alternative 1. Both residences near Painted Desert Inn would be rehabilitated and used for park staff housing or offices, resulting in a long-term, site-

specific, minor, beneficial effect to these resources.

Alternative 2 would require modifications to existing headquarters structures in order to adaptively reuse space, plus the addition of a few new structures to accommodate current and future space needs. These types of projects would further change character-defining features of the complex if not properly designed, resulting in a long-term, site-specific, moderate to major, adverse effect.

Cumulative Impacts. Cumulative impacts to the inn would be the same as in alternative 1.

Past modifications of buildings at the Painted Desert headquarters complex over the past 30 years have compromised the historic integrity of some of the buildings. For example, a noticeable roof addition over the visitor center and modifications to the concessions building facade have altered the character of the plaza. The entry to the visitor center has been altered. Past roofing projects have changed drainage patterns around buildings, which has exacerbated building movement and settling. Repair and maintenance projects have been insufficient to keep pace with deterioration caused by initial construction on uncompacted soils. Addition of new structures and modifications to other structures for adaptive reuse would result in a long-term, site-specific, moderate to major, adverse impact. Other projects would undo past modifications, restoring character-defining features. The potential result would be long-term, site-specific, minor to moderate, beneficial effects.

In summary, the cumulative effect of alternative 2 would include long-term, site-specific, moderate to major, adverse impacts, and long-term, site-specific, minor to moderate beneficial effects.

Mitigation. Proposed actions at the Painted Desert headquarters complex would be addressed through consultation with the Arizona SHPO and additional NEPA compliance, as necessary. Proposed additions and modifications for adaptive reuse would be designed to appropriately reflect character-defining features of the buildings. Preliminary schematic designs were developed during the planning process in concert with the SHPO. With proper design, implementation of proposed additions and modifications, in conjunction with reversal of past modifications, would minimize potential adverse effects and result in a site-specific, long-term, minor to moderate, beneficial effect.

Section 106 Summary. After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5), the National Park Service determined that there would be an adverse effect at the headquarters complex; therefore, consultation and mitigation would be required.

Conclusion. Proposed rehabilitation plans and associated potential impacts for the Painted Desert Inn would be the same as in alternative 1. Rehabilitation of residences near Painted Desert Inn would result in a long-term, site-specific, minor, beneficial impact. Modifications to buildings at Painted Desert headquarters complex for adaptive reuse, plus addition of a few new structures to accommodate current and future space needs, would further change character-defining features of the complex if not properly designed, resulting in a long-term,

site-specific, moderate to major, adverse impact. The cumulative effect of alternative 2 would include long-term, site-specific, moderate to major, adverse impacts, and long-term, site-specific, minor to moderate beneficial effects.

Through compliance with section 106 of the National Historic Preservation Act, consultation with the Arizona SHPO, and proper design and mitigation, the severity of impacts can be reduced below the "major" threshold. There would be *no impairment of historic structures* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

CULTURAL LANDSCAPES

Under alternative 2, several changes are proposed at Rainbow Forest. Modifications to the museum would be interior in scope and would not affect the cultural landscape. Reducing the scale of the concessions building would have a long-term, negligible or minor, beneficial effect on the historic landscape. The proposed parking and walkway realignment would result in a long-term, minor to moderate, adverse impact to the historic landscape. The addition of new structures would result in a long-term, moderate, adverse impact. Reconfiguration of the Giant Logs Trail would have a long-term, minor, adverse impact.

Shortening and realigning the trail at Crystal Forest would eliminate part of the original CCC trail system. Changing the character of the trail could result in a long-term, minor, adverse impact to the cultural landscape.

Proposed new trails near Puerco Pueblo and The Tepees would have a long-term, minor to moderate, adverse impact due to changes and the addition of modern features into a potential archeological cultural landscape.

Cumulative Impacts. Past and present modifications to the roads, bridge, trails, parking, and pedestrian circulation have had a moderate, long-term, adverse impact on the Rainbow Forest historic designed landscape. Proposed changes and additions to the landscape would have a long-term, negligible to minor, adverse effect, while restoration of structures would have a long-term, minor, beneficial effect. Cumulatively, without proper design and mitigation, alternative 2 would potentially have a long-term, minor to moderate, adverse effect on the cultural landscape.

At Crystal Forest, past and present high use of the area by visitors has resulted in a noticeable loss of petrified wood, rendering the area near the parking lot almost barren. The result has been a long-term, minor to moderate, adverse impact. Past modifications to the trails and addition of a sun shelter have also had a long-term, minor, adverse impact to the Crystal Forest cultural landscape. The proposed trail reduction would have a long-term, minor, adverse impact to the character-defining feature of the cultural landscape, while reducing impacts to visual quality from petrified wood removal. Cumulatively, the impact would remain long-term, minor to moderate, and adverse due to past impacts (removal of wood) to the site that cannot be reversed.

In summary, cumulative effects of alternative 2 would include long-term, minor to moderate, adverse impacts on the Rainbow Forest and Crystal Forest cultural landscapes.

Mitigation. Proposed actions at Rainbow Forest would be addressed in consultation with the Arizona SHPO, and under separate NEPA compliance, as necessary. The proposed additions and changes would be designed to appropriately reflect character-defining features of the landscape. Proper design would reduce the intensity of the potential adverse impact from moderate to minor, and it would possibly restore the historic integrity and character of the landscape (a beneficial effect).

Prior to adding new trails near Puerco River, on Old Route 66, and near The Tepees, landscapes would be evaluated to determine if they are eligible for the NRHP. If determined eligible, the actions would be addressed in consultation with the Arizona SHPO to ensure that designed features conform to cultural landscape character and integrity. Mitigation would be designed to minimize the intensity of adverse effect.

Section 106 Summary. After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5), the National Park Service determined there is the potential for adverse effects to the Rainbow Forest, Puerco River, Crystal Forest, Giant Logs, and Teepees. At a minimum, consultation would be required.

Conclusion. Changes at Rainbow Forest would have mixed impacts on the cultural landscape. Reducing the scale of the concessions building would have a long-term, negligible or minor, beneficial effect. Proposed parking and walkway realignment would have a long-term, minor to moderate, adverse impact. Addition of new structures would result in a long-term, moderate, adverse impact, and reconfiguration of the Giant Logs Trail would have a long-term, minor, adverse impact. At Crystal Forest, shortening and realigning the trail at Crystal Forest would have a long-term, minor, adverse impact to the cultural landscape. Proposed new trails near Puerco Pueblo and The Tepees would have long-term, minor to moderate, adverse impacts on a potential archeological cultural landscape. Cumulative effects of alternative 2 would include long-term, minor to moderate, adverse impacts on the Rainbow Forest and Crystal Forest cultural landscapes.

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

ETHNOGRAPHIC RESOURCES

Alternative 2 would involve no changes to current management of ethnographic resources, and therefore impacts would be the same as those produced by alternative 1.

Cumulative Impacts. Cumulative impacts from visitor use and park operations would be the same as in alternative 1.

Mitigation. Mitigation measures would be the same as in alternative 1.

Section 106 Summary. Since no change to current management is being proposed, criteria of adverse effect (36 CFR 800.5) would not be applied.

Conclusion. Ethnographic resource impacts related to visitor use would be long term, adverse, and minor to major depending on the resource. Impacts from park operations would have long-term, minor, localized, adverse impacts. Impacts from natural

processes would be long term, adverse, and minor to major, depending on the site. Cumulative impacts to ethnographic resources would be long term and adverse and would range from minor to major depending on the scope, type, and location of the activity.

Although major, adverse impacts to ethnographic resources would be possible, such impacts would not occur throughout the park. They would be confined instead to individual sites. Most ethnographic resources in the park would remain well protected. Thus, there would be *no impairment of ethnographic resources* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

MUSEUM COLLECTIONS

Under alternative 2, a new museum collections facility would be constructed at Painted Desert headquarters complex. This facility would potentially provide a long-term, major, beneficial impact because it would have adequate storage and work space and would meet NPS standards for curation. Offsite collections would be stored only at facilities that meet NPS standards. This would provide the collections with adequate protection and constitute a long-term, negligible to moderate, beneficial effect, depending on the standards of the facilities in which the collections are currently housed.

Cumulative Impacts. No ongoing or reasonably foreseeable future actions by others would be expected to combine with these actions and result in a cumulative impact on the museum collections under alternative 2.

Mitigation. Mitigation under alternative 2 would be the same as for alternative 1.

Conclusion. The new museum collections facility at Painted Desert headquarters complex would have a long-term, major, beneficial impact. Offsite collections would be stored only at facilities that meet NPS standards, a long-term, negligible to moderate beneficial effect. No cumulative impacts to museum collections would be expected.

There would be *no impairment of museum collections* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

PALEONTOLOGICAL RESOURCES

Petrified Wood

According to recently approved *NPS Management Policies* (2001a), sales of petrified wood would be discontinued at gift shops in the park. The impact this would have on petrified wood theft is unknown, but there is concern that it could result in additional wood theft in the park.

Long-term, negligible to moderate, adverse impacts from theft and displacement of petrified wood would be expected to continue at Jasper Forest, Agate Bridge, and Blue Mesa. Visitors tend to concentrate at these areas for the opportunity to see the special and/or extensive petrified wood deposits.

At Crystal Forest and Giant Logs, signs, patrols, and trail barriers would continue to be used to help prevent moving, damage to,

and removal of, petrified wood. Proposed modifications to the trails, such as shortening them or making portions accessible only with a guide, would also help prevent visitors from moving, damaging, or removing petrified wood. This would have a short-term, negligible to moderate, beneficial effect on petrified wood in these areas. However, long-term major adverse impacts to petrified wood near the Crystal Forest parking area, which currently sustains the highest impacts, would probably continue. Long-term, negligible to minor, adverse impacts would potentially occur over the rest of Crystal Forest and Giant Logs.

The proposed frontcountry trail near The Tepees would be sited, designed, and constructed to avoid impacts to the sensitive resources in this area. However, providing visitor access to this site would probably still result in increased occurrences of moving, damaging, or removing petrified wood. As a result of increased visitation, long-term, minor adverse impacts would be expected from construction of the trail to The Tepees.

In general, the backcountry experience at Petrified Forest National Park is not advertised, meaning that visitors are not particularly encouraged to use these areas and that petrified wood theft and vandalism is probably fairly low. Under alternative 2, several small, informal (gravel) turnouts would be provided as access points to the backcountry. A new frontcountry trail along the old Route 66 road trace would also provide a potential new access point for backcounty use. Backcountry opportunities would be highlighted in a new pamphlet provided to visitors.

Although backcountry visitation could increase as a result of providing additional access, it is not expected to greatly increase resource protection needs compared with alternative 1. Long-term, minor to moderate, adverse impacts (depending on the site) would be expected to continue in the backcountry. It is very difficult to determine how many people *do* damage, steal, or relocate petrified wood in the backcountry, so impacts could be more or less severe. Impacts to petrified wood would probably decrease the farther one travels into the backcountry because fewer visitors reach the remote areas.

Other Fossils

Many of the same impacts discussed for petrified wood would also result for other paleontological resources (fossils). However, most visitors have a harder time identifying plant and animal fossils than petrified wood, so impacts would tend to be less severe for these fossils. Fossil loss tends to occur in areas where visitors are concentrated and leave their vehicles to experience park resources first hand. For most of these sites, long-term, minor, adverse impacts result, with the exception of one known site (location undisclosed) where impacts are major. It is expected that these minor to major impacts would continue under alternative 2.

Proposed frontcountry trails would have minor to moderate, adverse impacts to fossil resources from trail construction and from unsupervised visitors moving or stealing wood after leaving the trails. At one site, mitigation could reduce impacts to non-petrified wood fossils to negligible or minor.

Cumulative Impacts. Despite the best efforts of the park staff, theft of petrified

wood continues to be a serious problem. The cumulative effect of past and ongoing wood theft is obvious at Petrified Forest National Park. Continued theft and movement of wood in the future would continue to decimate this resource at Crystal Forest and in other park areas where petrified wood is found near high visitor use areas. As sources of petrified wood on private and public lands surrounding the park are depleted, the potential for theft of this resource from backcountry areas may increase. Petrified wood harvesting for commercial purposes occurs legally on private lands outside the park and is unregulated, further adding to the loss of this resource and cumulative effects. Cumulative effects on petrified wood would be localized, moderate to major, long term, and adverse.

Other paleontological resources are damaged, moved, or taken within the park and on private lands in the region, including some just outside of the park boundary recently. As a result of past, ongoing, and future taking or the moving of these resources, cumulative impacts on fossils would be similar to those discussed above for petrified wood.

As in alternative 1 (no action), the Long Logs Road is being converted to a trail and the visitor experience directed towards pedestrians, resulting in long-term, minor, beneficial effects to paleontological resources. Installation of vault toilets at Puerco Pueblo and Agate Bridge / Jasper Forest would result in long-term, negligible, adverse impacts to fossil resources.

The cumulative effect of alternative 2, in combination with other past, present, and reasonably foreseeable future actions, would be moderate to major (depending on the site), long-term, adverse impacts.

Mitigation. Changes to the Long Logs Trail, trailhead, and parking area would mitigate some impacts to paleontological resources within park boundaries. Mitigation measures would include increased interpretation and education, signs, barriers along trails, ranger patrols, and trail modification. These measures would be used particularly in areas such as the new backcountry access points, as well as the new trail near The Tepees. Prior to activities such as trail construction, paleontological resources would be identified and curated as appropriate.

Conclusion. Long-term, negligible to moderate, adverse impacts from theft and displacement of petrified wood would be expected to continue at Jasper Forest, Agate Bridge, and Blue Mesa. Modifications to trails and trail management at Crystal Forest and Giant Logs would have short-term, negligible to moderate, beneficial effects on petrified wood, but long-term, major, adverse impacts to petrified wood near the Crystal Forest parking area would probably continue. Impacts would be long term, negligible to minor, and adverse over the rest of Crystal Forest and Giant Logs areas. Long-term, minor, adverse impacts would be expected from construction of the roadbed trail near The Tepees. Long-term, minor to moderate, adverse impacts (depending on the site) would be expected to continue in the backcountry. Cumulative effects would be moderate to major (depending on the site), long-term, adverse impacts.

Although major, adverse impacts to petrified wood would be possible, such impacts would not be spread throughout the park. They would be confined instead to high visitor use areas located near specific concentrations of petrified wood. Most significant deposits of petrified wood in the park would remain well

protected. Thus, there would be *no impairment of petrified wood or other fossils* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

VEGETATION

New trails proposed under alternative 2 could affect vegetation resources of the park near Route 66, Puerco River, and frontcountry trails (Route 66 and east of The Tepees). The Route 66 road trace currently used for administrative purposes would be widened and improved to allow visitors to drive an intact portion of the road. Widening of the Route 66 road trace and construction of a parking area/turn around at the end, would result in minor, local, adverse impacts to vegetation resources. Providing a backcountry trailhead at the end of the frontcountry trail proposed on Route 66 may encourage more visitors to use the Painted Desert wilderness area. As there are no defined trails in the backcountry, visitors would be hiking in areas that were likely previously undisturbed, trampling vegetation along the way. As a result of this access, negligible to minor, local, long-term, adverse impacts to vegetation resources could occur, depending on how much visitor use increases in the northern wilderness area. Continued impacts to vegetation would continue in the wilderness area in the southern section of the park.

There are no defined trails here, so hikers who use this wilderness area are trampling vegetation with every step. Because use of this area is limited, impacts to vegetation resources are expected to be negligible to minor, local, and adverse, depending on actual visitor use.

Construction of a turnout with wayside exhibits and an overlook to interpret historic Route 66, just north of where the park road passes over I-40, could have long-term, negligible, localized, adverse impacts on vegetation resources.

The proposed Puerco River overlook trail would disturb a minimal amount of vegetation in the park. This would result in negligible, localized, adverse impacts on vegetation resources. However, because much of this vegetation is likely dominated by the exotic, invasive species tamarisk, construction of the trail may actually warrant removal of some of this species. This could result in a negligible, short- or long-term, beneficial effect on vegetation resources of the Puerco River, depending on how long it takes for tamarisk to become reestablished.

A new turnout on the east side of the main park road near The Tepees would provide access to the proposed universally accessible trail. This trail would head east for about one mile along an old roadbed. Minor, local, long-term, adverse impacts to vegetation resources would be anticipated as a result of constructing the turnout.

Construction of several small informal turnouts adjacent to the main park road for backcountry access, and construction of the turnout and wayside exhibit interpreting Route 66 would constitute a negligible, localized, long-term, adverse impact on vegetation resources. A new pamphlet would be provided describing the untrailed opportunities available from these backcountry access points, which may encourage increased visitor use in this backcountry area. As most of this area is relatively undisturbed, hiking would result in trampling of vegetation along the way.

Negligible to minor, local, adverse effects on vegetation resources could occur depending on the increase in visitor use as a result of increased backcountry opportunities.

Low impact, traditional activities such as guided hiking or backpacking tours would be appropriate under this alternative. Such services would encourage visitors to experience the park's backcountry, help them to understand and appreciate the park's special resources, and ensure that visitor use is compatible with protecting vegetation resources. This could have a negligible to moderate, long-term, beneficial effect on vegetation resources, depending on the proportion of visitors who partake in guided tours.

Cumulative Impacts. Past and ongoing trampling of vegetation in the backcountry of Petrified Forest National Park would result in long-term, minor, adverse impacts to vegetation. Replacement of sewer system lines at the Painted Desert headquarters complex and Rainbow Forest, as well as removal of the Puerco sewage lagoons, are planned activities that would have short-term, local, negligible to minor, adverse impacts on vegetation resources of Petrified Forest National Park. Current plans to replace restroom facilities at Jasper Forest and Agate Bridge would have local, negligible, long-term, adverse impacts. Removal of the parking trailheads in the vicinity of the Flattops would result in local, minor, long-term, beneficial impacts on vegetation resources, as these areas would be reverted back to native landscapes.

Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would be long-term, negligible to minor, adverse effects on the vegetation resources of Petrified Forest National Park.

Mitigation. All disturbed areas associated with construction activities for trails, parking areas, turnouts, and wayside exhibits would be sited to avoid impacts to vegetation if possible. Revegetation plantings would seek to reconstruct the natural spacing, abundance, and diversity of native species. Otherwise, they would be restored to pre-construction conditions during and/or as soon as practicable following construction, to the extent possible. The principal goal is to avoid interfering with natural processes. Efficient planting and staging, as well as careful machine work, would be emphasized.

New parking areas/turnouts for backcountry access would be monitored and changed (e.g., closed or locations changed) as necessary on the basis of resource considerations.

Conclusion. Increased backcountry hiking opportunities could result in increased trampling of vegetation in the wilderness areas of Petrified Forest National Park. Negligible to minor, localized, adverse impacts would be anticipated. Construction of several small informal turnouts adjacent to the main park road for backcountry access and construction of the turnout and wayside exhibit interpreting Route 66 would constitute a negligible, localized, long-term, adverse impact on vegetation resources. Improvements to the Route 66 road trace, construction of a Puerco River overlook trail, and construction of a parking area / universally accessible trail near The Tepees would result in negligible to minor, long-term, adverse impacts on vegetation resources at the park.

Some beneficial effects could occur from construction of the Puerco River overlook trail (as a result of removing tamarisk, if necessary) and from encouraging concessioners to provide low-impact, guided hiking and backcountry experiences. The effects would be negligible to moderate, local, short and long term, and beneficial.

Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would have long-term, negligible to minor, adverse effects on vegetation resources of Petrified Forest National Park.

There would be *no impairment of vegetation resources* from this alternative (see specific definition of impairment in the "Impairment of National Park Resources" section above).

SOILS

New trails proposed under alternative 2 could affect the soils of the park near Route 66, Puerco River, and at new frontcountry trails (Route 66 and east of The Tepees). The Route 66 road trace currently used for administrative purposes would be widened and improved to allow visitors to drive an intact portion of the road. Soils along this stretch of the Route 66 road trace range in erosion hazard from slight to very high. Therefore, widening of the Route 66 road trace and construction of a parking area / turn-around at the end, would result in negligible to moderate, site-specific, adverse impacts to soils. Providing a backcountry trailhead at the end of the frontcountry trail proposed on Route 66 may encourage more visitors to use the Painted Desert wilderness area. As there are no defined trails in the backcountry, visitors would be hiking in areas that were never heavily used, disturbing soils with slight to high erosion hazard. As a result of this access, negligible to minor, local, long-term, adverse impacts to soils could occur, depending on the amount of visitor use increase in the northern wilderness area.

Impacts to vegetation would continue in the backcountry in the southern part of the park as described in the no-action alternative. There are no defined trails and hikers who use the backcountry cause soil disturbance, potentially including cryptobiotic soils. Because use of this area is limited, the impacts to soils are expected to be negligible to minor, local, and adverse, depending on erosion hazard and actual visitor use.

Construction of a turnout with wayside exhibits and an overlook to interpret historic Route 66, just north of where the park road passes over I-40, would affect soils with slight erosion hazard. Therefore, long-term, negligible, site-specific, adverse impacts on soils would be anticipated.

Construction and use of the proposed Puerco River overlook trail would disturb soils that have slight erosion hazards, except for the Sheppard loamy sand in this area, which has a high wind erosion hazard and a slight water erosion hazard. Therefore, negligible to moderate, localized, adverse impact on soils would be anticipated from construction and use of this trail.

A new turnout on the east side of the main park road near The Tepees would provide access to the proposed universally accessible trail. This trail would head east along an old roadbed for about one mile. Soils along this roadbed have been previously disturbed; however, they are Badland soils that have a high erosion hazard. As this would be an

elevated "boardwalk" style trail, only those areas needed for support structures would be affected for the long term. Therefore, moderate, site-specific, long-term, adverse impacts to soils would be anticipated as a result of construction of the turnout and trail. Short-term, site-specific, negligible to minor, adverse impacts would result from construction workers and the use/storage of equipment that would disturb soils, potentially including cryptobiotic soils.

Construction of several small informal turnouts adjacent to the main park road for backcountry access would constitute a negligible to moderate, site-specific, long-term adverse impact on soils, depending on the erosion hazard of the soil. A new pamphlet would be provided describing the untrailed opportunities available from these backcountry access points, which may encourage increased visitor use. This pamphlet could provide pictures of cryptobiotic soils so that visitors have an idea of their appearance and importance, and could avoid these sensitive soils. Even with the educational opportunity, negligible, local adverse effects on cryptobiotic soils could occur, depending on the increase in visitor use as a result of increased backcountry opportunities.

Low impact, traditional activities such as guided hiking or backpacking tours would be appropriate under this alternative. Such services would encourage visitors to experience the backcountry, help them understand and appreciate the special resources, and ensure that visitor use is compatible with protecting soils, especially cryptobiotic and highly erosive soils. This could have a negligible to moderate, site-specific, long-term, beneficial effect on soils, depending on the proportion of visitors who partake in guided tours.

All construction activities would seek to avoid impacts to cryptobiotic and highly erosive soils. However, it is expected that some negligible to moderate, site-specific, short-term, adverse impacts to these soil types would result from construction workers and the use/storage of equipment.

Cumulative Impacts. The erosive action of wind and water are readily apparent throughout Petrified Forest National Park. These natural processes have long-term, moderate, adverse impacts on soils, including cryptobiotic soils. Past and ongoing soil disturbances from off-trail hiking in the backcountry of Petrified Forest National Park would result in long-term, negligible to moderate, adverse impacts to soils, including cryptobiotic soils. Replacement of sewer system lines at the Painted Desert headquarters complex and Rainbow Forest, as well as removal of the Puerco sewage lagoons, are planned activities that would have short-term, site-specific, negligible to minor, adverse impacts on soils of Petrified Forest National Park. Current plans to replace restroom facilities at Jasper Forest and Agate Bridge would have negligible to moderate, site-specific, long-term adverse impacts. Removal of the parking trailheads in the vicinity of the Flattops would result in site-specific, minor, long-term, beneficial impacts on soils, as these areas would be returned to native landscapes.

Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would be long-term, negligible to moderate, adverse effects on the soils of Petrified Forest National Park.

Mitigation. All disturbed areas associated with construction activities for trails, parking areas, turnouts, and wayside exhibits would be located to avoid impacts to cryptobiotic and highly erosive soils, to the extent possible. Otherwise, they would be restored during and/or as soon as practicable following construction. The principal goal is to avoid interfering with natural processes. Efficient planning and staging, as well as careful machine work, would be emphasized.

New parking areas/turnouts for backcountry access would be monitored and changed (e.g., closed or locations changed) as necessary on the basis of resource considerations.

Conclusion. Increased backcountry hiking opportunities could increase soil disturbances in the wilderness areas of Petrified Forest National Park. Negligible to minor, localized, adverse impacts would be anticipated. Construction of several small informal turnouts adjacent to the main park road for backcountry access, and construction of the turnout and wayside exhibit interpreting Route 66 would constitute negligible, site-specific, long-term, adverse impacts on soils. Improvements to the Route 66 road trace, construction of a Puerco River overlook trail, and construction of a parking area/universally accessible trail near The Tepees would result in negligible to moderate, short- and long-term, local and site-specific, adverse impacts on soils at the park.

Some beneficial effects to cryptobiotic soils could occur from the production of an educational pamphlet. However, it would be expected that negligible, local, adverse impacts to these soils would continue as a result of off-trail hiking. Beneficial impacts would be anticipated for cryptobiotic and highly erosive soils as a result of guided hikes and backcountry trips compatible with this alternative. This could have negligible to moderate, site-specific, beneficial effects on these and other soils, depending on the proportion of visitors who take advantage of guided tour opportunities.

All construction activities would seek to avoid impacts to cryptobiotic and highly erosive soils. However, it is expected that some negligible to moderate, site-specific, short-term, adverse impacts to these soil types would result from construction workers and the use/storage of equipment.

Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would have long-term, negligible to minor, adverse effects on soils of Petrified Forest National Park.

There would be *no impairment of soils* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

VISITOR EXPERIENCE AND APPRECIATION

Visitor vehicle access to a portion of the Route 66 roadbed and a new turnout and wayside interpreting Route 66 would benefit visitors who want to learn about and view this historic resource. The impact on visitor experience and appreciation would be long term and minor.

New turnouts and new trails at Route 66, The Tepees, and Puerco River would allow visitors to experience the park in new ways—a long-term, moderate, beneficial impact. On

the other hand, the new trails and turnouts would potentially have a long-term, minor, adverse impact on those looking for unmarred views of the Painted Desert and a remote backcountry experience.

Renovations at Rainbow Forest and Painted Desert complex, trail changes at Crystal Forest, and a new universally accessible trail to The Tepees would improve accessibility for those with limited mobility. As a result, such visitors would have more opportunities to see and explore the park. The impact would be moderate, long-term, and beneficial.

Parking and walkway improvements at Rainbow Forest would reduce potential for vehicle-pedestrian conflicts and confusion in the Rainbow Forest area. These improvements would have a long-term, minor to moderate, beneficial impact.

Renovations at Painted Desert headquarters complex and Rainbow Forest Museum would provide space for improved exhibits and media. The result would be a moderate, long-term, beneficial impact on visitor experience and appreciation.

Extended hours in the northern portion of the park would allow for longer periods of visitor access and the opportunity to view sunsets and sunrises over the Painted Desert. Potential expanded visitor services (trading post, food service) at the Painted Desert Inn would benefit visitors by providing more services near popular park attractions. These changes would be expected to have a long-term, minor to moderate, beneficial impact on visitor experience and appreciation.
The development of an information pamphlet to inform visitors about off-trail hiking options would also improve visitor experience and appreciation. The impact would be long term and minor.

Cumulative Impacts. Impacts associated with conversion of the Long Logs access road to a hiking trail would remain the same as in alternative 1: long term, moderate, and adverse or beneficial, depending on the visitors being affected. Impacts from I-40 interchange improvements would also be the same as in alternative 1: minor and adverse in the short term, and minor and beneficial over the long term.

In summary, cumulative effects of alternative 2 would include long-term, minor to moderate, adverse, and beneficial impacts and short-term, minor, beneficial impacts.

Mitigation. Mitigation measures would be the same as for alternative 1.

Conclusion. Various accessibility improvements and additional space at Painted Desert headquarters complex and Rainbow Forest Museum for improved exhibits would have long-term, moderate, beneficial impacts. Parking and walkway improvements at Rainbow Forest, and new turnouts, trails, and vehicular access to a portion of old Route 66 would have long-term, minor to moderate impacts. However, certain new trails and turnouts could have a long-term, minor, adverse impact on visitors desiring unmarred views of the Painted Desert and a remote backcountry experience. Extended hours in the and potential for expanded visitor services at the Painted Desert Inn would have long-term, minor to moderate beneficial impacts on visitor experience and appreciation. Development of an information pamphlet to inform visitors about off-trail hiking options would have a long-term, beneficial, minor impact.

Cumulative effects of alternative 2 would include long-term, minor to moderate, adverse and beneficial impacts and short-term, minor, beneficial impacts on visitor experience and appreciation.

NATIONAL PARK OPERATIONS

General Operations

At Giant Logs and Crystal Forest, some portions of the trail may be accessible only with a guide. Additional staff would be needed if these changes were implemented. Additional staff would also be needed for increased interpretation at Rainbow Forest and Painted Desert headquarters complex. New trails represent an increased park maintenance burden, resulting in long-term, minor, adverse impacts to park operations. Some trails and grounds are in poor condition due to erosion, and pose a safety concern for visitors, park employees, and others. These concerns represent moderate, long-term, adverse impacts to park operations.

A new museum collections building that meets NPS standards would be constructed. This building would improve administrative access to and curation of the collections. Construction of a new museum collections facility would also free up space for other functions in the Painted Desert headquarters complex. Removing deteriorated structures at the complex would reduce the overall maintenance load at the park. Other potential improvements at the complex would result in improved work space conditions, increases in available space, and improved operational efficiency for employees, visitors, and researchers and scientists. These actions would have long-term, moderate, beneficial effects on park operations.

Several residential structures would be improved. Employee morale, ability to recruit and retain employees and volunteers, and health and safety would improve as a result. Flexible housing opportunities for visiting researchers and scientists would also be provided under this alternative. These actions would have long-term, moderate, beneficial impacts to park operations.

Hours of operation and services provided at Painted Desert Inn would be expanded under this alternative. The north part of the park would also be open longer each day. Additional interpretation and protection staff would probably be needed as a result. Longer hours would have long-term, minor to moderate, adverse impacts on park operations.

Cumulative Impacts. Structures in the Painted Desert headquarters complex would be rehabilitated and stabilized as needed under alternative 2. Even so, these structures would require more maintenance than is typical for most structures of this age. This maintenance would require funds, staff time, and equipment on an ongoing basis to preserve the structures' integrity. Park operations would sustain long-term, minor to moderate, adverse impacts regardless of other improvements that would enhance operational efficiency in this complex (e.g., the new museum collections facility).

Mitigation. Trail reductions in this alternative would involve an archeologist and paleontologist to ensure that archeological and paleontological sites are not damaged. A landscape architect, engineer, or other design

professional would help to rectify erosion problems at Blue Mesa Trail.

Careful design and planning would allow adaptive reuse of historic buildings. Related operations would be moved closer to each other if possible. Improvements would be made to accessibility and fire suppression / alarm systems would be installed. Asbestos and lead-based paint inspections would be conducted prior to remodeling existing structures. Remediation would be carried out, as necessary, to eliminate potential health hazards.

Any new facilities (e.g., the museum collections facility) would be built to NPS standards and fire and safety codes, and would be accessible to persons with limited mobility.

Conclusion. Long-term, moderate, adverse impacts to park operations would be expected from trail modifications at Giant Logs and Crystal Forest and from expanded interpretation at Rainbow Forest and the Painted Desert headquarters complex. Long-term, moderate, beneficial effects on park operations would be expected from improved work space conditions, removing deteriorated structures, increasing available space, and improving operational efficiency for employees, visitors, and researchers and scientists. Expanded services at the Painted Desert Inn and extended park hours in the north would have long-term, minor to moderate, adverse impacts on park operations. The cumulative effect of alternative 2 on park operations would be long-term, minor to moderate, adverse impacts.

Energy Requirements and Conservation Potential

In alternative 2, some changes in energy requirements and conservation potential would occur at the Painted Desert headquarters complex. Energy requirements would likely increase as a result of building a new museum collections facility with sophisticated lighting, ventilation, humidity, and temperature control systems. However, removing and/or replacing a few other structures could result in some energy savings. In all, long-term, negligible, adverse impacts to energy requirements at the park would continue.

There is potential to implement energy conservation measures in the new museum collections facility. If the facility were constructed using sustainable development technologies, negligible, long-term, beneficial effects would result for the potential to conserve energy.

Energy would be required to produce new materials and transport new and old building materials during new construction at the headquarters complex. Energy would also be consumed in the removal of any unused materials. This consumption would have a short-term, negligible, adverse impact on energy requirements at Petrified Forest National Park, but only for the duration of the project.

Cumulative Impacts. No cumulative impacts to energy requirements and conservation potential at the park would be anticipated.

Mitigation. Mitigating measures would be implemented to reduce the energy requirements of Petrified Forest National

Park. Most of these are related to energy efficiency. Where incandescent light bulbs are in use, they should be replaced by regular and compact fluorescent lighting (fluorescent bulbs use 75% less electricity than incandescent bulbs). Lighting, ventilation, and other devices or systems can be controlled by sensors that reduce electricity consumption and, therefore, energy requirements.

By recycling materials from existing facilities, building the minimum to satisfy functional requirements, and having facilities serve multiple functions, the embodied energy of new building materials and the energy of transporting them would be minimized. In addition, electrical and thermal energy can be saved through facility design that incorporates day lighting and other passive-energy strategies appropriate to the climate at the park and function of the facility.

Using environmentally sensitive building materials can also reduce energy requirements and enhance conservation potential. Natural materials are less energy-intensive and polluting to produce. Using local materials reduces energy needs. Using durable materials can save on energy costs for maintenance as well as for production and installation of replacement materials. Mitigation measures described in alternative 1 could be expanded and implemented in this alternative. Such measures could include the use of hidden photovoltaic systems to heat water and provide power.

Conclusion. Long-term, negligible, adverse impacts to energy requirements at the park would continue. Incorporation of sustainable development technologies in a few new structures would have negligible, long-term, beneficial effects on the potential to conserve energy. No cumulative impacts to energy requirements and conservation potential at the park would be anticipated.

SOCIOECONOMIC RESOURCES

Current beneficial economic effects from the park would be expected to continue. Life cycle costs over the 15 to 20 year life of the plan, which includes maintenance, operations, and personnel costs (as well as capital costs), are estimated at $65,700,000. These costs would continue to have a long-term, moderate, beneficial impact to the economy of Apache and Navajo Counties from park expenditures and personal spending by employees. The impact would be greater than that expected from alternative 1.

Elimination of petrified wood sales within the park would have a long-term, major, adverse impact on the concessioner's business, but local businesses would realize a moderate, long-term, benefit.

Limited new construction and improvements to existing facilities would result in a temporary increase in opportunities for the local construction work force and a modest increase in potential revenue for local businesses generated by construction activities and workers. The potential benefits would be short term, beneficial, and minor in intensity.

With encouragement from park staff, nearby cooperators or neighbors may choose to develop more campgrounds. If this happens, the impact would be minor, long term, and beneficial to local businesses, the concessioner, and cooperators, because some visitors would likely spend more time at the park and in the region. Extended park hours

and expanded interpretive programs could benefit local or regional businesses if some visitors spend more time at the park and in the area. This would have a minor, long-term, beneficial impact on local economy. The new museum collections facility would have a negligible, long-term, beneficial impact on local businesses, park concessioners, and cooperators if researchers remain in the local area longer to work with collections.

Other impacts would be the same as in alternative 1.

Cumulative Impacts. Other foreseeable actions (including those proposed in the 1993 GMP), such as construction of new trails, turnouts, wayside exhibits, and comfort stations could encourage visitors to stay in the park and/or local area longer. Longer stays could result in a minimal increase in visitor expenditures at the park, as well as locally in Holbrook and at nearby campgrounds. The cumulative effect of alternative 2 on socioeconomic resources would be a minor, long-term, beneficial impact.

Conclusion. Beneficial effects from park-related spending would increase; benefits would be greater than for the no-action alternative, but still long term, beneficial, and moderate. Elimination of petrified wood sales within the park would have a long-term, major, adverse impact on the concessioner's business, but local businesses would realize a moderate, long-term, benefit. Potential benefits from new construction and improvements to existing facilities would be short term, beneficial, and minor in intensity. Negligible to minor, long-term, beneficial impacts would result if proposed actions result in visitors spending more time at the park and in the local area. The cumulative effect of alternative 2 on socioeconomic resources would be a minor, long-term, beneficial impact.

UNAVOIDABLE ADVERSE IMPACTS

There would be unavoidable, moderate to major, adverse impacts on archeological resources, petrified wood, and other fossils under alternative 2. These impacts could be slightly greater than those resulting from current management, even though trails proposed in alternative 2 were located in areas that tend not to have concentrations of these resources. Impacts could be avoided only if human use were not allowed in the park. Disturbance to archeological resources from wind and water erosion would also be unavoidable. Mitigation measures would be taken when possible to reduce these impacts.

Long-term, major, adverse impacts on the concessioner's business would be unavoidable when petrified wood sales in park gift shops are discontinued, as required by *NPS Management Policies*. Businesses outside the park would benefit, however, to the extent that visitors buy petrified wood there instead.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Archeological resources, petrified wood, or other fossils that are stolen or vandalized are irreversibly lost. Even moving or disturbing these resources constitutes an irreversible commitment of resources because information is lost if the context (location and condition) of the resources is changed, even inadvertently. Thus, there would be some irreversible loss or commitment of

archeological resources, petrified wood, and other fossils in alternative 2, as discussed in the "Unavoidable Adverse Impacts" section above.

Removal of even a few Painted Desert headquarters complex structures would constitute an irreversible loss. These buildings are potentially eligible for the NRHP even though they are less than 50 years old. A detailed record of the buildings could be created via the Historic American Buildings Survey or Historic American Engineering Record, but the buildings themselves would be irretrievably lost.

Limited amounts of nonrenewable resources would be used for construction projects and park operations, including energy and materials. These resources would be essentially irretrievable once they were committed.

RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

This section discusses the effects of the short-term use of resources on the long-term productivity of resources.

There would be no adverse effects on biological, agricultural, or economic productivity associated with implementing alternative 2.

IMPACTS OF ALTERNATIVE 3

ARCHEOLOGICAL RESOURCES

Under alternative 3, fewer visitors would come into contact with sensitive archeological resources in the special protection zone because those who travel into the area would either be accompanied by a guide or, as part of the permitting process, would be informed of proper protocol when traveling in a special protection zone. This action would potentially lead to less trampling, moving, vandalism, and theft of resources. However, overall impacts from visitor use would remain long term, adverse, and minor to major, depending on the site.

Crystal Forest and Giant Logs are archeologically sensitive areas. Trail reductions in these areas would benefit archeological sites because visitors would be encouraged not to enter the areas and come in contact with the sensitive resources contained therein. The potential beneficial impact would be long term, localized, and minor.

The new museum collections facility at headquarters would be built in a previously disturbed area with low archeological sensitivity. The potential impacts from this project would be localized, long term, negligible, and adverse. Other impacts would be the same as in alternative 1.

Cumulative Impacts. Development, park maintenance, vandalism, theft, traditional visitor use, and natural processes all pose a threat to resources. Past development has resulted in disturbance to, and loss of, some archeological resources. Vandalism and theft of resources has occurred in the past, both within and outside park boundaries. Resources have been directly and indirectly damaged through visitor use and natural processes. Reasonably foreseeable changes to facilities and visitor use activities could pose a threat to archeological resources.

In some areas, lithics are scattered among petrified wood. Theft and displacement of petrified wood can lead to theft and displacement of archeological resources. Cattle trespass has impacted archeological resources in the past and would continue to do so in the future unless park managers can find more effective ways of keeping livestock from crossing fences.

The cumulative effect of alternative 3, in combination with other past, present, and reasonably foreseeable future actions, would be long term and adverse and would range from minor to major depending on the scope, type, and location of the activity.

Mitigation. Except for potential negligible impacts associated with construction of the new museum collections facility, there would be no new adverse impacts to archeological resources in this alternative. Mitigation measures would be the same as in alternative 1.

Section 106 Summary. After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5), the National Park Service determined there would be no adverse effects to archeological resources.

Conclusion. Implementation of the special protection zone could lead to less trampling,

moving, vandalism, and theft of archeological resources. However, overall impacts from visitor use would remain long term, adverse, and minor to major, depending on the site. Trail reductions at Crystal Forest and Giant Logs would have long-term, localized, and minor, beneficial impacts. Potential impacts from construction of a new museum collections facility would be localized, long term, negligible, and adverse. Other impacts would be the same as for alternative 1. Cumulative impacts would be long term, adverse, and range from minor to major depending on the scope, type, and location of the activity.

Although major, adverse impacts to archeological resources would be possible, such impacts would not occur throughout the park. They would be confined instead to individual sites. Most archeological resources in the park would remain well protected. Thus, there would *be no impairment of archeological resources* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

HISTORIC STRUCTURES

Proposed rehabilitation plans and associated potential impacts for the Painted Desert Inn would be the same as in alternative 1. Both residences would be rehabilitated and used for housing, resulting in a long-term, site-specific, minor, beneficial effect to these resources.

Alternative 3 would involve modifications to existing headquarters structures in order to adaptively reuse space, plus addition of some new structures to meet current and future space needs. These projects would further change character-defining features of the complex if not properly designed, resulting in a long-term, site-specific, moderate to major, adverse effect.

Cumulative Impacts. Cumulative impacts to Painted Desert Inn would be the same as in alternative 1.

Modifications of buildings in the Painted Desert headquarters complex over the past 30 years have compromised the historic integrity of some of the buildings. For example, a noticeable roof addition over the visitor center and modifications to the concessions building facade have altered the character of the plaza. The entry to the visitor center has been altered. Past roofing projects have changed drainage patterns around buildings, which has exacerbated building movement and settling. Repair and maintenance projects have been insufficient to keep pace with the deterioration caused by initial construction on uncompacted soils. The addition of new structures and modifications to existing structures to adaptively reuse space would result in a long-term, site-specific, moderate to major, adverse impacts. Efforts to reverse modifications, restoring character-defining features, would result in potential long-term, site-specific, minor to moderate, beneficial effects.

In summary, the cumulative effect of alternative 2 would include long-term, site-specific, moderate to major, adverse impacts, and long-term, site-specific, minor to moderate, beneficial effects.

Mitigation. Proposed actions at headquarters would be addressed through consultation with the Arizona SHPO and additional NEPA compliance, as necessary. Proposed additions and modifications for

adaptive reuse would be designed to appropriately reflect character-defining features of the buildings. Preliminary plans were developed with the involvement of the SHPO. Through proper design, implementation of the proposed additions and modifications, plus undoing past modifications, would minimize potential adverse effects, possibly resulting in a site-specific, long-term, minor to moderate, beneficial effect.

Section 106 Summary. After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5), the National Park Service determined that there would be an adverse effect at the Painted Desert headquarters complex, and consultation and mitigation would be required.

Conclusion. Potential impacts to the Painted Desert Inn would be the same as in alternative 1. Improvements to the residences near Painted Desert Inn would have a long-term, site-specific, minor, beneficial effect. Modifications to existing Painted Desert headquarters complex structures to adaptively reuse space, plus addition of some new structures, would further change character-defining features of the complex if not properly designed, resulting in a long-term, site-specific, moderate to major, adverse effect. Cumulative effects of alternative 2 would include long-term, site-specific, moderate to major, adverse impacts, and long-term, site-specific, minor to moderate beneficial effects.

Through compliance with section 106 of the National Historic Preservation Act, consultation with the Arizona SHPO, and proper design and mitigation, the severity of impacts can be reduced below the "major" threshold. There would be *no impairment of historic structures* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

CULTURAL LANDSCAPES

Under alternative 3, reconfiguration of Giant Logs Trail would have a long-term, minor, adverse impact on the Rainbow Forest cultural landscape. Proposed changes to the Rainbow Forest Museum are to the building's interior, and would not affect the cultural landscape. Reducing the scale of the concessions building would have a long-term, negligible or minor, beneficial effect to the historic landscape. Other proposed construction projects would be small in scale (new comfort station) or sited out of the central portion of the landscape (new fire station). These changes would result in a long-term, minor to moderate, adverse impact to the historic landscape. The proposed parking realignment would result in a long-term, minor to moderate, adverse impact to the historic landscape.

Proposed actions for Crystal Forest to shorten and realign the trail would eliminate part of the original CCC trail system, changing the character of the trail, which could result in a long-term, minor, adverse impact to the cultural landscape.

Impacts associated with the Puerco River and Painted Desert Inn would be the same as for alternative 1.

Cumulative Impacts. Past and present modifications to the roads, bridge, trails, parking, and pedestrian circulation have had a moderate, long-term, adverse impact to

Rainbow Forest. Proposed changes and additions to the landscape would have a long-term, minor to moderate, adverse effect, while restoration of structures would have a long-term, minor, beneficial effect. Cumulatively, with proper design and mitigation, alternative 3 would potentially have a long-term, negligible to minor, adverse effect on the cultural landscape.

At Crystal Forest, past and present high use of the area by visitors has resulted in a noticeable loss of petrified wood, rendering the area near the parking lot almost barren, constituting a long-term, minor to moderate, adverse impact. Past projects involving modifications to trails and addition of a sun shelter have also had a long-term, minor, adverse impact to the cultural landscape. The proposed trail reduction would have a long-term, minor, adverse impact to the character-defining feature of the cultural landscape, while reducing visual quality impacts from petrified wood removal. Cumulatively the impact would remain long-term, minor to moderate, and adverse due to past impacts (removal of wood) that cannot be reversed.

In summary, cumulative impacts to the Rainbow Forest cultural landscape would be long-term, negligible to minor, and adverse, and cumulative impacts to the Crystal Forest cultural landscape would be long term, minor to moderate, and adverse.

Mitigation. Proposed actions at Rainbow Forest would be addressed in consultation with the Arizona SHPO, and under separate NEPA compliance, as necessary. The proposed additions and changes would be designed to appropriately reflect character-defining features of the landscape. Proper design would reduce the intensity of the potential adverse impact from moderate to minor, and it would possibly restore the historic integrity and character of the landscape resulting in a beneficial effect.

Section 106 Summary. After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5), the National Park Service determined that there may be an adverse effect to the Giant Logs, Rainbow Forest, and Crystal Forest cultural landscapes. At a minimum, consultation would be required.

Conclusion. Reconfiguration of Giant Logs and Crystal Forest Trails would have long-term, minor, adverse impacts on Rainbow Forest and Crystal Forest cultural landscapes. Reducing the scale of the concessions building would have a long-term, negligible or minor, beneficial effect to the historic landscape. Other new facilities at Rainbow Forest have long-term, minor to moderate, adverse impacts to the historic landscape. The proposed parking realignment would have a long-term, minor to moderate, adverse impact to the historic landscape. Impacts associated with the Puerco River and Painted Desert Inn would be the same as for alternative 1. Cumulative impacts to the Rainbow Forest cultural landscape would be long-term, negligible to minor, and adverse, and cumulative impacts to the Crystal Forest cultural landscape would be long term, minor to moderate, and adverse.

Through compliance with section 106 of the NHPA, consultation with the Arizona SHPO, and proper design and mitigation, the severity of impacts can be reduced below the "major" threshold. There would be *no impairment of cultural landscapes* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

ETHNOGRAPHIC RESOURCES

Under alternative 3, fewer visitors would come into contact with sensitive ethnographic resources in the special protection zone because those who travel into the area would be accompanied by a knowledgeable guide or, as part of the permitting process, informed of proper protocol when traveling in the special protection zone. This would lead to less trampling, moving, vandalism, and theft of resources. However, overall impacts from visitor use would remain long term, adverse, and minor to major, depending on the resource.

Otherwise impacts would be the same as for alternative 1.

Cumulative Impacts. Cumulative impacts would be the same as for alternative 1: long term and adverse, and they would range from minor to major depending on the scope, type, and location of the activity.

Mitigation. Mitigation measures would be the same as for alternative 1.

Section 106 Summary. After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5), the National Park Service determined there would be no adverse effects to ethnographic resources.

Conclusion. Fewer visitors would come into contact with sensitive ethnographic resources in the special protection zone, which would lead to less trampling, moving, vandalism, and theft of resources. Impacts from visitor use would remain minor to major, however, depending on the resource. Impacts from park operations would be long term, minor, localized, and adverse. Impacts from natural processes would be long term, adverse, and minor to major, depending on the site. Cumulative impacts would be long term, adverse, and range from minor to major, depending on the scope, type, and location of the activity.

Although major, adverse impacts to ethnographic resources would be possible, such impacts would not occur throughout the park. They would be confined instead to individual sites. Most ethnographic resources in the park would remain well protected. Thus, there would be *no impairment of ethnographic resources* from this alternative (see specific definition of impairment in "Impairment of National Park Resources Section" above).

MUSEUM COLLECTIONS

Under this alternative, a new museum collections facility would be constructed at Painted Desert headquarters complex. This building would potentially provide a long-term, major, beneficial impact because the new facility would have adequate storage space and would meet NPS standards for curation. Items stored offsite would be returned to the park, where all items would be accessible to park staff and researchers in one location for study and protection. The benefit would be long term, moderate, and beneficial. With the collections consolidated, there would be better recordkeeping and accountability. This impact would be long term, and minor to moderate, and beneficial, depending on whether a full-time curator is hired. Some researchers could be inconvenienced by having to travel to the relatively remote park to access the park

museum collection, but wherever the collections are housed, some researchers would have to travel to get there. This would potentially be a long-term, minor, adverse impact.

Cumulative Impacts. No ongoing or reasonably foreseeable future actions by others would be expected to combine with these actions and result in a cumulative impact on the museum collections under alternative 3.

Mitigation. Mitigation under alternative 3 would be the same as under alternative 1 with the exception of offsite storage.

Conclusion. Construction of a new museum collections facility would have a long-term, major, beneficial impact. Consolidating collections at the park would make all items accessible in one location for study and protection, a long-term, moderate, and beneficial impact. Better recordkeeping and accountability associated with consolidated collections would have a long-term, minor to moderate, beneficial impact, depending on whether a full-time curator is hired. Some researchers could be inconvenienced by having to travel to the relatively remote park to access the park museum collection. This would potentially be a long-term, minor, adverse impact. No cumulative impacts to museum collections would be expected.

There would be *no impairment of museum collections* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

PALEONTOLOGICAL RESOURCES

Petrified Wood

As in the no-action alternative, sales of petrified wood (and other fossils) will be discontinued at all gift shops in the park. The impact of this action on petrified wood theft is unknown, but there is concern that it could result in additional wood theft in the park.

Zoning most of the park as a special protection zone would result in enhanced protection for paleontological resources. Visitors would access special protection zone areas, which include the wilderness areas at Petrified Forest National Park, only by obtaining a permit or as part of a guided tour. The permitting process would provide another opportunity for park staff to educate visitors about protecting sensitive resources within the park. Visitors may also be directed away from certain areas for resource protection reasons, and they would be encouraged to learn about and appreciate these areas from offsite, or remotely through "virtual experience" such as videos. These changes would result in long-term, moderate, beneficial effects to petrified wood.

This alternative includes better delineation of the trail from Kachina Point to Lithodendron Wash to encourage users to stay on the trail. The intent is for visitors to experience the Painted Desert badlands without fear of becoming lost and in a manner that better protects the fossils and other resources near the trail. Although beneficial effects would probably result from maintaining this trail and limiting impacts nearby, long-term, negligible, adverse impacts would probably continue.

Visitor use of unmaintained trails and road traces does not particularly discourage visitors from stepping off the trail, so long-term, negligible, adverse impacts from visitors moving or stealing petrified wood would probably continue.

The Crystal Forest Trail would be shortened and realigned to better protect remaining petrified wood in this area. Signs, benches, barriers, and the like would be installed to further encourage people to stay on the trail and off of the resource. These actions would have a short-term, moderate, beneficial effect on the petrified wood in this area. However, as a high-use site, continued loss of petrified wood at Crystal Forest would result in long-term, minor, (moderate near the parking lot, which sustains the highest use) adverse impacts.

The western section of the trail at Giant Logs is not visible from the Rainbow Forest Museum, making it difficult to monitor petrified wood theft. Access to this portion of the trail would be guided and a schedule of guided tours would be established. Long-term, moderate, beneficial effects would result. Long-term, moderate, beneficial effects would also be expected at Blue Mesa, where the interpretive loop trail would be closed and rehabilitated to prevent additional loss of fossils and petrified wood. Barriers would be placed, as necessary, to reduce social trails created by visitors who wander from Blue Mesa overlooks. Some displacement of impacts could occur if visitors move to other areas of the park instead.

Other Fossils

Many of the impacts discussed for petrified wood under this alternative would result for other paleontological resources (fossils). However, most visitors have a harder time identifying plant and animal fossils other than petrified wood, so impacts would tend to be fewer for these fossils. Closing the Blue Mesa Trail would result in long-term, beneficial effects for fossils. Smaller trails at Crystal Forest and new operations at Giant Logs would likely have no impact on paleontological resources other than petrified wood.

The special protection zone proposed under this alternative calls for increased visitor-use management (e.g., visitor education, permits, and guided hikes) to protect paleontological resources throughout the park. Such visitor management would result in negligible to moderate, long-term, beneficial impacts to fossils. However, long-term, negligible, adverse impacts from visitors moving or stealing fossils in unsupervised situations would probably continue.

As discussed for petrified wood, long-term, beneficial effects to other fossil resources would result from changes to trail management. In the case of paleontological resources other than petrified wood, these benefits would be minor.

Cumulative Impacts. Despite the best efforts of the park staff, petrified wood theft continues to be a serious problem. The cumulative effect of past and ongoing wood theft is obvious. Continued theft and movement of wood in the future would continue to reduce this resource at Crystal Forest and in other areas where petrified wood is found near high visitor use areas. As

sources of petrified wood on private and public lands surrounding the park are depleted, the potential for theft of this resource from backcountry areas may increase. Petrified wood harvesting for commercial purposes occurs legally on private lands outside the park and is unregulated, further adding to the loss and cumulative effects. Cumulative effects on petrified wood would be localized, moderate to major, long term, and adverse.

Other paleontological resources are damaged, moved, or taken within the park and on private lands in the region, including some just outside the park boundary. As a result of past, ongoing, and future stealing and disturbance of these resources, similar cumulative impacts as for petrified wood would occur.

As in the no-action alternative, Long Logs Road is being converted to a trail, and the visitor experience is being redirected towards pedestrians and hiking. This will have long-term, minor, beneficial effects on the park's petrified wood.

The cumulative effect of alternative 3, in combination with other past, present, and foreseeable future actions would be localized, moderate to major, long term, and adverse.

Mitigation. Proposed changes to Long Logs and closing the Blue Mesa loop trail would help to mitigate impacts to paleontological resources within park boundaries. Other mitigation measures would include increased interpretation to communicate the significance of these resources to visitors, signs, trail barriers, ranger patrols, and guided tours.

Conclusion. Despite benefits from rezoning most of the park as a special protection zone, long-term, negligible, adverse impacts would be likely to continue. Better delineating the trail from Kachina Point to Lithodendron Wash, and shortening and realigning the trail at Crystal Forest would result in short-term, negligible to moderate, beneficial effects. Changes in management of Blue Mesa Trail (which would be closed), and Giant Logs Trail would have long-term, minor to moderate, beneficial impacts on petrified wood and other fossils. The cumulative effect of alternative 3, in combination with other past, present, and foreseeable future actions would be localized, moderate to major, long term, and adverse.

Although major, adverse impacts to petrified wood would be possible, such impacts would not be spread throughout the park. They would be confined instead to high visitor use areas located near concentrations of petrified wood. Most significant deposits of petrified wood in the park would remain well protected. Thus, there would be *no impairment of petrified wood or other fossils* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

VEGETATION

Trampling of vegetation that results from off-trail hiking in the wilderness areas of Petrified Forest National Park would be expected to continue. However, some sensitive areas would be closed to visitor use and backcountry access would be carefully managed with permits and/or other methods (e.g., access by guided tours only) to protect sensitive resources. Visitors would gain in-depth understanding of the significance of

park resources through additional tours and programs, multiple media, and interactions with researchers. They also may be directed away from certain resource areas. Despite these efforts, it is anticipated that negligible, local, long-term, adverse impacts to vegetation resources would continue as a result of off-trail hiking.

In this alternative, the trail from Kachina Point to Lithodendron Wash would be better delineated to encourage users to stay on the trail, which could better protect vegetation resources by reducing off-trail hiking. However, better definition of the trail could result in increased visitor use, which could result in increased off-trail hiking. Park staff would seek to educate visitors about sensitive vegetation during the permitting process, or hikes would be guided. Therefore, it is anticipated that long-term, local, negligible to minor, beneficial effects to vegetation would result from closing the Blue Mesa Trail and reducing the footprint of the trail at Crystal Forest.

Impacts to vegetation resources in the southern wilderness area of the park would be expected to continue as in the no-action alternative. There are no defined trails here, so hikers who use this wilderness area could trample vegetation with every step. Because current use of this area is limited and is not anticipated to increase greatly, the impacts to vegetation resources are expected to be negligible, local, and adverse, as in alternative 1.

Construction of a turnout with wayside exhibits and an overlook to interpret historic Route 66, just north of where the park road passes over I-40, could have long-term, negligible, localized, adverse impacts on vegetation resources.

Cumulative Impacts. Past and ongoing trampling of vegetation in the backcountry of Petrified Forest National Park would result in long-term, minor, adverse impacts to vegetation. Replacement of sewer system lines at the Painted Desert headquarters complex and Rainbow Forest, as well as removal of the Puerco sewage lagoons, are planned activities that would have short-term, local, negligible to minor, adverse impacts on vegetation resources of Petrified Forest National Park. Current plans to replace restroom facilities at Jasper Forest and Agate Bridge would have local, negligible, long-term, adverse impacts. Removal of the parking trailheads in the vicinity of the Flattops would result in local, minor, long-term, beneficial impacts on vegetation resources, as these areas would be reverted back to native landscapes.

Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would be long-term, negligible to minor, adverse effects on the vegetation resources of Petrified Forest National Park.

Mitigation. All disturbed areas associated with construction activities for trails, parking areas, turnouts, and wayside exhibits would be sited to avoid impacts to vegetation if possible. Revegetation plantings would seek to reconstruct the natural spacing, abundance, and diversity of native species. Otherwise, they would be restored to pre-construction conditions during and/or as soon as practicable following construction, to the extent possible. The principal goal is to avoid interfering with natural processes. Efficient planting and staging, as well as careful machine work, would be emphasized.

Conclusion. Efforts to reduce trampling of vegetation in the backcountry of Petrified Forest National Park could include closing specific areas to visitor use, carefully managing backcountry use with permits or guided tours, and clearly defining the trail from Kachina Point to Lithodendron Wash. Despite these efforts, it is anticipated that negligible, local, long-term, adverse impacts to vegetation resources would continue as a result of off-trail hiking. Negligible to minor, long-term, beneficial effects to vegetation resources would be anticipated in the northern wilderness area as a result. Negligible, long-term, site-specific, beneficial effects to vegetation would also result from closing the Blue Mesa Trail and reducing the footprint of the trail at Crystal Forest.

Construction of the turnout and wayside exhibit interpreting Route 66 would constitute a negligible, localized, long-term, adverse impact on vegetation resources.

Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would have long-term, negligible to minor, adverse effects on vegetation resources of Petrified Forest National Park.

There would be *no impairment of vegetation resources* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

SOILS

Disturbance of soils that results from off-trail hiking in the wilderness areas of Petrified Forest National Park would be expected to continue. The impacts would be the same as discussed in the no-action alternative. However, some sensitive areas could be closed to visitor use. Backcountry access would be carefully managed with permits and/or other methods (e.g., access by guided tours only) to protect sensitive resources. Should the park manage cryptobiotic soils, areas with high concentrations of such soils could be closed. Visitors would gain in-depth understanding about the significance of park resources through more tours and programs, multiple media, and interactions with researchers. They may also be directed away from certain resource areas, possibly, areas of cryptobiotic and/or highly erosive soils. This could have minor, site-specific, long-term, beneficial effects on these sensitive soil types. Negligible, long-term, site-specific, beneficial effects to soils would also result from closing Blue Mesa Trail and reducing the footprint of the trail at Crystal Forest.

In this alternative, the trail from Kachina Point to Lithodendron Wash would be better delineated to encourage users to stay on the trail, which would better protect soils by reducing off-trail hiking. However, better defining the trail could result in increased visitor use. Because the soils between Kachina Point and Lithodendron Wash have moderate to high erosion hazard, it is anticipated that minor, long-term, local, adverse effects to soils, including cryptobiotic soils, would result, depending on how much visitor use increases.

Construction of a turnout with wayside exhibits and an overlook to interpret historic Route 66, just north of where the park road passes over I-40 would affect soils with slight erosion hazard. Therefore, long-term, negligible, site-specific, adverse impacts on soils would be anticipated.

Although cryptobiotic soils exist at Petrified Forest National Park, resource staff do not manage for these soils and their exact locations are generally unknown. These soils do not respond well to human disturbances such as compaction associated with off-trail hiking. Therefore, it would be anticipated that some negligible to minor, localized, adverse, impacts to cryptobiotic soils would occur due to off-trail hiking in the wilderness areas of the park; however, the extent of impact is probably unknown.

All construction activities would seek to avoid impacts to cryptobiotic and highly erosive soils. However, it is expected that some negligible, site-specific, short-term, adverse impacts to these soil types would result from construction workers and the use/storage of equipment.

Cumulative Impacts. The erosive action of wind and water are readily apparent throughout Petrified Forest National Park. These natural processes have long-term, moderate, adverse impacts on soils, including cryptobiotic soils. Past and ongoing soil disturbances from off-trail hiking in the backcountry of Petrified Forest National Park would result in long-term, negligible, adverse impacts to soils, including cryptobiotic soils. Replacement of sewer system lines at the Painted Desert complex and Rainbow Forest, as well as removal of the Puerco sewage lagoons, are planned activities that would have short-term, site-specific, negligible to minor, adverse impacts on soils of Petrified Forest National Park. Current plans to replace restroom facilities at Jasper Forest and Agate Bridge would have negligible, site-specific, long-term, adverse impacts. Removal of the parking trailheads in the vicinity of the Flattops would result in site-specific, minor, long-term, beneficial impacts on soils, as these areas would be returned to native landscapes.

Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would be long-term, negligible, adverse effects on the soils of Petrified Forest National Park.

Mitigation. All disturbed areas associated with construction activities for trails, parking areas, turnouts, and wayside exhibits would be sited to avoid impacts to cryptobiotic and highly erosive soils, to the extent possible. Otherwise, they would be restored during and/or as soon as practicable following construction. The principal goal is to avoid interfering with natural processes and to minimize erosion caused by construction related activities. Efficient planning and staging, as well as careful machine work, would be emphasized.

Conclusion. Impacts to soils in the backcountry would be expected to continue as a result of off-trail hiking in the wilderness areas of the park. These impacts would be the same as those discussed in the no-action alternative. However, minor, site-specific, long-term, beneficial effects on cryptobiotic and highly erosive soils could occur from careful management of the backcountry, including closing certain areas, providing guided tours, and/or directing visitors away from such soils. Negligible, long-term, site-specific, beneficial effects to soils would also result from closing the Blue Mesa Trail and reducing the footprint of the trail at Crystal Forest.

Because the soils between Kachina Point and Lithodendron Wash have a moderate to high erosion hazard, it is anticipated that minor to moderate, long-term, local, adverse effects to

soils, including cryptobiotic soils, would result, even with efforts to better delineate the trail.

Construction of a turnout with wayside exhibits and an overlook to interpret historic Route 66, just north of where the park road passes over I-40, would affect soils with a slight erosion hazard. Therefore, long-term, negligible, site-specific, adverse impacts on soils would be anticipated.

It would be anticipated that some negligible to minor, localized, adverse impacts to cryptobiotic soils would occur due to off-trail hiking in the wilderness areas of the park; however, the extent of impact is unknown.

All construction activities would seek to avoid impacts to cryptobiotic and highly erosive soils. However, it is expected that some negligible to moderate, site-specific, short-term, adverse impacts to these soil types would result from construction workers and the use/storage of equipment.

Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would have long-term, negligible to minor, adverse effects on soils of Petrified Forest National Park.

There would be *no impairment of soils* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

VISITOR EXPERIENCE AND APPRECIATION

Parking and walkway improvements at Rainbow Forest would reduce the potential for vehicle-pedestrian conflicts and confusion in the Rainbow Forest area. This would be a long-term, minor to moderate, beneficial impact.

Changes at Giant Logs Trail, Rainbow Forest Museum, and Painted Desert headquarters complex would mean more areas would be universally accessible. Increased accessibility would be a minor to moderate, long-term, beneficial impact, depending on the extent to which historic buildings could be made accessible during renovations. Expanded exhibit space and updated exhibits and media at Rainbow Forest Museum and the Painted Desert headquarters complex would constitute a major, long-term, beneficial impact. Increased contact with researchers would provide another minor, long-term, beneficial impact.

Closure of Blue Mesa Trail and trail reductions at Giant Logs and Crystal Forest would make some notable resource areas less accessible to visitors. Addition of a turnout and wayside exhibit overlooking and interpreting the old Route 66 road would benefit visitors who want to learn about and view the old road. Improvements to Lithodendron Wash Trail would enhance visitor access to the Painted Desert. The net impact of these actions on visitor experience and appreciation would be minor, adverse, and long term.

The lack of in-depth park experiences for most park visitors would remain the same as in alternative 1, except for the potential for guided trips into the backcountry. Addition of this service would be a minor, long-term, benefit to visitors—those who enter the special protection zone with a guide would see more and learn more about special park resources. Obtaining a permit to enter the special protection zone would be a long-term,

minor, adverse, impact because some visitors would perceive this requirement as an inconvenience.

Expanded interpretation at the Painted Desert visitor center would benefit visitors because there would be more opportunities to improve visitor appreciation of the park, its resources, and values. The effect would be moderate and long term.

Discontinuation of petrified wood sales would adversely impact visitors wishing to purchase this type of souvenir in the park. This impact would be long term and minor because petrified wood would be available for purchase outside the park for the foreseeable future.

Park staff would encourage interested parties to provide new campgrounds in the local area outside the park. If these efforts were successful, additional campground choices would become available, a long-term, minor, beneficial impact on visitor experience and appreciation.

Cumulative Impacts. Cumulative impacts associated with conversion of Long Logs access road to a hiking trail and I-40 interchange improvements would be the same as in alternative 1: long-term, minor to moderate, adverse effects, and minor, beneficial effects.

Mitigation. Park staff would offer expanded interpretive programs and "virtual tours" to visitors who are unable to access areas of the park designated as special protection zones. Other mitigation measures would be the same as for alternative 1.

Conclusion. Visitors would experience minor, long-term, adverse impacts from trail closures and reductions, and the permit requirement for independent entrance into the special protection zone. Minor, long-term, beneficial impacts would result from the availability of guided trips into the special protection zone, the Route 66 turnout and wayside exhibit, and the opportunity to interact with researchers. Parking and walkway improvements at Rainbow Forest would be a long-term, minor to moderate, beneficial impact. Universal accessibility improvements at Giant Logs Trail, Rainbow Forest Museum, and Painted Desert headquarters complex would have a minor to moderate, beneficial impact. Expansion of interpretive programs would have a moderate, long-term, beneficial impact. Creation of more space for better exhibits and media at Rainbow Forest Museum and Painted Desert headquarters complex would constitute a long-term, beneficial, major impact. Cumulative impacts on visitor experience and appreciation would include long-term, minor to moderate, adverse effects, and minor beneficial effects.

NATIONAL PARK OPERATIONS

General Operations

At Giant Logs, the rear trail section would be accessible only with a park guide. This restriction would require staff to be available to lead these guided hikes. Additional staff would also be needed for increased interpretation activities in Rainbow Forest and Painted Desert areas. Additional maintenance would be required for upkeep of new equipment and trails. The special protection zone would also require additional staff to administer and monitor permits and enforce permit or guide

provisions. Impacts on park operations would be long term, adverse, and moderate.

Improvements to park housing would be made under this alternative. Some structures would be removed completely (e.g., three employee residences that are in poor condition), and two residences at the Painted Desert Inn would be repaired and used for housing and/or offices. Employee morale and the ability to recruit and retain employees would improve. Flexible housing opportunities for visiting researchers and scientists would also be provided under this alternative. These actions would have long-term, moderate, beneficial impacts to park operations.

Removal of the Holbrook housing from NPS ownership would benefit operations because maintenance staff would not have to drive 25 miles each way to repair and/or care for the structures. Less time would be spent in travel, wear and tear on vehicles would be reduced, and more maintenance employees would be available for in-park projects. These changes would have minor, long-term, beneficial impacts to park operations.

A new museum collections building that meets NPS standards would be constructed in this alternative. This building would improve administrative access to the museum collections. It would have offices, a laboratory and work space for visiting researchers and scientists, and work space for a curator. Construction of a new museum collections facility would also free up space for other functions in this part of the Painted Desert headquarters complex. This extra space would result in long-term, moderate, beneficial effects on park operations due to improved work space conditions, increases in available space, and improved operational efficiency for employees, visitors, and researchers and scientists.

Major renovations and stabilization of structures at Painted Desert headquarters complex would be completed. Renovations and removing deteriorated structures would reduce needs for constant repairs and allow the maintenance budget to be more effectively prioritized throughout the park. These renovations would have a long-term, moderate, beneficial effect on park operations.

Closing Blue Mesa Trail, as recommended in this alternative, would eliminate potential safety hazards associated with eroding trail conditions. This trail closure would also eliminate associated maintenance requirements. In all, minor, long-term, beneficial impacts to park operations are expected.

Health and safety concerns would be alleviated at the residences near the Painted Desert Inn as a result of bringing the units back into use. These improvements would result in long-term, minor, beneficial effects on park operations.

Cumulative Impacts. On-going repairs to the Painted Desert headquarters complex would require funding, staff time, and equipment to preserve the integrity of these potentially historic structures. Because the structures would be stabilized in this alternative, the amount of maintenance would be reduced from alternative 1 and result in long-term, minor to moderate, adverse impacts to park operations. The remaining buildings would probably still require more maintenance than new buildings.

Park maintenance staff would have to maintain the new trail from Rainbow Forest to Long Logs. This additional burden would have a long-term, minor, adverse impact on park operations.

The cumulative effect of alternative 3 on park operations would be long term, minor to moderate, and adverse.

Mitigation. Trail reductions in this alternative would involve an archeologist and paleontologist to ensure that archeological and paleontological sites are not damaged. A landscape architect, engineer, or other design professional would be involved at Blue Mesa to prevent erosion problems that could result from removing the trail.

Careful design and planning would allow adaptive reuse of historic buildings. Related operations would be moved closer to each other if possible. Improvements would be made to accessibility and fire suppression / alarm systems installed. Asbestos and lead-based paint inspections would be conducted prior to remodeling existing structures. Remediation would be carried out, as necessary, to eliminate potential health hazards.

Any new facilities (e.g., the museum collections facility) would be built to NPS standards and fire and safety codes, and would be accessible to persons with limited mobility.

Conclusion. Long-term, moderate, adverse impacts to park operations would result from providing only guided access to the western portion of Giant Logs, increased interpretation throughout the park, maintenance associated with new interpretive technologies and monitoring systems, maintaining the Kachina Point to Lithodendron Wash Trail, and administering and monitoring an expanded permit program. These adverse impacts would be due to increases in staff to accommodate new interpretive programs, maintenance, and monitoring, as well as new maintenance responsibilities.

Beneficial effects of implementing alternative 3 would result from increased accessibility to facilities, better housing and working conditions; proper storage of museum collections, removal of deteriorating structures that require ongoing maintenance, more efficient maintenance operations, and closing Blue Mesa Trail. Morale would be enhanced as a result of better housing and working conditions. Less maintenance would be required for inadequate structures such as residences. Renovating and reusing structures would alleviate some health and safety concerns. Long-term, beneficial impacts would range from minor to moderate in intensity.

The cumulative effect of alternative 3 on park operations would be long term, minor to moderate, and adverse.

Energy Requirements and Conservation Potential

Some changes in energy requirements and conservation potential would occur at Painted Desert headquarters complex, as a new museum collections facility would be built and a few other structures might be removed and/or replaced. Energy requirements would likely increase as a result of the new museum collections facility. The facility would require sophisticated lighting, ventilation, humidity, and temperature

control systems. However, removing and/or replacing a few other structures could result in some energy savings. In all, long-term, negligible, adverse impacts to energy requirements at the park would continue.

Under this alternative, the potential exists for energy conservation in the new museum collections facility. If the facility were constructed using sustainable development technologies, negligible, long-term, beneficial effects would result from the potential to conserve energy.

Cumulative Impacts. No cumulative impacts to energy requirements and conservation potential at the park are anticipated.

Mitigation. Through recycling materials from existing facilities, building the minimum to satisfy functional requirements, and having facilities serve multiple functions, the embodied energy of new building materials and the energy of transporting them would be minimized. In addition, electrical and thermal energy can be saved through facility design that incorporates day lighting and other passive-energy strategies appropriate to the climate at the park and function of the facility.

Using environmentally sensitive building materials can also reduce energy requirements and enhance conservation potential. Natural materials are less energy-intensive and polluting to produce. The use of local materials (if possible) has a reduced level of energy cost. Using durable materials can save on energy costs for maintenance as well as for production and installation of replacement materials. Mitigation measures described in alternative 1 could be expanded and implemented in this alternative. Such measures could include the use of hidden photovoltaic systems to heat water and to provide power in general.

Conclusion. Energy Requirements and Conservation Potential: Long-term, negligible, adverse impacts to energy requirements at the park would continue. Incorporation of sustainable development technologies in a few new structures would have negligible, long-term, beneficial effects on the potential to conserve energy. No cumulative impacts to energy requirements and conservation potential are anticipated.

SOCIOECONOMIC RESOURCES

Current beneficial economic effects from the park would be expected to continue. Life cycle costs over the 15 to 20 year life of the plan, which include maintenance, operations, and personnel costs (as well as capital costs), are estimated at $62,000,000 to $69,000,000.

These costs would continue to be a long-term, moderate, beneficial impact to the economy of Apache and Navajo Counties from park expenditures and personal spending by park employees. The impact would be greater than that expected from alternative 1.

Elimination of petrified wood sales within the park would have a long-term, major, adverse impact on the concessioner's business, and local businesses would realize a moderate, long-term, benefit.

Under alternative 3 there would be changes to community character, employee commutes, and housing. The presence of NPS employees in Holbrook would decrease when the park divests itself of Holbrook housing.

This change in ownership would have a long-term, negligible to moderate, adverse or beneficial impact on local businesses and nearby residents, depending on the ultimate disposal of the residences. With the elimination of the Holbrook housing, some employees' commutes to work would be drastically reduced, but commutes to town for groceries and other necessities would increase in number.

Expanded interpretive programs at the headquarters complex, in conjunction with the establishment of the special protection zone that would focus visitation in the developed area, would probably benefit the concessioner and the Petrified Forest Museum Association. Many visitors may spend more time in the developed area where gift shops, snack bar, and café are located, resulting in minor and long-term, beneficial impacts.

With encouragement from park staff, nearby cooperators and neighbors may choose to develop more campgrounds. If this happens, the impact would be minor, long term, and beneficial to local businesses, the concessioner, and cooperators because some visitors would likely spend more time at the park and in the region. The availability of more accommodations for researchers would constitute a negligible, long-term, beneficial impact on local businesses, park concessioners, and cooperators because more researchers may remain in the local area for longer periods.

Construction of a new museum collections facility and renovation of the Rainbow Forest area would result in a temporary increase in opportunities for the local construction work force and a modest increase in potential revenue for local businesses generated by construction activities and workers. The potential benefits would be minor to moderate and temporary.

Other impacts would be the same as for alternative 1.

Cumulative Impacts. Other foreseeable actions (including those proposed in the 1993 GMP) such as construction of new trails, turnouts, wayside exhibits, and comfort stations could encourage visitors to stay in the park and/or local area longer. This construction could result in a minimal increase in visitor expenditures in the park at the concessioner and cooperators facilities, and in Holbrook and at nearby campgrounds. These actions would result in a minor, long-term, cumulatively beneficial impact.

Conclusion. Beneficial effects from park-related spending would increase; benefits would be greater than for the no-action alternative, but still long term, beneficial, and moderate. Elimination of petrified wood sales within the park would have a long-term, major, adverse impact on the concessioner's business, but local businesses would realize a moderate, long-term, benefit. Potential benefits from new construction and improvements to existing facilities would be short term, beneficial, and minor in intensity. The cumulative effect of alternative 2 on socioeconomic resources would be a minor, long-term, beneficial impact.

UNAVOIDABLE ADVERSE IMPACTS

There would be unavoidable, moderate to major, adverse impacts on archeological resources, petrified wood, and other fossils under alternative 3. Implementation of the special protection zone and changes to park

trail systems would provide better protection of these resources compared to current conditions, but instances of vandalism, theft, and inadvertent disturbance would still be likely to occur. These impacts would be avoided only if human use were not allowed in the park. Disturbance to archeological resources from wind and water erosion would also be unavoidable. Mitigation measures would be taken, when possible, to reduce these impacts.

Long-term, major, adverse impacts on the concessioner's business would be unavoidable when petrified wood sales in park gift shops are discontinued, as required by *NPS Management Policies*. Businesses outside the park would benefit, however, to the extent that visitors buy petrified wood there instead.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Archeological resources, petrified wood, or other fossils that are stolen or vandalized are irreversibly lost. Even moving or disturbing these resources constitutes an irreversible commitment of resources because information is lost if the context (location and condition) of the resources is changed, even inadvertently. Thus, there would be some irreversible loss or commitment of archeological resources, petrified wood, and other fossils in alternative 3, as discussed in the "Unavoidable Adverse Impacts" section above.

Limited amounts of non-renewable resources would be used for construction projects and park operations, including energy and materials. These resources would be essentially irretrievable once they were committed.

RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

This section discusses the effects of the short-term use of resources on the long-term productivity of resources.

There would be no adverse effects on biological, agricultural, or economic productivity associated with implementing alternative 3.

IMPACTS OF ALTERNATIVE 4

ARCHEOLOGICAL RESOURCES

New trails proposed under alternative 4 may allow more visitors to come into contact with sensitive sites near Route 66, the Puerco River, and new designated backcountry corridor routes. There would be potential for more trampling of sites, moving of resources, vandalism, and theft in these areas. Impacts would be long term, minor to major, and site specific.

The reconstructed Painted Desert headquarters complex would be built in a previously disturbed area with low archeological sensitivity. The potential impacts from this project would be localized, long term, negligible, and adverse.

Widening the Route 66 access road would constitute a minor, localized impact on subsurface historical archeological resources contained within the road corridor. Other impacts would be the same as in alternative 1.

Cumulative Impacts. Cumulative impacts from visitor use and park operations would remain the same as in alternative 1: long term, adverse, and range from minor to major depending on the scope, type, and location of the activity.

Mitigation. Archeological surveys would be conducted, as necessary, prior to any ground-disturbing activities on the Route 66 roadbed, Puerco River, or new backcountry corridor trails. If archeological resources cannot be avoided, the data they possess regarding prehistoric and/or historic lifeways would be recorded and recovered. Recordation and recovery would be performed in consultation with the Arizona SHPO.

Impacts from visitor use would be mitigated through careful placement of new trails away from undisturbed or sensitive archeological sites. Other mitigation measures would be the same as in alternative 1.

Section 106 Summary. After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5), the National Park Service determined there is the potential for adverse effects to the Route 66, Puerco River, and the new trail in The Tepees area. At a minimum, consultation would be required.

Conclusion. Alternative 4 would allow for increased impacts near Route 66, the Puerco River, and new backcountry corridor trails. Parkwide, there would be minimal change (from alternative 1) in impacts from trampling, moving, vandalism, and theft of resources. Potential impacts from reconstruction of the Painted Desert headquarters complex would be localized, long term, negligible, and adverse. Cumulative impacts would be long term and adverse, and they would range from minor to major depending on the scope, type, and location of the activity.

Although major, adverse impacts to archeological resources would be possible, such impacts would not occur throughout the park. They would be confined instead to individual sites. Most archeological resources in the park would remain well protected. Thus, there would *be no impairment of archeological resources* from this alternative

(see specific definition of impairment in "Impairment of National Park Resources" section above).

HISTORIC STRUCTURES

Proposed plans and associated potential impacts for the Painted Desert Inn are the same as for alternative 1.

Demolishing and rebuilding the Painted Desert headquarters complex would result in a regional, long-term, major, adverse impact to the resource, one of the few remaining examples of Neutra's NPS projects and of National Park Service "Mission 66" program architecture.

Cumulative Impacts. Impacts to the Painted Desert Inn (minor, long-term, and beneficial) would be the same as for alternative 1. There would be no additional cumulative impacts to the headquarters complex once it is destroyed.

Mitigation. Mitigation to the inn associated with alternative 4 would be the same as alternative 1.

Alternative 4 would destroy the Painted Desert headquarters complex, a cultural resource that is potentially eligible for listing on the NRHP. Data recovery would most likely be chosen for mitigation. Generally, it is suggested that Historic American Buildings Survey or Historic American Engineering Record documentation be prepared prior to implementation of any activity that could affect the character or integrity of the resource. Alternative 4 would require consultation and negotiation between the Arizona SHPO and the National Park Service to determine appropriate mitigation measures and the acceptable level of documentation.

Section 106 Summary. After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5), the National Park Service determined there would be an adverse effect to the headquarters. Consultation and mitigation would be required.

Conclusion. Impacts to the inn would be the same as for alternative 1. Demolishing and rebuilding the Painted Desert headquarters complex would result in a regional, long-term, major, adverse impact to the resource. Cumulative impacts would be the same as for alternative 1, except that there would be no additional cumulative impacts to the Painted Desert headquarters complex once it is destroyed.

Major, adverse impacts to historic structures (complete loss of the Painted Desert headquarters complex) would be possible under this alternative. Conservation of the complex is not (1) necessary to fulfill specific park purposes identified in the establishing legislation or proclamation of the park, or (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park. Preservation of cultural resources has been identified as a mission goal in this GMP Revision. However, *impairment of historic structures could result from this alternative* (see specific definition of impairment in "Impairment of National Park Resources" section above).

CULTURAL LANDSCAPES

Several changes are proposed at Rainbow Forest. Modifications to the museum would

be interior in scope and would not affect the cultural landscape. Reducing the scale of the concessions building would have a long-term, negligible or minor, beneficial effect on the historic landscape. The proposed parking and walkway realignment would result in a long-term, minor to moderate, adverse impact to the historic landscape. Proposed construction of a new building on the north side of the parking lot at Rainbow Forest, without proper design and siting, would change the intent and integrity of the cultural landscape resulting in a long-term, moderate, adverse impact.

New trails near Puerco Pueblo would have a long-term, minor to moderate, adverse impact due to changes and the addition of modern features into a potential archeological cultural landscape.

Proposed actions to Painted Desert Inn would have a long-term, negligible to minor, adverse impact due to addition of modern trails into the viewshed of a potential historic landscape.

At Crystal Forest, current management practices would continue, including using signs, minor trail realignments, patrols, and trail barriers to prevent moving, damage, and removal of petrified wood. Continued high use of this site would potentially result in the loss of petrified wood and degradation of the visual quality of this cultural landscape, resulting in a site-specific, long-term, minor, adverse impact to this landscape.

Cumulative Impacts. Past and present modifications to the roads, bridge, parking, and pedestrian circulation have resulted in a moderate, long-term, adverse impact to Rainbow Forest. Proposed changes and adding new buildings to the landscape would have a long-term, minor to moderate, adverse effect, while restoration of structures would have a long-term, minor, beneficial effect. Cumulatively, without proper design and mitigation, alternative 4 would potentially have a long-term, moderate to major, adverse effect on the Rainbow Forest cultural landscape.

At Crystal Forest, past and present high use of the area by visitors has resulted in a noticeable loss of petrified wood (a component of the visual quality of the landscape), rendering the area nearest the parking lot almost barren of petrified wood. Past projects involving modifications to trails and addition of a sun shelter have also had a minor, adverse impact to the cultural landscape. Continued high use of the area would result in further loss of wood and degradation of the visual quality, resulting in a long-term, minor, adverse impact to the landscape (primarily around the parking lot).

Cumulative impacts associated with past, present, and proposed actions for Crystal Forest would be the same as for alternative 1: long term, minor, and adverse.

Mitigation. Proposed actions at Rainbow Forest would be addressed through consultation with the Arizona SHPO and additional NEPA compliance, as necessary. Preliminary plans were developed during the planning process with the involvement of the SHPO. With proper design, the proposed changes, in conjunction with reversing past modifications, would potentially minimize adverse effects, resulting in a site-specific, long-term, minor, adverse effect.

Prior to implementation of proposed actions near Puerco River, Old Route 66, and trails in the Painted Desert, these three landscapes

would be evaluated to determine if they are eligible for the NRHP. If determined eligible, the actions would be addressed in consultation with the Arizona SHPO to ensure that design features conform to the cultural landscape character and integrity. Mitigation would be designed to minimize the intensity of adverse effects.

Section 106 Summary. After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5), the National Park Service determined there is the potential for adverse effects to the Rainbow Forest, Puerco Pueblo, and Painted Desert Inn. At a minimum, consultation would be required.

After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5), the National Park Service determined that there would be an adverse effect at Rainbow Forest and the headquarters complex, consultation and mitigation would be required.

Conclusion. Changes at Rainbow Forest would have mixed impacts on the cultural landscape. Reducing the scale of the Rainbow Forest concessions building would have a long-term, negligible or minor, beneficial effect. Proposed parking and walkway realignment would have a long-term, minor to moderate, adverse impact. Adding a new structure on the north side of the parking lot at Rainbow Forest could have a long-term, moderate, adverse impact. Proposed new trails near Puerco Pueblo and The Tepees would have long-term, minor to moderate, adverse impacts on a potential archeological cultural landscape. Proposed trail changes below Painted Desert Inn would have a long-term, negligible to minor, adverse impact if determined to be a cultural landscape.

Impacts associated with proposed actions for Crystal Forest would be the same as for the alternative 1: site-specific, long-term, minor, adverse impact to this landscape. Cumulative impacts of alternative 4 on cultural landscapes would potentially be long term, moderate to major, and adverse at Rainbow Forest, and long term, minor, and adverse at Crystal Forest.

Through compliance with section 106 of the National Historic Preservation Act, consultation with the Arizona SHPO, and proper design and mitigation, the severity of impacts can be reduced below the "major" threshold. There would be *no impairment of cultural landscapes* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

ETHNOGRAPHIC RESOURCES

Alternative 4 proposes no changes to current management of ethnographic resources, and impacts would, therefore, be the same as for alternative 1. Any new trail construction would be planned in consultation with interested American Indian tribes to determine issues and concerns and long-term impacts to ethnographic resources would be avoided.

Cumulative Impacts. Cumulative impacts from visitor use and park operations would remain the same as for alternative 1.

Mitigation. Mitigation measures would be the same as for alternative 1.

Section 106 Summary. Since no change to current management is being proposed,

criteria of adverse effect (36 CFR 800.5) would not be applied.

Conclusion. Ethnographic resource impacts related to visitor use would be long term, adverse, and minor to major depending on the resource. Impacts from park operations would have long-term, minor, localized, adverse impacts. Impacts from natural processes would be long term, adverse, and minor to major, depending on the site. Cumulative impacts to ethnographic resources would be long term and adverse and would range from minor to major depending on the scope, type, and location of the activity.

Although major, adverse impacts to ethnographic resources would be possible, such impacts would not occur throughout the park. They would be confined instead to individual sites. Most ethnographic resources in the park would remain well protected. Thus, there would *be no impairment of ethnographic resources* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

MUSEUM COLLECTIONS

Proposed relocation of museum collections to offsite locations that meet NPS standards for curation, plus consolidation of similar items would constitute a moderate, beneficial impact to the museum collections due to protection in adequate storage facilities. This would also allow offsite researchers to gain easier access to specific classes of items. This would likely be a minor, beneficial impact to the collections from information gained from the items. Otherwise, impacts associated with researchers would be the same as alternative 3. Better recordkeeping and accountability, under NPS standards for curation, constitute a minor, beneficial impact to the museum collections, because fewer items would be lost or inaccurately catalogued. With items stored offsite, it may be difficult to obtain an overall picture of the nature of the park's collections, resulting in a potential long-term, minor, adverse impact.

Cumulative Impacts. No ongoing or reasonably foreseeable future actions by others would be expected to combine with these actions and result in a cumulative impact on the museum collections under alternative 4.

Mitigation. Since the collections would be stored at offsite facilities that meet NPS standards for curation, mitigation measures at the facilities would be at least as extensive as those discussed under alternative 1.

A park representative would travel to the offsite facilities on an annual basis to ensure that the objects are stored and accounted for in accordance with NPS standards.

Conclusion. Benefits from moving museum collections to facilities where they would receive better protection would be long term, moderate, and beneficial. Offsite researchers would be able to access certain parts of collections more easily and gain information from the items, a long-term, minor, beneficial impact. Better recordkeeping and accountability have a long-term, minor, beneficial impact. Offsite storage at more than one location could have a minor, long-term, adverse impact on the park staff's ability to gain a complete picture of the collections. No cumulative impacts would be expected.

There would be *no impairment of museum collections* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

PALEONTOLOGICAL RESOURCES

Petrified Wood

As in the other alternatives, sales of petrified wood and other fossils will be discontinued at gift shops in the park. The impact this would have on petrified wood theft is unknown, but there is concern that it could result in additional wood theft in the park.

Most of Petrified Forest National Park would be zoned preservation emphasis, including all wilderness lands within the park. This zoning would mean essentially no change from the way these lands are currently managed, except for areas in the Painted Desert near where new backcountry corridor trails are proposed (see below).

New backcountry corridor routes would be opened to the public, including a trail network in the south end of the park on unpaved administrative road segments. Minor, adverse impacts would result from adding these trails to Petrified Forest National Park's trail network. With a few exceptions, these trails would not cross sensitive petrified wood areas and could potentially divert a small proportion of visitors from areas of higher resource concentration. This would result in long-term, negligible, beneficial effects to paleontological resources located in other areas of the park.

New backcountry corridor routes in the Painted Desert area would have long-term, moderate, adverse impacts to petrified wood in this part of the park. The proposed loop trail that starts and ends at Kachina Point and the Onyx Bridge spur trail would be constructed primarily on undisturbed lands, resulting in a long-term, negligible, adverse impact to petrified wood disturbed during trail construction. Creation of a trail to Onyx Bridge may have a beneficial impact in leading visitors directly to the site, so visitors would avoid the futile searches (and associated petrified wood disturbance and theft) that occur under the current situation. On the other hand, development of trails would probably locally increase visitation. Some visitors would undoubtedly leave the trail, then disturb or steal petrified wood. All things considered, long-term, moderate impacts would be expected. Impacts would be moderate because paleontological resources in this area are thus far relatively undisturbed.

Over the long term, minor to major, adverse impacts would probably continue in frontcountry areas of concentrated resources, as they are attractive sites where visitor use is encouraged (such as Blue Mesa and Crystal Forest). The new frontcountry trail proposed near the badland formation known as The Tepees would be sited, designed, and constructed to avoid impacts to the sensitive resources in this area. However, providing visitor access to this site would probably result in more incidences of petrified wood theft and removal, a long-term, minor, adverse impact.

Other Fossils

Many of the same impacts discussed for petrified wood under this alternative would result for other paleontological resources

(fossils). However, most visitors typically have a harder time identifying plant and animal fossils than petrified wood, and therefore, the impacts would tend to be fewer for these fossils.

New backcountry and frontcountry trails proposed under this alternative would have moderate, adverse impacts to fossil resources disturbed by trail construction, and from theft or removal of fossils by unsupervised visitors leaving the trails. At one site, mitigation could reduce the impacts on paleontological resources other than petrified wood to negligible or minor.

As in the no-action alternative, minor to moderate, beneficial effects would result from educating the public about the importance of leaving paleontological resources where they are found.

Cumulative Impacts. Despite the best efforts of the park staff, petrified wood theft continues to be a serious problem. The cumulative effect of past and ongoing wood theft is obvious at Petrified Forest National Park. Continued theft and movement of wood in the future would continue to decimate this resource at Crystal Forest and in other park areas where petrified wood is found near high visitor use areas. As sources of petrified wood on private and public lands surrounding the park are depleted, the potential for theft of this resource from backcountry areas may increase. Petrified wood harvesting for commercial purposes occurs legally on private lands outside the park and is unregulated, further adding to the loss of this resource and cumulative effects. Cumulative effects on petrified wood would be localized, moderate to major, long term, and adverse.

Other paleontological resources are damaged, moved, or taken within the park and on private lands in the region, including some just outside the park boundary. As a result of the past, ongoing, and future taking, moving, or damaging of these resources, the same cumulative impacts to petrified wood would occur for certain other fossils, too.

Installation of vault toilets at Agate Bridge / Jasper Forest and Puerco Pueblo would be carried forward and would result in long-term, negligible, adverse impacts. Long Logs Road will be converted to a trail and the visitor experience directed towards pedestrians and hiking, resulting in long-term, minor, beneficial effects for the park's paleontological resources.

The cumulative effect of alternative 4, in combination with other past, present, and reasonably foreseeable future actions, would be localized, moderate to major, adverse impacts on petrified wood and other fossils.

Mitigation. Mitigation measures would include increased interpretation to communicate the significance of paleontological resources, signs, trail barriers, and ranger patrols. These measures would be especially used at new backcountry trails and trailhead areas, as well as the new frontcountry near The Tepees. Petrified Forest National Park staff should monitor fossil sites annually and collect specimens as they are exposed. During activities such as trail construction, fossil areas should be cleared similar to the way in which an archeological area would be.

Conclusion. Impacts to high use frontcountry areas like Giant Logs, Blue Mesa, Crystal Forest, Jasper Forest, Agate Bridge, and Long Logs would be the same as

for alternative 1. Impacts from building a new frontcountry trail near The Tepees would have a long-term, minor, adverse impact. New backcountry corridor routes in the Painted Desert area would have long-term, moderate, adverse impacts to petrified wood in this part of the park. Cumulative impacts would be localized, moderate to major, and adverse.

Although major, adverse impacts to petrified wood would be possible, such impacts would not be spread throughout the park. They would be confined instead to high visitor use areas located near concentrations of petrified wood. Most significant deposits of petrified wood in the park would remain well protected. Thus, there would be *no impairment of petrified wood or other fossils* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

VEGETATION

In the southern portion of Petrified Forest National Park, several unpaved road segments, occasionally used for administrative purposes, would be zoned backcountry corridor. Several small trailhead parking areas, located adjacent to the main park road, would be provided for access to these backcountry corridors. The construction of the small trailhead parking areas would have long-term, localized, negligible, adverse impacts on vegetation resources. Using the administrative roads as backcountry corridors, although on previously disturbed roadbeds, would provide new opportunities for visitors to access previously undisturbed areas. Off-trail hiking in these areas could have long-term, local, negligible to minor, adverse impacts on vegetation resources, depending on how much visitor use occurs in this area.

Impacts to vegetation also occur in the wilderness area in the southern part of the park. There are no defined trails here, so hikers who use this wilderness area are trampling vegetation with every step. Because use of this area is limited, the impacts to vegetation resources are expected to be negligible, local, and adverse.

Construction of several new trails (e.g., a loop trail to and from Kachina Point, the spur trail to Onyx Bridge, the Route 66 trail, and the wilderness access trail) in the northern part of the park would be expected to have long-term, localized, negligible to minor, adverse effects on vegetation resources in this part of the park. Defined trail opportunities for visitors in the backcountry could have a beneficial effect on vegetation resources by discouraging the random trampling of the desert that occurs now. However, if an increase in visitor use of the backcountry occurs, it could result in a higher level of off-trail hiking in previously undisturbed areas. Therefore, long-term, negligible to minor, adverse effects would be expected to continue from trampling of vegetation.

Impacts to vegetation also occur in the wilderness area in the southern part of the park. There are no defined trails here, so hikers who use this wilderness area are trampling vegetation with every step. Because use of this area is limited, the impacts to vegetation resources are expected to be negligible, local, and adverse.

The Route 66 road trace currently used for administrative purposes would be widened and improved to allow visitors to drive an intact portion of the road. Widening of the

Route 66 road trace and construction of a parking area/turn around at the end, would result in minor, local, adverse impacts to vegetation resources.

Construction of a new turnout on the west side of the main park road near The Tepees would provide access to the proposed universally accessible trail. Negligible to minor, local, long-term, adverse impacts to vegetation resources would be anticipated as a result of constructing the turnout and trail.

The proposed Puerco River overlook trail would disturb a minimal amount of vegetation in the park. This would result in negligible, localized, adverse impacts on vegetation resources. However, as much of this vegetation is likely dominated by the exotic, invasive species tamarisk, construction of the trail may actually warrant removal of some of this species. This could result in a negligible, short-term or long-term, beneficial effect on vegetation resources of the Puerco River, depending on how long it takes for tamarisk to become reestablished.

The proposed CCC work camp trail near Puerco Pueblo would be sited in an old road trace that has been allowed to revert to native vegetation. Therefore, long-term, localized, negligible, adverse effects on vegetation resources would be anticipated.

Construction of a turnout with wayside exhibits and an overlook to interpret historic Route 66, just north of where the park road passes over I-40, could have long-term, negligible, localized, adverse impacts on vegetation resources.

Cumulative Impacts. Past and ongoing trampling of vegetation in the backcountry of Petrified Forest National Park would result in long-term, minor, adverse impacts to vegetation. Replacement of sewer system lines at the Painted Desert headquarters complex and Rainbow Forest, as well as removal of the Puerco sewage lagoons, are planned activities that would have short-term, local, negligible to minor, adverse impacts on vegetation resources of Petrified Forest National Park. Current plans to replace restroom facilities at Jasper Forest and Agate Bridge would have local, negligible, long-term, adverse impacts. Removal of the parking trailheads in the vicinity of the Flattops would result in local, minor, long-term, beneficial impacts on vegetation resources, as these areas would be reverted back to native landscapes.

Combined with other past, present, and reasonably foreseeable future actions, the cumulative impacts would be long-term, negligible to minor, adverse effects on the vegetation resources of Petrified Forest National Park.

Mitigation. All disturbed areas associated with construction activities for trails, parking areas, turnouts, and wayside exhibits would be sited to avoid impacts to vegetation if possible. Revegetation plantings would seek to reconstruct the natural spacing, abundance, and diversity of native species. Otherwise, they would be restored to pre-construction conditions during and/or as soon as practicable following construction, to the extent possible. The principal goal is to avoid interfering with natural processes and to minimize erosion caused by construction related activities. Efficient planting and staging, as well as careful machine work, would be emphasized.

Conclusion. Construction of small trailhead parking areas and several new backcountry

trails would have long-term, localized, negligible to minor, adverse impacts on vegetation resources. Off-trail hiking in these areas could have long-term, local, negligible to minor, adverse impacts on vegetation resources. Construction of the turnout and wayside exhibit interpreting Route 66 would constitute a negligible, localized, long-term, adverse impact on vegetation resources. Improvements to the Route 66 road trace, construction of a Puerco River overlook trail, construction of a CCC work camp trail, and construction of a parking area/universally accessible trail near The Tepees would result in negligible to minor, long-term, adverse impacts on vegetation resources at the park.

Some beneficial effects could occur from construction of the Puerco River overlook trail (as a result of removing tamarisk, if necessary), and from encouraging concessioners to provide low-impact, guided hiking and backcountry experiences. These would be negligible to moderate, local, short- and long-term, beneficial impacts.

Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would have long-term, negligible to minor, adverse effects on vegetation resources of Petrified Forest National Park.

There would be *no impairment of vegetation resources* from this alternative (see specific definition of impairment in the "Impairment of National Park Resources" section above).

SOILS

In the southern portion of Petrified Forest National Park, several unpaved road segments, occasionally used for administrative purposes, would be zoned backcountry corridor. Several small trailhead parking areas, located adjacent to the main park road, would be provided for access to these backcountry corridors. The construction of the small trailhead parking areas would have long-term, localized, minor, adverse impacts, as the soils in the proposed locations have moderate erosion hazards. Using the administrative roads as backcountry corridors, although on previously disturbed roadbeds, would provide new opportunities for visitors to access previously undisturbed areas. Off-trail hiking in these areas could have long-term, somewhat local, negligible to minor, adverse impacts on soils, potentially including cryptobiotic soils, as they have moderate to very high erosion hazards. The intensity of the impacts would also depend on the level of visitor use in this area.

Construction and use of several new trails (e.g., a loop trail to and from Kachina Point, the spur trail to Onyx Bridge, the Route 66 trail, and the wilderness access trail) in the northern part of the park would be expected to have long-term, somewhat localized, negligible to moderate, adverse effects on soils. This is because the soils in this part of the park have slight to very high erosion hazard. Defined trail opportunities for visitors in the backcountry could have a beneficial effect on soils by discouraging the random trampling of desert soils. However, if an increase in visitor use of the backcountry occurs, it could result in a higher level of off-trail hiking in previously undisturbed areas. Therefore, long-term, negligible to moderate, adverse effects would be expected to continue from disturbance of soils with slight to very high erosion hazard.

The Route 66 road trace currently used for administrative purposes would be widened and improved to allow visitors to drive an intact portion of the road. Soils along this stretch of the Route 66 road trace range in erosion hazard from slight to very high. Therefore, widening of the Route 66 road trace, and construction of a parking area/turn around at the end, would result in negligible to minor, localized, adverse impacts to soils.

Continued impacts to soils would also occur in the wilderness area in the southern part of the park. There are no defined trails and hikers who use this wilderness area could be disturbing soils, potentially including cryptobiotic soils, with every step. Because use of this area is limited, the impacts to soils are expected to be negligible to minor, local, and adverse, depending on erosion hazard and actual visitor use.

A new turnout on the west side of the main park road near The Tepees would provide access to the proposed universally accessible trail. Soils in this area have slight to high erosion hazards. As this would be an elevated "boardwalk" style trail, only those areas needed for support structures would be affected for the long term. Therefore, negligible to minor, site-specific, long-term, adverse impacts to soils would be anticipated as a result of construction of the turnout and trail.

A proposed turnout with wayside exhibits and an overlook to interpret historic Route 66, just north of where the park road passes over I-40, would affect soils with slight erosion hazard. Therefore, long-term, negligible, site-specific, adverse impacts on soils would be anticipated.

Construction and use of the proposed Puerco River overlook trail would disturb soils that have slight erosion hazards, except for the Sheppard loamy sand in this area, which has a high wind erosion hazard and a slight water erosion hazard. Therefore, negligible to minor, localized, adverse impacts on soils would be anticipated from construction and use of this trail.

The proposed CCC work camp trail near Puerco Pueblo would be sited in an old road trace that has been allowed to revert to a native landscape. Soils in this area have slight to moderate erosion hazards. Therefore, long-term, localized, negligible to minor, adverse effects on soils, potentially including cryptobiotic soils, would be anticipated.

All construction activities would seek to avoid impacts to cryptobiotic and highly erosive soils. However, it is expected that some negligible to minor, site-specific, short-term, adverse impacts to these soil types would result from construction workers and the use/storage of equipment.

Cumulative Impacts. The erosive action of wind and water are readily apparent throughout Petrified Forest National Park. These natural processes have long-term, moderate, adverse impacts on soils, including cryptobiotic soils. Past and ongoing soil disturbances from off-trail hiking in the backcountry of Petrified Forest National Park would result in long-term, negligible to minor, adverse impacts to soils, including cryptobiotic soils. Replacement of sewer system lines at the Painted Desert headquarters complex and Rainbow Forest, as well as removal of the Puerco sewage lagoons, are planned activities that would have short-term, site-specific, negligible to minor, adverse impacts on soils of Petrified

Forest National Park. Current plans to replace restroom facilities at Jasper Forest and Agate Bridge would have negligible to moderate, site-specific, long-term, adverse impacts. Removal of the parking trailheads in the vicinity of the Flattops would result in site-specific, minor, long-term, beneficial impacts on soils, as these areas would be reverted back to native landscapes.

Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would be long-term, negligible to minor, adverse effects on the soils of Petrified Forest National Park.

Mitigation. All disturbed areas associated with construction activities for trails, parking areas, turnouts, and wayside exhibits would be sited to avoid impacts to cryptobiotic and highly erosive soils, to the extent possible. Otherwise, they would be restored during and/or as soon as practicable following construction. The principal goal is to avoid interfering with natural processes. Efficient planning and staging, as well as careful machine work, would be emphasized.

Conclusion. Construction of small trailhead parking areas would have long-term, site-specific, negligible, adverse impacts on soils. Off-trail hiking in these areas could have long-term, somewhat localized, negligible to minor, adverse impacts on soils. Construction of the turnout and wayside exhibit interpreting Route 66 would constitute a negligible, site-specific, long-term, adverse impact on soils. Improvements to the Route 66 road trace, construction of a Puerco River overlook trail, construction of a CCC work camp trail, and construction of a parking area/universally accessible trail near The Tepees would result in negligible to minor, long-term, local or site-specific, adverse impacts on soils at the park.

All construction activities would seek to avoid impacts to cryptobiotic and highly erosive soils. However, it is expected that some negligible to moderate, site-specific, short-term, adverse impacts to these soil types would result from construction workers and the use/storage of equipment.

Combined with other past, present, and reasonably foreseeable future actions, the cumulative impact would have long-term, negligible to minor, adverse effects on soils of Petrified Forest National Park.

There would be *no impairment of soils* from this alternative (see specific definition of impairment in "Impairment of National Park Resources" section above).

VISITOR EXPERIENCE AND APPRECIATION

Parking lot and walkway improvements at Rainbow Forest would reduce the potential for vehicle-pedestrian conflicts and confusion. The impact would be the same as in alternative 3.

Reconstruction of the Painted Desert headquarters complex would mean that the entire complex would be universally accessible for visitors, park staff, and others wishing to conduct business there. Renovations at Rainbow Forest, trail changes at Crystal Forest, and a new accessible trail to The Tepees would also improve accessibility. Visitors with limited mobility would be freer to explore the park, and the National Park Service would be able to hire, accommodate, and retain staff with physical disabilities. The

net impact would be major, long term, and beneficial.

Reconstruction of the Painted Desert headquarters complex and renovations at other facilities would provide more space for better exhibits and media. This would have a major, long-term, beneficial impact on visitor experience and appreciation.

New trails at Kachina Point, Onyx Bridge, Route 66, the CCC work camp (near The Tepees), and Puerco River; more backcountry access; and additional turnouts would allow visitors to experience new areas and the park in different ways. These new trails and turnouts would potentially have a long-term, minor to moderate, beneficial impact on visitor experience and appreciation. New trails and turnouts would also have a long-term, minor, adverse impact on views of natural scenery (Painted Desert) and on visitors seeking remote backcountry experiences.

Visitor vehicle access to a portion of the Route 66 roadbed and a new turnout and wayside exhibit interpreting Route 66 would benefit visitors who want to learn about and view this historic resource. The impact on visitor experience and appreciation would be long term and minor.

Extended hours in the northern portion of the park would allow for longer periods of visitor access and the opportunity to view sunsets and sunrises over the Painted Desert. Expanded visitor services (trading post, food service) at the Painted Desert Inn would benefit visitors by providing more services near popular park attractions. Together, these changes have a long-term, moderate, beneficial impact on visitor experiences and appreciation.

Park staff would encourage interested parties to provide new campgrounds in the local area. If these efforts were successful, additional campground choices would become available, and they would have a minor, beneficial impact on visitor experience and appreciation.

The discontinuation of petrified wood sales would adversely impact visitors wishing to purchase this type of souvenir within the park. This impact would be minor because petrified wood would be available for purchase outside the park for the foreseeable future, minimizing the effect the new policy would have on visitor experience.

Cumulative Impacts. Impacts associated with conversion of the Long Logs access road to a hiking trail would be the same as for alternative 1. Impacts from the I-40 interchange improvements and the refurbishment and/or replacement of toilets at Chinde Point, Puerco Pueblo, and Agate Bridge / Jasper Forest would be the same as for alternative 1.

The cumulative effect of the no-action alternative, in combination with other past, present, and foreseeable future actions, would be long-term, moderate, beneficial impacts on visitor experience and appreciation.

Mitigation. There would be no new adverse impacts to visitor experience and appreciation in this alternative. Mitigation measures would be the same as for alternative 1.

Conclusion. New trails and turnouts would have a long-term, minor, adverse impact on views of natural scenery (Painted Desert) and on visitors seeking remote backcountry

experiences. Minor, long-term, beneficial impacts would result from the new Route 66 turnout and wayside exhibit and from new vehicle access to a portion of Route 66. Moderate, long-term, beneficial impacts would result from extended park hours in the northern portion of the park, more visitor services at the Painted Desert Inn, new trails, more backcountry access, and more turnouts. Major, long-term, beneficial impacts would also be expected from improved accessibility. Cumulative impacts would be moderate and beneficial overall.

NATIONAL PARK OPERATIONS

General Operations

In alternative 4, operations would become more complex and intensive, requiring more resources, equipment, and time.

In this alternative, several new trails would be zoned as backcountry corridors. Some trails would result from conversion of several unpaved road segments that are currently used for administrative purposes in the south part of the park. Several new trailhead parking areas, located adjacent to the main park road, would be provided for access to the trails. Several new trails would facilitate access to more remote areas of the park. However, these new trails and trailhead parking areas would result in increased maintenance, interpretation, and protection requirements. New trails would have long-term, minor to moderate, adverse impacts to park operations.

Services and hours of operation at Painted Desert Inn would be expanded under this alternative. Longer hours would require that more interpretive, maintenance, and protection staff and services be available to serve the inn and its vicinity. Additional protection staff would be required to patrol the park during its expanded hours. New trails and the improved segment of Route 66 would require more interpretation and protection. The need for additional personnel would result in long-term, minor to moderate, adverse impacts on park operations because additional interpretive programs would have to be developed, operational hours in the north part of the park would be extended, and staff numbers would probably have to be increased.

In alternative 4, the Painted Desert headquarters complex would be demolished and reconstructed in a phased approach. This rehabilitation would improve the amount and type of work space available and improve functional relationships between divisions. These improvements would have a long-term, major, beneficial effect on park operations. Some maintenance of existing structures would continue during phased demolition and reconstruction of the headquarters complex. Costs associated with this alternative would force other maintenance projects to be delayed or forgone, and would result in short-term, minor, adverse impacts. However, maintenance costs would be reduced over the long term. New residences would result in long-term, major, beneficial effects from improved living conditions, heightened employee morale, better recruitment and retention of park employees, and more flexible housing opportunities for visiting researchers and scientists. The new laboratory and work space for researchers provided in this alternative would also be beneficial. However, short-term, minor, adverse impacts would be expected to occur during demolition and reconstruction of the

complex, as certain functions would be temporarily relocated and interrupted.

Long-term, minor, beneficial effects would be expected for park operations as reconstruction of the complex would eliminate several health and safety concerns. Inadequacies related to fire suppression and alarm systems would be eliminated as the old buildings are demolished and new buildings are built. Potential health hazards posed by asbestos and lead-based paint would also be eliminated as old buildings are demolished and new ones built.

Payments associated with housing the museum collections at offsite facilities would come from the park's operating budget, which would have a long-term, adverse, minor impact. On the other hand, park maintenance staff would have the burden of maintaining the new trail from Rainbow Forest to Long Logs. This would have a long-term, minor, adverse impact on park operations.

Cumulative Impacts. No cumulative impacts to general operations would be expected from alternative 4.

Mitigation. Several mitigating measures would be implemented to reduce impacts that alternative 4 would have on park operations. New park facilities would be designed to accommodate current and anticipated future needs for space, as determined by a 2001 study (e^2M 2001) or more current information, as appropriate. New facilities would be built to current NPS standards and fire and safety codes, and they would be universally accessible. These new facilities would help curtail problems the park currently experiences related to operations. Demolition and construction would be phased and temporary buildings would be used as needed to ensure that park operations were disrupted as little as possible during this project. Rehabilitation of the two residences near the Painted Desert Inn for staff offices would help in this respect.

Structures that are in immediate need of rehabilitation and stabilization for safety reasons would receive routine maintenance during the phased reconstruction of the headquarters complex. This would reduce the cost of ongoing maintenance and its impacts on park operations.

Conclusion. Operations would become more complex and intensive, requiring more resources, equipment, and time. New trails and trailheads would require additional maintenance, and expand needs for resource protection, resulting in long-term, moderate to major, adverse impacts on park operations. Expanded hours and expanded interpretation and concession services at the Painted Desert Inn would have long-term, major, adverse impacts to park operations. Long-term, minor to major, beneficial effects would be expected from phased demolition and reconstruction of the Painted Desert headquarters complex. Employee housing and work space would be sufficient and appropriate. Museum collection storage facilities would be appropriate, meet applicable standards, and be more accessible to park staff and researchers. Health and safety concerns that impact park operations would be alleviated by demolishing existing buildings and replacing them with buildings that meet standards. Short-term, minor, adverse impacts would be expected to occur during demolition and reconstruction, as certain functions would be temporarily relocated and interrupted. No cumulative

impacts to general operations would be expected from alternative 4.

Energy Requirements and Conservation Potential

Alternative 4 has the greatest potential to affect the energy requirements and conservation potential of the park. The entire Painted Desert headquarters complex would be demolished and reconstructed using a phased approach. The new buildings would eliminate energy inefficiencies. Using sustainable development technologies during reconstruction would minimize energy required to operate new structures after their completion. The buildings would result in long-term, moderate, beneficial effects on energy requirements of the park.

Energy would be required to produce new materials and transport new and old building materials during reconstruction of the headquarters complex. Energy would also be consumed in removal of any unused materials. This energy consumption would have a short-term, negligible, adverse impact on energy requirements at Petrified Forest National Park, but only for the duration of the project. Additionally, if the new headquarters complex is somewhat larger than the old complex, as proposed, negligible, short-term, adverse impacts to energy requirements may result from operating the slightly larger facility. Energy savings from sustainable technologies would offset this impact in the long term, however.

Building new structures in the headquarters complex would provide the opportunity to implement sustainable technologies at the park. These technologies would be considered throughout the planning process, from site selection for individual buildings to building design and construction, to material selection. Responsible energy use is fundamental to sustainable development. It requires energy awareness, conservation, and efficiency, coupled with the use of primary resources (materials found in nature such as stone, earth, flora [hemp, jute, and reed], cotton, and wood), avoiding nonrenewable resources to the extent possible. Incorporation of sustainable technologies and materials would provide long-term, moderate, beneficial effects for energy conservation potential at Petrified Forest National Park.

Cumulative Impacts. No cumulative impacts are anticipated as a result of impacts to energy requirements and conservation potential at the park.

Mitigation. Passive energy technologies (e.g., wind-scoops, cross-ventilation, and passive thermal chimneys) can reduce or eliminate the need for energy-intensive systems such as air conditioning. Consideration of onsite energy production and storage (e.g., photovoltaic systems and wind generators for remote applications and small power demands such as pumping water) in the early planning can eliminate otherwise necessary energy requirements.

By recycling building materials, building the minimum necessary to satisfy functional requirements, and by having facilities serve multiple functions, the embodied energy of new building materials and the energy of transporting them is minimized. The energy required to operate these new structures is also minimized. In addition, considerable electrical and thermal energy can be saved through facility design that incorporates day lighting and other passive energy-saving

strategies appropriate to the climate at the park and function of the facility.

Using environmentally sensitive building materials reduces energy requirements and enhances conservation potential. Natural materials are less energy intensive and polluting to produce. Energy costs are also reduced by using local materials (if possible). Durable materials can save on energy costs for maintenance, as well as for the production and installation of replacement materials. The new headquarters structures would be built to allow for future expansion and/or adaptive uses with a minimum of demolition and waste. Materials and components for reconstruction of the complex should be chosen to maximize potential reuse and/or recycling (to reduce energy associated with producing and transporting new materials) if and when the time comes.

More information on sustainable development technologies that reduce energy requirements and enhance conservation potential can be found in *NPS Guiding Principles of Sustainable Design* (1994b), *National Park Service Management Policies* (2001), and Director's Order–13 (*Environmental Leadership*).

Conclusion. Demolishing and reconstructing the Painted Desert headquarters complex would eliminate energy inefficiencies and allow incorporation of sustainable technologies that reduce energy requirements. The new buildings would result in long-term, minor to moderate, beneficial effects for energy requirements at the park. As some new materials would have to be consumed, energy required to produce and transport these materials increase, a short-term, negligible, adverse impact to energy requirements. Short-term, negligible, adverse impacts would also result from building a somewhat larger complex than exists presently; these impacts would be mitigated in the long term by the benefits of sustainable technologies. As energy conservation would be considered during siting, design, construction, and furnishing, long-term, minor to moderate, beneficial effects would result for conservation potential. No cumulative impacts would be expected.

SOCIOECONOMIC RESOURCES

Beneficial impacts from the park would be expected to continue. Life cycle costs over the 15 to 20 year life of the plan, which include maintenance, operations, and personnel costs (as well as capital costs), are estimated at $64,300,000. This would continue to be a long-term, moderate, beneficial impact to the economy of Apache and Navajo Counties from park expenditures and personal spending by employees. The impact would be greater than that expected from alternative 1.

Elimination of petrified wood sales within the park would have a long-term, major, adverse impact on the concessioner's business, but local businesses would realize a moderate, long-term benefit.

There would be construction projects associated with alternative 4, specifically the renovation of the Rainbow Forest area and demolition and rebuilding of the Painted Desert headquarters complex. New trails and turnouts would also be established. Construction projects would result in a long-term increase in opportunities for the construction work force and an increase in

potential revenue for local businesses generated by construction activities and workers. The benefits would be moderate and long term.

About two or three researchers travel to the park each year solely to use the museum collections. Therefore, the foreseeable impact of the removal of the museum collections from the park would be adverse, yet negligible, to local businesses, cooperators, and concessioners. The facilities and communities that would hold the collections would benefit from potential NPS payments for storage and businesses would benefit from the presence of more researchers. The impacts would be negligible to minor and long term.

With encouragement from park staff, nearby cooperators and neighbors may choose to develop more campgrounds. Park hours of operation would be extended in the north. Some visitors would probably spend more time at the park and in the local area as a result. The likely benefits would be long term and minor to moderate.

Otherwise impacts would be the same as alternative 1.

Cumulative Impacts. Other foreseeable actions (including those proposed in the 1993 GMP) such as the construction of new trails, turnouts, wayside exhibits, and comfort stations could encourage visitors to stay in the park and/or local area longer, resulting in a minimal increase in visitor expenditures in the park at the concessioner and cooperators facilities, as well as locally in Holbrook and at nearby campgrounds. These actions would result in a minor, long-term, cumulatively beneficial impact.

Conclusion. Beneficial effects from park-related spending would increase; benefits would be greater than for the no-action alternative, but still long term, beneficial, and moderate. Elimination of petrified wood sales within the park would have a long-term, major, adverse impact on the concessioner's business, but local businesses would realize a moderate, long-term benefit. Potential benefits from new construction and improvements would be long term, beneficial, and moderate. Minor to moderate impacts would result if proposed actions result in visitors spending more time in the park and in the local area. Cumulative effects would be minor, long term, and beneficial.

UNAVOIDABLE ADVERSE IMPACTS

There would be unavoidable, moderate to major, adverse impacts on archeological resources, petrified wood, and other fossils under alternative 4. These impacts could be greater than those resulting from current conditions even though new proposed trails were carefully sited to minimize impacts to such resources. Impacts could be avoided altogether only if human use were not allowed in the park. Disturbance to archeological resources from wind and water erosion would also be unavoidable. Mitigation measures would be taken, when possible, to reduce these impacts.

Long-term, major, adverse impacts on the concessioner's business would be unavoidable when petrified wood sales in park gift shops are discontinued, as required by *NPS Management Policies*. Businesses outside the park would benefit, however, to the extent that visitors would buy petrified wood there instead.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Archeological resources, petrified wood, or other fossils that are stolen or vandalized are irreversibly lost. Even moving or disturbing these resources constitutes an irreversible commitment of resources because information is lost if the context (location and condition) of the resources is changed, even inadvertently. Thus, there would be some irreversible loss or commitment of archeological resources, petrified wood, and other fossils in alternative 4, as discussed in the "Unavoidable Adverse Impacts" section above.

Demolition and removal of the Painted Desert headquarters buildings as the headquarters complex is reconstructed would result in an irreversible loss. These buildings are potentially eligible for the NRHP. It is possible that a detailed record of the buildings would be created via the Historic American Buildings Survey or Historic American Engineering Record, but the buildings themselves would be irretrievably lost.

Limited amounts of non-renewable resources would be used for construction projects and park operations, including energy and materials. These resources would be essentially irretrievable once they were committed.

RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

This section discusses the effects of the short-term use of resources on the long-term productivity of resources.

There would be no adverse effects on biological, agricultural, or economic productivity associated with implementing alternative 4.

CHAPTER 5: CONSULTATION AND COORDINATION

CONSULTATION AND COORDINATION

SUMMARY OF PUBLIC INVOLVEMENT

In December 2000, the public was notified of the Petrified Forest GMP Revision effort via *Newsletter 1*. Part of the framework for the GMP Revision (and the first task for the planning team) was to reaffirm the purpose, significance, and mission of the park. In *Newsletter 1*, the public was asked to review the park's purpose and significance statements and to comment on a list of preliminary topics and issues to be addressed in the plan. *Newsletter 1* also introduced the public to a separate but related Petrified Forest planning effort, the Petrified Forest National Park Wilderness Management Plan.

In January 2001, a press release about the planning efforts was issued by the park and announcements were made in the media.

About twenty written comments were received in response to *Newsletter 1*. Additional verbal comments were received from visitors at the park. Members of the park staff who were not on the planning team were introduced to the planning process in a staff meeting and their comments were solicited.

Newsletter 2, issued in June 2001, provided information on several topics. It provided a draft park mission statement and mission goals, and it summarized public response to the first newsletter. It presented draft "decision points," which are key questions the GMP Revision needs to answer. It introduced several preliminary alternative concepts for managing the park. It also presented management zones, which represent a range of ways to protect resources and provide for different visitor experiences in different areas of the park. The newsletter asked the public to comment on the alternative concepts, management zones, and natural and cultural resources management in particular. Five comments were received in response to *Newsletter 2*.

In August 2001, a public meeting was held in Holbrook, Arizona, to solicit comments on possible ways to manage the park. A press release was issued and the media covered the meeting and progress on the planning effort. Nine people attended the Holbrook meeting, but no additional comments were submitted.

Using input from the public and considering the probable environmental consequences and costs of the alternatives, the planning team developed a preferred alternative. A *Draft General Management Plan Revision and Environmental Impact Statement* was produced and distributed for public review.

Newsletters and draft documents were also available online.

CONSULTATION

The National Park Service initiated consultation with the Arizona SHPO in January 2001. The SHPO acknowledged this contact and also participated in the Petrified Forest Space Charette in late February–early March 2001.

In January 2001, the National Park Service initiated informal consultation with the U.S.

Fish and Wildlife Service to determine the presence of federally listed threatened, endangered, and candidate species in Petrified Forest National Park. The Fish and Wildlife Service responded on 14 February 2001 with a list of species (see appendix F).

The National Park Service also contacted the Arizona Department of Game and Fish in January 2001, regarding state-listed species known or potentially occurring in the park. Despite several contacts, the Department of Fish and Game has not formally responded to date.

NPS staff consulted with and sought the view of several associated American Indian groups. The Navajo Nation and six Navajo chapters associated with the park have provided no comments related to the GMP Revision thus far. In June 2001, park staff met with Hopi tribal representatives. The Hopi stated during the meeting that they wish to remain informed about the GMP planning process. White Mountain Apache said there is no need for further consultation on the plan unless new evidence of Apache occupation or use within the park comes to light. The Zuni have provided no comments to date.

NPS staff met in April 2002 with representatives of the National Trust for Historic Preservation (Denver and San Francisco regional offices), the Arizona SHPO, and the Secretary of Interior to review the history and condition of the Painted Desert complex, to discuss GMP Revision alternatives for the complex, and to discuss the potential for partnerships that might help support the preservation of the complex. The findings and preliminary recommendations resulting from the meeting include the following:

- The complex may be nationally significant and is certainly significant to the state of Arizona, as it is a major monument to Modernism in Arizona.
- The complex should be nominated to the NRHP as soon as possible. The nomination should be based on the complex's national significance if possible.
- A Historic Structures Report for the complex is needed.
- If the complex is found to be eligible for the NRHP based on national significance, a long-term vision could be to seek National Historic Landmark status, after critical work on the project is completed.
- Public awareness of the complex and its significance should be heightened through a variety of methods.
- The complex has ties to several interpretive themes, including transportation, Route 66, paleontology, puebloan architecture, and sustainability.
- The complex might best be viewed as a "campus," which could pull together several of these themes.
- Potential stakeholders in the complex include the research community, universities, elderhostel groups, and others.

The participants also identified several follow-up tasks related to fund raising and other support for the complex.

TABLE 16. COMPLIANCE WITH SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

Action	Section 106 Compliance
Renovation of the Rainbow Forest Museum (interior only)	This action would not have an adverse effect on a historic property and therefore would not require consultation with the Arizona State Historic Preservation Officer.
Rehabilitation of the Painted Desert Inn and two residences Modifications to existing Painted Desert headquarters complex structures in order to adaptively reuse space, plus the addition of new structures for current and future space needs. Reduction of the scale of the Rainbow Forest concessions building. Realignment of the Rainbow Forest parking lot. Realignment of the Rainbow Forest Giant Logs Trail. Long Logs Trail project. Realignment of the Crystal Forest Trail. New trails within the Painted Desert Inn viewshed.	These actions have the potential to adversely affect an eligible historic property, and therefore would require consultation with the Arizona State Historic Preservation Officer.
New trails at Puerco Pueblo New trails on Old Route 66 New trail in the Painted Desert and within the viewshed of the Painted Desert Inn Widening the Route 66 access road; the construction of several small informal turnouts adjacent to the main park road; and the construction of the turnout and wayside exhibit interpreting Route 66 Trail modifications at Giant Logs	These actions have the potential to adversely affect a potentially eligible historic property, and therefore would require consultation with the Arizona State Historic Preservation Officer. If the evaluation of these properties determines that the resource is not eligible, then consultation would not be required for that resource.

LIST OF AGENCIES AND ORGANIZATIONS CONTACTED FOR INFORMATION OR REVEIVING A COPY OF THE DRAFT PLAN

Federal Agencies

Advisory Council on Historic Preservation
Bureau of Indian Affairs
Bureau of Land Management
Federal Highways Administration
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Forest Service
U.S. Geological Survey
U.S. Natural Resources Conservation Service

Tribes

Hopi Tribe
Navajo Nation
White Mountain Apache Tribe
Zuni Pueblo

U.S. Senate / House of Representatives

John Kyle
John McCain
Jeff Flake
J.D. Hayworth
Jim Kolbe
Ed Pastor
John Shadegg
Bob Stump

State Agencies

Arizona Department of Environmental Quality
Arizona Department of Game and Fish
Arizona Department of Public Safety
Arizona Department of Water Resources
Arizona Office of Tourism
Arizona State Lands Department
Arizona State Parks–State Historic Preservation Office

Other Agencies and Organizations

Xanterra Parks and Resorts
Apache County, Arizona
Burlington Northern–Santa Fe Railroad
City of Holbrook, Arizona
Grand Canyon Trust
Museum of Northern Arizona
Museum of Paleontology; University of California, Berkeley
National Parks and Conservation Association
Navajo County, Arizona
Navajo Country Historical Society
Petrified Forest Museum Association
The Nature Conservancy
White Mountain Audubon Society

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Mike Snyder, Associate Regional Director
Rodd Wheaton, Associate Regional Director
Karen Wade, Director
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Pat Baird, Archeological Technician
Anne Trinkle Jones, Supervisory Archeologist

Dr. Sidney Ash, Paleobotanist, Albuquerque, NM

APPENDIX A: LEGISLATION

LEGISLATIVE HISTORY

Proclamation No. 697, December 8, 1906, (34 Stat. 3266)

Established Petrified Forest National Monument 60,776 acres

Proclamation No.1167, July 31, 1911 (37 Stat. 1716)

Reduced monument acreage to 25,626 acres

Act of May 14, 1930, (46 Stat. 278)

Authorized exchanges of land with owners of private land holdings within the Petrified Forest National Monument

Proclamation No.1927, November 14, 1930, (46 Stat. 3040)

Added 11,010 acres to include Blue Mesa section and approach road

Proclamation No. 1975, November 30, 1931, (47 Stat. 2486)

Added 80 acres for "approach highway and additional features of scenic and scientific interest"

Proclamation No. 2011, September 23, 1932, (47 Stat. 2532)

Added 53,300 acres to include a major portion of the Painted Desert and highway connecting it to the original monument.

Act of March 28, 1958, (72 Stat. 69)

Authorized establishment of Petrified Forest National Park upon gaining title to all inholdings except certain highway, railroad and utility easements and rights-of-way. This was accomplished and notice published in the Federal Register which formally established the National Park on December 8, 1962. The act also states, "The Petrified Forest National Park shall be preserved and administered in its natural condition. . ."

Act of October 23, 1970, (84 Stat. 1105)

Designated 50,260 acres of land within Petrified Forest National Park as wilderness.

P.L. 91-504

16. Petrified Forest

An Act to designate certain lands as wilderness. (84 Stat. 1105)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

* * * * * * *

DESIGNATION OF WILDERNESS AREAS WITHIN NATIONAL PARKS AND MONUMENTS

SEC. 2. In accordance with section 3(c) of the Wilderness Act (78 Stat. 890; 16 U.S.C. 1132(c)), the following lands are hereby designated as wilderness:

(a) certain lands in the Craters of the Moon National Monument, which comprise about forty-three thousand two hundred and forty-three acres and which are depicted on a map entitled "Wilderness Plan Craters of the Moon National Monument, Idaho," numbered 131–91,000 and dated March 1970, which shall be known as the "Craters of the Moon National Wilderness Area";

(b) certain lands in the Petrified Forest National Park, which comprise about fifty thousand two hundred and sixty acres and which are depicted on a map entitled "Recommended Wilderness, Petrified Forest National Park, Arizona", numbered NP–PF–3320–O and dated November 1967, which shall be known as the "Petrified Forest National Wilderness Area".

* * * * * * *

SEC. 4. As soon as practicable after this Act takes effect, a map and a legal description of each wilderness area shall be filed with the Interior and Insular Affairs Committes of the United States Senate and the House of Representatives, and such description shall have the same force and effect as if included in this Act: *Provided, however*, That correction of clerical and typographical errors in such legal description and map may be made.

SEC. 5. Wilderness areas designated by or pursuant to this Act shall be administered in accordance with the provisions of the Wilderness Act governing areas designated by that Act as wilderness areas, except that any reference in such provisions to the effective date of the Wilderness Act shall be deemed to be a reference to the effective date of this Act, and any reference to the Secretary of Agriculture shall be deemed to be a reference to the Secretary who has administrative jurisdiction over the area.

Approved October 23, 1970.

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19. Petrified Forest National Park

Establishment authorized ..... Act of March 28, 1958 Page 155

An Act To authorize the establishment of the Petrified Forest National Park in the State of Arizona, and for other purposes, approved March 28, 1958 (72 Stat. 69)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in order to permit the establishment of the Petrified Forest National Monument, Arizona, and other lands as provided for herein, as the Petrified Forest National Park, such national park shall be established (a) after title to all of the lands described in section 2 of this Act shall have been vested in the United States, with the exception of such easements and rights-of-way for railroad, public utilities, and highway purposes as may be acceptable to the Secretary of the Interior, and (b) when notification of the effective date of such establishment of the park, as determined by the said Secretary, is published in the Federal Register. Disestablishment of the Petrified Forest National Monument shall be effected concurrently with the establishment of the park.

Petrified Forest National Park, Ariz. Establishment.

Publication in F.R.

The Petrified Forest National Park shall be preserved and administered in its natural condition by the Secretary of the Interior for the public benefit in accordance with the general laws governing areas of the National Park System and in accordance with the basic policies relating thereto as prescribed by the Act of August 25, 1916 (39 Stat. 535; 16 U.S.C., 1952 edition, secs. 1–3).

The exchange authority prescribed for the Petrified Forest National Monument in the Act of May 14, 1930 (46 Stat. 278; 16 U.S.C., 1952 edition, secs. 444, 444a), is hereby extended to all the lands within the Petrified Forest National Park as herein authorized.

For the purposes of this Act, the Secretary is authorized to acquire, in such manner as he shall consider to be in the public interest, any non-Federal land or interests in land within the area hereby authorized to be established as the Petrified Forest National Park. In acquiring any State-owned land or interests therein within the aforesaid area, such property may be procured by the United States without regard to any limitations heretofore prescribed by the Congress relating to the disposal of State-owned properties.

Upon establishment of the Petrified Forest National Park, as authorized by this Act, any remaining balance of funds that may be available for purposes of the Petrified Forest National Monument shall thereafter be

available for expenditure for purposes of the
Forest National Park. (16 U.S.C. §119.)

SEC. 2. The Petrified Forest National Park, authorized to be established pursuant to section 1 of this Act, shall comprise the following described lands:

GILA AND SALT RIVER MERIDIAN

Township 20 north, range 23 east: Sections 1, 2, 3, 10, 11, 12, 13, 14, 15, 22, 23, 24, 25, 26, 27, 34, 35, 36, all.

Township 20 north, range 24 east: All.

Township 20 north, range 25 east: Sections 4, 5, 6, 7, 8, 9, 16, 17, 18, all.

Township 19 north, range 23 east: Sections 1, 2, 3, 10, 11, 12, 13, 14, 15, all.

Township 19 north, range 24 east: Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, all; section 11, northwest quarter and north half northeast quarter; sections 16, 17, 18, 21, 28, 33, all.

Township 18 north, range 24, east: Sections 4, 9, all; section 10, southwest quarter; sections 13, 14, 15, 16, 21, 22, 23, 24, 25, 26, 27, 28, 33, 34, 35, 36, all.

Township 17 north, range 24 east: Sections 2, 11, 14, 23, 26, west halves; sections 3, 4, 5, 6, 7, 8, 9, 10, 15, 16, 17, 18, 19, 20, 21, 22, 27, 28, 29, 30, 31, 32, 33, all.

Township 17 north, range 23 east: Sections 34, 35, 36, all.

Township 16 north, range 24 east: Sections 3 and 10, west halves; sections 4, 5, 6, 7, 8, 9, all.

Township 16 north, range 23 east: Sections 1, 2, 11, 12, all; sections 3, 10, east halves. (16 U.S.C. § 119a.)

62. Petrified Forest National Monument

Establishment: Proclamation (No. 697) of December 8, 1906 268
Boundaries reduced: Proclamation (No. 1167) of July 31, 1911 270
Boundaries enlarged: Proclamation (No. 1927) of November 14, 1930 272
Boundaries enlarged: Proclamation (No. 1975) of November 30, 1931 273
Boundaries enlarged: Proclamation (No. 2011) of September 23, 1932 273

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

A PROCLAMATION

[No. 697—Dec. 8, 1906—34 Stat. 3266]

WHEREAS, it is provided by section two of the Act of Congress, approved June 8, 1906, entitled, "An Act for the preservation of American Antiquities," "That the President of the United States is hereby authorized, in his discretion, to declare by public proclamation historic land marks, historic and prehistoric structures, and other objects of historic or scientific interest that are situated upon the lands owned or controlled by the Government of the United States to be National Monuments, and may reserve as a part thereof parcels of land, the limits of which in all cases shall be confined to the smallest area compatible with the proper care and management of the object to be protected;"

AND, WHEREAS, the mineralized remains of Mesozoic forests, commonly known as the "Petrified Forest," in the Territory of Arizona, situated upon the public lands owned and controlled by the United States, are of the greatest scientific interest and value and it appears that the public good would be promoted by reserving these deposits of fossilized wood as a National monument with as much land as may be necessary for the proper protection thereof;

NOW, THEREFORE, I, Theodore Roosevelt, President of the United States of America, by virtue of the power in me vested by section two of the aforesaid Act of Congress, do hereby set aside as the Petrified Forest National Monument, subject to any valid and existing rights, the deposits of mineralized forest remains situated in Gila and Apache counties, Arizona, more particularly located and described as follows, to wit:

Sections 1 to 18 inclusive in township 16 north, range 23; sections 20 to 29 inclusive and sections 31 to 36 inclusive in township 17 north, range 23; sections 1 to 12 inclusive and section 18 in township 16 north, range 24; sections 2 to 11 inclusive and sections 14 to 36 inclusive in township 17 north, range 24; sections 5, 6, 7 and 8, in township 16 north, range 25; and sections 19, 20, 29, 30, 31 and 32 in township 17 north, range 25, all east of the Gila and Salt River Meridian as shown upon the map hereto attached and made a part of this proclamation.

Warning is hereby expressly given to all unauthorized persons not to appropriate, excavate, injure or destroy any of the mineralized forest remains hereby declared to be a National monument or to locate or settle upon any of the lands reserved and made a part of said monument by this proclamation.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the United States to be affixed.

DONE at the City of Washington, this 8th day of December, in the year of our Lord one thousand nine hundred and six and the Independence of the United States the one hundred and thirty-first.

[SEAL]

THEODORE ROOSEVELT.

By the President:
ELIHU ROOT,
Secretary of State.

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

A PROCLAMATION

[No. 1167—July 31, 1911—37 Stat. 1716]

WHEREAS, The Petrified Forest National Monument, Arizona, created by proclamation dated December 8, 1906, has been found, through a careful geological survey of its deposits of mineralized forest remains, to reserve a much larger area of land than is necessary to protect the objects for which the Monument was created, and therefore the same should be reduced in area to conform to the requirements of the act authorizing the creation of National Monuments;

NOW, THEREFORE, I, William H. Taft, President of the United States of America, by virtue of the power in me vested by Section two of the act of Congress entitled, "An Act for the Preservation of American Antiquities", approved June 8, 1906, do hereby set aside and reserve as the Petrified Forest National Monument, subject to any valid, existing rights, the deposits of mineralized forest remains, together with enough lands to insure the protection thereof, situated in Gila and Apache counties, Arizona, these lands being more particularly located and described as follows: Sections one, two, eleven and twelve, and the east half each of sections three and ten, in township sixteen north, range twenty-three; Sections four, five, six, seven, eight and nine, and the west half each of sections three and ten, in township sixteen north, range twenty-four; Sections thirty-four, thirty-five and thirty-six, in township seventeen north, range twenty-three; Sections three to ten, inclusive, fifteen to twenty-two, inclusive, twenty-seven to thirty-three, inclusive, and the west half each of sections two, eleven, fourteen, twenty-three and twenty-six, in township seventeen north, range twenty-four, all east of the Gila and Salt River Meridian, Arizona, as shown upon the map hereto attached and made a part of this proclamation.

Warning is hereby expressly given to all unauthorized persons not to appropriate, excavate, injure or destroy any of the mineralized forest remains situated within this Monument reservation, or to locate or settle upon any of the lands reserved by this proclamation.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the United States to be affixed.

DONE at the city of Washington this 31st day of July, in the year of our Lord one thousand nine hundred and eleven, and of the [SEAL] Independence of the United States the one hundred and thirty-sixth.

By the President: WM. H. TAFT.

ALVEY A. ADEE,
Acting Secretary of State.

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

A PROCLAMATION

[No. 1927—Nov. 14, 1930—46 Stat. 3040]

WHEREAS it appears that the public interest would be promoted by adding to the Petrified Forest National Monument, in the State of Arizona, certain adjoining lands for the purpose of including within said monument a certain approach highway and additional features of scenic and scientific interest;

NOW, THEREFORE, I, Herbert Hoover, President of the United States of America, by virtue of the power in me vested by section 2 of the act of Congress entitled "An act for the preservation of American antiquities," approved June 8, 1906 (34 Stat. 225), do proclaim that, subject to the rights of the owners of privately owned lands and prior valid claims initiated and maintained pursuant to the land laws of the United States, the following described lands in Arizona be, and the same are hereby, added to and made a part of the Petrified Forest National Monument: those portions of the SE.¼ and E.½ SW.¼ sec. 4 lying south and east of the southern boundary of the Atchison, Topeka & Santa Fe Railway Co.'s right of way; E.½, SW.¼ and that part of the E.½ NW.¼ sec. 9 lying south and east of the southern boundary of said right of way; SW.¼ sec. 10; and secs. 14 to 16, inclusive, secs. 21 to 28, inclusive, and secs. 33 to 36, inclusive, all in T. 18 N., R. 24 E., Gila and Salt River meridian, containing approximately 11,010 acres.

Warning is hereby expressly given to all unauthorized persons not to appropriate, injure, destroy, or remove any feature of this monument and not to locate or settle upon any of the lands thereof.

The Director of the National Park Service, under the direction of the Secretary of the Interior, shall have the supervision, management, and control of this monument as provided in the act of Congress entitled "An act to establish a National Park Service, and for other purposes," approved August 25, 1916 (39 Stat. 535), and acts additional thereto or amendatory thereof.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the United States to be affixed.

DONE at the City of Washington this 14th day of November, in the year of our Lord nineteen hundred and thirty, and of the Independence of the United States of America the one hundred and [SEAL] fifty-fifth.

By the President: HERBERT HOOVER.

HENRY L. STIMSON,
Secretary of State.

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

A PROCLAMATION

[No. 1975—Nov. 30, 1931—47 Stat. 2486]

WHEREAS it appears that the public interest would be promoted by adding to the Petrified Forest National Monument, in the State of Arizona, certain adjoining lands for administrative purposes and the protection of a certain approach highway and additional features of scenic and scientific interest;

NOW, THEREFORE, I, Herbert Hoover, President of the United States of America, by virtue of the power in me vested by section 2 of the act of Congress entitled "AN ACT For the preservation of American antiquities," approved June 8, 1906 (34 Stat. 225), do proclaim that, subject to the rights of the owners of privately owned lands and prior valid claims initiated and maintained pursuant to the land laws of the United States, the following-described lands in Arizona be, and the same are hereby, added to and made a part of the Petrified Forest National Monument: That portion of the W.½ NW.¼ sec. 9 lying south and east of the southern boundary of the Atchison, Topeka & Santa Fe Railway Co.'s right of way in T. 18 N., R. 24 E., Gila and Salt River meridian.

Warning is hereby expressly given to all unauthorized persons not to appropriate, injure, destroy, or remove any feature of this monument and not to locate or settle upon any of the lands thereof.

The Director of the National Park Service, under the direction of the Secretary of the Interior, shall have the supervision, management, and control of this monument as provided in the act of Congress entitled "AN ACT To establish a National Park Service, and for other purposes," approved August 25, 1916 (39 Stat. 535–536), and acts additional thereto or amendatory thereof.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the United States to be affixed.

DONE at the City of Washington this 30th day of November, in the year of our Lord nineteen hundred and thirty-one, and of the Independence of the United States of America the one hundred and fifty-sixth.

[SEAL]

HERBERT HOOVER.

By the President:

HENRY L. STIMSON,
Secretary of State.

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

A PROCLAMATION

[No. 2011—Sept. 23, 1932—47 Stat. 2532]

WHEREAS it appears that the public interest would be promoted by adding to the Petrified Forest National Monument, in the State of Arizona, certain adjoining lands for administrative purposes and the protection of a certain approach highway and additional features of scenic and scientific interest;

NOW, THEREFORE, I, Herbert Hoover, President of the United States of America, by virtue of the power in me vested by section 2 of the act of Congress entitled "AN ACT For the preservation of American antiquities,"

Warning is hereby expressly given to all unauthorized persons not to appropriate, injure, destroy, or remove any feature of this monument and not to locate or settle upon any of the lands thereof.

The Director of the National Park Service, under the direction of the Secretary of the Interior, shall have the supervision, management, and control of this monument as provided in the act of Congress entitled "AN ACT To establish a National Park Service, and for other purposes," approved August 25, 1916 (39 Stat. 535–536), and acts additional thereto or amendatory thereof.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the United States to be affixed.

DONE at the City of Washington this 23rd day of September, in the year of our Lord nineteen hundred and thirty-two, and of the Independence of the United States of America the one hundred and fifty-seventh.

[SEAL]

HERBERT HOOVER.

By the President:

HENRY L. STIMSON,

Secretary of State.

APPENDIX B: LAWS AND EXECUTIVE ORDERS

LEGAL CITATIONS

National Park Service Enabling Legislation

- Act of June 30, 1864, 13 Stat. 325, 16 U.S.C. § 48
- Act of March 1, 1872, 17 Stat. 32, 16 U.S.C. § 21 *et seq*.
- Lacey Act of 1900, as amended by P.L. 97-79, 18 U.S.C. §§ 42-44, Title 50 CFR
- Act of August 25, 1916 (National Park Service Organic Act), P.L. 64-235, 16 U.S.C. § 1 *et seq*. as amended
- Act of June 5, 1920, 41 Stat. 917, 16 U.S.C. § 6
- Act of February 21, 1925, 43 Stat. 958, (temporary act, not classified)
- Act of May 26, 1930, 16 U.S.C. § 17-17j
- Act of March 3, 1933, 47 Stat. 1517
- Parks, Parkways, and Recreational Programs Act, June 23, 1936, 49 Stat. 1894, 16 U.S.C. §§ 17k-n
- Act of August 8, 1953, 16 U.S.C. § 1b-1c
- Act to Improve the Administration of the national park system, August 18, 1970; P.L. 91-383, 84 Stat. 825, as amended by P.L. 94-458, P.L. 95-250, and P.L. 95-625; 16 U.S.C. § 1a1 *et seq*.
- General Authorities Act, October 7, 1976, P.L. 94-458, 90 Stat. 1939, 16 U.S.C. § 1a-1 *et seq*.
- Act amending the Act of October 2, 1968 (commonly called Redwoods Act), March 27, 1978, P.L. 95-250, 92 Stat. 163, 16 U.S.C. §§ 1a-1, 79a-q
- National Parks and Recreation Act, November 10, 1978, P.L. 95-625, 92 Stat. 3467; 16 U.S.C. § 1 *et seq*.
- Alaska National Interest Lands Conservation Act of 1980, P.L. 96-487, 94 Stat. 2371, 16 U.S.C. § 3161 *et seq*.
- NPS resources, improve ability to manage, P.L. 101-337, 16 U.S.C. § 19jj
- National Parks Omnibus Management Act of 1998, P.L. 105-391, Title IV, National Park Service Concessions Management Improvement Act of 1998

OTHER LAWS AFFECTING NATIONAL PARK SERVICE

Accessibility

- Americans with Disabilities Act, P.L. 101-336, 104 Stat. 327, 42 U.S.C. § 12101
- Architectural Barriers Act of 1968, P.L. 90-480, 82 Stat. 718, 42 U.S.C. § 4151 *et seq*.
- Rehabilitation Act of 1973, P.L. 93-112, 87 Stat. 357, 29 U.S.C. § 701 *et seq*. as amended by the Rehabilitation Act Amendments of 1974, 88 Stat. 1617

Cultural Resources

- Abandoned Shipwreck Act of 1987, P.L. 100-298, 102 Stat. 432, 42 U.S.C. § 2101-6
- American Folklife Preservation Act of 1976, P.L. 94-201, 89 Stat. 1130, 20 U.S.C. §§ 2101-2107

- American Indian Religious Freedom Act, P.L. 95-341, 92 Stat. 469, 42 U.S.C. § 1996
- Antiquities Act of 1906, P.L. 59-209, 34 Stat. 225, 16 U.S.C. § 432 and 43 CFR 3
- Archaeological and Historic Preservation Act of 1974, P.L. 93-291, 88 Stat. 174, 16 U.S.C. § 469
- Archaeological Resources Protection Act of 1979, P.L. 96-95, 93 Stat. 712, 16 U.S.C. § 470aa *et seq*. and 43 CFR 7, subparts A and B, 36 CFR 79
- Executive Order 11593: Protection and Enhancement of the Cultural Environment, 3 CFR 1971
- Executive Order 13007: Indian Sacred Sites, May 24, 1996
- Historic Sites Act, P.L. 74-292, 49 Stat. 666, 16 U.S.C. §§ 461-467 and 36 CFR 65
- Historic Preservation Certifications Pursuant to the Tax Reform Act of 1976, the Revenue Act of 1978, the Tax Treatment Extension Act of 1980, and the Economic Recovery Tax Act of 1981, 36 CFR 67
- Management of Museum Properties Act of 1955, P.L. 84-127, 69 Stat. 242, 16 U.S.C. § 18f
- National Historic Preservation Act as amended, P.L. 89-665, 80 Stat. 915, 16 U.S.C. § 470 *et seq*. and 36 CFR 18, 60, 61, 63, 68, 79, 800
- National Trust Act of 1949, P.L. 81-408, 63 Stat. 927, 16 U.S.C. §§ 468c-e
- Native American Grave Protection and Repatriation Act, P.L. 101-601, 104 Stat. 3049, 25 U.S.C. §§ 3001-3013
- Presidential Memorandum of April 29, 1994 "Government-to-Government Relations with Native American Tribal Governments," 59 FR 85
- Protection of Historic and Cultural Properties, E.O. 11593: 36 CFR 60, 61, 63, 800; 44 FR 6068
- Public Buildings Cooperative Use Act of 1976, P.L. 94-541, 90 Stat. 2505, 42 U.S.C. § 4151-4156
- Reservoir Salvage Act of 1960, P.L. 86-523, 70 Stat. 220, 16 U.S.C. §§ 469-469c
- Tax Reform Act of 1976, P.L. 94-455, 90 Stat. 1916
- World Heritage Convention, 1980, P.L. 96-515, 94 Stat. 3000

Natural Resources

- Acid Precipitation Act of 1980, P.L. 96-294, 94 Stat. 770, 42 U.S.C. § 8901 *et seq*.
- Bald and Golden Eagles Protection Act, as amended, P.L. Chapter 28, 54 Stat. 250, 16 U.S.C. §§ 668-668d
- Clean Air Act, as amended, P.L. Chapter 360, 69 Stat. 322, 42 U.S.C. § 7401 *et seq*.
- Coastal Barrier Resources Act of 1982, P.L. 97-348, 96 Stat. 1653, 16 U.S.C. § 3501 *et seq*.
- Coastal Zone Management Act of 1972, as amended, P.L. 92-583, 86 Stat. 1280, 16 U.S.C. § 1451 *et seq*.
- Comprehensive Environmental Response Compensation and Liability Act (commonly referred to as CERCLA or Superfund), P.L. 96-510, 94 Stat. 2767, 42 U.S.C. § 9601 *et seq*.
- Emergency Planning and Community Right-to-Know Act, P.L. 99-499, 100 Stat. 1725, 42 U.S.C. § 1101
- Endangered Species Act of 1973, as amended, P.L. 93-205, 87 Stat. 884, 16 U.S.C. § 1531 *et seq*.
- Endangered Species Conservation Act of 1969

- Estuary Protection Act, P.L. 90-454, 82 Stat. 625, 16 U.S.C. § 1221
- Executive Order 11988: Flood Plain Management, 42 FR 26951, 3 CFR 121 (Supp 177)
- Executive Order 11990: Protection of Wetlands, 42 FR 26961, 3 CFR 121 (Supp 177)
- Executive Order 11991: Protection and Enhancement of Environmental Quality
- Farmland Protection Policy Act of 1982, P.L. 97-98
- Federal Cave Resources Protection Act of 1988, P.L. 94-377, 102 Stat. 4546, 16 U.S.C. § 4301
- Federal Advisory Committee Act of 1972, P.L. 92-463, 86 Stat. 770
- Federal Insecticide, Fungicide, and Rodenticide Act, P.L. 92-516, 86 Stat. 973, 7 U.S.C. § 136 *et seq*.
- Federal Water Pollution Control Act (commonly referred to as Clean Water Act), P.L. 92-500, 33 U.S.C. § 1251 *et seq*., as amended by the Clean Water Act, P.L. 95-217
- Fish and Wildlife Coordination Act of 1958, as amended, P.L. 85-624, 72 Stat. 563, 16 U.S.C. § 661 *et seq*.
- Flood Disaster Protection Act of 1973, P.L. 93-234, 87 Stat. 975, 12 U.S.C. § 24, § 1709-1
- Geothermal Steam Act of 1970, as amended, 84 Stat. 1566, 30 U.S.C. §§ 1001-1027
- Geothermal Steam Act Amendments, P.L. 100-443, 30 U.S.C. §§ 1001, 1105, 1026, 1027
- Manguson Fishery Conservation and Management Act of 1976, P.L. 94-625, 90 Stat. 331m 16 U.S.C. § 1801 *et seq*.
- Marine Mammal Protection Act, P.L. 92-552, 86 Stat. 1027, 16 U.S.C. § 1361 *et seq*.
- Marine Protection, Research, and Sanctuaries Act of 1972 (commonly known as Ocean Dumping Act), P.L. 92-532, 86 Stat. 1052, 16 U.S.C. § 1361 *et seq*.
- Migratory Bird Conservation Act, P.L. Chapter 257, 45 Stat. 1222, 16 U.S.C. § 715 *et seq*.
- Migratory Bird Treaty Act of 1918, P.L. 186, 40 Stat. 755
- National Environmental Policy Act of 1969, P.L. 91-190, 83 Stat. 852, 42 U.S.C. § 4321 *et seq*.
- National Flood Insurance Act of 1968, P.L. 90-448, 82 Stat.572, 42 U.S.C. § 4001 *et seq*., as amended
- National Park System Final Procedures for Implementing E.O. 11988 and 11990 (45 FR 35916 as revised by 47 FR 36718)
- Protection and Enhancement of Environmental Quality, E.O. 11514, as amended, 1970, E.O. 11991, 35 *Federal Register* 4247; 1977, 42 *Federal Register* 26967)
- Resource Conservation and Recovery Act, P.L. 94-580, 30 Stat. 1148, 42 U.S.C. § 6901 *et seq*.
- Rivers and Harbors Act of 1899, 33 U.S.C. Chapter 425, as amended by P.L. 97-332, October 15, 1982 and P.L. 97-449, 33 U.S.C. §§ 401-403
- Safe Drinking Water Act, P.L. 93-523, 88 Stat. 1660, 42 U.S.C. § 300f *et seq*., 42 U.S.C. § 201 and 21 U.S.C. § 349
- Soil and Water Resources Conservation Act of 1977
- Water Resources Planning Act of 1965 (P.L. 89-80, 42 U.S.C. § 1962 *et seq*.) and Water Resource Council's

Principles and Standards, 44 FR 723977
- Watershed Protection and Flood Prevention Act, P.L. 92-419, 68 Stat. 666, 16 U.S.C. § 100186

Other

- Administrative Procedures Act, 5 U.S.C. § 551-559, §§ 701-706
- Aircraft Overflights Study Act of 1987, P.L. 101-91, 101 Stat. 674
- Airport and Airway Development Act of 1970, P.L. 91-258, 84 Stat. 226, 49 U.S.C. § 2208
- Airports in or Near National Parks Act, 64 Stat. 27, 16 U.S.C. §§ 7a-e
- Arizona Desert Wilderness Act (contains NPS boundary study provisions), P.L. 101-628, 16 U.S.C. §§ 1a-5, 460ddd, 460fff, and many more
- Concessions Policy Act of 1965, P.L. 89-249, 79 Stat. 969, 16 U.S.C. § 20 *et seq*.
- Department of Transportation Act of 1966, P.L. 89-670, 80 Stat. 931, 49 U.S.C. § 303
- Disposal of Materials on Public Lands (Material Act of 1947), 30 U.S.C. §§ 601-604
- Energy Supply and Environmental Coordination Act of 1974
- Executive Order 11987: Exotic Organisms, 42 FR 26407
- Executive Order 11989: (42 FR 26959) and 11644: Offroad Vehicles on Public Lands
- Executive Order 12003: Energy Policy and Conservation, 3 CFR 134 (Supp. 1977) 42 U.S.C. § 2601
- Executive Order 12008: Federal Compliance with Pollution Control Standards
- Executive Order 12372: Intergovernmental Review of Federal Programs, 47 FR 30959
- Federal Coal Leasing Amendments Act of 1976, P.L. 94-377, 90 Stat. 1083, 30 U.S.C. § 201
- Federal Land Policy and Management Act, P.L. 94-579, 90 Stat. 199, 43 U.S.C. § 1714 *et seq*.
- Federal Power Act of 1920, P.L. Chapter 285, 41 Stat. 106, 16 U.S.C. § 791a *et seq*.
- Federal Water Power Act, P.L. Chapter 285, 41 D 1063, 16 U.S.C. § 823a, as amended, 16 U.S.C. § 797
- Federal Water Project Recreation Act, 79 Stat. 213, P.L. 89-72, 16 U.S.C. §§ 460/-12 to 460/-21
- Forest and Rangeland Renewable Resources Planning Act, P.L. 95-307, 92 Stat. 353, 16 U.S.C. § 1600 *et seq*.
- Freedom of Information Act, P.L. 93-502, 5 U.S.C. § 552 *et seq*.
- Interagency Consultation to Avoid or Mitigate Adverse Effects on Rivers in the Nationwide Inventory, 45 FR 59189, 08/15/80, ES 80-2
- Intergovernmental Cooperation Act of 1968, P.L. 90-577, 40 U.S.C. §§ 531-535 and 31 U.S.C. §§ 6501-6508
- Intergovernmental Coordination Act of 1969, 42 U.S.C. §§ 4101, 4231, 4233
- Land and Water Conservation Fund Act of 1965, as amended, P.L. 88-578, 78 Stat. 897, 16 U.S.C. §§ 460/-4 to 460/-11
- Mineral Leasing Act for Acquired Lands of 1947, P.L. Chapter 681, 61 Stat. 681, 30 U.S.C. § 351 *et seq*.
- Mineral Leasing Act of 1920, 30 U.S.C. § 181 *et seq*., as amended
- Mineral Materials Disposal Act of 1947, 30 U.S.C. § 601 *et seq*.

- Mining Law of 1872, 30 U.S.C. § 22 *et seq*.
- Mining Activity Within National Park Service Areas, P.L. 94-429, 90 Stat. 1342, 16 U.S.C. § 1901 *et seq*.
- National Trails System Act, P.L. 90-543, 82 Stat. 919, 16 U.S.C. §§ 1241-1251
- National Wildlife Refuge System Administration Act, P.L. 93-509, 88 Stat. 1603, 16 U.S.C. § 668dd-ee
- Noise Control Act of 1972, as amended, P.L. 92-574, 42 U.S.C. § 4901 *et seq*.
- Outdoor Recreation Coordination Act of 1963, P.L. 88-29, 77 Stat. 49
- Outer Continental Shelf Lands Act, P.L. Chapter 345, 67 Stat. 462, 43 U.S.C. § 1331, *et seq*. and § 1801 *et seq*.
- Payment in Lieu of Taxes Act, P.L. 94-565, 90 Stat. 2662, 31 U.S.C. § 6901 *et seq*.
- Policies on Construction of Family Housing for Government Personnel, OMB A-18
- Procedures for Interagency Consultation to Avoid or Mitigate Adverse Effects on Rivers in the Nationwide Inventory, E.S. 80-2, 08/15/80, 45 FR 59191
- Revised Statute 2477, Right-of-Way Across Public Lands, Act of July 26, 1866, 43 U.S.C. § 932 (1976), repealed by FLPMA § 706(a) October 21, 1976
- Surface Mining Control and Reclamation Act, P.L. 95-87, 91 Stat. 445, 30 U.S.C. § 1201 *et seq*.
- Surface Resources Use Act of 1955, 30 U.S.C. § 601 *et seq*.
- Surface Transportation Assistance Act of 1982, 96 Stat. 2097, 23 U.S.C. §§ 101 and many others
- Toxic Substances Control Act, P.L. 94-469, 90 Stat. 2003, 15 U.S.C. § 2601
- Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, P.L. 91-646, 84 Stat. 1894, 42 U.S.C. § 4601 *et seq*.
- Urban Park and Recreation Recovery Act of 1978, P.L. 95-625, 92 Stat. 3467, 16 U.S.C. § 2501 *et seq*.
- Wild and Scenic Rivers Act, P.L. 90-542, 82 Stat. 906, 16 U.S.C. §§ 1271-1287
- Wilderness Act, P.L. 88-577, 78 Stat. 890, 16 U.S.C. §§ 1131-1136
- Wildfire Disaster Recovery Act, P.L. 101-286
- Wildlife Suppression Assistance Act, P.L. 101-11, 42 U.S.C. § 1856m, 1856p

APPENDIX C: SERVICEWIDE MANDATES AND POLICIES

The alternatives considered in this document incorporate and comply with the provisions of the following mandates and policies as funding and staffing allow. Conditions prescribed by servicewide mandates and policies that are particularly important to this document are summarized below. These mandates and policies illustrate that a general management plan is not needed to decide, for instance, that it is appropriate to protect endangered species, control exotic species, protect archeological sites, provide for universal access, and conserve artifacts. These items and other similar issues are already laws, mandates, or policies.

RELATIONS WITH NATIONAL PARK NEIGHBORS

Current policy requires the following:

Relations with National Park Neighbors and Other Agencies Desired Condition	Source
The national park is managed as part of a greater ecological, social, economic, and cultural system. Because the national park is an integral part of a larger regional environment, the National Park Service works cooperatively with others to anticipate, avoid, and resolve potential conflicts, protect national park resources, and address mutual interests. Regional cooperation involves federal, state, and local agencies, Indian tribes, neighboring landowners, and all other concerned parties.	*NPS Management Policies*

The National Park Service will take the following kinds of actions to meet legal and policy requirements related to national park neighbors:

Continue to establish and foster partnerships with public and private organizations to achieve the mission and purposes of the national park. Partnerships will be sought for resource protection, research, education, and visitor enjoyment.

National park staff will keep landowners, land managers, local governments, and the general public informed about national park management activities. Periodic consultations will occur with landowners and communities affected by national park visitors and management actions. The National Park Service will work closely with local, state, and federal agencies and tribal governments whose programs affect or are affected by activities in the national park. National park staff will continue their regular consultations with such entities as: the Arizona State Historic Preservation Office, the Arizona Department of Environmental Quality, American Indian tribes, Apache and Navajo Counties, Arizona, the U.S. Fish and Wildlife Service, the city of Holbrook, Arizona Department of Public Safety, and the Department of Defense.

AIR QUALITY

The national park is a Class I air quality area. Current laws and policies require that the following conditions be achieved in the national park.

Air Quality Desired Condition	Source
Air quality in the national park meets national ambient air quality standards for specified pollutants.	Clean Air Act *NPS Management Policies*
Activities in the national park do not contribute to deterioration in air quality.	Clean Air Act *NPS Management Policies*

The National Park Service has little control over air quality in the southwestern United States. Therefore, the national park must cooperate with other government agencies and the Environmental Protection Agency to monitor and protect air quality. The National Park Service will take the following kinds of actions to meet the legal and policy requirements related to air quality in Petrified Forest National Park.

- Conduct air quality monitoring in conjunction with other government agencies.
- Participate in regional air pollution control plans and regulations.
- Conduct national park operations in compliance with federal, state, and local air quality regulations.

WATER RESOURCES

Current laws and policies require that the following conditions are achieved in the national park.

Water Resources Desired Condition	Source
Surface waters and groundwater are protected and water quality meets all applicable water quality standards.	Clean Water Act Executive Order 11514 *NPS Management Policies*
NPS programs and facilities are maintained and operated to avoid pollution of surface waters and groundwater.	Clean Water Act Executive Order 12088 NPS *Management Policies*
Natural floodplain values are preserved.	Clean Water Act Executive Order 11988 Rivers and Harbors Act *NPS Management Policies*
The natural and beneficial values of wetlands are preserved and enhanced.	Clean Water Act Executive Order 11990 Rivers and Harbors Act *NPS Management Policies*

As with air quality, the National Park Service must cooperate with other government agencies to protect water quality. The National Park Service will take the following kinds of actions to meet legal and policy requirements related to water resources.

- Apply best management practices to all pollution-generating activities and facilities in the national park, such as operating maintenance and storage facilities and parking areas.
- Minimize the use of pesticides and other chemicals and manage them in conformance with NPS policy and federal regulations.
- Promote greater public understanding of water resource issues at Petrified Forest National Park and encourage public support for and participation in protecting the park watershed.
- Continue NPS monitoring program and participation in watershed councils.

GEOLOGIC RESOURCES

Current laws and policies require that the following conditions be achieved in the national park.

Geologic Resources Desired Condition	Source
Natural soil resources and processes function in as natural a condition as possible, except where special considerations are allowable under policy.	*NPS Management Policies*

Soil resources in some portions of the national park are adversely affected by accelerated erosion, compaction, and deposition caused by human activities. The National Park Service will take the following kinds of actions to comply with the legal and policy requirements related to geologic resources.

- Survey areas of the national park with soil resource problems and take actions appropriate to the management prescription to prevent further artificial erosion, compaction, or deposition.
- Apply effective best management practices to problem soil erosion and compaction areas in a manner that stops or minimizes erosion, restores soil productivity, and re-establishes or sustains a self-perpetuating vegetative cover.

PALEONTOLOGICAL RESOURCES

Current laws and policies require that the following conditions be achieved in the national park.

Paleontological Resources Desired Condition	Source
Paleontological resources, including both organic and mineralized remains in body or trace form, are protected and preserved. Paleontological research by the academic community is encouraged and facilitated when the project cannot be conducted outside the park, involves more than simple collection of additional specimens of types already collected, and will answer an important question about the resource Management actions are taken to prevent illegal collecting and may be taken to prevent damage from natural processes such as erosion. Protection may include construction of shelters over specimens, stabilization in the field, or collection, preparation, and placement of specimens in museum collections. The localities and geologic settings of specimens are documented when specimens are collected.	National Parks Omnibus Management Act of 1998, *NPS Management Policies*

Paleontological resources are a primary reason for the establishment of the national park. Much of the park has been surveyed or inventoried for paleontological resources. The National Park Service will take the following kinds of actions to meet legal and policy requirements related to paleontological resources.

- Survey, inventory, and monitor for newly exposed paleontological resources.
- Scientifically significant paleontological resources will be recorded and, if necessary, protected by collection or on-site stabilization.
- Appropriate action will be taken to prevent damage to, and unauthorized collection of, paleontological resources.
- The park will exchange fossil specimens only with other qualified museums and public institutions dedicated to the preservation and interpretation of natural heritage.

SPECIES OF SPECIAL CONCERN

Current laws and policies require that the following conditions be achieved in the national park.

Species of Special Concern Desired Condition	Source
Federal- and state-listed threatened and endangered species and their habitats are protected and sustained.	Endangered Species Act and equivalent state protective legislation *NPS Management Policies*
Populations of native plant and animal species function in as natural condition as possible except where special considerations are warranted.	*NPS Management Policies*
Native species populations that have been severely reduced in or extirpated from the national park are restored where feasible and sustainable.	*NPS Management Policies*

The management of populations of exotic plant and animal species, up to and including eradication, will be undertaken wherever such species threaten national park resources or public health and when control is prudent and feasible.	*NPS Management Policies*

Development and activities in the national park affect native species habitat. For instance, structures, roads, and trails needed for visitor use and national park maintenance influence both native and exotic species distribution. Roads also dissect the natural areas of the national park and may create barriers or hazards for some animals such as invertebrates, snakes, and small mammals.

In the case of species that are rare and subject to collection for American Indian cultural reasons, surveys and monitoring programs will be undertaken to ensure that stable populations of these species are maintained.

The National Park Service will take the following kinds of actions to comply with legal and policy requirements related to native species.

- Inventory plants and animals in the national park. Use the inventory as a baseline against which to regularly monitor the distribution and condition of selected species, including indicators of ecosystem condition and diversity, rare or protected species, and invasive exotics. Modify management plans to be more effective, based on the results of monitoring.
- Support research that contributes to management knowledge of native species.
- Manage exclusively for native plant species in special protection and preservation emphasis. In other management zones, limit planting of nonnative species to noninvasive plants that are justified by the historic scene or operational needs.
- Control or eliminate exotic plants and animals, exotic diseases, and pest species where there is a reasonable expectation of success and sustainability. Base control efforts on:
    - the potential threat to legally protected or uncommon native species and habitats
    - the potential threat to visitor health or safety
    - the potential threat to scenic and aesthetic quality
    - the potential threat to common native species and habitat
- Manage exotic diseases and pest species based on similar priorities.
- Provide interpretive and educational programs on the preservation of native species for visitors.

FIRE MANAGEMENT

Current laws and policies require that the following condition be achieved in the national park.

Fire Management Desired Condition	Source
Park fire management programs will be designed to meet resource management objectives for various areas of the park and to ensure that the safety of firefighters and the public are not compromised. Until a fire management plan is approved, all wildfires will be suppressed, taking into account the resources to be protected, safety of firefighters and the public, and cost.	*NPS Management Policies*

The National Park Service will take the following kinds of actions to comply with this policy:

- Until a fire management plan is approved, suppress all wildfires.
- Develop a park fire management plan.
- Maintain a cooperative agreement for fire suppression in the national park with the Bureau of Land Management and U.S Forest Service.

LIGHTSCAPES

Views of the national park night skies are features that contribute to the visitor experience.

Night Sky Desired Condition	Source
The National Park Service cooperates with national park neighbors to help minimize the intrusion of artificial light into the night sky in the national park. In natural areas, artificial outdoor lighting is limited to basic safety requirements and is shielded when possible.	*NPS Management Policies*

The National Park Service will take the following kinds of actions to comply with this policy:

- National park staff will work with neighbors to encourage protection of the views of the night sky.
- National park staff will evaluate impacts on the night sky caused by facilities in the national park. If light sources in the national park are determined to be affecting views of the night skies, national park staff will study alternatives such as shielding lights, changing lamp types, or eliminating unnecessary light sources.

NATURAL SOUNDSCAPES

An important part of the NPS mission is to preserve or restore the natural soundscapes associated with national park system units. The sounds of nature are among the intrinsic elements that form the environment of our national park system units. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials. Natural sounds are slowly and inexorably disappearing from most national park system units.

Natural Soundscapes Desired Condition	Source
The National Park Service preserves the natural ambient soundscapes, restores degraded soundscapes to the natural ambient condition wherever possible, and protects natural soundscapes from degradation due to human-caused noise. The National Park Service manages disruptions from recreational uses to provide a high-quality visitor experience, striving to preserve or restore natural quiet and natural sounds.	*NPS Management Policies*

The National Park Service will take the following kinds of actions to comply with this policy:

- Activities causing excessive or unnecessary unnatural sounds in and adjacent to the national park, including low-elevation aircraft overflights, will be monitored, and action will be taken to prevent or minimize unnatural sounds that adversely affect national park resources or values or visitors' enjoyment of them. The National Park Service will limit idling of passenger bus engines in parking lots to a few minutes before passengers board.
- Noise generated by NPS management activities will be minimized by strictly regulating administrative functions such as motorized equipment. Noise will be a consideration in the procurement and use of equipment by the national park staff.

ARCHEOLOGICAL RESOURCES

Current laws and policies require that the following conditions be achieved in the national park.

Archeological Resources Desired Condition	Source
Archeological sites are identified and inventoried, and their significance is determined and documented. Archeological sites are protected in an undisturbed condition unless it is determined through formal processes that disturbance or natural deterioration is unavoidable. In those cases where disturbance or deterioration is unavoidable, the site is professionally documented and salvaged.	National Historic Preservation Act, Executive Order 11593, Archeological and Historic Preservation Act, Archeological Resources Protection Act, *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* (1992), Programmatic Memorandum of Agreement among the National Park Service, Advisory Council on Historic Preservation, and National Council of State Historic Preservation Officers (1995), *NPS Management Policies*

About 35% of the national park has been systematically surveyed or inventoried for archeological sites. Precise information about the location, characteristics, significance, and condition of most archeological resources in the national park is lacking, and impacts are difficult to measure. The National Park Service will take the following kinds of actions to meet legal and policy requirements related to archeological sites.

- Survey and inventory archeological resources and document their significance.
- Treat all archeological resources as eligible for listing on the NRHP pending the opinion of the Arizona SHPO and a formal determination by the Keeper of the National Register as to their significance.
- Protect all archeological resources determined eligible for listing or listed on the national register. If disturbance to such resources is unavoidable, conduct formal consultation with the Advisory Council on Historic Preservation (ACHP) and the state historic preservation officer in accordance with the National Historic Preservation Act.

HISTORIC PROPERTIES

Current laws and policies require that the following conditions be achieved in the national park for historic properties, such as buildings, structures, roads, trails, and cultural landscapes.

Historic Properties Desired Condition	Source
Historic properties are inventoried and their significance and integrity are evaluated under National Register of Historic Places criteria. The qualities of historic properties that contribute to their actual listing or their eligibility for listing on the National Register of Historic Places are protected in accordance with the *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* unless it is determined, through a formal process, that disturbance or natural deterioration is unavoidable.	National Historic Preservation Act, Executive Order 11593, Archeological and Historic Preservation Act, *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* (1992), Programmatic Memorandum of Agreement among the National Park Service, Advisory Council on Historic Preservation, and National Council of State Historic Preservation Officers (1995), *NPS Management Policies*

The national park includes several listed National Register of Historic Places sites and several others that are considered eligible for listing. The condition of these cultural resources ranges from fair to good condition. The survey, inventory, and evaluation of cultural resources has begun.

The National Park Service will take the following kinds of action to meet legal and policy requirements related to historic properties.

- Complete a survey, inventory, and evaluation of historic properties under National Register criteria.
- Complete a survey, inventory, and evaluation of cultural landscapes.
- Submit the inventory and evaluation results to the State Historic Preservation Office and the keeper of the National Register with recommendations for eligibility to the National Register.
- Determine the appropriate level of preservation for each historic property formally determined to be eligible for listing or actually listed on the national register, subject to the *Secretary of the Interior's Standards.*

- Implement and maintain the appropriate level of preservation for such properties.
- Identify, inventory, and conserve collections.

ETHNOGRAPHIC RESOURCES

Certain contemporary American Indian and other communities are permitted by law, regulation, or policy to pursue customary religious and other cultural uses of national park resources with which they are traditionally associated. Recognizing that its resource protection mandate affects this human use and cultural context of national park resources, the National Park Service plans and executes programs in ways that safeguard cultural and natural resources while reflecting informed concern for the contemporary peoples and cultures traditionally associated with them.

Ethnographic Resources Desired Condition	Source
Appropriate cultural anthropological research is conducted in cooperation with national park-associated groups.	*NPS Management Policies*
The National Park Service accommodates access to and ceremonial use of American Indian sacred sites by Indian religious practitioners and avoids adversely affecting the physical integrity of these sacred sites.	Executive Order 13007 on American Indian Sacred Sites
NPS general regulations on access to and use of natural and cultural resources in the national park are applied in an informed and balanced manner that is consistent with national park purposes and does not unreasonably interfere with American Indian use of traditional areas or sacred sites and does not result in the degradation of national park resources.	*NPS Management Policies* Executive Order 13007 on American Indian Sacred Sites
Other federal agencies, state, and local governments, potentially affected American Indian and other communities, interest groups, the State Historic Preservation Office, the Tribal Historic Preservation Office, and the Advisory Council on Historic Preservation are given opportunities to become informed about and comment on anticipated NPS actions at the earliest practicable time.	National Historic Preservation Act, Programmatic Memorandum of Agreement among the National Park Service, Advisory Council on Historic Preservation, and the National Council of State Historic Preservation Officers (1995), Executive Order 11593, American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Executive Order 13007 on American Indian Sacred Sites, Presidential Memorandum of April 29, 1994 on Government-to-Government Relations with Tribal Governments, *NPS Management Policies*
The National Park Service consults with tribal governments before taking actions that affect federally-recognized tribal governments. These consultations are open and candid so that all interested parties may evaluate for themselves the potential impact of relevant proposals. National park staff regularly consult with traditionally associated American Indians regarding planning, management, and operational decisions that affect sacred places or other ethnographic resources with which they are historically associated.	American Indian Religious Freedom Act, Presidential Memorandum of April 29, 1994 of Government-to-Government Relations with Tribal Governments, *NPS Management Policies*

Ethnographic Resources Desired Condition	Source
The identities of community consultants and information about sacred and other culturally sensitive places and practices are kept confidential.	*NPS Management Policies*
American Indians and other individuals and groups linked by ties of kinship or culture to ethnically identifiable human remains are consulted when remains may be disturbed or are encountered on national park lands.	*NPS Management Policies*

To accomplish these goals, the National Park Service will do the following:

- Survey and inventory ethnographic resources and document their significance.
- Treat all ethnographic resources as eligible for listing on the National Register of Historic Places pending a formal determination by the National Park Service and the Arizona State Historic Preservation Office as to their significance.
- Protect all ethnographic resources determined eligible for listing or listed on the National Register; if disturbance to such resources is unavoidable, conduct formal consultation with Advisory Council on Historic Preservation and the State Historic Preservation Office in accordance with the National Historic Preservation Act.
- Conduct regular consultations with affiliated tribes to continue to improve communications and resolve any problems or misunderstandings that occur.
- Make reasonable accommodations for access to and use of natural and cultural resources in the national park as long as the activities are consistent with national park purposes. The National Park Service will not unreasonably interfere with American Indian use of traditional areas or sacred sites.

In addition, consultation with affiliated Indian tribes was conducted throughout the course of the planning process for this document.

COLLECTIONS

Current laws and policies require that the following condition be achieved in Petrified Forest National Park.

Collections Desired Condition	Source
All museum objects and manuscripts are identified and inventoried, and their significance is determined and documented. Collections are protected in accordance with established standards.	National Historic Preservation Act, American Indian Religious Freedom Act, Archaeological and Historic Preservation Act, Archaeological Resources Protection Act, Native American Graves Protection and Repatriation Act, *NPS Management Policies*

The Petrified Forest National Park museum collections are at risk. Improper storage and lack of adequate security and fire protection at facilities where the collections are housed threaten their safety and integrity. Significant portions of the archeological and historical collections are not catalogued. The National Park Service will take the following kinds of actions to meet legal and policy requirements related to collections.

- Inventory and catalogue all of the national park's museum collection in accordance with standards outlined in the *NPS Museum Handbook* (NPS 1976).
- Develop and implement a collection management program according to NPS standards to guide protection, conservation, and use of museum objects.

VISITOR EXPERIENCE AND USE REQUIREMENTS

Current laws and policies require that the following conditions be achieved in Petrified Forest National Park.

Visitor Experience and Use Desired Condition	Source
Visitor and employee safety and health are protected.	*NPS Management Policies*, General Authorities Act
Visitors understand and appreciate national park values and resources and have the information necessary to adapt to the national park environments. Visitors have opportunities to enjoy the national park in ways that leave national park resources unimpaired for future generations.	NPS Organic Act Petrified Forest National Park enabling legislation *NPS Management Policies*
Recreational uses in the national park are promoted and regulated. Basic visitor needs are met in keeping with the national park purposes.	NPS Organic Act Petrified Forest National Park enabling legislation Title 36 of the Code of Federal Regulations *NPS Management Policies*
To the extent feasible, facilities, programs, and services in the national park are accessible to and usable by all people, including those with disabilities.	The Architectural Barriers Act of 1968; the Americans with Disabilities Act of 1990 and 28 CFR Part 36 (most current) on Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities (ADAAG – ADA) Accessibility Guidelines for Buildings and Facilities: *NPS Management Policies*; the Uniform Federal Accessibility Standards of 1984 (UFAS); the U.S. Access Board Draft Accessibility Guidelines for Outdoor Developed Areas of 1999; the Rehabilitation Act of 1973; Secretary of the Interior's regulation 43 CFR 17 – Enforcement on the Basis of Disability in the Interior Programs

Regulations governing visitor use and behavior in units of the national park system are contained in 36 CFR. These regulations have the force of law and include a variety of use limitations, such as limits on commercial activities.

The National Park Service will take the following kinds of actions to meet legal and policy requirements related to visitor experience and use at the national park:

- Provide opportunities for visitors to understand, appreciate, and enjoy the national park.
- Ensure that all national park programs and facilities are accessible to the extent feasible.
- Continue to enforce the regulations in 36 CFR.

These laws, regulations, and policies leave room for judgment regarding the best mix of types and levels of visitor-use activities, programs, and facilities. The alternatives presented and evaluated in this general management plan revision represent different approaches to visitor experience and national park use.

The National Park Service will take the following kinds of actions to meet legal and policy requirements related to accessibility.

- Architectural and Site Access. The National Park Service will develop strategies to ensure that all new and renovated buildings and facilities, including those provided by concessioners, are designed and constructed in conformance with applicable rules, regulations, and standards. Existing buildings and facilities will be evaluated to determine the degree to which they are currently accessible to and usable by people with disabilities, and to identify barriers that limit access. Each national park system unit will develop action plans identifying how those barriers will be removed. Action plan elements and funding strategies should be included within annual and strategic (five-year) plans.
- Programmatic Access. The National Park Service will develop strategies to ensure that all services and programs, including those offered by concessioners and interpreters, are designed and implemented in conformance with applicable rules, regulations, and standards. Existing programs and activities (including interpretation, communication, media, and Web pages) will be evaluated to determine the degree to which they are currently accessible to and usable by people with disabilities, and to identify barriers that limit access. Each national park system unit will develop action plans to identify how those barriers will be removed. Action plan elements and funding strategies should be included in annual and strategic plans.
- National park-specific discussion should include: the types of national park experiences offered and how a representative range of experiences are offered to those with disabilities; any factors likely to limit access solutions or require alternative forms of access (steep grades, historic structures, special circumstances, and restrictions on service animals). Every attempt should be made to provide

access to essential national park experiences.

SUSTAINABLE DESIGN/DEVELOPMENT

Sustainability can be described as the result achieved by doing things in ways that do not compromise the environment or its capacity to provide for present and future generations. Sustainable practices minimize the short- and long-term environmental impacts of developments and other activities through resource conservation, recycling, waste minimization, and the use of energy efficient and ecologically responsible materials and techniques.

Sustainable Design/Development Desired Condition	Source
NPS visitor and management facilities are harmonious with national park resources, compatible with natural processes, aesthetically pleasing, functional, as accessible as possible to all segments of the population, energy efficient, and cost effective.	*NPS Management Policies*

The NPS *Guiding Principles of Sustainable Design* (1994) directs NPS management philosophy. It provides a basis for achieving sustainability in facility planning and design, emphasizes the importance of biodiversity, and encourages responsible decisions. The guidebook articulates principles to be used in the design and management of tourist facilities that emphasize environmental sensitivity in construction, use of nontoxic materials, resource conservation, recycling, and integration of visitors with natural and cultural settings. Sustainability principles have been developed and are followed for interpretation, natural resources, cultural resources, site design, building design, energy management, water supply, waste prevention, and facility maintenance and operations. The Park Service also reduces energy costs, eliminates waste, and conserves energy resources by using energy-efficient and cost-effective technology. Energy efficiency is incorporated into the decision-making process during the design and acquisition of buildings, facilities, and transportation systems emphasizing the use of renewable energy sources.

In addition to following these principles, the following will also be accomplished:

- National park staff will work with appropriate experts to make the national park facilities and programs sustainable. Value analysis and value engineering, including life-cycle cost analysis, will be performed to examine the energy, environmental, and economic implications of proposed national park developments.
- National park staff will support and encourage suppliers, permittees, and contractors to follow sustainable practices.

APPENDIX D: DEVELOPMENT OF THE PLAN

Work on the Petrified Forest Draft General Management Plan Revision/Environmental Impact Statement began in November 2000. The planning team consisted of Petrified Forest National Park staff, specialists from the NPS Intermountain Support Office, and from the consulting firm, engineering-environmental Management, Inc. (e^2M). Early in the planning process the park's mission, purpose, and significance were reaffirmed, legislative mandates and constraints were considered, and issues to be addressed by the GMP were identified.

The next major step was to develop a range of alternatives for managing the park. The planning team gathered and studied information on park resources, visitor use, and planning issues. With this information, the team developed five preliminary alternative concepts (including a no-action alternative) for managing natural and cultural resources and visitor use. These concepts were presented to the public in a newsletter and comments from the public were collected and reviewed.

Based on public input and further consideration, the planning team decided that two of the alternative concepts were not sufficiently distinct to allow a complete alternative to be developed from them. Thus, two of the concepts were dropped and ideas from them were incorporated into the remaining concepts. Three full draft alternatives were then developed from the remaining concepts. These draft alternatives were then presented at a public meeting, and again comments were collected and reviewed.

The next step was to identify a preferred alternative. The three draft alternatives (including the no-action alternative) were evaluated. The planning team used an evaluation process called "Choosing by Advantages." This process evaluates different choices (in this case, the three alternatives) by identifying and comparing the relative advantages of each according to a set of criteria. In this case, the criteria were based on the park's mission, purpose, significance, laws, policies, and public concerns.

The criteria are listed below, not in priority order.

- Protects/preserves the Painted Desert headquarters complex
- Protects/preserves other cultural resources
- Protects/preserves natural resources and processes
- Fosters and enhances scientific research related to the park
- Provides opportunities to understand, experience, and enjoy the park and its resources
- Preserves or enhances wilderness values
- Provides for efficient and sustainable operations
- Provides for visitor and staff safety
- Provides other NPS advantages (community/partner relations, socioeconomic benefits, etc.)

The team identified the relative advantages of each alternative for each of the nine criteria. Each *advantage* (not each factor) was given a point value that reflected its importance. Then, by adding up the scores for each

alternative the team was able to determine how the alternatives compared overall. Costs of implementing the alternatives were then compared to examine the relationships between advantages and costs.

The relative advantages of the alternatives for each criterion are summarized below:

Protects/preserves the Painted Desert headquarters complex— Alternative 3 best met this criterion because most historic structures in the complex would be preserved and adapted for park uses according to a comprehensive master plan. Alternative 1 was next best according to this criterion. It would keep the historic structures over the short term, but they would continue to deteriorate and their historic integrity would be compromised from cumulative alterations over the years. Their protection and preservation would not be ensured over the long term.

Protects/preserves other cultural resources— Alternative 3 would protect other cultural resources slightly better than alternative 4. Alternative 1 scored lowest because ongoing threats to the park's museum collections, archeological resources, cultural landscapes, and historic structures would not be averted.

Protects/preserves natural resources and processes— Alternative 3 scored best according to this criterion, primarily because it would best protect petrified wood and other fossils. Alternative 4 scored next highest, and alternative 1 scored lowest.

Fosters and enhances scientific research related to the park— Alternatives B and C scored equally well with respect to this criterion. Both would improve laboratory work space and temporary housing for researchers. Alternative 1 scored lowest for this criterion.

Provides opportunities to understand, experience, and enjoy the park and its resources— Alternative 4 would provide the best opportunities for understanding, experiencing, and enjoying the park due primarily to new trail opportunities, expanded visitor services, renovated facilities, and improved accessibility. Alternative 3 scored slightly lower than alternative 4, and alternative 1 scored lowest.

Preserves or enhances wilderness values— The alternatives were not much different with respect to this criterion. Alternative 3 scored slightly higher than alternative 1, and alternative 4 scored lowest.

Provides for efficient and sustainable operations— Alternative 4 would best provide for efficient and sustainable operations, primarily because new structures at the Painted Desert headquarters complex would best meet functional and space requirements, improve staff morale, and provide for more sustainable operations. Alternative 3 scored considerably lower than alternative 4, and alternative 1 scored lowest for this criterion.

Provides for visitor and staff safety— Alternative 4 was rated slightly better than alternative 3 for providing visitor and staff safety. Alternative 1 scored lowest. The advantages of alternatives B and C over alternative 1 were mostly attributable to safety and health improvements at the Painted Desert headquarters complex.

Provides other NPS advantages (community/partner relations, socioeconomic benefits, etc.)— Alternative 3 scored best for this

criterion. Alternative 4 scored only slightly higher than alternative 1, which was rated lowest.

DEVELOPMENT OF ALTERNATIVE 2 (PREFERRED ALTERNATIVE)

After studying the advantages of the draft alternatives according to the nine criteria in the foregoing discussion, the planning team developed a preferred alternative. A first step was to decide how to manage the Painted Desert headquarters complex. This decision took priority because: (1) the Choosing by Advantages process indicated that the most important differences between the alternatives (relative to the nine criteria) were linked to management of the headquarters complex, and (2) reevaluating how to manage the complex was a main reason for undertaking a revision of the 1992 *General Management Plan*.

The Painted Desert Headquarters Complex

Based on a recent Petrified Forest building condition assessment and "class C" cost estimates, the planning team assumed that adaptive re-use of the complex would include a comprehensive approach for rehabilitation of the buildings to correcting existing problems. This would result in greatly improved workspaces and residences. Comprehensive rehabilitation would also greatly reduce short-term repair demands and provide significant improvements in operational efficiency and safety. Not all problems would be entirely eliminated, but the historic structures would be functional and stable. Although efficiency and safety would be even better if the historic complex were removed and replaced with new buildings, the complete, irreversible loss of the historic complex would be contrary to historic preservation laws and NPS policies.

New construction of the Painted Desert headquarters complex would include durable materials and systems, plus other measures to reduce recurring maintenance needs. It would be designed and constructed to address local soils conditions, and construction would be closely monitored to ensure quality control. The lack of these considerations during construction of the existing headquarters complex have led to many of the existing problems with the complex. New construction would provide the greatest advantage in operational efficiency and sustainability, particularly providing energy-efficient and healthful working environments. Newly constructed buildings would still require maintenance, however, and the possibility of structural or functional problems would not be entirely eliminated.

The least expensive option studied for the headquarters is no action or status quo management. In this case, some $11 million would be spent over the next 25 years with incomplete improvements to operations and safety, and the buildings would continue to decline. The next lowest life-cycle cost is $15 million for replacing the complex with new buildings. Life-cycle costs for adaptively re-using the complex range from 4% to 50% higher than the cost of replacement, depending on the amount of limited new construction combined with adaptive re-use. Within the adaptive re-use option, selectively providing more new construction and removing the most deteriorated structures (while keeping the integrity of the historic complex) would provide the most advantages: greater operational efficiency and

safety while keeping costs similar to total reconstruction.
Given that the costs of adaptive re-use and replacement are similar, it turned out that money was not a major factor in deciding how to manage the headquarters complex over the life of this plan. The major considerations were protection of the historic complex and the amount of improvement in operational efficiency and safety. Although adaptive re-use would not be as effective as new construction in improving operational efficiency and safety, it would provide significantly better conditions than today. Adaptively re-using the historic complex (rather than removing and rebuilding the headquarters facility) was judged more important than the improved operational efficiency gained by new construction.

Thus, the planning team chose to zone Painted Desert headquarters complex as Historic Preservation/Adaptive Use in alternative 2, which means that most historic structures in the complex would be kept and adapted for NPS-related purposes. This choice best represents the values of the National Park Service by balancing historic preservation, operational efficiency, visitor and staff safety, and value for taxpayer dollars.

Other Elements of Alternative 2

Once the management zoning and philosophy for the Painted Desert headquarters complex was decided, the next step was to decide the main conceptual elements of alternative 2. These elements are as follows:

- Merge the best resource protection aspects of alternative 3 with the opportunities for visitor experience and understanding from alternative 4 that have least impacts.
- Maximize options to adapt to future changes, unknown conditions, and new information.
- Demonstrate fiscal responsibility and value.

The planning team continued to build alternative 2. Using the conceptual elements listed above and information from the Choosing by Advantages process, management zones were applied to each area of the park to indicate the management intent for each area. The team then discussed what actions the National Park Service would be most likely to take over the next 15–20 years, given the preferred alternative's concept, the management zones, current conditions in the park, and environmental constraints. For additional details about the preferred alternative, see the "Alternative 2" section of chapter 2.

APPENDIX E: CONSULTATION LETTERS

"D18: GMP Revision"

Arizona Department of Transportation

Transportation Planning Division
206 S. 17th Ave. Phoenix, Arizona 85007-3212
Phone 602.712.7333 FAX 602.712.3046

Jane Dee Hull
Governor

Mary E. Peters
Director

Mary Lynn Tischer
Division Director

28 February 2001

Ms. Michele M. Hellickson, Superintendent
Petrified Forest National Park
P.O. Box 2217
Petrified Forest, AZ 86028

Dear Ms. Hellickson:

After reviewing the materials that you have provided and our discussion on the revision of The 1992 Petrified Forest National Park General Plan (GMP) and the preparation of a new Wilderness Management Plan (WMP) for the Petrified Forest National Park, it would appear that at this time there are no issues of concern to the Arizona Department of Transportation on which the Department needs to comment. An exception is the possible expansion of the boundaries of the wilderness area. If this were to occur, it could have implications for US 180.

If the wilderness boundaries are extended, I look forward to working cooperatively with you to identify and define a solution that meets the needs of both the Park and the Department.

Sincerely,

Dale Buskirk
Deputy Director
Transportation Planning Division

DB/dh

RECEIVED
FEB 28 2001
PETRIFIED FOREST NATIONAL PARK

United States Department of the Interior

NATIONAL PARK SERVICE
Petrified Forest National Park
Arizona 86028

IN REPLY REFER TO:

D18

January 22, 2001

Andrea Alpine, Regional Director's Representative
Western Region
U.S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025

various addresses attached

Dear Ms Alpine:

Petrified Forest National Park and National Park Service Intermountain Region staff are beginning two new planning initiatives, they are: **1) Revise the 1992 Petrified Forest National Park General Management Plan** and **2) Prepare a new Wilderness Management Plan for Petrified Forest National Park**. The wilderness management plan will build upon the management prescriptions in the general management plan revision. A series of newsletters (*Newsletter 1,* attached) will be prepared to inform agencies and interested individuals of planning progress and to provide a forum for comments concerning management issues.

Petrified Forest National Park is located approximately 25 miles east of Holbrook, AZ. It is a globally significant park, containing exposures of the late Triassic Chinle Formation with forest and vertebrate fossils dating more than 200 million years of age.

To assist Petrified Forest National Park and the National Park Service in refining issues to be addressed in the General Management Plan revision and the Wilderness Management Plan, please provide us with written comments concerning interests within your agency's responsibilities. Please pay particular attention to the following sections of the enclosed newsletter: Preliminary Issues for the General Management Plan Revision, Park Purpose and Significance, and Petrified Forest Wilderness Management Issues.

Your response within 30 days from the receipt of this letter will be greatly appreciated. If you have any questions regarding this request, please contact me at (520) 524-~~6726~~ 6228 x225 or by electronic mail, Michele_Hellickson@nps.gov. Thank you for your participation in these planning efforts.

Sincerely,

Michele M. Hellickson, Superintendent
Petrified Forest National Park
P. O. Box 2217
Petrified Forest, AZ 86028
http://www.nps.gov/planning/pefo

Attachment: Newsletter 1

"D18: GMP Revision"

THE HOPI TRIBE

Wayne Taylor, Jr.
CHAIRMAN

Phillip R. Quochytewa, Sr.
VICE-CHAIRMAN

February 7, 2001

Michele M. Hellickson, Superintendent
Petrified Forest National Park
P.O. Box 2217
Petrified Forest, Arizona 86028

Dear Micki,

Thank you for your letter dated January 22, 2001, with the enclosed *Newsletter 1*, regarding Petrified Forest and National Park Service Regional staff beginning two new planning initiatives, revision of the 1992 *General Management Plan*, and preparation of a new *Wilderness Management Plan*.

As you know, the Hopi Tribe claims cultural affiliation to the *Hisatsinom*, People of Long Ago, including the prehistoric cultural groups in Petrified Forest National Park. Therefore we appreciate your solicitation of our input and your efforts to address our concerns, and we wish to participate in these planning initiatives.

Therefore, to assist Petrified Forest National Park and the National Park Service in refining issues important to the Hopi Tribe to be addressed by the *General Management Plan* revision and the *Wilderness Management Plan,* the Hopi Cultural Preservation Office invites the appropriate Petrified Forest and National Park Service regional staff, and you, to make a presentation on these two new planning initiatives at our March, 2001, administrative meetings.

Please contact Lanell Yeoytewa at the Hopi Cultural Preservation Office to set up an appointment. Thank you again for your consideration.

Respectfully,

Leigh J. Kuwanwisiwma, Director
Cultural Preservation Office

RECEIVED
FEB 12 2001
PETRIFIED FOREST
NATIONAL PARK

xc: Suzy Stutzman, MSC IMDE-PE, NPS, P.O. Box 25287, Denver, CO 80225-9811

P.O. BOX 123 — KYKOTSMOVI, AZ. — 86039 — (520) 734-3000

"D18: GMP Revision"

THE HOPI TRIBE

Wayne Taylor, Jr.
CHAIRMAN

Phillip R. Quochytewa, Sr.
VICE-CHAIRMAN

May 21, 2001

Michele M. Hellickson, Superintendent
Attention: Water Line Project
Petrified Forest National Park
P.O. Box 2217
Petrified Forest, Arizona 86028

Dear Micki,

Thank you for your letter dated May 16, 2001, regarding a proposed project involving the potential replacement of a 13 mile waterline between the Puerco River and Rainbow Forest, with an additional 12 miles of distribution lines which serve Park facilities. As you know, the Hopi Tribe claims cultural affiliation to the *Hisatsinom*, People of Long Ago, including the prehistoric cultural groups in Petrified Forest National Park. Therefore we appreciate your continuing solicitation of our input and your efforts to address our concerns.

The Hopi Cultural Preservation Office understands that an Environmental Assessment is being prepared for this proposal. To assist us in identifying if this proposal may affect cultural resources significant to the Hopi Tribe, please provide us with cultural resources surveys of the areas of potential effect.

As you also know from our letter dated February 7, 2001, regarding revision of the 1992 *General Management Plan*, and preparation of a new *Wilderness Management Plan*, we are interested in assisting Petrified Forest National Park and the National Park Service in refining issues important to the Hopi Tribe to be addressed by the *General Management Plan* revision and the *Wilderness Management Plan*. Unfortunately, the Hopi Cultural Preservation Office was unable to send a representative in response to your letter dated March 7, 2001, to the April 17 workshop.

Therefore, the Hopi Cultural Preservation Office reiterates our invitation to the appropriate Petrified Forest and National Park Service regional staff and you to make a presentation on these two new planning initiatives at our June, 2001, administrative meetings. Please contact the Hopi Cultural Preservation Office to set up an appointment, and thank you again for your consideration.

Respectfully,

Leigh J. Kuwanwisiwma, Director
Cultural Preservation Office

xc: Suzy Stutzman, MSC IMDE-PE, NPS, P.O. Box 25287, Denver, CO 80225-9811

P.O. BOX 123 — KYKOTSMOVI, AZ. — 86039 — (520) 734-3000

"D18: GMP Revision"

PAINTED DESERT PETRIFIED FOREST

Operated By AmFac Parks & Resorts

RECEIVED
FEB - 5 2001
PETRIFIED FOREST NATIONAL PARK

February 5, 2001

Michele M. Hellickson
Superintendent
Petrified Forest National Park
Petrified Forest, AZ 86028

Dear Micki:

Thank you for allowing us the opportunity to comment on the General Management Plan Revision. We have provided our comments below, which we have numbered to correspond with the list of Preliminary Issues for the General Management Plan Revision.

Paragraph 1

Amfac's retail shops have sold a substantial amount of petrified wood each year to Petrified Forest National Park visitors. There is no doubt that a petrified wood sample purchased from our gift shops is an appropriate memento of a visit to Petrified Forest National Park that enhances the visitor experience. The sale of this product is regionally appropriate, interpretive and educational.

Further, offering petrified wood collected outside park boundaries in our gift shops encourages and promotes conservation of park resources. Understandably, our guests desire a tangible memory of their visit to Petrified Forest National Park, and they want that memory from inside the Park. If we do not make a variety of petrified wood products available at both the North and South end of the Park, visitors will be further tempted to remove "just a small piece" for their memories of the Park. Thus, we agree with the concern expressed in paragraph 1 that the theft of petrified wood would be more serious if our guests did not have immediate access to a retail store for purchase of a petrified wood memento.

We understand that there is the potential for confusion when a store in the Park is selling a product that is otherwise illegal to remove from the Park. But we believe that with proper interpretation and signage this can be resolved and serve as a great educational tool for our guests.

Paragraph 4

We offer some of the best housing available in the National Park system to our employees. All of the management housing has been renovated in the last year and three of the five employee units have been improved in the last two years. Our current housing allotment appears adequate for our needs and we see no reason for the removal of our manager/staff trailers.

Painted Desert Oasis - Rainbow Forest, P.O. Box 2247, Pertrified Forest National Park, Arizona 86025, Fax: (520) 524-1904, Phone: (520) 524-3756

Paragraph 9

The Petrified Forest National Park concessionaire fulfills a "necessary and appropriate" function for the use and enjoyment of the visitor. The concessionaire has a unique opportunity to further the message of protection, conservation, and preservation of the environment. Equally important, the concessionaire fulfills a basic and important food/beverage, service station, and retail function for guests. Our operations carry diversified products at varied price ranges allowing each guest an opportunity to memorialize their special visit.

Furthermore, our guests expect on-site services. They do not want to wait thirty minutes to reach Holbrook or one hour to reach Gallup for their needs to be met. Our guest wants to shop in the Park, dine in the Park, and fill their gas tanks in the Park. These activities also become a part of their park experience. In addition, our facilities have been used numerous times when emergencies occur on I-40.

Thank you for considering these comments. Please keep us apprised of developments on the General Management Plan Revision and Wilderness Management Plan.

Sincerely,

Jerry Schadt
General Manager

cc: MSC IMDE-PE
Suzy Stutzman
National Park Service
P. O. Box 25287
Denver, CO 80225-9811

Steve Lynam – Vice President
Retail Division
Amfac Parks & Resorts Inc.
Suite 217
14001 E. Iliff Ave.
Aurora, Co 80014

"D18: GMP Revision"

USGS
science for a changing world

U. S. Department of the Interior
U. S. GEOLOGICAL SURVEY
BIOLOGICAL RESOURCES DIVISION
WESTERN ECOLOGICAL RESEARCH CENTER
California State University, Sacramento
6000 J Street, Placer Hall
Sacramento, CA 95819-6129

April 23, 2001

APR 2 6 2001

Michele Hellickson, Superintendent
Petrified Forest National Park
P.O. Box 2217
Petrified Forest, AZ 86028

Dear Ms. Hellickson,

I am in receipt of your letter to Andrea Alpine, USGS Regional Director's Representative, dated January 22, 2001. In the letter you invited comments from the USGS with respect to the revision of your 1992 Petrified Forest National Park General Management Plan, and preparation of your new Wilderness Management Plan.

We appreciate the offer to comment, but at this time the Western Ecological Research Center of the USGS, Biological Resources Division does not have any research activities in the vicinity of your Park. If you would like more information about our Center or our research activities, please visit our website at http://www.werc.usgs.gov/ or feel free to contact my Research Manager, Dr. Jeff Lovich at (916) 278-3210.

Sincerely,

DC Maxwell

Deborah Maxwell
Center Director

APPENDIX F: WILD AND SCENIC RIVER EVALUATION

INTRODUCTION

This appendix presents the results of a National Park Service (NPS) study of potential Wild and Scenic Rivers in Petrified Forest National Park. Congress created the National Wild and Scenic Rivers System. In October of 1968, the freshly penned Wild and Scenic Rivers Act pronounced:

> *"…that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations."*

NPS Management Policies 2001 state that the National Park Service will compile a complete listing of all rivers and river segments in the national park system that it considers eligible for the national Wild and Scenic Rivers system. The purpose of this study was to determine whether any of the rivers or washes in Petrified Forest National Park are eligible for inclusion in the national Wild and Scenic Rivers System.

The Wild and Scenic River study process, as described in the *National Wild and Scenic Rivers System: Final Revised Guidelines for Eligibility, Classification, and Management of River Areas* (1982), is composed of three steps:

- Determine if rivers are eligible as components of the National Wild and Scenic Rivers System.
- Determine the appropriate classification of rivers.
- Determine whether the eligible segments would make suitable additions to the National Wild and Scenic Rivers System.

Of the rivers and washes in Petrified Forest National Park, this study finds that the reach of the Puerco River within the current park boundary is eligible and suitable for designation as a scenic river area, but not recommended for designation at this time.

ELIGIBILITY EVALUATION

To be eligible for inclusion in the national Wild and Scenic Rivers System, a study segment must be free flowing and the stream corridor must exhibit at least one outstandingly remarkable resource value.

"Free flowing" means existing in a largely natural condition without major impoundments, diversions, or other modifications of the waterway. There are no specific requirements for minimum flow for eligible segments. Flows are considered sufficient for eligibility if they sustain or complement the outstandingly remarkable values for which the segment would be designated. Rivers with intermittent flows have been included in the national park system.

Outstandingly Remarkable Values are scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values that are professionally judged to be regionally significant—those that stand out as among the best on a regional basis. All resources assessed should be directly river-related, or

owe their location or existence to the river. Features that are exemplary (outstanding examples of common types), as well as those that are rare or unique, should be considered.

OUTSTANDINGLY REMARKABLE VALUES

An assessment of potential outstandingly remarkable values was made by NPS professionals for the major rivers and washes of the park: Lithodendron Wash, Digger Wash, Wild Horse Wash, Puerco River, Dead Wash, Nine-Mile Wash, Dry Wash, Jim Camp Wash, and Cottonwood Wash. Resources evaluated include biological resources, paleontological resources, and cultural resources. Scenic and recreation values were not considered because these values would be similar for all segments, and would be similar to such values throughout the park. They would not be specifically river- or wash-related.

Lithodendron Wash

The Lithodendron is a southwest flowing wash that originates mainly within the northeastern portion of the Painted Desert section of Petrified Forest National Park. It is the main drainage for this area, eventually draining into the Puerco River west of the park. The north bank of Lithodendron Wash within Petrified Forest National Park serves as the boundary of the Painted Desert Wilderness Area.

This stream flows intermittently, primarily after storm events during the summer monsoon and winter seasons. Small, clayey areas along the banks and in shadow most of the day tend to hold water for up to a month after storm events. Limited biological resource surveys have been conducted along this wash. Most of the information regarding species has come from casual observations by park staff and visitors. Mule deer are known to frequent the area. Tamarisk and Russian olive are exotic shrub species found along the wash banks, and they appear to be spreading. No rare, threatened, or endangered plant or animal species have been observed. No significant biological resources have been reported along Lithodendron Wash.

The Lithodendron possesses a fairly broad floodplain of Quaternary alluvial deposits that could possess historical or archeological sites. Two prehistoric archeological sites are located within 200 meters of Lithodendron Wash. Two historical sites include the original Zuni Well and the final Zuni Well, which were originally drilled as prospective oil wells. The final site provided water to the Painted Desert Rim for several years. These wells are no longer in use but the historical structures associated with them still exist. The Quaternary alluvial sediments surrounding the river could possess fossil vertebrates of this age. The wash also cuts through Triassic age sediments, which are exposed at several places along its course. In and northeast of the Black Forest, fossil logs are exposed along the banks. These areas also have potential for containing Triassic vertebrate, invertebrate, and leaf fossils. Historically the Lithodendron area was part of a major transportation corridor. This corridor still exists. Some of the first exposures of fossil wood in the American Southwest were made in Lithodendron Wash by U.S. Army exploration parties following the corridor.

National Park System areas are authorized by Congress because they have “nationally significant resource values.” These values in turn can be considered “Outstandingly

Remarkable Values" in the terminology of the Wild and Scenic Rivers Act. Therefore, a case might be made that all rivers in a national park system unit meet the criteria for Wild and Scenic River status. It seems unlikely this was ever congressional intent. The resources in proximity to Lithodendron Wash are typical of those found throughout the park, and do not owe their existence to the presence of the wash. Therefore, the wash is not considered to meet eligibility criteria.

Digger Wash

Digger Wash is an intermittent stream within the Painted Desert Wilderness Area. It originates on the western slopes of Chinde Mesa, and flows southwestward through the Painted Desert portion of the park to the western boundary. Before its inclusion in the park, this area was used for livestock grazing. Historical reports mention livestock tanks still being present in some places along its course. No formal biological surveys have been done along this watercourse. No rare, threatened, or endangered plant or animal species have been reported along Digger Wash.

This area has not been surveyed for paleontological resources, but it is most likely similar to the Lithodendron in this respect. No archeological sites have been documented within 200 meters of Digger Wash. However, little of the area surrounding this wash has been surveyed, so very limited data is available.

National park system areas are authorized by Congress because they have "nationally significant resource values." These values in turn can be considered "Outstandingly Remarkable Values" in the terminology of the Wild and Scenic Rivers Act. Therefore, a case might be made that all rivers in a national park system unit meet the criteria for Wild and Scenic River status. It seems unlikely that this was congressional intent. The resources in proximity to Digger Wash are typical of those found throughout the park, and do not owe their existence to the presence of the wash. Therefore, the wash is not considered to meet eligibility criteria.

Wildhorse Wash

Wildhorse Wash is a small, south flowing drainage which originates in the southwestern section of the Painted Desert portion of the park, flowing into the Lithodendron just before it reaches the southwestern park boundary. It is an intermittent stream within the Painted Desert Wilderness Area. No formal biological surveys have been done along this watercourse. No rare, threatened, or endangered plant or animal species have been reported along Wildhorse Wash.

In its southern reaches, Wildhorse Wash has Quaternary overbank deposits, which could include archeological resources. In its northern extremity, the wash deeply cuts into Triassic Chinle Formation exposures known to be fossiliferous. The wash has cut several of the sandstone units along its course into scenic areas of hoodoos and sculptured rock, making the area one of the most scenic in the park. No archeological sites have been documented within 200 meters of Wildhorse Wash. However, little of the area surrounding this wash has been surveyed, so very limited data is available.

National park system areas are authorized by Congress because they have "nationally significant resource values." These values in turn can be considered "Outstandingly

Remarkable Values" in the terminology of the Wild and Scenic Rivers Act. Therefore, a case might be made that all rivers in a national park system unit meet the criteria for Wild and Scenic River status. It seems unlikely that this was congressional intent. The resources in proximity to Wildhorse Wash are typical of those found throughout the park, and do not owe their existence to the presence of the wash. Therefore, the wash is not considered to meet eligibility criteria.

Puerco River

The Puerco River is a large, intermittent stream with an associated floodplain. Surveys indicate that the Puerco River is probably the most biologically rich and diverse area in the park. This area currently supports cottonwood and willow populations, which are being impacted by populations of the exotic shrubs tamarisk and Russian olive. Fences cannot be maintained across the stream channel at the park boundaries, so cattle from neighboring ranches sometimes move through this area and impact the vegetation through grazing. Elk and mule deer are occasionally seen and are thought to be using the river as a migration corridor. Coyote are regularly observed, and bobcat tracks have been reported. The shrub communities support breeding populations of birds and provide cover for a diverse assemblage of small mammal, amphibian, and reptile species. Past park naturalist observations from the 1950s reported willow flycatchers in the area, but a 1998 targeted survey for the Southwestern willow flycatcher provided negative findings. An exotic lizard, the New Mexican whiptail, was discovered in the Puerco River corridor within the park in 1998. No rare, threatened, or endangered plant or animal species have been reported along the Puerco River.

The Puerco River is surrounded by Quaternary floodplain deposits which may contain vertebrate fossils from that time period. In addition, there are rare outcrops of Chinle Formation along its banks that may possess Triassic fossil resources. One area in particular on the south bank, west of the park bridge, contains fossil leaves.

Four archeological sites have been documented within 200 meters of Puerco River. One is a historic CCC camp, two are prehistoric sites, and one, Puerco Pueblo, was listed in the National Register of Historic Places on 12 July 1976. Puerco Pueblo is the only park archeological site listed in the National Register of Historic Places. The remaining prehistoric cultural resources are potentially eligible for listing as contributing elements of archeological districts or multiple property nominations. The historic sites are judged potentially eligible as thematic elements of nominations for CCC or historic National Park Service properties at Petrified Forest. A formal evaluation may result in some individual sites being determined not eligible for listing, but until the evaluation and consultation are completed, all sites are potentially eligible.

Puerco Pueblo is the only archeological site near a major drainage considered to have "Outstandingly Remarkable Values." The site includes a single-story, 100-plus room pueblo occupied by the Ancestral Pueblo from Late Pueblo III to middle Pueblo IV times (A.D. 1200 to 1380). It is located on a small mesa above the Puerco River. Petroglyphs occur on the surrounding mesa edges (Burton 1990). These values have been determined to meet the outstandingly remarkable values criteria, making the Puerco River eligible for inclusion in the national Wild and Scenic Rivers System.

Nine-Mile Wash

Nine-Mile Wash is an intermittent stream that is part of the Puerco River watershed within the park. Under the park's current boundaries, the west-flowing Nine-Mile Wash flows through the park for less than one-quarter mile before its confluence with the Puerco River. The banks of this wash are infested with tamarisk in a number of areas. This exotic shrub supports breeding populations of birds and provides cover for small mammals, amphibians and reptiles. No rare, threatened, or endangered plant or animal species have been reported along Nine-Mile Wash.

The banks of the wash are mainly Quaternary overbank sediments. However, in the proposed park boundary expansion area, Nine Mile Wash cuts through some Triassic deposits as well. This area would need to be surveyed for paleontological resources. No archeological sites have been documented within 200 meters of Nine-Mile Wash. However, little of the area surrounding this wash has been surveyed, so very limited data is available.

National park system areas are authorized by Congress because they have "nationally significant resource values." These values in turn can be considered "Outstandingly Remarkable Values" in the terminology of the Wild and Scenic Rivers Act. Therefore, a case might be made that all rivers in a national park system unit meet the criteria for Wild and Scenic River status. It seems unlikely that this was congressional intent. The resources in proximity to Nine-Mile Wash are typical of those found throughout the park, and do not owe their existence to the presence of the wash. Therefore, the wash is not considered to meet eligibility criteria.

Dry Wash

Dry Wash is a meandering system that generally trends to the north and west. It originates in the Rainbow Forest Wilderness area, and meanders northwards between Crystal and Jasper Forests before turning west, where it leaves the current park boundary and eventually flows into the Puerco River. Dry Wash generally follows the trend of the main park road for several miles, criss-crossing it several times. It is an intermittent stream, generally traversing both grassland and badlands areas within the park. The banks of this stream are highly erodible and generally support only grass species. Pronghorn frequent the area and make use of pools of water that remain in the wash after storm events. Migrating bear have been seen in the area. coyote, badger, small mammal, reptile, and amphibian species have been observed. No rare, threatened, or endangered plant or animal species have been reported along Dry Wash.

The wash has cut down into the Sonsela Sandstone horizon north of the Flattops, where it exposes fossil wood deposits. As it moves northward, more exposures of the Chinle Formation can be found along its banks, with fossil vertebrate and plant exposures in a couple of areas. Generally, however, the river course is situated in Quaternary floodplain deposits; this is especially true to the west in the proposed park expansion area. Cultural sites are common along the banks.

Nine archeological sites are located within 200 meters of Dry Wash. Eight of these sites are prehistoric, and one is historic. Four archeological sites are located within 200 meters of the East Fork of Dry Wash. Three

of these sites are prehistoric and one is historic.

National Park System areas are authorized by Congress because they have "nationally significant resource values." These values in turn can be considered "Outstandingly Remarkable Values" in the terminology of the Wild and Scenic Rivers Act. Therefore, a case might be made that all rivers in a national park system unit meet the criteria for Wild and Scenic River status. It seems unlikely that this was congressional intent. The resources in proximity to Dry Wash are typical of those found throughout the park, and do not owe their existence to the presence of the wash. Therefore, the wash is not considered to meet eligibility criteria.

Jim Camp Wash

Jim Camp Wash is a southwestern flowing drainage originating in the Flattops area and passing through the Rainbow Forest area before joining Cottonwood Wash south of the park. It is an intermittent stream that runs through badlands and grassland areas. This wash also runs beside the Rainbow Forest developed area. The banks of Jim Camp Wash support grass, plus some shrub and cactus species. Small infestations of tamarisk and Russian olive can be found. A few cottonwood trees grow along its banks. Raptors frequently use the large trees as perches. A number of songbird species nest in trees in the nearby developed area. Coyote, bobcats, porcupine, badgers, small mammals, reptiles, and amphibian species have been observed. Pronghorn frequent the wash to use water pools left by storms. No rare, threatened, or endangered plant or animal species have been reported along Jim Camp Wash.

Since it is a short reach, this wash has not built up a thick floodplain of sediments along its banks, and in many places the old Triassic-age outcrops can be seen. In the Flattops area and northeast of the visitor center, these exposures can be fossiliferous. South of the visitor center, Jim Camp Wash cuts into the fossil log-bearing Rainbow Sandstone and fossil logs can be seen in some places along the wash. Nine archeological sites are located within 200 meters of Jim Camp Wash. Eight of these sites are prehistoric and one is historic.

National park system areas are authorized by Congress because they have "nationally significant resource values." These values in turn can be considered "Outstandingly Remarkable Values" in the terminology of the Wild and Scenic Rivers Act. Therefore, a case might be made that all rivers in a national park system unit meet the criteria for Wild and Scenic River status. It seems unlikely that this was congressional intent. The resources in proximity to Jim Camp Wash are typical of those found throughout the park, and do not owe their existence to the presence of the wash. Therefore, the wash is not considered to meet eligibility criteria.

Cottonwood Wash

Cottonwood Wash is another southwest-flowing drainage in the Rainbow Forest area. It originates in the Rainbow Forest Wilderness Area and flows south of Long Logs. It is an intermittent stream, which runs through badlands and grassland areas. The banks of Cottonwood Wash support grass and some shrub and cactus species. Small infestations of tamarisk and Russian olive can be found. A few cottonwood trees grow along the banks of this wash and are used by raptors as perches. Coyote, bobcats,

porcupine, badgers, small mammal, reptiles, and amphibian species have been observed. Pronghorn frequent the wash to use pools of water left by storms. No rare, threatened, or endangered plant or animal species have been reported along Cottonwood Wash.

The headwaters are cut fairly deep into the Chinle Formation exposures and many of these outcrops are fossiliferous. As the drainage flows southeast and picks up sediment, it deposits floodplain sediments on the banks. This area could possess Quaternary fossils, and cultural sites are more common here. Just before Cottonwood Wash crosses old Highway 180, it cuts into the fossil log-bearing Rainbow Sandstone and logs are exposed near the northern bank (Long Logs). Seven archeological sites are located within 200 meters of Cottonwood Wash. Four of these sites are historic, two are prehistoric, and one has both prehistoric and historic components.

National Park System areas are authorized by Congress because they have "nationally significant resource values." These values in turn can be considered "Outstandingly Remarkable Values" in the terminology of the Wild and Scenic Rivers Act. Therefore, a case might be made that all rivers in a national park system unit meet the criteria for Wild and Scenic River status. It seems unlikely that this was congressional intent. The resources in proximity to Cottonwood Wash are typical of those found throughout the park, and do not owe their existence to the presence of the wash. Therefore, the wash is not considered to meet eligibility criteria.

Dead Wash

Dead Wash flows southwest, entering the park from that direction and draining into the Puerco River. Within the current park boundaries, Dead Wash enters the park twice, running through a corner east of Chinde Mesa, and another portion just before its confluence with the Puerco (just before Puerco River bridge). The wash is surrounded by Quaternary deposits in these areas, so the potential for Triassic fossils along the banks is low. Future park expansion may include a larger portion of this drainage, but this area has not been surveyed for paleontological resources. One archeological site is located within 200 meters of Dead Wash. The extensive Dead Wash petroglyph site is outside the current park boundary, but is included in the authorized boundary expansion.

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ARCHEOLOGICAL SITES LOCATED NEAR MAJOR DRAINAGES AT PETRIFIED FOREST NATIONAL PARK

State Site Number	Wash Name	Time Period
AZ Q:01:334(ASM)	Cottonwood	Both
AZ Q:01:351(ASM)	Cottonwood	Historic
AZ Q:01:352(ASM)	Cottonwood	Historic
AZ Q:01:353(ASM)	Cottonwood	Historic
AZ Q:01:387(ASM)	Cottonwood	Historic
AZ Q:01:121(ASM)	Cottonwood	Prehistoric
AZ Q:01:124(ASM)	Cottonwood	Prehistoric
AZ Q:01:403(ASM)	Dry Wash	Historic
AZ Q:01:035(ASM)	Dry Wash	Prehistoric
AZ Q:01:036(ASM)	Dry Wash	Prehistoric
AZ Q:01:038(ASM)	Dry Wash	Prehistoric
AZ Q:01:364(ASM)	Dry Wash	Prehistoric
AZ Q:01:379(ASM)	Dry Wash	Prehistoric
AZ Q:01:380(ASM)	Dry Wash	Prehistoric
AZ Q:01:402(ASM)	Dry Wash	Prehistoric
AZ Q:01:404(ASM)	Dry Wash	Prehistoric
AZ Q:01:365(ASM)	East Fork, Dry Wash	Historic
AZ Q:01:048(ASM)	East Fork, Dry Wash	Prehistoric
AZ Q:01:348(ASM)	East Fork, Dry Wash	Prehistoric
AZ Q:02:049(ASM)	East Fork, Dry Wash	Prehistoric
AZ Q:01:100(ASM)	Jim Camp	Historic
AZ Q:01:027(ASM)	Jim Camp	Prehistoric
AZ Q:01:096(ASM)	Jim Camp	Prehistoric
AZ Q:01:097(ASM)	Jim Camp	Prehistoric
AZ Q:01:102(ASM)	Jim Camp	Prehistoric
AZ Q:01:238(ASM)	Jim Camp	Prehistoric
AZ Q:01:372(ASM)	Jim Camp	Prehistoric
AZ Q:01:373(ASM)	Jim Camp	Prehistoric
PF 186	Jim Camp	Prehistoric
AZ K:13:082(ASM)	Lithodendron Wash	Prehistoric
AZ K:13:084(ASM)	Lithodendron Wash	Prehistoric
AZ Q:01:271(ASM)	Puerco River	Historic
AZ Q:01:022(ASM)	Puerco River	Prehistoric
AZ Q:01:067(ASM)	Puerco River	Prehistoric
AZ Q:01:101(ASM)	Puerco River	Prehistoric

SUMMARY OF ELIGIBILITY EVALUATION

Although the rivers and washes evaluated are all free-flowing, only the reach of the Puerco River within the current park boundary contains Outstandingly Remarkable Values which make it eligible for inclusion in the national Wild and Scenic Rivers System. It is further evaluated for classification and suitability below.

CLASSIFICATION

Classification is based on development conditions existing in the river corridor at the time of designation. The Wild and Scenic Rivers Act provides three classifications defined as follows:

- Wild river areas free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent the vestiges of primitive America.
- Scenic river areas are free of impoundments with shorelines largely undeveloped, but accessible in places by roads.
- Recreational river areas are readily accessible by road or railroad, may have some development along their shorelines, and may have undergone some impoundment or diversion in the past.

The Puerco River is classified as a scenic river because it is free of impoundments with shorelines largely undeveloped, except for the railroad.

SUITABILITY

The suitability phase of the study evaluates whether designation as a national Wild and Scenic River would be the best way to manage eligible rivers. Suitability considerations include the environmental and economic consequences of designation and the manageability of the river if designated.

The Puerco River segment within Petrified Forest National Park is suitable for designation as a Wild and Scenic River because the National Park Service owns and manages the land. The National Park Service does not recommend designation at this time due to the minimal length (one mile) of the segment within the park, and because resources within the park are already well protected.

CONCLUSION

The Puerco River within Petrified Forest National Park is free flowing and contains Outstandingly Remarkable Values that make it eligible for inclusion in the national Wild and Scenic Rivers System. Its freedom from impoundments and relatively undeveloped character qualify it as a scenic river area. Although the river is managed by the National Park Service under a protection mandate, it is not considered suitable for designation because of its very short length—about one mile—within current park boundaries.

If Congress authorizes the proposed boundary expansion and the National Park

Service is successful in adding that land to the park, the National Park Service will evaluate new river segments in the park for Wild and Scenic River eligibility. This amounts to approximately 5.7 miles more. If the entire 6.7 miles is determined eligible, the length would be sufficient for a determination of suitability as well. Through an amendment to the *General Management Plan*, the National Park Service would decide whether to recommend designation to Congress.

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