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Petrified Forest NP

general management plan / development concept plans
and environmental assessment

June 1989

PETRIFIED FOREST NATIONAL PARK • ARIZONA

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

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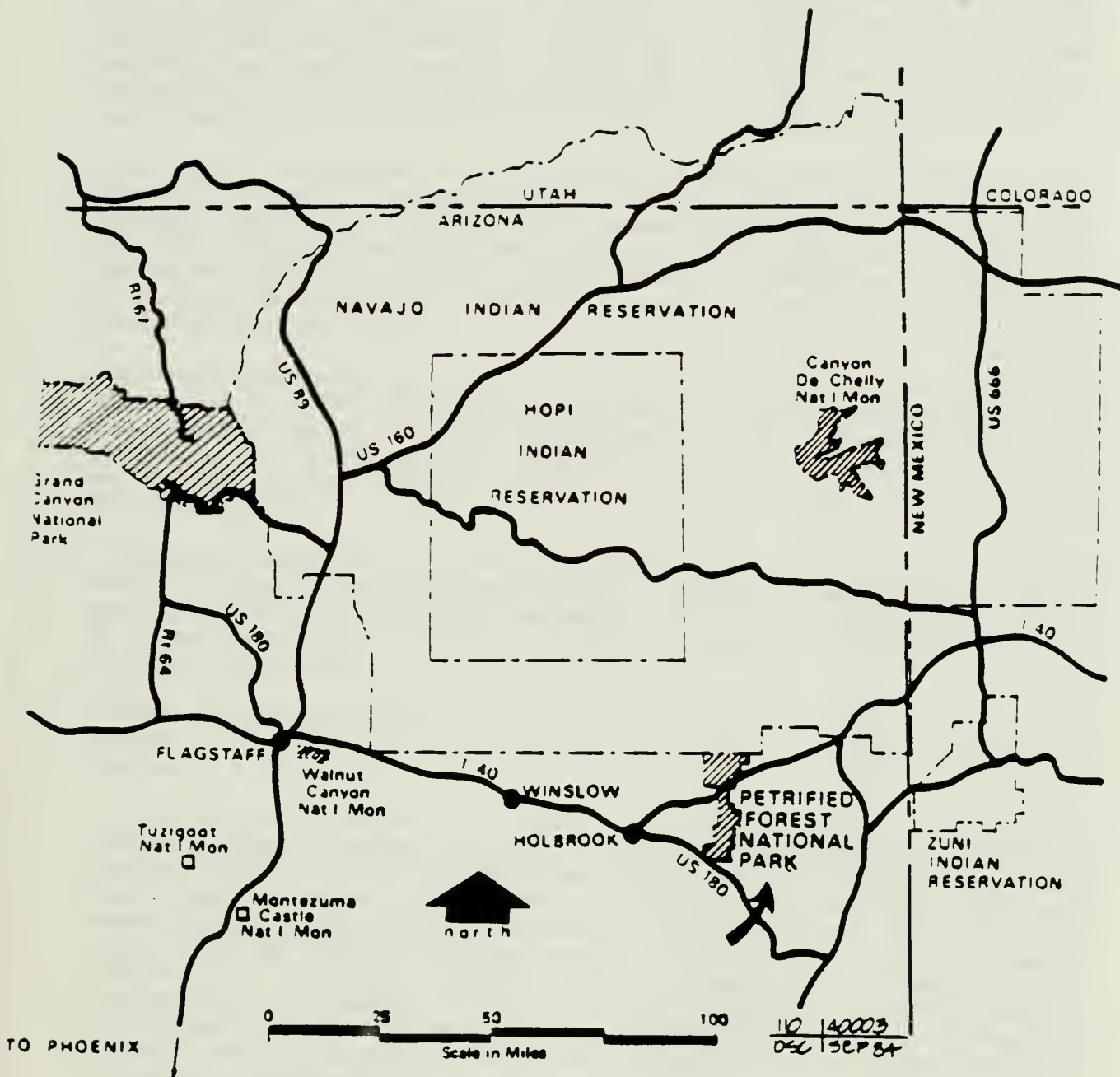



Figure 1:
VICINITY MAP



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THE NEED FOR A PLAN

The latest master plan for Petrified Forest National Park was completed in 1966. Since that time the park has experienced an unprecedented period of scientific discovery. Paleontological research is piecing together an understanding of an ecosystem dating from 230 million years ago, during the Triassic period of the Mesozoic era of Earth's history. No longer are the park's abundant petrified logs seen merely as a beautiful collection of oddities. They are now known to be part of this ancient ecosystem, which represents an especially significant time in the evolution of life – a time of transition, when earlier life forms were giving way to the earliest dinosaurs.

When President Theodore Roosevelt created Petrified Forest National Monument in 1906, the stated purpose was to reserve "the mineralized remains of Mesozoic forests...[which] are of the greatest scientific interest and value." The drafters of the presidential proclamation had no way of knowing the variety or the significance of the resources they were protecting. However, the mandate they provided was sufficiently broad to accommodate an expanding awareness of the many facets of the ancient forest ecosystems now coming to light in the park and the promise they hold for gaining more knowledge of life on Earth.

Three major planning issues are raised by this broadening perspective of the park's resources. One is the need to refocus the visitor experience to make people aware that the park encompasses more than just petrified logs and to help them understand how all the park's resources interrelate. The park staff has been working hard to keep visitors abreast of the discoveries occurring at the park, but their efforts are severely hampered by the park's out-of-date visitor centers and by other facility and staffing problems.

A second major planning issue is the need to initiate and coordinate paleontological research efforts. Most of the research in the park is being conducted by academic institutions. Without a research plan and funded program, park managers have not been able to assume the responsibility of caring for the park's paleontological resources or to generate the information most needed for resource protection and interpretation.

The third major planning issue is the need for boundary adjustments to protect resources that are important to the park and have been determined to extend beyond the park's section-line boundaries.

The proposed general management plan included in part one of this document outlines integrated strategies for visitor use, resource management, and boundary adjustments intended to resolve the above issues. The plan also includes development concepts for the facilities needed to implement these management strategies. In analyzing the range of feasible alternatives for this project, it was determined that all the feasible management strategies could and should be combined into a single general management plan, but that several development options existed for siting the needed facilities. All of the feasible development options are included for consideration in the "Development" section of the plan; the proposed development concepts are presented first, followed by descriptions of the other feasible but less desirable options. The environmental assessment included in part two of this document analyzes and compares the impacts of taking no action and the impacts of implementing the proposed plan, including the impacts of all the feasible development options.

EXPRESSIONS OF AN ANCIENT LAND: AN OVERVIEW OF THE PARK

The colorful badlands of Petrified Forest – yellow mudstone, gray and green siltstones, purple and blue claystones, pink tuff, red and tan sandstones – are the present-day manifestations of the Chinle formation, which accumulated layer upon layer over a period of several million years...but not the several million years that have just passed. The Painted Desert, Blue Mesa, and other prominent features visible in the park today are the results of events that occurred 230 million years ago, during the Triassic period of Earth's history. To understand the Triassic period and its current manifestations requires some radical adjustments in our everyday perceptions of time and place.

Most geologic time lines start about 3.8 billion years ago, when the earliest life is believed to have appeared. For more than 3 billion years only primitive animals and plants inhabited the seas. Then about 0.4 billion (or 400 million) years ago, higher (vertebrate) animals appeared, followed by vascular plants, and the scene began to get imaginable. By the beginning of the Triassic period, about 250 million years ago, Earth was inhabited by a variety of fishes, amphibians, and reptiles. Plants included giant ferns, towering evergreens, and palmlike cycads, but flowering plants and grasses had not developed yet. Neither had birds or mammals – or even dinosaurs. Life on Earth was on the brink of a transition that would finally establish all the major groups of animals and plants we are familiar with today.

That long ago, Earth itself was a different place. Throughout all of geologic time the Earth's crust has been constantly moving, molding and remolding the continents and the seas. About 230 million years ago the area now called Arizona lay along the western shore of Earth's single supercontinent, Pangaea. It was nearer the equator than it is today, and the land mass was tilted and configured in such a way that present-day New Jersey was at about the same latitude as Arizona. Also, present-day North America and Eurasia were joined, and central Europe was relatively close to New Jersey. Because of their geographic similarities, these areas had many of the same plants and animals, as evidenced by their fossil records.

Petrified Forest National Park contains unusually rich Triassic fossil beds because of a series of geologic events unique to that area. During the Triassic, the western coastal area around Arizona was unstable, and volcanic mountains were forming in the Mogollon Highlands. Tremendous amounts of volcanic material were being carried north by wind and water and deposited in the area of what is now the park. This rapid deposition was conducive to the burial, preservation, and fossilization of the plants and animals inhabiting the area.

By 100 million years ago the area that would become the park was deeply buried under thick layers of sediment. Then about 35 million years ago the strata were thrust upward, greatly increasing their exposure to wind and rain, and the layers of sediment began to be gradually stripped away. Today the lack of overburden makes the Triassic deposits in the park some of the most accessible for study, greatly increasing their scientific value. Furthermore, the fossils preserved at the park appear to represent entire ecosystems. These rare accessible associations of both animals and plants make it possible to learn more about the Triassic period here than anywhere else in the world. To date, about 100 species of plants and about 50 species of animals have been identified in the multicolored strata known to scientists as the Petrified Forest member of the Chinle formation.

THE TRIASSIC FOREST

What is not known about the Triassic greatly exceeds what is known. From the available evidence scientists suspect that the area that is now the park was a swampy woodland. The petrified logs



Pangaea in late Triassic time, showing important tetrapod localities. (1) Chinle, Petrified Forest, Arizona; (2) Dockum, Texas; (3) Popo Agie, Wyoming; (4) Newark, Eastern North America; (5) Keuper, Europe; (6) Lufeng, China; (7) Maleri, India; (8) Red Beds and Cave Sandstone, South Africa; (9) Forest Sandstone, Zimbabwe; (10) Santa Maria, Brazil; (11) Ischigualasto and Los Colorados, Argentina.

The Continent of Pangaea

seen in the park today are the remains of *Araucarioxylon*, *Woodworthia*, and *Schilderia* trees, all of which were tall conifers. Relatively few stumps have been found, leading to speculation that many of the logs may have washed in from higher, more densely wooded areas to the south, perhaps in the aftermath of a volcanic eruption.

Numerous streams cut across these woodlands on their way to the sea. Heavily scaled fishes, some up to 6 feet long, inhabited the waters, along with a number of amphibians and reptiles. Notable among the amphibians were the metoposaurs, 10-foot-long creatures looking something like giant salamanders with teeth. The reptiles included phytosaurs (which looked like crocodiles), aetosaurs (horned, and heavily armored dinosaur-like animals), and poposaurs (large carnivores that walked on two legs). These animals looked much like dinosaurs, but they were actually thecodonts, an earlier group of reptiles that dominated Earth for millions of years, just as the dinosaurs would do in the next period of Earth's history.

By the late Triassic, the first dinosaurs were just beginning to appear, and some of the earliest dinosaur fossils known in the world have been found at Petrified Forest National Park. What scientists will ultimately learn from research at the park remains to be seen, but there is great excitement that the dawn of the age of dinosaurs is documented better here than anywhere else in the world. Furthermore, the Triassic is now considered by some paleozoologists and paleobotanists to be the time in Earth's history when all the modern ecosystems we know today were being established. The earliest mammals appeared then, and there is speculation that birds and flowering plants also began in the Triassic. The Triassic clays and shales at Petrified Forest, with their rich associations of plant and animal fossils, promise to contain a comprehensive record of this time of transition, helping us understand more of our legacy from the past.

THE MODERN DESERT

Today what was once a low and swampy region is high, dry desert. It is hard to believe that in the entire 147-square-mile park only ten named drainages exist and that none of them has a perennial stream. Rain puddles on the rocks are soon evaporated. What little surface water occurs is during spring runoff or right after heavy rains. The few springs are also seasonal. Although the duration of surface flow is short, the impact of flowing water on the landscape is great, judging from the many striking erosional features. The resulting stark and colorful landscape is ever-changing with the interplay of light and shadow and the vagaries of the weather. This is a land of immense vistas. The impression on visitors can be sublime and invigorating, or in environmental extremes, daunting.

The park's high elevation (averaging 5,600 feet above sea level) plus its present-day position inland on the continent combine to create a cool arid climate. Precipitation averages less than 10 inches a year, about half of which is from thunderstorms in late summer. On midsummer days temperatures occasionally exceed 100 degrees Fahrenheit, but nights are cool. And although winter nights are often colder than freezing, the daytime temperatures are moderate. Because of the cool, dry climate, air quality is excellent, and mountain peaks more than 100 miles away are often visible from the park. The wide scenic vistas and clean air seem almost as exotic to some visitors as petrified wood and fossilized bones.

The park is best described in terms of three distinctive geographic areas: the Painted Desert, the Puerco River Valley, and the Rainbow Forest.

Painted Desert

The northern third of the park is an expanse of roughly southwest-to-northeast-trending clay hills, mesas, and buttes that reflect the regional geologic influences of the Little Colorado River as it erodes the Chinle formation in this portion of the Colorado Plateau. The dramatic background of mesa cliffs and escarpment rimrock against the far horizon is a result of resistant sandstone and lava caprock overlying more easily eroded layers of clay and shale. The highest elevation in the park occurs in the Painted Desert on the summit of Pilot Rock at 6,236 feet above sea level. Pilot Rock is on the northwesternmost extension of three parallel eroded ridges. Views of the middle and largest of these ridges are what most visitors take home as memories of Painted Desert. The southeasternmost ridge is actually the Painted Desert rim, upon which the park road and viewpoints are built. The large drainage at the base of the clay hills is Lithodendron (Latin for *stone-tree*) Wash, named for the petrified wood found within the drainage. The floor of the Painted Desert is also the site of the recent excavation of early dinosaur bones.

In areas of very active erosion, like Painted Desert, little vegetation grows because it is difficult for plants to take root in the sterile, expanding clays. However, some pinyon-juniper woodland occurs in sheltered side canyons below the mesa rims and on the mesa tops.

Puerco River Valley

From the Painted Desert rim the land slopes gently to the southeast, down through a series of wide erosional basins to the Puerco River. The middle section of the park is a relatively narrow strip of shortgrass prairie connecting the badlands to the north and south. The lowest point in the park, approximately 5,300 feet above sea level, is on the Puerco River. Sage, saltbush, rabbitbrush, and various mixed grasses cover this high desert river valley. Over areas of relatively stable slopes a



PETRIFIED FOREST NP GEOGRAPHIC AREAS GMP

shortgrass prairie of blue grama, alkali sacaton, and Indian ricegrass has recovered since the complete exclusion of grazing in the park in 1962. This shortgrass prairie may be the best example of its kind in the Southwest. The vegetative cover is noticeably denser on the ungrazed lands inside the park than on the grazed lands just outside the park boundary. A limited riparian zone along the banks of the Puerco River is dominated by tamarisk, an alien species that is unusable by native wildlife. Some planted cottonwoods have survived, and they provide valuable habitat, especially for migrating birds.

The park's wildlife are naturally concentrated in the Puerco River valley, where the shortgrass prairie vegetation provides needed forage and cover. Gunnison's prairie dogs are common in the grasslands north of the river, and several of their towns are visible from the park road. Pronghorn, black-tailed jackrabbits, desert cottontails, and coyotes are also common and often seen from the road. Many species of flycatchers, warblers, and sparrows migrate through the park in spring and fall, relying on the insects and seeds in the shortgrass prairie to sustain them on their way. In spring and summer collared lizards bask in the sunshine on petrified logs. Sagebrush lizards seek the shade of the desert scrub. Painted Desert whiptail lizards scurry away in front of hikers, while Hopi rattlesnakes lie still under the bushes or beside petrified logs, waiting for hikers to move on.

Rainbow Forest

In the southern third of the park the land has eroded into small groups of buttes and mesas separated by the wide expanses of the drainage basins of Dry Wash and its tributaries. Large deposits of multicolored petrified wood are scattered throughout the area. Blue Mesa, Jasper Forest, Crystal Forest, Long Logs, and Giant Logs are petrified wood areas easily accessible from the park road. High points on Blue Mesa and the Flattops offer wide panoramas over the clay hills of the fossil-rich Chinle formation. Numerous thecodont skeletons have been excavated here, and bone fragments, teeth, mollusk shells, and other fossilized animal remains, and also ancient plant materials, are readily apparent to knowledgeable observers.

HUMAN HISTORY

Compared to the geologic history of northern Arizona, the human history represents only a moment of time. Scattered bits of chipped stone and colorful pottery, the ruins of pit houses and pueblos, traces of trails and roads, historic buildings, and other archeological and historic features tell us that man has occupied the area that is now the park for about the past 10,000 years.

A few hearths and chipped stone artifacts on mesa tops and ridges attest to the migratory lifestyles of Archaic peoples, who hunted a variety of game animals and gathered wild plants in the Petrified Forest area. Later, more permanent sites, including shallow slab-lined pit houses, mark the beginnings of agriculture by Basketmaker peoples during a period extending from A.D. 1 to 850. Small pueblos clustered on terraces near arable land and major watercourses mark the beginning of the Pueblo period, thought by some archeologists to have been marked by a regional drought that extended from about A.D. 750 to 1000. Excellent examples of rock art, including solar calendars, reflect the cultural richness of the Pueblo II period (A.D. 950-1100), a time of great regional change during which populations increased and trade flourished. The area of the park was a frontier trade zone between the Anasazi to the north and east, the Mogollon from the mountain country to the south, and the Sinagua to the west. The Newspaper Rock petroglyph district is probably one of the best concentrations of rock art in the Little Colorado River drainage.

The Puerco ruins, one of the most visible archeological resources in the park, date from near the end of the Pueblo period, when large planned communities with multistory dwellings and large kivas were built. Another period of drought, perhaps exacerbated by warfare and other factors, probably contributed to the abandonment of much of the Southwest during the mid 1400s. According to some native American legends, when the pueblo peoples left this vicinity, they went north to settle on the high mesas, where permanent water was available.

Sometime during the next two centuries Navajo and other Athapaskan peoples moved into the Southwest. Only scattered sites mark the presence of these nomads in the park. The earliest remains from historic times are the traces of trails used by explorers, wagon trains, and even an experimental military camel train. Because of the low gradient, the Puerco River valley became a major historic travel corridor, and it remains so today. The old 35th Parallel route, old Route 66, Interstate 40, and the Santa Fe Railroad all cross the park here, following the lay of the land.

The Petrified Forest was first brought to the attention of the American public in the mid 1800s through the reports of U.S. Army expeditions. Logs were collected and shipped to the Smithsonian, and U.S. geological surveys were conducted. The growing excitement over the area's scenic and scientific values spurred Congress to withdraw the area from homestead entry. However, the petrified forests remained vulnerable to wood theft, which reached alarming proportions with the completion of the railroad in the early 1880s.

When President Theodore Roosevelt signed the Act for the Preservation of American Antiquities in 1906, it marked the culmination of several decades of struggle by John Muir and others to conserve America's southwestern scenic, historic, and scientific sites. Within three months of the passage of the act, Petrified Forest National Monument was created to preserve and protect the concentrations of fossilized wood. However, it was almost two decades more before the monument had a full-time resident superintendent, and the large-scale theft of wood continued well into the 1920s. In fact, the earliest caretakers of the monument were allowed to sell petrified wood to supplement their "salaries" of one dollar per year.

With the completion of the railroad, northern Arizona's astounding landscapes began drawing increasing numbers of tourists. Adamana, a railroad town about 2 miles west of the Puerco Indian ruins, was the first local center of tourist facilities. By the late 1920s, a trading post had been established near Giant Logs at what was then the NPS headquarters for the national monument. An inn had also been built on the Painted Desert rim at Kachina Point, which was then some distance north of the monument. In the early 1930s the National Park Service acquired the Painted Desert and a thin strip of land to connect the monument's two units.

The Depression years marked a number of changes at the monument. An attractive museum and headquarters complex near Giant Logs, a new bridge across the Puerco River, and a new road to join the north and south units were constructed by Arizona contractors. The Civilian Conservation Corps and Works Progress Administration rebuilt the Painted Desert Inn and worked on a variety of smaller tasks, including trails, roads, fences, antelope reservoirs, and water and sewer systems. Most of this development is still in use today, augmented by a new headquarters/visitor center complex built in the 1960s to serve travelers entering the north end of the park from I-40.

Petrified Forest gained national park status in 1962, and portions of the park were designated as wilderness in 1970. During the course of the park's history its boundaries have changed several times, most recently in 1986. Today the park encompasses 93,333 acres in Navajo and Apache counties.

Now, in the late 1980s, the systematic paleontological research that has been conducted in the park since the 1920s is culminating in major discoveries, ushering in a new era of park history that will see major changes in visitor use and resource management.

SUMMARY OF THE SIGNIFICANT RESOURCE VALUES OF PETRIFIED FOREST NATIONAL PARK

Globally significant scientific value of a late Triassic ecosystem represented by fossilized plant and animal remains in such quantity and variety as to give a clear and complete picture of the ancient ecosystem

Scenic value of expansive vistas of colorful eroding badlands, stark landscapes, and the rainbow hues of petrified wood

Cultural value of an extensive and varied prehistory that reflects a 10,000-year continuum of human adaptation, cultural interaction, and technological change

Scientific value of a rare shortgrass prairie ecosystem recovered from grazing

PART ONE: THE PLAN

INTRODUCTION

How should we use this ancient land that is now Petrified Forest National Park? This plan establishes three primary management goals:

The land and resources should be protected, retaining their value for future generations.

Visitors should be given a wide range of sensory and perceptual opportunities to experience the park's land and its scenic, paleontological, cultural, and ecological resources, and to understand them in the broad context of Earth's history.

Scientific inquiry into the Triassic period of Earth's history should be encouraged and supported.

There is a potential for conflict among these goals, in that visitor use and research inevitably result in some disturbance of the land and its resources and also may interfere with one another. But there is also potential for great harmony. Excavation, documentation, and placement in a museum is often the only way to preserve fossils that are eroding out of their protective overburden. Thus, both the goals of protection and scientific inquiry are served by these activities.

In the same way, providing opportunities for people to walk into the landscape, to discover a special piece of petrified wood or a fossilized bone, to hold it in their hands, and to understand its history may enhance people's appreciation of what these objects represent, and strengthen their sense of connection with the Earth. In the long term people's sense of being a part of the Earth may be the only thing that can ultimately protect it. While some preservation issues, like air and water quality, require complex considerations and actions to improve, a simple positive and symbolic commitment can be made by visitors to Petrified Forest by choosing to leave the park exactly as they found it, foregoing the temptation to keep small pieces of souvenir petrified wood. Thus, both the goals of protection and a quality visitor experience are served by bringing resources and people together.

Scientific inquiry and visitor use can also be complementary goals. Many people are fascinated by the opportunity to watch researchers at work, and seeing where a fossil skeleton came out of the ground and how it was prepared for exhibit can greatly help people put static exhibits into a broader ecological context. Science, for its part, benefits from increased public interest and support, which may translate into money for additional work.

The success of this plan will depend on how well it can balance resource protection, scientific inquiry, and visitor experiences, minimizing the potential for conflict and taking advantage of the potential for harmonious and mutually beneficial interplay. The result could be a prototype partnership of federal land managers, the scientific community, and the general public, in which each would be asked to relinquish some of the exclusivity of their traditional approaches to the land and its resources in exchange for possible benefits that can only be achieved through cooperation.

VISITOR EXPERIENCES

People visiting Petrified Forest are first impressed by the aesthetic aspects of the park – the grand vistas of stark desert landscapes, the changeable weather and its visual effect upon distant horizons, and the exotic beauty of the colorful petrified wood. If they wander short distances from their cars, they might discover a fossil bone, a pedestal log, or a petroglyph etched on a cliffside. In the absence of a holistic framework for understanding what they see, most visitors experience the park as a collection of seemingly unrelated natural and cultural oddities. The major challenge of this plan is to take visitors from this perspective to an understanding of the Triassic period of Earth's history and what it represents to us today. The programs and facilities included in this plan are intended to orient visitors to what they can see and do in the park, to provide opportunities for sensory and discovery experiences, and to place the resources of the park into the context of Earth's history.

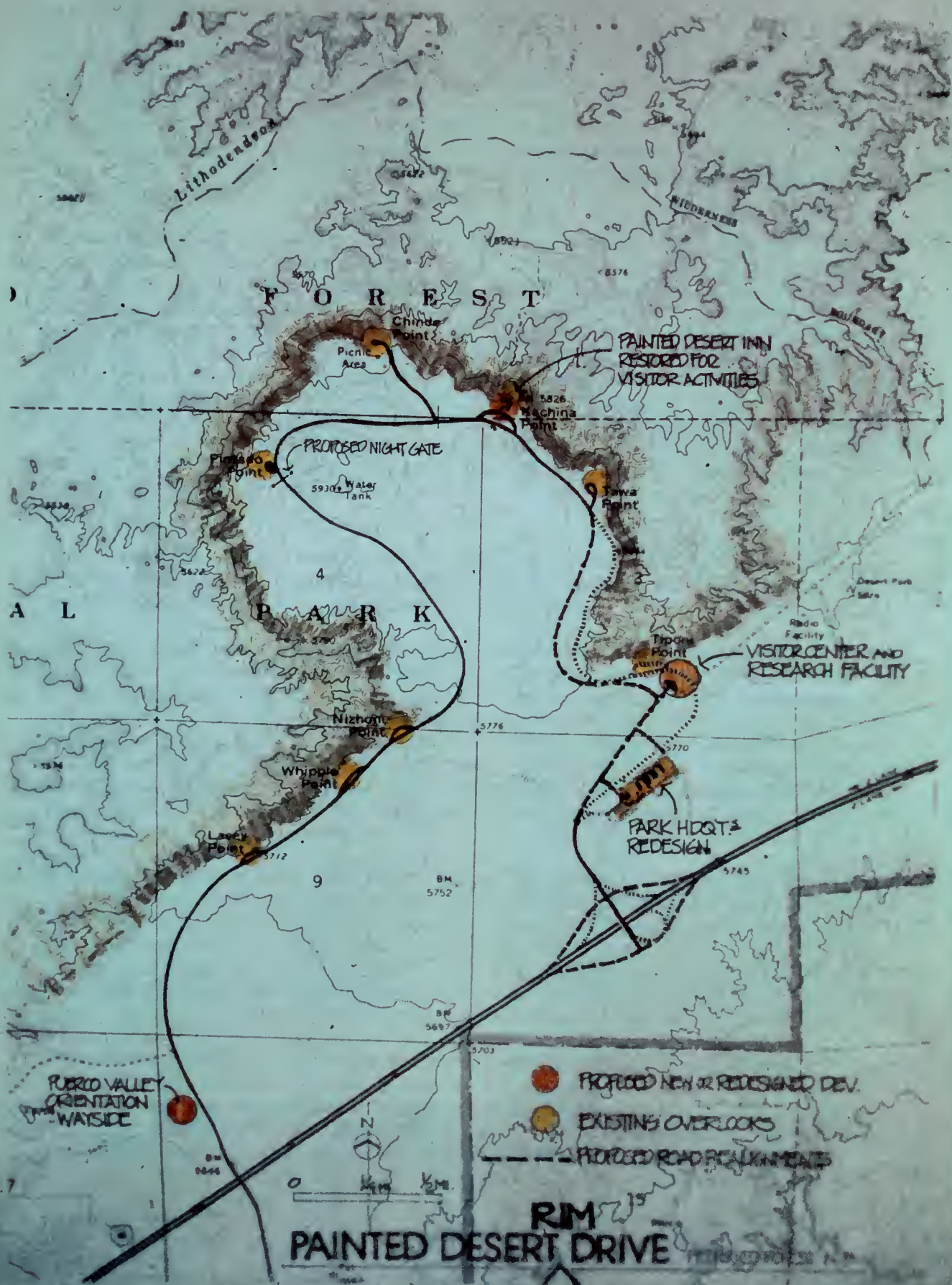
The three geographic areas of the park – Painted Desert, the Puerco River valley, and Rainbow Forest – lend themselves differently to the various aspects of the visitor experience. The plan capitalizes on these differences to provide visitors with a rich and varied journey through the park.

PAINTED DESERT: GEOLOGICAL AND PALEONTOLOGICAL OVERVIEW

Background. The Painted Desert, with its expansive vistas, is an ideal setting for providing visitors with the big picture. Currently about 65 percent of the park's visitors enter here, at the north end of the park, and they need information, restroom and concession services, and interpretation of what they are about to experience at Petrified Forest. The existing facilities pose a number of problems: The visitor center near the park entrance was originally designed as an interstate highway regional information center, and its site near the interstate is not conducive to any sense of entry into a unique natural area. About 25 to 30 percent of the people stopping at this visitor center choose to go no farther into the park, and they leave with no sense of the park's resource values. Also, the entire headquarters/visitor center development complex has severe structural problems and must be completely rehabilitated or rebuilt.

Proposal. To create a better sense of arrival for visitors, a new visitor center will be built at Tiponi Point near the Painted Desert rim. Relocating the center less than a mile farther into the park will separate visitors from the I-40 corridor, give them a view of the Painted Desert, and allow immediate access to scenic walks along the rim or down to the desert floor.

The commanding landscape visible from Tiponi Point will provide a focus for interpreting eons of time and the concept that the landscape visible today is a manifestation of geologic and climatic events that occurred 230 million years ago. Rather than focusing on particular features of the past or present, interpretation at the Painted Desert visitor center will emphasize the concepts of geologic time, continental drift, ecology, and evolution. Through various interpretive media visitors will learn that the Triassic period of Earth's history was a time of major transition, and that the life forms from that period, which at first might seem completely alien, carried the seeds of life on Earth today—including our own. Interpretation will also cover the scientific process as it relates to the research occurring in the park. Because of the great untapped research potential of the park, it would be a disservice to visitors to present a comprehensive picture of the Triassic period as if scientists knew everything about it – when, in fact, new discoveries are being made every year. Visitors will be invited to experience some of the excitement associated with research in the park by making part of a proposed new research facility open to public viewing and by offering tours of excavation sites when field work is being conducted. (The proposed research center is discussed in the next section of the plan.) Helping visitors understand the origins and the age of the petrified wood and other fossils in the park, and also their value to science, will help them understand and respect the federal



prohibitions against taking these objects from the park.

Visitors coming off the interstate often need food service, since no restaurants exist outside the park within approximately 20 miles of the north entrance. A concession offering meals, light refreshments, and gift sales, similar to the existing concession near the park headquarters, will be developed near the new visitor center, consolidating all visitor services for the Painted Desert area in a single location. The existing concession will be closed once the new facility is open. Petrified wood will no longer be sold in the park gift shops. Visitors will be asked to enjoy the wood and other fossils nonconsumptively in their natural settings.

People at the visitor center will be encouraged to take a relatively easy walk to the floor of the Painted Desert. Within 15 minutes visitors following an existing trail from Tiponi Point can find themselves in another world free of the sights and sounds of automobile traffic and development. Although people must carry water, the Painted Desert is an easily accessible wilderness, and novices as well as experienced wilderness users can enjoy a primitive hiking experience across fascinating badlands. A second trail from the rim into the Painted Desert will begin at Kachina Point, allowing visitors to descend or ascend the escarpment at either location. Better information and orientation at the park entrances and additional signing will make visitors more aware of these and many other opportunities to leave the road and hardened trails and to discover the park on their own. For people desiring an intermediate walking experience, a new 4-mile loop trail will allow them to follow the rim from Tiponi Point to Chinde Point and return. The pinyon/juniper vegetation along the rim provides a buffer from the road, and this separation will help people start to perceive the desert's tranquility and solitude.

From Tiponi Point visitors in their cars will continue along the Painted Desert rim past a series of seven more pullouts. Interpretive waysides now in preparation will address topics such as prominent geologic features, air quality, and hiking opportunities.

The Painted Desert Inn on Kachina Point, a gracious old Pueblo Revival structure, will be restored to serve again as a place to relax and enjoy the magnificent views from its many interior and exterior vantage points. The historic soda fountain will be reopened to the public, and the building's cultural resource values will be interpreted. The building interior is decorated with a series of native American murals, and a native American arts motif will be carried out by furnishing the inn with museum quality pieces in appropriate display cases. Visitors will be able to purchase Indian arts from a small museum shop operated in the building. The view from Kachina Point constantly changes with the time of day and the season, and this quality will be captured for short-term visitors through a time-lapse media presentation.

To minimize nighttime wood theft and to protect the Painted Desert Inn, the park road has traditionally been closed from 6 p.m. to 6 a.m. This means that during most of the year the general public does not have the opportunity to view the Painted Desert at sunrise and sunset, when it is often most spectacular and photogenic. In the future, the night gate for the north end will be relocated to Pintado Point, and visitors may begin to time their visits to enjoy early mornings or evenings in the park. Allowing greater access to this part of the park will require a state-of-the-art security system for the Painted Desert Inn to protect it from trespass entry or vandalism.

The wide ledge at Chinde Point will be used for picnicking, interpretive activities, and scenic viewing. The fact that this viewpoint is removed somewhat from the main traffic flow makes it quieter than the other pulloffs, and its size offers an opportunity to create relaxing settings where visitors may want to spend some time enjoying the views. A wayside exhibit will interpret the site of a significant dinosaur excavation, visible from this overlook.

PUERCO RIVER VALLEY: MAN AND THE ENVIRONMENT

Background. The Puerco River valley, man's habitation zone, best speaks to the modern landscape and the continuation of life in the present. Interpretation in this zone is currently limited to early human occupation, but this story can be expanded to the present day, enhancing visitors' awareness of their complex relationship with the Painted Desert environment.

Proposal. A new pulloff and wayside will be provided at a vantage point just south of Lacy Point where visitors can see the shortgrass prairie and the remnants of old Route 66 paralleling the new alignment of I-40 – a good visual representation of the historic and continuing use of this valley for transcontinental travel. Additional interpretation of the valley's use as a transportation corridor will occur at another new wayside overlooking the railroad tracks near the Puerco ruins.

The Puerco ruins will be the focal point of interpreting prehistoric people's use of the area. An overview of the park's archeological resources will be provided at a visitor contact station near the ruins, and visitors will be invited to explore the ruins and nearby petroglyphs following a self-guiding interpretive trail. The petroglyphs on Newspaper Rock will be viewed from the existing overlook with greatly improved magnification devices and wayside exhibits.

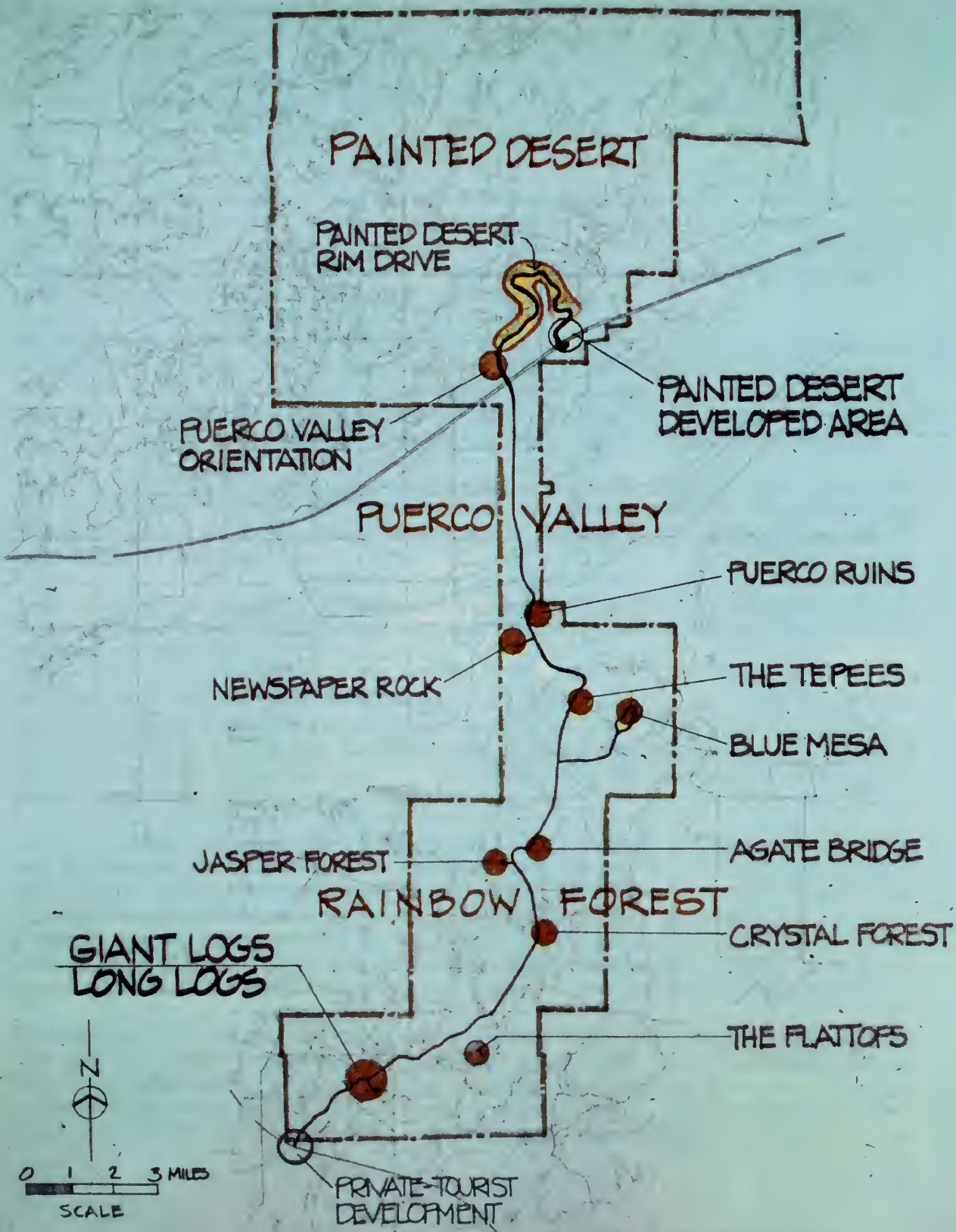
RAINBOW FOREST: CLOSE-UP ON FOSSILS

Background. The Rainbow Forest area offers wonderful opportunities to experience fossils on an intimate scale. Here, the park road cuts across the floor of the badlands, and travelers are surrounded by the colored strata of the Chinle formation. Petrified wood, other plant fossils, and fossilized bones and shells representative of a broad cross section of species from the Triassic forest ecosystem are readily visible and touchable.

Proposal. To help visitors see the park's many manifestations of the Triassic, and to protect the fossil resources from theft and inadvertent destruction, interpretation will depend heavily on on-site personal services.

For the approximately 35 percent of visitors who enter the park from the south, basic park information and orientation will be repeated at the Rainbow Forest visitor center. However, the interpretive theme will be different from the theme in the north. Here, interpretation will focus on the ancient species of the Triassic ecosystem. To help visitors imagine the petrified logs and other fossils as integrated parts of a living system, casts of some of the larger animals will be exhibited in a life-size diorama with sound effects, simulating what the Triassic looked like and might have sounded like at a particular place and moment in time. The media used in this exhibit will be flexible enough to allow for updating when discoveries expand the knowledge of this scene. Other exhibits will highlight some of the fossils found in the park, placing the petrified wood in the context of being one of many kinds of fossils visible here. In addition to evoking a 230-million-year step back in time, the visitor center will serve as a staging area for self-guiding and guided tours of the surrounding petrified wood sites and fossil beds.

In the future less emphasis will be placed on Giant Logs (previously the focus of the Rainbow Forest development) and more emphasis will be placed on Long Logs as the primary visitor attraction in this part of the park. Long Logs is a more natural resource and a more fitting introduction to the park. The existing parking lot at Long Logs will be removed, and the area will be managed as a quieter, more secluded walk-in site available to visitors with the time and inclination to travel away from the road corridor, thus reinforcing the management concept for this



part of the park. Eliminating vehicle access from the Long Logs area is also expected to reduce the loss of wood from theft.

Giant Logs, where the views encompass petrified logs in the foreground and the cliffs of the Chinle formation as a backdrop, will be redesigned as an outdoor exhibit interpreting the formation and erosion of petrified wood. A self-guiding trail through this area will be accessible to all visitors, including the handicapped. Giant Logs is also a highly scenic area for viewing sunsets, and the park staff will offer sunset tours before closing the park at the south end. Additional evening outreach programs will be provided for people staying in the proposed commercial campground outside the park.

Only limited concessions are needed at this end of the park. Restaurants and gift shops are available immediately outside the park boundary, less than 2 miles from the visitor center. One of the operators plans to add a motel and RV campground in the near future. These commercial services should adequately serve visitors and will not be duplicated in the southern end of the park. The park concession operation will be limited to light refreshments.

The wilderness trailhead at the Flattops, which is currently the first stop north of Long Logs, will be closed. The easy access to the Flattops afforded by this pulloff is resulting in the formation of social trails, erosion, and degradation of sensitive archeological sites. The Crystal Forest area will continue to be managed for intensive use. Interpretation will concentrate on the petrification process and the variety of minerals formed, including the exquisite crystals concentrated in this area.

Jasper Forest will be retained as an accessible wood area with no developed trails. Visitors can view the area from the overlook or wander over the wood-littered landscape. Interpretation will stress the historic theft and destruction of the wood in this area, which was exacerbated here by the proximity of the railroad.

Agate Bridge will be interpreted as a historical irony, the National Park Service's previous attempt at preservation through stopping natural processes. Foot traffic will be channeled away from a federally listed candidate threatened plant.

The Blue Mesa area has great recreational value. Visitors can follow the paved trail into the badlands or wander freely around the untrailed but easily accessible hills and gullies. An unpaved trail will connect Blue Mesa with the Tepees area, providing another opportunity for visitors to experience the badlands and their fossil resources. Picnic tables and restrooms will be provided to support longer stays by visitors in the Blue Mesa area.

Many of the vertebrate fossils taken from the park have come from the Tepees area. A wayside here will interpret the weathering of the badlands formations and the subsequent uncovering of fossil skeletal remains. For visitors coming from the north, the Tepees is the first stop in the Rainbow Forest geographic area, and the theme for this area will be established by the exhibit of a partially excavated skeleton. To avoid misleading visitors about the authenticity of the skeletal remains, they will be frankly presented as a reproduction for the purpose of display. Even in this context, however, they will provide a strong first impression of the interpretive theme for this area.

Petrified wood is by far the most easily identifiable fossil in the park. The general public could walk right over the top of most other fossils and not even see them. Guided tours throughout this unit will allow for visitors to experience these resources while providing for maximum resource protection. Also, public tours of research worksites will be arranged wherever possible. A major objective in this part of the park will be to share the excitement of discovery with park visitors,

helping them to appreciate the significance of the park's resources and stimulating them to learn more about them.

PARK WILDERNESS

Two areas of the park are designated wilderness. The Painted Desert wilderness consists of 43,020 acres located in the northern portion of the park. The Rainbow Forest wilderness lies in the southeast portion of the park and consists of 7,240 acres. Only a small percentage of park visitors actually enter the wilderness. Still, overnight camping in wilderness has slowly increased from 240 overnight stays in 1973 to 681 in 1988. Both wilderness areas will remain open to day use and overnight camping. Other backcountry areas in the park will be open to day hiking only. Backcountry service roads will continue to be restricted to official use only.

RESOURCE MANAGEMENT AND RESEARCH

The park's paleontological, cultural, and natural resources have considerably different management requirements. The critical concerns for each type of resource are summarized below.

The Triassic fossils are nonrenewable resources. Once the remaining 300-foot-deep layer of the Chinle formation erodes away, the source of these fossils will be gone. The theft of petrified wood is the park's number one resource protection problem. Petrified wood is continuously eroding out of the Chinle formation, but the rate of replacement is so slow that it is meaningless in human terms of time, and areas along the road and trails that once were littered with brightly colored chips of petrified wood – the accumulation of the ages – have been picked clean. Visitors and would-be poachers must be convinced to leave the petrified wood undisturbed if future generations are to benefit from its educational and aesthetic values.

Unlike most other nonrenewable resources, the park's vertebrate fossils cannot be preserved by leaving them alone. Preservation of fossilized bone requires excavation, preparation, and protected storage. Otherwise, as the fossils erode out of the ground, their exposure to the elements causes them to oxidize, disintegrate, and relatively quickly be washed away in storm runoff. Indeed, large skeletal remains begin to break up even before they are exposed at the surface, so their preservation depends on early detection and subsurface excavation. The significance of the park's Triassic vertebrate fossils warrants an intensive research program to find and protect these resources.

Archeological resources are usually best protected by leaving them undisturbed. Consequently, the collection of buried cultural artifacts is generally limited to instances when they must be removed to protect them from construction activity or other unavoidable ground-disturbing activities or natural phenomena. The park's archeological resources need to be surveyed and evaluated as a basis for management decisions that avoid disturbance whenever possible and provide for appropriate salvage where necessary.

Historic structures are best preserved in their present condition if that condition allows for satisfactory protection, maintenance, use, and interpretation. Badly deteriorated buildings need to be rehabilitated to a maintainable condition to ensure their long-term preservation. Restoration to return a structure to an earlier appearance or reconstruction of a vanished structure is warranted only if essential to telling the park story and if sufficient data exist to ensure accuracy of the restoration or reconstruction. Using structures for compatible activities helps protect them from neglect and vandalism.

The park's natural resources need protection from air- and water-borne pollutants, habitat destruction, and invasion by alien species. Current known threats include vegetation trampling and erosion caused by foot traffic at turnouts and viewing areas, and invasions of alien Russian thistle and salt cedar. Trespass grazing will be a potential problem along the eastern boundary if sheep are brought onto the range adjacent to the park as is currently planned. Plant and animal populations need to be inventoried and monitored to detect other potential threats and to provide the necessary data for identifying appropriate protective management strategies.

Specific management issues and strategies are described in the park's *Resource Management Plan*. That plan will be updated as necessary to direct the implementation of the following management concepts.

PALEONTOLOGICAL RESOURCE MANAGEMENT

Research

Background. Paleontological research in the park began in earnest in the early 1920s, when Professor Charles Camp of the University of California was attracted by news of discoveries of phytosaur and metoposaur fossils by amateur paleontologists. Over the next decade and a half Camp conducted systematic surveys of vertebrate fossils, which he documented with extensive field notes and photographs. Camp shipped tons of fossilized bone to the Berkeley campus, establishing the foundation for the university's world-class Triassic vertebrate collection.

Berkeley professors and students have maintained close ties with the park and frequently undertake field work there. Other academic institutions that have sponsored field work in the park and that are major repositories of fossils excavated from the Petrified Forest member of the Chinle formation are the Smithsonian Institution, the American Museum of Natural History, the University of Colorado, Weber College, Arizona State University, Northern Arizona University, the Museum of Northern Arizona, and the New Mexico Museum of Natural History.

In spite of seven decades of active paleontological research, as late as 1981 only about 40 Triassic plants and a handful of Triassic animals were known from the park. Just recently, however, there have been dramatic additions to the park's information base. Now more than 100 species of plants and 50 animals are known, and paleontologists are better defining the topography and climate of the Triassic period. Because Petrified Forest contains the most important accessible exposure of Triassic rock in the world, the research here is of global significance to paleontology, and also to geology (notably to the study of sedimentology). It may also prove to be of global importance to biology. Some of the most astounding discoveries of the 1980s have been of organic plant and animal material, with its genetic information intact, dating from a hundred million years ago. Although no genetic material has been found in the park, and all of it found to date has been more recent than the Triassic, additional discoveries are undoubtedly forthcoming in this field of study.

Academic research in the park is currently coordinated by a park staff generalist who has the counsel of an advisory group made up of noted paleontologists from several regional institutions with an interest in the Chinle formation. Little research is initiated or funded by the National Park Service. Most is accomplished by outside institutions who request and receive NPS research permits. Through the permit process, these institutions agree to publish their findings and to provide the National Park Service with information it can use in resource management and interpretation in exchange for the opportunity to excavate and study park resources. Often, fossils are removed from the park and added to the collections of the excavating institutions. The National Park Service retains jurisdiction over the resources and can direct that they be relocated to another appropriate institution if the original institution violates the terms of its permit. Thus, the long-term preservation of the fossils removed from the park is ensured. However, the fossils are scattered and not easily accessible as a group for comparative studies.

Such arrangements have proved relatively successful over the past decade, in large part because of the dedication of the individuals involved. One notable success is the cooperative agreement between the park and UC Berkeley through which the park is receiving skeletal reconstructions of four Triassic reptiles. When completed the mounts will be the only ones of their kind and will greatly enhance the park's world-class interpretive value.

However, a research program as it is being conducted in the park also has significant disadvantages. An obvious problem is the inefficiency of an uncoordinated program of unrelated efforts by multiple institutions. Another problem is the often incomplete and sporadic return of information to the

National Park Service and the public – who should be the ultimate beneficiaries of these public resources.

Proposal. Recognizing the global significance of the park's paleontological resources, the National Park Service proposes to establish a research center in the park to direct the scientific inquiry into the Triassic environment of the Chinle formation. The center will allow for coordinated, long-term research activities, such as quarry operations in the bone beds, and it will provide the facilities needed to care for park resources on site. A research plan, scope of collections statement, and collection management plan will be prepared to establish goals and direct specific research and collection activities. Programs funded through the center will ensure that research conducted in the park will benefit park management and interpretive programs.

The proposed research center will consist of a preparation lab, where specimens brought in from field excavation sites can be professionally prepared for study and storage, a collection storage area for a comprehensive comparative collection, a library, a common workspace for visiting researchers, a large meeting room, classrooms, and offices for the center staff. Minimal staffing needs for the center will be a director (PhD paleontologist), a curator/collections manager, a conservator, a computer technician, and a secretary. Compatible uses of the center will include conferences, workshops, environmental education classes, and interpretive programs.

One of the primary purposes of having the center in the park will be the opportunity it provides for interpreting the park's research to visitors. A window in the preparation lab will allow visitors to view work in progress, and guided tours may also be conducted. The accessibility of the research center to park visitors will greatly enhance their awareness and appreciation of the park's research values and help them understand the relationships among the park's scenic, geologic, and paleontological resources.

Such a facility could serve as a center of excellence for paleontological research in the national park system. The center's programs could be expanded to serve some or all of the 33 other NPS units with paleontological resources.

Protection of Petrified Wood

Background. An estimated 12 tons of petrified wood are stolen from the park each year, mostly in small, easily carried pieces taken from the Rainbow Forest area (NPS 1986). The temptation to steal wood is being encouraged by the sale of petrified wood for high prices at gift shops throughout the region. Two private gift shops immediately outside the south park boundary and concessioner-operated gift shops at both park entrances sell petrified wood. Thus, many visitors' first impressions of this park resource are of its commercial value and usefulness for bookends and jewelry. As the quality and quantity of commercially available petrified wood decreases, the potential for major wood theft in the park will increase.

Various methods of preventing the theft of petrified wood have been attempted. Free samples (purchased from commercial sources) have been given to visitors as they exited the park. Uniformed personnel have been stationed at high-theft sites during the peak travel season, and frequent patrols by both on-foot and horse-mounted rangers have been scheduled. Car searches have been conducted. And letters from people who took wood from the park and later returned it have been exhibited in the visitor center. A 1971 study by Northern Arizona University concluded that it would be impossible to measure and compare the effectiveness of these various measures with any accuracy. However, park managers agree that on-site interpretation and ranger patrols seem to be the most effective known methods of reducing wood theft.

Proposal. Considerable emphasis will be placed on helping visitors understand the significance of the wood and the importance of preserving it in the park (see "Visitor Experience"). Additionally, it is proposed that two patrol rangers be added to the law enforcement/visitor protection division to increase patrols in high theft areas. In an effort to discontinue giving a mixed message to visitors about the appropriateness or inappropriateness of taking petrified wood from the park, it will no longer be sold inside park boundaries.

Petrified wood will be further protected by adjusting the park boundary to include additional significant wood sites (see "Boundary Adjustments").

NATURAL RESOURCE MANAGEMENT

The Shortgrass Prairie Ecosystem

Background. The destruction of the shortgrass prairie ecosystem as a result of overgrazing, drought, and floods during the late 1880s and early 1890s changed the face of northern Arizona. Overgrazing is still evident over much of the range, and erosion continues to deepen steeply incised gullies. Satellite photos show that the park is the only area in northeastern Arizona where the shortgrass prairie has made a substantial comeback. The abrupt increase in vegetation density is quite obvious within the park boundary fence. Although the shortgrass prairie will never fully recover to its pre-1880s species composition, it will come closest to recovery within the park.

All ground disturbances in the past, even when revegetated with native species, have resulted in at least a temporary proliferation of weedy annuals, such as Russian thistle, cheatgrass, and sunflower. Regeneration of native grasses is slow, and in the case of roadside revegetation projects is expected to take three to seven years before native species stabilize disturbed areas.

Proposal. Management will seek every strategy feasible to ensure continued recovery of the shortgrass prairie ecosystem. Language identifying the importance of the shortgrass prairie should continue to be included in park planning documents, such as the *Statement for Management* and the *Resource Management Plan*. Basic resource inventories will be completed as funding is available. Range conditions and their correlation with wildlife populations will be monitored. Areas of concentrated human activity will be monitored to identify changes in species composition, and action will be taken to eliminate or mitigate adverse effects on natural biological processes. Such action will include revegetation of all areas disturbed by foot or vehicle traffic. Alien plant species will be removed wherever practicable, and the boundary will remain fenced to protect native plants and animals from the adverse effects of grazing by trespassing livestock. Vegetative recovery rates will be monitored. If the boundary is adjusted (see "Boundary Adjustments") the boundary fence will be relocated to encompass the new park additions. Fencing will be of an appropriate type to allow for unrestricted movement of pronghorns.

Species of Special Concern

Background. No federally listed threatened or endangered wildlife reside in the park, although American peregrine falcons (*Falco peregrinus anatum*) and southern bald eagles (*Haliaeetus leucocephalus leucocephalus*) occasionally pass through on their seasonal migrations. The only known rare plant is gladiator milk vetch (*Astragalus xiphoides*), which has been designated a category 1 candidate for threatened status on the federal list of threatened and endangered plants (USFWS 1985). It occurs in four populations in the park at Angels Garden (the largest), Chinde

Mesa, Blue Mesa, and Agate Bridge. An inventory of these populations in 1988 estimated that they contained about 7,000 to 10,000 individuals.

Proposal. A survey will be conducted to inventory other likely habitat for rare plants. Annual monitoring of gladiator milkvetch will be continued. A redesign of the facilities at Agate Bridge is proposed to increase the protection of this rare plant population (see "Development").

Fire Management

Background. The shortgrass prairie and sagebrush plant communities are so sparse that the vegetation will not carry fire any great distances.

Proposal. Where fire threatens life, property, or cultural resources, it will be suppressed by personnel using fire trucks and other equipment. In natural areas of the park where life, property, and cultural resources are not threatened, wildland fire will be contained by indirect suppression methods (use of roads or natural firebreaks, such as barren areas, rim rock, and dry washes). All fires will be controlled with suppression techniques that cause the least damage to natural and cultural resources.

Air Quality

Background. Petrified Forest is a class I area for purposes of implementing the Clean Air Act, which means that only minor increases in ambient pollution levels can be tolerated. Air-quality-related values such as visibility of colorful panoramas inside the park and clear long-distance views outside the park are considered to be primary attractions and essential to a visitor's enjoyment of the park. These values are also protected under the Clean Air Act.

Proposal. Adequate air quality baseline data will be established to ensure compliance with the Clean Air Act.

CULTURAL RESOURCE MANAGEMENT

Archeological Sites

Background. About 500 prehistoric archeological sites have been found in the park. Most are in remote locations, but some are near existing or proposed developed sites, where they are potentially threatened by excavation, foot and vehicle traffic, and other ground-disturbing activities. Rapidly escalating market prices for prehistoric artifacts are making all resources – even those in remote locations – more susceptible to theft. Pot hunting has occurred within the park boundary.

Proposal. The park's archeological sites will be managed through a proactive program of conservation, protection, and interpretation. A planned, phased research program will be initiated to complete the park's cultural resource data base. A research design will be prepared to guide this program. Much of the research needed to learn about the prehistoric peoples who inhabited the park can be accomplished as part of scientific studies conducted for multiple purposes. For example, agricultural rock alignments can be identified from low-level aerial photography used for vegetative mapping. All the park's research projects will be closely coordinated to ensure maximum data benefits.

Cultural resources will be evaluated, and those that appear to be potentially eligible will be nominated to the National Register of Historic Places. Agate House, a partially reconstructed eight-room pueblo built of petrified wood, should be reevaluated for possible delisting from the National Register. It was the first major archeological site excavated in the park, and much of its scientific value was destroyed during the excavation and reconstruction.

An ongoing evaluation/monitoring program will be conducted to determine the extent and nature of vandalism and site destruction through erosion, and priorities for protective measures will be established based on site integrity and vulnerability. Samples will be salvaged from ruins found to be threatened by natural erosion.

A significant archeological site on the Flattops is being adversely affected by foot traffic and probably by removal of artifacts. The parking pull-off and wilderness trailhead will be removed and foot traffic will be greatly reduced in this part of the park, helping to preserve this archeological site.

Resources to be interpreted include the Puerco ruin and petroglyphs, Newspaper Rock, the 35th parallel transportation route (Whipple's route, Beale camel trail), the traces of Route 66, and the Santa Fe Railroad tracks. They will be interpreted using techniques that will protect the resources.

Prior to any ground-disturbing activities, potential development sites will be intensively surveyed. Site plans will be developed to avoid disturbing archeological resources wherever possible. If disturbance is unavoidable, mitigation procedures will be developed in consultation with the Arizona state historic preservation officer and the Advisory Council on Historic Preservation. Sites that might potentially be affected by development or concentrated visitor use are listed in table 1.

The scope of collections statement will be updated, and a collection management plan will be prepared. Artifacts not needed for display will be moved to the Western Archeological and Conservation Center. Artifacts retained at the park will be cataloged and stored in appropriate facilities.

The National Park Service will initiate cooperative agreements with private landowners, Indian tribes, and other federal agencies to increase protection for related archeological resources outside park boundaries.

Historic Sites and Structures

A historic resource study will document the historic events that helped shape the landscape and identify historic sites, structures, and objects. It will define historic contexts and significant themes for historic resources and their level of eligibility for the National Register of Historic Places.

The only structure on the National Register of Historic Places is the Painted Desert Inn. This former trading post and tourist stop has been designated a national historic landmark in recognition of its aesthetic qualities. Originally constructed in 1924, the mud mortar 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 high, but banked into a hillside, so it exposes a low profile to the Painted Desert. The thick stone walls are covered with pink-earth-toned stucco. The magnificent interior spaces are finished with log vigas, carved posts, flagstone floors, and wood-frame casement windows. The building's masterful combination of architecture and design is enhanced by a painted glass skylight and murals by Hopi artist Fred Kabotie.

Table 1: Archeological Resources Near Developed Areas

Headquarters Area

- Prehistoric archeological site. Sherd and lithic scatters and possibly buried structures. Site integrity and National Register significance unknown.

Tiponi Point Vicinity

- Prehistoric archeological sites dating from Pueblo II and III periods. Sherd and lithic scatters and possibly buried structures. Site integrity and National Register significance unknown.

Kachina Point Vicinity

- Prehistoric archeological sites dating from Pueblo II and III periods. Sherd and lithic scatters and possibly buried structures. Site integrity and National Register significance unknown.
- Historic archeological site(s) dating from the early 1900s. Artifact scatters. Site integrity and National Register significance unknown.

Painted Desert Rim

- Painted Desert Petroglyphs and Ruins Archeological District. Listed on the National Register.
- Isolated artifacts and prehistoric archeological sites. Lithic scatters, hearths, quarries, and rock alignments. Site integrity and National Register significance unknown.

Painted Desert

- Historic archeological sites. Litter of broken bottles across the Painted Desert. Location, site integrity, and National Register significance unknown.

Puerco River Vicinity

- Prehistoric/historic transportation corridor. Possible prehistoric travel route, 35th parallel route (Whipple's route, Beale camel trail), traces of 1800s wagon/stage road, traces of Route 66, Santa Fe Railroad tracks. The 35th parallel route and wagon/stage road are listed on the National Register. Site integrity and National Register status of other resources unknown.
- Puerco ruin and petroglyphs. Prehistoric 75-room masonry pueblo from the Pueblo IV period. Site includes adjacent petroglyphs, solar calendar. Listed on the National Register.
- CCC camp. Site integrity and National Register significance unknown.

Newspaper Rock

- Newspaper Rock Petroglyphs Archeological District. Listed on the National Register.

Blue Mesa Vicinity

- Prehistoric archeological sites from the Pueblo II and III periods. Rock art, artifact scatters, and possibly buried structures. Site integrity and National Register significance unknown.
- Historic archeological sites dating from the early 20th century. Remains of historic camps and excavations related to paleontological research. Site integrity and National Register significance unknown.

Agate Bridge Vicinity

- Historic archeological site. Sandstone foundations and remains of superintendent's house and shed, trash deposits. Site integrity and National Register significance unknown.

Flattops Area

- Prehistoric archeological site from the Basketmaker period. Pit house village. Evidence of horticulture, early ceramics. Listed on the National Register.

Giant Logs/Long Logs Vicinity

- Historic archeological sites dating from the 1930s. Traces of CCC camps, golf course, and early park structures. Site integrity and National Register significance unknown.
 - Agate House (bldg. 6). Prehistoric structure built of petrified wood. Reconstructed in the 1930s. Listed on the National Register.
 - Prehistoric archeological sites from Pueblo I, II, and III periods. Surface structures, petrified wood masonry, and quarry areas. Site integrity and National Register significance unknown.
-

The inn will be restored and returned to use for interpretation and visitor services. The interpretive themes will include the history of the building and regional native American culture. Historically appropriate visitor services (a soda fountain and museum shop) will be operated by the concessioner. A historic structure report, necessary to guide restoration work, will have a high priority for completion.

The two buildings across the road from the inn are in the same style and contribute to the ambiance of the historic scene; however, they were not part of the 1975 nomination for listing on the National Register of Historic Places or the 1985 national historic landmark nomination. It is recommended that nomination forms be prepared and that the buildings be maintained as part of the historic scene and used for storage.

The following additional park structures were evaluated for possible inclusion on the National Register of Historic Places and were determined to be ineligible:

- comfort station at Puerco River ruins

- pump house at Puerco River

- comfort station at Agate Bridge

- development complex near Giant Logs, consisting of the visitor center/ranger station (historically known as the Rainbow Forest Museum building), park housing, maintenance structures, the concession building, and a concessioner duplex

The concrete piers built by the Santa Fe Railroad in 1917 to support Agate Bridge will be studied to determine their eligibility for the National Register of Historic Places. A similar study will be conducted for the 1934 box culvert bridge across Jim Camp Wash near Giant Logs and for any other bridges determined to be more than 50 years old.

Ethnographic Considerations

The *Resource Management Plan* will outline ethnographic concerns and provide direction for special park uses by local Indian tribes.

Acquired Properties

Any properties added to the park as a result of boundary adjustments (see "Boundary Adjustments") will be evaluated for cultural resources, and the historic resource study, archeological assessment, cultural resources base map, and resource management plan will be revised to reflect any new findings. Cultural resources on newly acquired properties will be incorporated into the park's ongoing management, interpretive, and preservation maintenance programs.

DEVELOPMENT

The development needed to support the proposed management and use of the park is described in this section. Development concept plans are included for the park headquarters/Tiponi Point and the Giant Logs/Long Logs areas. The development options considered during the preparation of the development concept plans are in part two of this section, "Development Options."

PROPOSED DEVELOPMENT CONCEPTS

Park Headquarters/Tiponi Point

Existing Development. The headquarters developed area serves as the park headquarters and main visitor entrance. The existing building complex includes

- a two-story visitor center/administration building
- a gift shop and 140-seat cafeteria
- a gas station
- a ranger/fee collection office
- a community building
- a post office
- a two-story, eight-unit apartment building
- 18 three-bedroom residences
- a manager's residence and trailer park housing concession employees
- a maintenance building and six vehicle storage bays

This complex was built in the 1960s and has a modern architectural style. The structures are steel frame with brick masonry. The standard of construction was not adequate to compensate for the bentonite soils on the site, with the result that the foundations have heaved and the walls have separated, forming large cracks. Bentonite is a clay, found in soils in many locations throughout the park, that has a great capacity for expansion when wet and contraction when dry. When nonflexible structures are placed on these soils, they heave and crack as the soils move beneath them. There is also evidence of some subsidence of the unconsolidated rock beneath the soils further contributing to the instability of the headquarters site. The entire building complex needs to be extensively rehabilitated or replaced using construction methods suited to the site. Current costs of maintenance are exorbitantly high (\$247,000 in 1988). The National Park Service contracted with a private architectural and engineering firm to identify the extent of the required structural work and to estimate the costs of rehabilitation and replacement. That study concluded that all the building foundations would have to be replaced, along with many of the walls. The preliminary estimates indicated that rehabilitation costs would be somewhere between 75 percent and 95 percent of the costs of complete reconstruction.

Proposal. As stated under "Visitor Experiences," it is proposed to relocate the visitor center to Tiponi Point. The administrative offices, maintenance facilities, and housing will be reconstructed or rehabilitated at the existing headquarters site to avoid new land disturbance and the costs of replacing existing utilities (see the Development Concept Plan map). Based on preliminary cost estimates, it is proposed that the buildings be reconstructed. The alternative of rehabilitating the structures would result in an initial cost savings of 5 percent to 25 percent; however, the life cycle costs would likely be greater under that alternative. If subsequent detailed engineering and cost analyses indicate that existing structures can effectively be incorporated into the new design, they will be salvaged as appropriate. New construction will use techniques appropriate for bentonite soils. The complex will encompass 10,000 square feet of administrative, community, and post office

facilities and 29,000 square feet of maintenance facilities. NPS employee housing will include 11 three-bedroom and 10 two-bedroom residences and 10 apartments. In addition, four to six trailer pads with full utility hookups will be provided for visiting researchers, volunteers, and concession employees who desire them. The concessioner is committed to improving employee housing as soon as possible, and this work will be coordinated with the implementation of the other development proposals. The park road will be realigned in this area to avoid having visitors drive close to the headquarters area and to provide a strong line of sight to the visitor center. The entrance station and gas station will be relocated with the park road, and the night gate will be relocated to Pintado Point.

The new 11,000-square-foot visitor center at Tiponi Point will be sited east of the existing parking pulloff. The building will be set back far enough from the rim to avoid a visual intrusion on the wilderness. Tiponi Point offers the advantage of overlooking a small arm of the Painted Desert, where visitors can enjoy scenic vistas without being visible from the main section of the desert floor. The *Interpretive Plan* will be updated and a new exhibit plan will be prepared to guide interpretive media at the visitor center.

The existing overlook at Tiponi Point will be incorporated into a viewing esplanade that will open off the visitor center, leading people directly to the rim. A system of loop trails providing a variety of walking and hiking opportunities will originate at the end of the viewing platform. Visitors will be able to walk along the rim from Tiponi to Chinde Points or any of the points in between. The park road will be realigned between Tiponi and Tawa points to move traffic farther from the rim, and the existing roadway will be reduced and incorporated into the rim-top trail. A slight natural rise and the pinyon/juniper vegetation will visually separate the trail from the road. Another trail will descend from Tiponi Point to the desert floor, where visitors can either follow a short loop trail before walking back up to the visitor center or walk across the desert floor to Kachina Point, where a trail will ascend to the rim.

The 8,000-square-foot research center will be adjacent to the visitor center. Some of the workspaces in the research center will have viewing windows, allowing visitors to watch the work in progress there. The gift shop and cafeteria will be relocated near the visitor center to keep visitor services consolidated. These facilities will occupy a separate building that will be set back farther from the rim.

The Tiponi Point development will be connected to the existing power lines, groundwater source, and wastewater treatment facilities serving the headquarters area. A new cell will be added to the existing sewage ponds.

Kachina Point

Existing development at Kachina Point includes the Painted Desert Inn and two outbuildings used for storage, a parking pulloff, a viewpoint, and a trail to the floor of the Painted Desert. This trail is the major access to the Painted Desert wilderness. The inn has become badly deteriorated and will be restored to make it available for interpretive and concession use. Interior restoration will include the historic soda fountain and the gift sales area. The two outbuildings will be maintained as part of the historic scene and used for storage.

The concrete steps at the trailhead will be removed, and the trail tread will be rehabilitated. New signing will encourage more visitors to use the trail.



PETRIFIED FOREST N.P. HDQTS./TIPONI PT. DEVELOPMENT CONCEPT

Chinde Point

The wide, flat ledge at Chinde Point is the result of a previous quarry operation. The site must be recontoured and revegetated to make it a pleasant place for picnicking and viewing the Painted Desert. A 24-table picnic area will be relocated nearer the rim and oriented to take advantage of the views. A short, looped nature trail will be constructed through the revegetated western section of the site.

Tawa, Pintado, Nizhoni, Whipple, and Lacey Points

Each of these points along the Painted Desert rim drive is developed with a parking pulloff and interpretive viewpoint. The roadway surfaces, curbing, and walkways were all recently rehabilitated, and a project to replace the interpretive waysides is underway. No further development is needed at these sites with the exception of a night gate at Pintado Point. The gate will be installed across the main park road just south of the parking pulloff.

Puerco Valley Viewpoint

A new parking pulloff and wayside exhibit interpreting the transcontinental travel corridor and the shortgrass prairie will be installed just north of the point where the main park road crosses I-40. New road signs just north of this pulloff will advise southbound travelers that they are entering the Puerco River Valley and advise northbound travelers that they are approaching the Painted Desert.

Puerco Ruins

A new parking lot at Puerco Ruins is included in the scheduled road rehabilitation project. A new trail will lead from the lot to the ruins and the petroglyphs, and a second trail will lead to a new wayside exhibit interpreting the railroad tracks to the north. The existing parking lot and the numerous social trails wandering through the ruins and through the nearby petroglyph area will be obliterated.

New restrooms that meet the uniform federal accessibility standards will be constructed near the new parking lot, and the existing comfort station building will be completely refurbished for use as a visitor contact station, which was one of the building's original uses.

Newspaper Rock

The existing spur road and parking lot were rehabilitated in 1985 and remain in good condition. The only facilities proposed for this site are new optical viewing devices designed for viewing the petroglyphs below the overlook and a new exhibit interpreting the petroglyphs.

Tepees

The proposed trail between the Tepees and Blue Mesa will start at a new trailhead adjacent to the Tepees parking pulloff. The 1.5-mile trail will follow abandoned road and trail alignments, which will be rehabilitated to an unpaved trail standard. A new wayside in preparation for this site will represent the erosion of a fossil skeleton and interpret paleontological field methods for excavating

fossils. It is projected that parking for 25 cars will be needed to adequately serve the proposed new exhibit and the trailhead. The existing parking pulloff will be expanded in the same general vicinity to achieve this capacity.

Blue Mesa

Development of Blue Mesa for day use will involve construction of a picnic area with restrooms in the slight depression on top of the mesa. Water is not available on the mesa, so composting toilets will be installed. The location of the picnic area will keep it out of view from the trail leading to the floor of the badlands. Three groups of five covered picnic tables will be installed. A new 10-car parking lot will be constructed to serve the picnic area. The separate trailhead parking area will be retained at its existing capacity of 9 cars.

Agate Bridge

This significantly modified resource will be deemphasized in the park literature, and a new wayside exhibit contrasting historic and modern management practices will be installed. The existing parking lot and comfort station will be retained. A 1/8-mile handicap-accessible loop trail will be constructed from the parking lot to the bridge and the mesa rim overlook. This trail will channel visitor foot traffic and help protect the rare gladiator milkvetch from incidental trampling.

Jasper Forest

A new wayside exhibit is being prepared for the overlook. No additional development is proposed for this area.

Crystal Forest

The parking lot was rehabilitated in 1985. The only new development proposed for this area is a new wayside exhibit.

The Flattops

The existing parking pulloff, trailhead, and trail will be removed and the sites will be revegetated.

Giant Logs/Long Logs

Existing Conditions. The Giant Logs developed area serves as the southern entrance to the park and as a base of operations for park staff. The existing facilities include

- a visitor center and ranger station in one building (also known as the museum building)
with an adjacent interpretive trail through Giant Logs
- a gift shop and a 60-seat snack bar
- adjoining housing built around a courtyard consisting of 6 two-bedroom units, 1 one-bedroom unit, and 1 one-room unit
- a two-unit concessioner residence
- a maintenance shop
- a storage building
- a garage for the fire truck
- a picnic area

Most of the development at Giant Logs (previously called the Rainbow Forest developed area) dates from the 1930s. The visitor center/ranger station, the residences, and the maintenance buildings 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 carrying out the southwestern theme. All of these buildings have been modified over the years, which has reduced their architectural integrity. The gift shop/coffee shop building, which is the oldest structure on the site, has been drastically altered and no longer resembles the other structures. The visitor center/administration building has been altered by an architecturally incompatible addition at the rear of the building.

Proposal. As described earlier, the Giant Logs/Long Logs area offers excellent opportunities for visitors to see petrified wood and other fossils embedded in the colorful strata of the Chinle formation. The developments in this part of the park should encourage visitors to slow their pace, to walk the park's trails, and to discover and examine the intricate details of its landscapes. The interpretive emphasis at the Rainbow Forest visitor center will be refocused to provide information for visitors entering the park from the south, to exhibit and interpret a variety of components of the Triassic ecosystem, and to serve as a staging area for guided and self-guiding tours of the surrounding wood sites and fossil beds. To tie the visitor center more closely to the Long Logs area and to provide a more convenient orientation for visitors approaching from the south, a new visitor center building will be constructed near the existing bridge just above the floodplain of Jim Camp Wash (see the Development Concept Plan map). A new 0.75-mile trail will lead from the visitor center, across a foot bridge over Jim Camp Wash, to Long Logs. The existing access road and parking lot at Long Logs will be removed, so the only access will be the trail from the visitor center. Visitors will walk through the visitor center to get from the trail to the parking lot, which is expected to reduce the theft of petrified wood from the Long Logs area.

A small snack bar will be built adjacent to the visitor center, and the existing concession building and nearby concessioner cabin will be removed. The concession building currently dominates the developed area and attracts visitor's attention away from the visitor center. The new concession facility will be much smaller in scale and designed to complement, rather than compete with, the visitor center. A ramada structure between the two buildings will provide a shaded outdoor seating area for visitors. The picnic area will be relocated to the south side of the road along with the visitor center. The sites will be oriented to overlook Jim Camp Wash and the far views to the south.

The visual impact of development on Giant Logs and Long Logs will be significantly reduced by removing the existing concession building and by relocating all housing and maintenance functions to a new administrative site near the park boundary (see the South Entrance Area map). The new

administrative site will be about 1.5 miles northwest of the existing developed area, in the shortgrass prairie on top of the mesa. This site is out of view from Giant Logs and Long Logs, has no wood or other fossil remains, and has low potential for archeological resources. The shortgrass prairie at this site has previously been disturbed by the construction and use of corrals, a water reservoir, an abandoned section of old US 180, and an abandoned golf course. The site is served by an existing road (the old US 80 alignment) and has utilities nearby. This is a good time to relocate the housing, since four additional residences are required and since the concessioner is committed to replacing the concessioner employee housing as soon as possible. NPS housing requirements at the new mesa-top site will include 2 three-bedroom and 2 two-bedroom residences and 10 apartments. The concessioner will need 2 two-bedroom residences. Once the new housing and maintenance facilities are in place, the existing facilities will be removed, and much of the existing developed area will be restored to natural conditions.

The existing visitor center/ranger station will be retained and renovated to provide the needed office space. This structure will be the only existing building retained on the site. A new facade will make the building's later additions more compatible with the original structure. The interpretive trail through the Giant Logs behind the ranger station will be redesigned to improve its interpretive potential and to make it accessible to all visitors, including the handicapped.

Once the existing concession building is removed, the access road will be realigned to straighten the curves and relocate it farther from Jim Camp Wash, freeing a developable site for the visitor center. The road bridge across Jim Camp Wash will be relocated north of the existing crossing. The access road is currently routed through the middle of the parking lot in a confusing and unsafe layout. Once the road is realigned, the parking lot can be reconstructed on the south side of the road, adjacent to the new visitor center, so that visitors will no longer have to walk across the main park road to get to their cars. As stated above, the segment of old US 180 west of the main park road will be rehabilitated for access to the new housing area. The 1.5-mile-long segment east of the main park road, which serves no purpose and is a visual intrusion on the view from Long Logs, will be obliterated. This will require the removal of two small bridges.

CONSTRUCT NEW BRIDGE



PARKING FOR
RANGER STATION

LANDSCAPE
RESTORATION

RESTROOMS
INFORMATION
REFRESHMENTS



GIANT

LOGS

INTERPRETIVE

AREA

PARKING
130 SPACES
5 BUSES

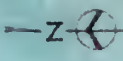
RANGER STATION
AND OFFICES

LEGEND

- PROPOSED STRUCTURES
- PROPOSED ROAD / PARKING
- STRUCTURES TO BE REMOVED
- EXISTING STRUCTURES TO REMAIN
- ROADS / PARKING TO BE REMOVED

FOOTBRIDGE

VISITOR CENTER



TRAIL TO LONG LOGS

FEIRIFIED FOREST N.P.

GIANT LOGS

DEVELOPMENT CONCEPT



PETRIFIED FOREST N.P. SOUTH ENTRANCE AREA GMP

DEVELOPMENT OPTIONS

Options for the Headquarters/Tiponi Point Development Concept Plan

Reconstruct Headquarters and Visitor Center. This option would minimize new land disturbance by keeping all facilities, including the visitor center, consolidated at the existing headquarters site. The visitor center, gift shop, cafeteria, administrative offices, maintenance facilities, and housing would all be redesigned and reconstructed in the same general area, and a research center would be added adjacent to the visitor center. The gas station would be relocated to the other side of the road to improve access and circulation at the site. The night gate would be relocated to Pintado Point.

There would be no change at Tiponi Point in this alternative. The existing parking pulloff and viewpoint would be maintained.

Options for the Giant Logs/Long Logs Development Concept Plan

Retain Housing and Maintenance. This option would preserve existing structures and minimize new land disturbance. All the existing buildings except the two concession buildings would be retained. The visitor center/ranger station would be renovated for exclusive use as the new visitor center, and the Giant Logs interpretive trail behind the center would be improved to make it less obtrusive and accessible to all visitors, including the handicapped. A small building with restrooms and vending machines would be built adjacent to the visitor center, and a ramada structure would connect the two facilities, as in the proposal. A new ranger station would be built, and a separate parking lot would be constructed for this facility. Two two-bedroom and two three-bedroom residences would be added to the existing NPS residential complex, and the existing units would be used for seasonal housing. A new maintenance/storage building would be provided. No concessioner housing would be needed under this option. Better separation of visitor use and park operations would be achieved through vegetative and structural screening and by relocating the picnic area to the other side of the access road, to a more scenic site overlooking Jim Camp Wash.

Once the concession operation was reduced, the existing concession building and the concessioner residence would be removed. This large building now dominates the scene, detracting from the historic ambience of the other development and commanding visitors' attention. Furthermore, the building is structurally unsound and would require major capital expenditures for renovation and maintenance. Its removal would greatly improve options for realigning the park entrance road.

The access and parking situation would be improved by realigning the road around the south side of the parking lot and by redesigning the parking lot configuration, taking advantage of the site vacated by the existing concession building. The road bridge across Jim Camp Wash would be replaced at the existing crossing.

A trail from the visitor center to Long Logs would not be desirable under this option because of the intervening parking lot and road. Consequently, the Long Logs parking lot would be retained, and visitors would continue to drive to that resource.

Adaptive Use of Existing Structures. Like the proposal this option would remove most park housing from the prime resource area and relocate it to the mesa northwest of the existing development. One residence would be retained at Giant Logs to provide a ranger presence and resource protection. Unlike the proposal, this alternative does not call for demolition of existing structures. The remaining abandoned residences would be adaptively used for administrative offices

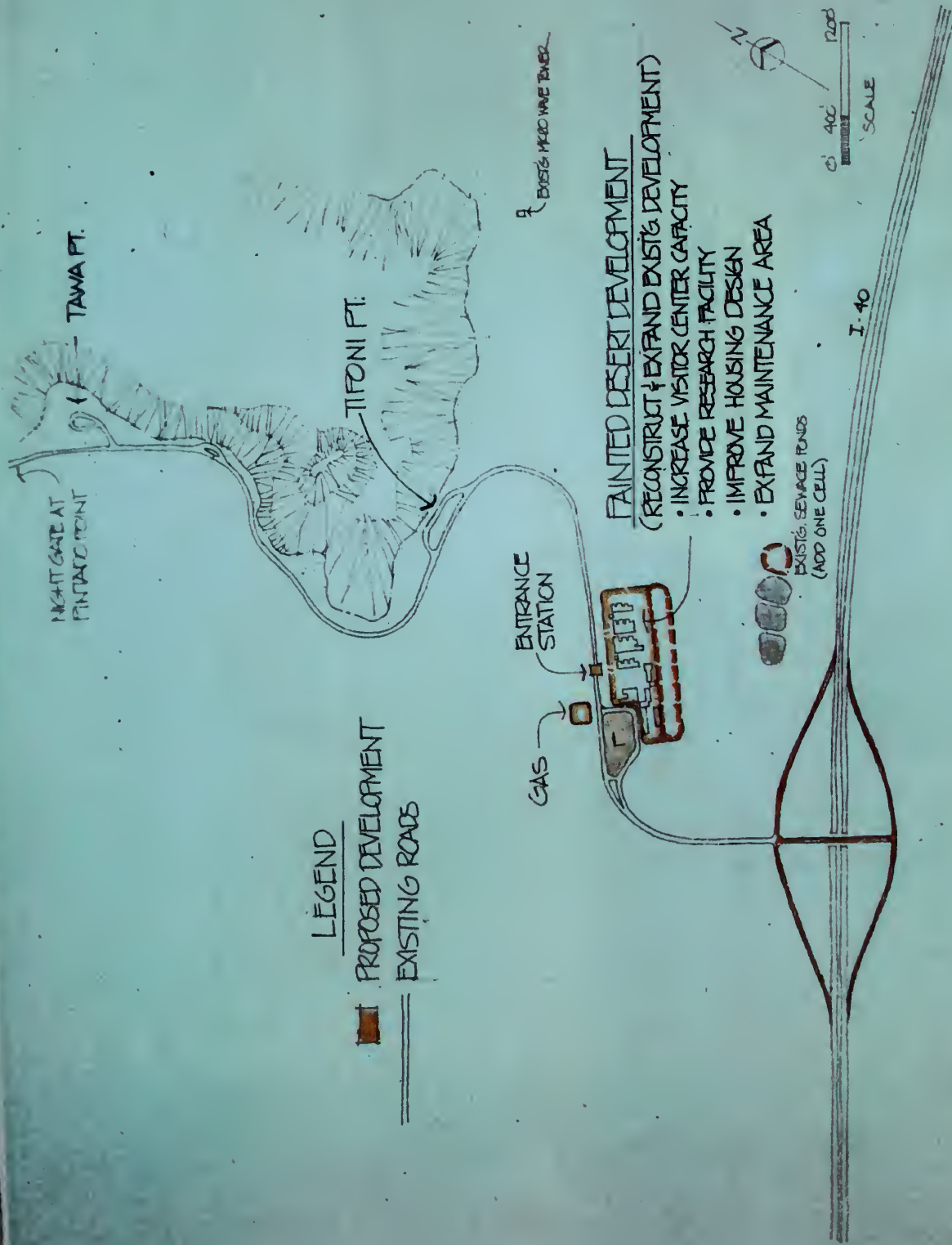
and visitor facilities. The visitor center/ranger station would be renovated for exclusive use as the new visitor center. The ranger station would be relocated to the buildings at the north end of the existing residential complex. The remaining residential structures would be renovated to provide information services, a snack bar, a small gift shop, and rest rooms. The courtyard at the center of the complex would be landscaped as a large shaded outdoor seating area for visitors, where they could leisurely enjoy both the natural and cultural amenities of the site. The picnic area would be retained at its existing location. The access road and parking lot would be improved, and a new maintenance/storage building would be provided. A trail from the visitor center to Long Logs would not be desirable because of the intervening parking lot and road.

Options Considered but Rejected

Two development options were considered but rejected because they were not economically feasible for the National Park Service or the concessioner.

The possibility of developing **park overnight accommodations** (a lodge, restaurant, recreation vehicle park, campground, and store) was studied by the superintendent and the concessioner in the fall of 1988. The study showed that the demand for overnight accommodations is being met by local enterprise in Holbrook and that these facilities would not be appropriate or economically feasible in the park.

The option of an **off-site administrative/maintenance/and housing area in Holbrook** was considered as a means of removing park operations that could be conducted outside the park, thus reducing the environmental and visual impacts of development. This option was rejected for several reasons. No compelling reason exists for moving these operations, since the existing development site at Painted Desert and the proposed site on the mesa top behind Giant Logs do not impair park resources. Such a move would result in the loss of productive time for maintenance employees, a longer emergency response time for rangers (unless additional housing was continued on site), and general inefficiencies for other park personnel who must conduct at least some of their work in the park. A substantial increase in base funding for park operations would be needed to pay for the additional vehicles and vehicle maintenance required to drive between the headquarters in Holbrook and the park during the course of each working day.



LEGEND

- PROPOSED DEVELOPMENT
- == EXISTING ROADS

MAINTENANCE AND
STORAGE BLDG

PARKING FOR R'S
AND HOUSING

RANGER STATION
AND OFFICES

PICNIC AREA

PICNIC AREA
PARKING

2-2 BR UNITS

2-3 BR UNITS

PARKING
120 SPACES, 5 BUSES

RAMADA

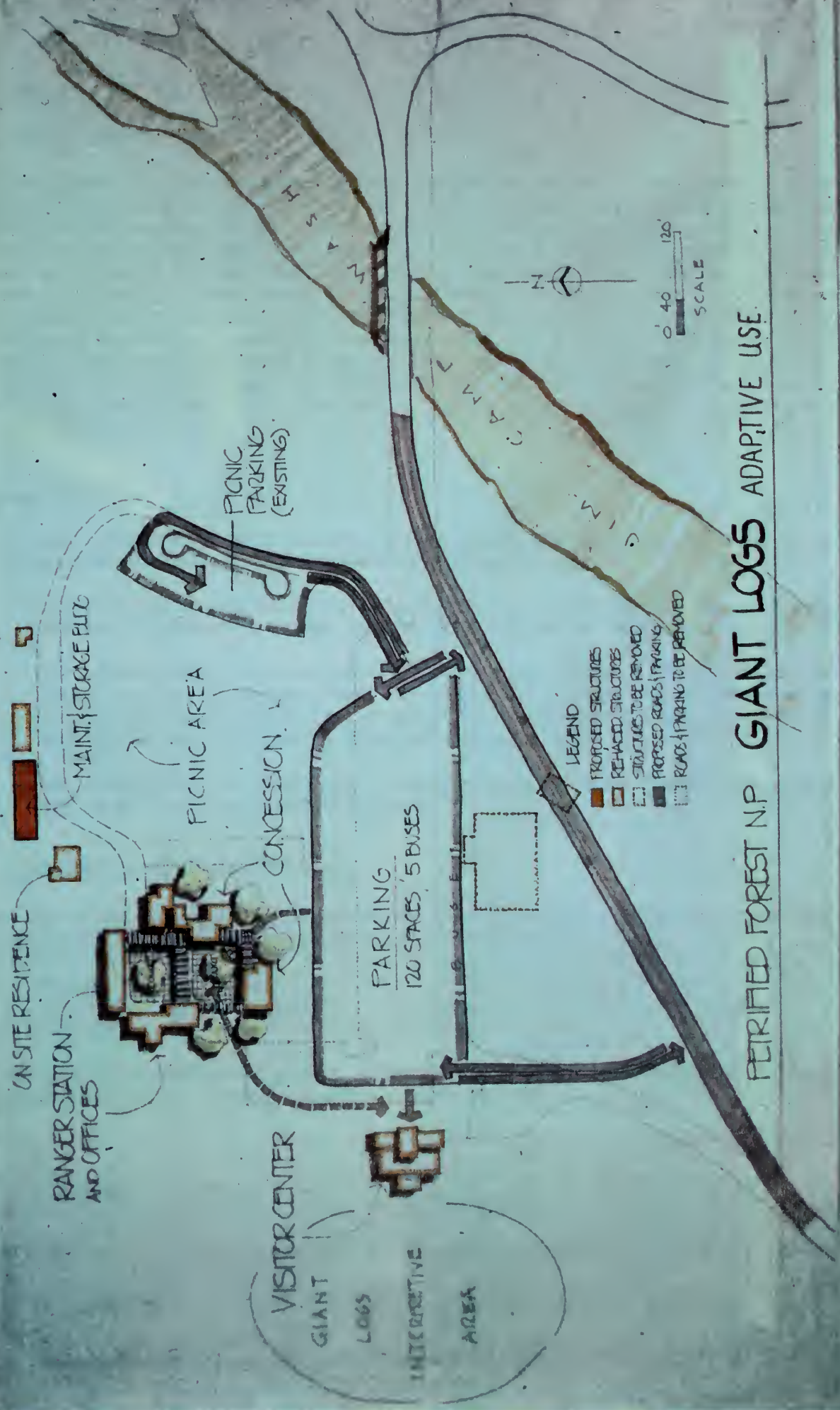
VISITOR CENTER
RESTROOMS
VENDING

LEGEND

- PROPOSED STRUCTURES
- REMOVED STRUCTURES
- STRUCTURES TO BE REMOVED
- PROPOSED ROADS / PARKING
- ROADS / PARKING TO BE REMOVED



PETRIFIED FOREST N.P. GIANT LOGS ADAPTIVE USE.



DESIGN CONSIDERATIONS

Access for Disabled Visitors

Sensitive park design will be employed to allow physically and mentally disabled visitors to enjoy the park and participate in recreational activities using the same facilities and programs as the able-bodied. Similar consideration will be given to employee work areas and housing. The degree of accessibility will be proportional to the degree of development. Visitor facilities and employee work areas and housing in developed areas will be built or rehabilitated to make them fully accessible. Most of the existing facilities currently meet this standard. New facilities at Tiponi Point and Giant Logs will be designed and constructed or rehabilitated to make them fully accessible. Facilities in backcountry areas, which typically have little development, will be made accessible to the extent feasible without major modification of the site. Thus, trails to and within backcountry areas will retain the basic unimproved nature and topographic variations currently existing. Where possible, accessibility considerations will be developed in consultation with local clubs and organizations whose members are disabled.

Design Details

The design details of all facilities, including waysides, parking lots, picnic areas, and trails, will be consistent throughout the park. The recommended details are as follows:

The use of gray cut sandstone for retaining walls should be consistent. Such walls are already fairly uniform throughout the park, and they blend well with the natural landscape.

The preferred surfacing for walkways is exposed aggregate because it blends better with the natural landscape. The obtrusive round river cobbles that have been used in some places to prevent erosion and define the limits of paths should be removed and replaced with native rock from the region that matches the natural rock in the area.

Picnic tables should be covered with ramada-type structures similar in style to the ramada adjacent to the Rainbow Forest visitor center.

ESTIMATED DEVELOPMENT COSTS

The costs of facility development to implement the proposal would be shared by the National Park Service, the Federal Highway Administration, and the concessioner, as follows:

National Park Service	\$29.4 million
Federal Highway Administration	5.0 million
Fred Harvey, Inc.	1.4 million

More detailed cost data for the proposal and the development options are included in the "Plan Implementation" section following "Boundary Adjustments."

BOUNDARY ADJUSTMENTS

BACKGROUND

Petrified Forest National Park is perceived by the average visitor as being much larger than its actual boundaries. The boundaries have been established along section lines, and they cut across many large landscape features. Major viewpoints in the park, such as the overlooks along the Painted Desert rim, look out over landscapes that are partially inside and partially outside the park. In areas where the landscape remains in a relatively natural state, visitors perceive the park as continuing to the horizon. This illusion is not detrimental to the visitor experience, but it causes a false impression that what is viewed is preserved inside the park. In fact, the opposite is true. The scenic vistas so enjoyed by park visitors do not necessarily exist as a result of park management preserving the scene, but rather as a result of a lack of development action by a park neighbor.

Scenic vistas are not the only park resources divided by long, straight section-line boundaries. Valuable paleontological, paleobotanical, and archeological resources of the Petrified Forest area have been left outside the park. Recent scientific work has revealed resources far beyond those known in 1962, when the monument was redesignated a national park. The park lands and surrounding environs are now known to contain an excellent record of a Triassic ecosystem and hundreds of important archeological sites related to several prehistoric cultures. Present park boundaries, established to protect concentrations of petrified wood, do not reflect these new findings, even though these discoveries are integral to the Petrified Forest story.

Only a small remnant of the shortgrass prairie ecosystem is included in the park. Grasslands are not mentioned specifically in the park's enabling legislation, and this ecosystem was not considered when boundaries were established. However, the recovery of the shortgrass prairie in Petrified Forest National Park since the elimination of grazing has greatly increased the scientific value of this biological community and has resulted in the park now being considered the finest example of this vegetation type in the state.

Land uses that are incompatible with the purposes of the park – such as subdivisions, petrified wood theft, pot hunting, and grazing – are occurring on the park boundaries. No control currently exists for moderating the derogation of resources and viewsheds important to the park.

PROPOSAL

Several boundary adjustments are proposed to create boundaries that more closely conform to the resources and features the park is mandated to protect. These boundary changes would incorporate eight parcels of adjacent lands that contain significant paleontological, paleobotanical, and archeological resources and important scenic and wilderness values warranting their inclusion in the park. Research potential in the park would be increased by the addition of many field sites, and the visitor experience would be enhanced by better interpretation, protected viewsheds, and larger park wilderness areas. Four of the parcels merit study for wilderness suitability and could be added to the two established wilderness areas in the park. A fifth parcel is large enough to be designated a wilderness area of itself if it was determined to be suitable. No proposals for additions of shortgrass prairie are included; however, consideration should be given to expanding the purpose of the park in future legislation to include the preservation of the shortgrass prairie.

Opportunities may now exist for acquiring the eight identified parcels, since some federal, state, and private landowners are planning to consolidate their holdings, realign jurisdictions, and dispose of

certain lands adjacent to the park. All acquisition would be on a willing seller basis. If the existing landowners were not willing sellers, the National Park Service would be interested in acquiring scenic and preservation easements on the parcels.

The eight parcels containing natural and cultural resources important to the park occur in five areas. These areas are listed below in order of their proposed priority for acquisition:

1. Billings Gap/Stone Axe Ruins – 7,280 acres in 3 parcels
2. Painted Desert – 5,760 acres in 1 parcel
3. Dead Wash Valley – 10,140 acres in 1 parcel
4. Jasper Mesas – 2,440 acres in 2 parcels
5. Grassland strip – 4,840 acres in 1 parcel

The total area of the parcels is 30,440 acres. The present ownership of this land is outlined below:

Bureau of Land Management	6,040 acres
State of Arizona	4,240
Private	<u>20,160</u>
Total	30,440 acres
Apache County	22,880 acres (16,440 acres private)
Navajo County	<u>7,560</u> acres (3,720 acres private)
Total	30,440 acres

BLM and state holdings were derived from BLM maps. No title checks were undertaken on private holdings; information about individual ownership of private plots must be regarded as preliminary.

Most of the proposed additions are comprised of whole sections, but partial sections are included as well. Some sections were divided because the excluded land was not of park calibre for various reasons: for example, the land contained developments incompatible with park purposes, or management difficulties would be out of proportion to the benefits derived from adding the land to the park.

Priority One: Billings Gap/Stone Axe Ruin

This proposed addition consists of three roughly triangular units located on the southern and southwestern boundaries of the park. The largest parcel lies east of Blue Mesa and contains Billings Gap and the Stone Axe ruin. The two smaller parcels are adjacent to the park's southern wilderness unit.

Major Resource Values:

- Fossils, including the most significant vertebrate fossil site in the region outside the current park boundary
- Numerous archeological sites, including the remains of the last stage of park human prehistory, the most important site to the park outside the current boundary
- Scenic areas visible from overlooks at Agate Bridge and Blue Mesa
- Three potential wilderness additions
- Continuation of major scenic park landforms

- Management Concerns Alleviated:
- Commercial petrified wood mining activities on park boundary adjacent to major visitor use areas
 - Narrow "neck" in the southern wilderness unit.
- Management Concerns Created:
- Increased potential for petrified wood mining in remote areas inside the park boundary

Acreage:	Apache County	
	Federal (BLM)	640
	State	560
	Private	<u>6,080</u>
	Total	7,280

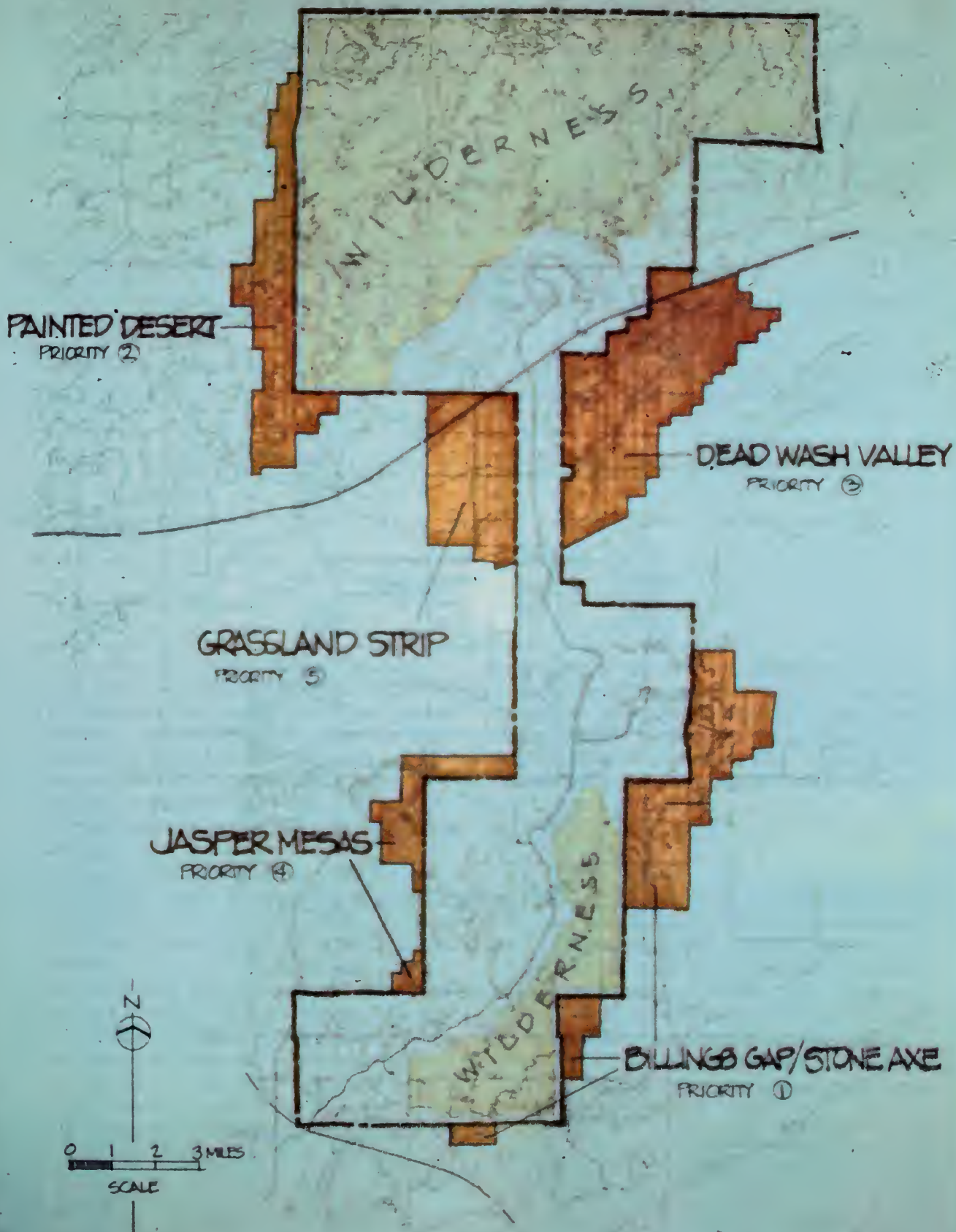
Discussion: In 1930 the Blue Mesa area was added to the park to preserve the Blue Forest petrified wood area, the Puerco ruin, and the numerous petroglyphs of the Newspaper Rock escarpment. Most of the extremely important bone fields of Billings Gap were left outside the park. Researchers have found not only bone and petrified wood in the area, but also burrows and other evidence of the life within the now-petrified forests of 225 million years ago. The badlands of Billings Gap are a paleontological as well as a visual continuation of Blue Mesa.

East of the Rainbow Forest portion of the park, the land rolls away in gentle grass-covered hills. These hills were important to the ancient farmers of the region. Ruins of their homes and villages are scattered throughout the rolling grasslands. The most recent and one of the largest of these villages, the Stone Axe (or Wallace tank) ruin, lies on private land about 1 mile east of the current park boundary. The ruins have been subjected to vandalism, but important information remains. The Stone Axe ruin represents the last chapter of the Anasazi history of Petrified Forest National Park.

The park's southern wilderness unit is narrow along its entire length, and in the middle it pinches down to a mere 600 yards across. The wilderness value of the area is dependent on the undeveloped character of the lands east of the park boundary. This proposed parcel would significantly widen this wilderness corridor and make it more feasible to preserve the wilderness values in this area.

The south boundary of the park cuts off the southern extent of the badlands that begin at the Flattops. These badlands contain the continuation of the extensive wood deposits and other paleontological resources of Long Logs.

The lands in question are mostly held by the New Mexico-Arizona Land Company. This company has expressed a desire to vacate this area and to acquire better lands elsewhere in the state. This represents an opportunity to add significantly to the park's fossil, archeological, wilderness, and grassland resources. Future landowners may not prove as compatible with park goals, nor would future acquisition be as easy if the land was subdivided.



PROPOSED BOUNDARY ADJUSTMENTS

PETRIFIED FOREST N.P.

G.M.P.

Priority Two: Painted Desert

This proposed addition consists of a single linear strip roughly a mile wide on the northwestern boundary of the park adjacent to the Painted Desert and the northern wilderness unit.

- Major Resource Values:
- The western rim and badlands of the spectacular Painted Desert
 - Major fossil sites, including the area's second-largest vertebrate fossil site outside the current park boundary and an important fossil transition zone
 - De facto wilderness adjacent to the designated park wilderness
 - Rare plant habitat
 - Wilderness vistas from major overlooks on the Painted Desert rim

- Management Concerns Alleviated:
- Potential for development of lands in the Painted Desert, including lands adjacent to established wilderness

- Management Concerns Created:
- Potential for off-road vehicle use inside the park boundary

Acreage:	Navajo County	
	Federal (BLM)	1,000
	State	2,040
	Private	<u>2,720</u>
	Total	5,760

Discussion: The Painted Desert is an extremely large area, stretching from Petrified Forest National Park almost to the Grand Canyon. Within Petrified Forest, two large drainages, Digger Wash and Lithodendron Wash, are commonly termed the Painted Desert. The area is typified by rugged pastel badlands with extensive fossil resources and archeological remains of unknown extent. Most of this part of the Painted Desert was added to Petrified Forest National Monument in 1932. However, the long, straight line forming the west boundary of the park actually cut off the upper reaches of a few badland drainages of the Painted Desert, even though a natural boundary occurs on the rim of the Painted Desert, generally less than a mile to the west. This rim area is the subject of this proposed addition.

This parcel would add the headwaters of Wildhorse Wash, the major tributary of Lithodendron Wash. The area is scenically equal to land within the park boundaries, forming a continuation of the Painted Desert landscape in the Devils Playground area. The landscape is clearly visible from Pintado Point on the Painted Desert rim drive, and can also be seen from other rim overlooks. Paleontological work has revealed some of the heaviest concentrations of fossils in this area along the park boundary. Thus, expansion of the park in this area would not only protect the scenic beauty of the rugged Painted Desert badlands, but would protect important paleontological remains as well. Archeological resources include ruins and petroglyphs. Nearly the entire parcel should be eligible for inclusion in the park's north wilderness unit, although the southern part overlooks I-40. The parcel contains one of five documented localities for *Astragalus xiphoides*, a category 1 candidate for threatened species status on the federal list.

Priority Three: Dead Wash Valley

This proposed addition consists of a single large parcel on the east-central boundary of the park immediately southeast of I-40 in the vicinity of park headquarters.

- Major Resource Values:
- Excellent proven and potential archeological resources, including early habitation sites and the Indian Mound ruin
 - Extensive rock art panels, including solar calendrical marker(s)
 - Proven and potential valuable fossil sites
 - Extensive shortgrass prairie

- Management Concerns Alleviated:
- Uncontrolled access to the McCreery pueblo
 - Periodic requests for access to private lands outside the park
 - Potential for undesirable developments between the park and the proposed rural areas of the Navajo Reservation north of the park

- Management Concerns Created:
- A longer boundary with the Navajo Reservation, creating a greater potential for trespass grazing (especially by sheep)

Acreage:	Apache County	
	Federal (BLM)	3,600
	State	80
	Private	<u>6,440</u>
	Total	10,140

Discussion: The narrow strip of land connecting the Painted Desert and Rainbow Forest districts of the park was added to the monument in 1932. At that time it was viewed as an administrative area to allow for a road connecting the two areas. Subsequent archeological investigation of the area has shown it to be extremely rich in homesites and campsites of the prehistoric people living in the Petrified Forest. The most significant of these sites found to date is the McCreery pueblo, added to the park through donation in 1986. This pueblo is currently accessible by way of a short hike from the park road. Additional archeological resources (rock art and structures) have been identified throughout the parcel, and the potential for further discoveries is excellent. The Indian Mound ruin is on the summit of the ridge forming the east side of Dead Wash Valley. Rugged badlands south of I-40 contain an important paleobotanical site containing the relatively rare petrified wood *Schilderia*, as well as paleontological resources.

In the past, subdivision of the Dead Wash Valley has created problems for park administration. Landowners have demanded access across park lands, and unauthorized use has been made of park lands for access. Pressure has also been exerted on the state of Arizona to develop a road for commercial enterprises on the park boundary, using park lands. Acquisition of this paleontologically and archeologically significant valley would end these pressures.

The whole Dead Wash Valley, combined with roadless acreage already in the park, is of sufficient size to be considered for wilderness designation. A few abandoned ranch roads, three windmill/tank combinations, and utility lines cross the area. These developments could be removed if it was decided to create a third unit of wilderness in the park.

Priority Four: Jasper Mesas

This proposed addition consists of two parcels on the southwest boundary of the park.

- Major Resource Values:
- Scenic cliffs and badlands visible from the park road and major overlooks
 - Known vertebrate fossils and extremely high potential for further discoveries
 - Archeological remains suggesting that the area was an important source of raw materials for prehistoric populations

- Management Concerns Alleviated:
- Occasional requests for cattle drives across park lands to access about 200 acres of grassland outside the park
 - Extension of the NPS water pipeline and service road outside the park boundary

- Management Concerns Created:
- Inclusion of radio facilities on mesa tops within the park

Acreage:

Apache County and Navajo Counties:

Federal (BLM)	800
State	480
Private	<u>1,160</u>
Total	2,440

Discussion: This proposed addition would protect the high cliffs west of Jasper Forest. These cliffs are clearly visible from the park road and overlooks between the I-40 overpass and Crystal Forest, and they form a scenic backdrop to some of the park's most important petrified wood deposits at Jasper Forest. Development within the proposed addition would seriously impact the viewshed of a large section of the park. Most of the addition is rugged cliffs and badlands. The mesa tops have potential for archaic archeological sites. Excellent cross-sections of the Chinle formation are exposed, and they have proven paleontological value.

An isolated parcel south of the major part of the proposed addition includes a prominent butte visible from a long stretch of the park road south of the Flattops. The low rolling badlands in this area have excellent paleontological potential. The Rainbow Forest water pipeline and service road are currently outside the park boundary at this point. The proposed addition would include the park's water line and service road inside the new boundary.

Priority Five: Grassland Strip

This proposed addition consists of a single rectangular unit on the west-central park boundary adjacent to the administrative corridor often referred to as the grassland strip.

- Major Resource Values:
- A scenic expanse of grassland highly visible from the park road

Management Concerns Alleviated:

- Unsightly developments and subdivisions adjacent to the park road
- Possible future pressures for access to lands outside the park from park roads

Management Concerns Created:

- Placement of the park boundary adjacent to a major natural gas storage facility
- Inclusion in the park of a major access road to the small community of Adamana and the natural gas facility
- Acquisition complicated by existing subdivision

Acreage:

Apache County:

Federal (BLM)	0
State	1,080
Private	<u>3,760</u>
Total	4,840

Discussion: This proposed addition parallels the park road through the grassland strip. Scenic vista protection from unsightly developments and subdivisions would be the primary reason for expanding the park to the west. Vistas west of the park road extend many miles beyond the park at two locations: an area just south of the I-40 overpass and an area near Rattlesnake Hill. Lands in the proposed addition are visible from both locations, along with other lands that are not proposed for addition. Just south of the I-40 overpass the vistas include the interstate highway and a divergent paved frontage road (the old Route 66). Near Rattlesnake Hill the view to the west for southbound travelers includes the natural gas storage facility at Adamana, scattered mobile homes, the Adamana townsite, and the railroad, in addition to grasslands. For northbound travelers, the vista is across largely state-owned grassland to some small bluffs about 2 miles west of the park.

Historic features of the proposed addition include the 35th Parallel route followed by the Beale wagon road and old US Route 66. The area has archeological potential, since adjacent park lands contain numerous sites. However, most of these sites are concentrated on bluffs overlooking Dead Wash Valley to the east, and the number of sites recorded on park surveys decreases markedly to the west. Archeological sites can be expected in this area, but they will not be numerous. Nearly the entire area is covered with wind-deposited soils; consequently there is little fossil potential and no paleontological resources are known.

Continued development of subdivisions in the area could create pressure to provide access from the park road. Such pressure is currently coming from landowners north of I-40. Future problems are likely to occur further south, where an NPS service road for the water treatment plant approaches the boundary. Residents of the subdivision a few yards away may wish to use this service road for access to the paved park road, rather than using the current dirt Adamana road, to reach I-40.

Addition of 1 mile to the width of the strip on the west would provide vista protection and could add some archeological resources to the park. It would also place the park boundary immediately adjacent to the brine ponds associated with the natural gas storage facility. Adding lands within 2 miles to the west of the park strip would bring the park boundary to a low divide, insulating the park road from development and adding considerable shortgrass prairie to the park. Widening the park to this extent would place all of the developments at Adamana, including the natural gas storage facility and the Santa Fe Railroad mainline, adjacent to the park. It may be that a scenic easement would be preferable to fee acquisition for this parcel.

PLAN IMPLEMENTATION

ESTIMATED CONSTRUCTION COSTS

The estimated construction costs for implementing the proposal and the development options are listed in table 2.

ADDITIONAL STAFFING REQUIREMENTS

Interpretation	interpretive specialist (GS-9) 2 district naturalists (GS-7)
Visitor Protection	2 district patrol rangers (GS-5)
Resource Management	biologist (GS-5)
Research Center	paleontologist (GS-13) collections manager/curator (GS-9) museum technician (GS-5) secretary (GS-4)
Maintenance	2 maintenance workers (WG-5) maintenance worker (WG-7) water treatment plant operator (WG-9)
Administration	project clerk

The annual cost of combined salaries based on step 5 of all pay grades equals \$350,000.

RECOMMENDED STUDIES AND RESEARCH

The following plan revisions, studies, and research are needed to implement the *General Management Plan*.

- Interpretive plan (revise existing plan)
- Wayside exhibit plan
- Resource management plan (revise existing plan)
- Paleontological research plan, scope of collections statement, and collection management plan
- Archeological research design, scope of collections statement, and collection management plan
- Archeological surveys of proposed development sites
- Rare plant survey (gladiator milkvetch)
- Historic resource study
- Historic structure report and historic preservation guide for the Painted Desert Inn and two outbuildings
- Cultural resource evaluation of newly acquired properties

Table 2: Estimated Construction Costs, Proposal and Development Options

	Option: Reconstruct	Option: Retain NPS Facilities	Option: Retain NPS Adaptive Use
Painted Desert Area			
National Park Service			
Visitor center	\$ 3,013,000	\$ 806,000	\$ 275,000
Research center	2,096,000	98,000	65,000
Trails	159,000	0	0
Administrative offices	1,768,000	210,000	105,000
Maintenance facilities	4,369,000	79,000	39,000
Employee housing	3,309,000	0	0
Employee/community bldg.	419,000	3,000	0
Utilities	352,000	0	39,000
Area Subtotal*	\$15,485,000	\$ 138,000	\$ 164,000
Federal Highways (FHLP)			
Roads	\$ 1,012,000	20,000	20,000
Road removal/restoration	270,000	26,000	13,000
Parking	51,000	33,000	38,000
Area Subtotal**	\$ 1,333,000	\$ 89,000	\$ 0
Concessioner			
Gift shop/cafe/teria	\$ 686,000	720,000	360,000
Gas station/food mart	310,000	413,000	1,356,000
Employee housing	284,000	751,000	751,000
Area Subtotal***	\$ 1,280,000	\$ 86,000	\$ 85,000
Total Area Cost	\$18,098,000	\$ 2,120,000	\$ 3,520,000
Road Corridor Sites			
National Park Service			
Painted Desert Inn	\$ 1,572,000	\$ 159,000	\$ 159,000
Interpretation	105,000	598,000	598,000
Picnic areas	92,000	286,000	206,000
Trails	54,000	0	0
Restrooms	196,000	0	213,000
Parking	42,000	0	213,000
Total Area Cost*	\$ 2,061,000	\$ 1,427,000	\$ 4,935,000
Boundary Fence			
National Park Service			
New boundary fence	\$ 2,300,000	\$ 24,661,000	\$ 24,661,000
Total Area Cost*	\$ 2,300,000	\$ 4,706,000	\$ 29,367,000
Federal Highways (FHLP)			
Construction Costs**	\$ 4,236,000	\$ 579,000	\$ 4,815,000
Design	579,000	0	0
Total (FHLP) Costs	\$ 4,815,000	\$ 579,000	\$ 4,815,000
Concessioner			
Total Concess. Costs***	\$ 1,422,000	\$ 1,422,000	\$ 1,422,000

* Includes net construction costs plus construction supervision and contingencies.

** Includes net construction costs plus construction supervision.

*** Includes all planning, design, and construction costs. NPS policy requires that, to the extent it is economically feasible, the concessioner undertake all costs relating to construction of its own facilities as well as utilities, roads, parking, and similar infrastructure. Such feasibility determination has not yet been made, but will be accomplished prior to implementation of this plan. The cost allocation above must therefore be regarded as tentative.

PART TWO: ENVIRONMENTAL ASSESSMENT

IMPACTS OF RESEARCH

If no action was taken to establish a research center at the park, it would be possible to reorient the park's research program on a programmatic level, by establishing a professional liaison position on the park staff and providing funding for contract work through a university cooperative park studies unit or a regional service center similar to the National Park Service's cultural resource centers. Such a program would help ensure that research conducted in the park would benefit park management and interpretive programs. However, without a park-based research center, most fossils excavated from the park would continue to be removed to outside depositories. Also, the research associated with the park would not be as visible to visitors, making it harder for them to appreciate the global significance of the park's paleontological resources.

If the proposal was implemented, the National Park Service would have an adequate program and facilities for managing the park's Triassic collection. The potential for resources to be damaged in shipping or lost in another collection would be reduced, thus helping to ensure their long-term preservation. The opportunity for extensive comparative studies of the entire collection would facilitate research into the park's Triassic environment, contributing valuable information to the interpretive program. Visitors would be able to see tangible evidence of the scientific research associated with the park's Triassic resources, increasing their awareness and appreciation of its global significance.

IMPACTS OF DEVELOPMENT

GENERAL COMPLIANCE

Prior to any ground-disturbing activity, the proposed development site would be surveyed to identify any threatened or endangered species or paleontological or archeological resources. If a potential for effect was identified, mitigating measures would be developed in consultation with the U.S. Fish and Wildlife Service and the Arizona Department of Game and Fish (in the case of biological resources), the park's paleontological advisory group (in the case of paleontological resources), or the Advisory Council on Historic Preservation and the state historic preservation officer (in the case of cultural resources).

HEADQUARTERS/TIPONI POINT

Natural Resources

Shortgrass prairie vegetation surrounds the development at the headquarters site and occupies the proposed development site on Tiponi Point. Gunnison's prairie dogs, black-tailed jackrabbits, desert cottontails, coyotes inhabit the area, and migratory shorebirds stop over at the sewage treatment ponds. The grasslands give way to juniper woodland immediately adjacent to and below the Painted Desert rim. No federally listed threatened or endangered species occur in the area under consideration for development.

The land disturbance that would occur under the proposal is compared to the existing condition (no action) and to the development option of reconstructing all facilities at the headquarters site in table 3. The net change figures in that table were derived from the acreage to be disturbed by new facilities minus the acreage to be restored once old facilities were removed. In analyzing the cumulative effects of the proposal, it should be noted that an acre of restored land does not equal the biomass, biodiversity, or ecological integrity of an acre of previously undisturbed land. The arid climate, poor soils, and other factors severely limit the recovery potential of these lands. The data do not exist to accurately estimate the recovery period or to describe the ecological differences between undisturbed and previously disturbed/restored sites.

If no action was taken, 29.5 acres of shortgrass prairie would remain disturbed by existing headquarters and visitor facilities.

Table 3. Acreage of Land Disturbance, Headquarters/Tiponi Point

	<u>Existing Conditions</u>	<u>Proposal</u>	<u>Option: Reconstruct Headquarters</u>
shortgrass prairie			
--existing disturbance	29.5		
--new disturbance		18.0	3.0
--restoration		<u>2.0</u>	<u>0</u>
net change		+16.0	+3.0

If the proposal was implemented, an additional 18 acres of shortgrass prairie vegetation would be disturbed by construction of visitor facilities and a research center near Tiponi Point and by road realignment. Approximately 2 acres of existing roadway would be restored, for a net new disturbance of 16 acres (table 3). The new facilities would be set back far enough from the rim to avoid a visual intrusion on the Painted Desert. Construction of the trail from Tiponi Point to Chinde Point would follow abandoned road and existing trail alignments for most of the way. New sections of trail would be carefully sited and designed to avoid any visual intrusions on the wilderness.

New construction might affect populations of Gunnison's prairie dog living in the area, either directly through destruction of their towns or indirectly through destruction and disturbance of forage areas. Individuals would be captured and relocated to suitable new habitat before towns were destroyed, and no long-term change in population levels would be expected. Construction of a new cell at the sewage ponds would increase habitat for migratory shorebirds and provide another open water resource for wildlife in the area. Wildlife road kills (primarily rodents) would increase once vehicles were allowed to drive on the Painted Desert rim road after sundown.

The option of reconstructing all of headquarters, including the visitor center, at the existing site would cause the least land disturbance of the actions being considered. Less than 1 acre of shortgrass prairie would be disturbed by construction of a new gas station, and approximately 2 additional acres would be disturbed by expansion of facilities around the periphery of the existing development site. As in the proposal, wildlife road kills would increase once the rim drive was opened to evening traffic.

Cultural Resources

Prehistoric and historic archeological sites, including the 35th parallel route, petroglyphs, and sherd and lithic scatters, exist in the general vicinities of the headquarters, the Tiponi Point development sites, and the proposed trails between Tiponi Point and Chinde Point. **If no action was taken**, there would be no potential for further impacts on these sites. **If the proposal was implemented**, the integrity and significance of all these sites would be evaluated prior to determining the exact sites of new construction. Historic preservation compliance procedures would ensure that there was no adverse effect on archeological resources, or if an adverse effect was unavoidable, that it was mitigated by adequate documentation and salvage. **If the option of rebuilding all facilities on the existing site was implemented**, the potential for new impacts on cultural resources would be less than under the proposal, because new ground disturbance would be less. Compliance procedures would ensure that adverse impacts were avoided or adequately mitigated.

Visitor Experience and Safety

If no action was taken, the visitor center would remain inadequate and poorly located to provide visitors with a quality introductory experience. Many visitors would leave with little or no appreciation of the park's scenic, paleontological, and geologic resources and how they interrelate to tell the story of the Triassic period of Earth's history. Also, most visitors would not be aware of the opportunity to hike along the rim or to the floor of the Painted Desert. The park road would continue to be closed at 6 p.m., denying visitors the chance to drive along the Painted Desert rim at sunset.

If the proposal was implemented, the new visitor center near Tiponi Point would introduce arriving visitors to the scenery and natural resources of the park and give them an adequate overview of the concept that those resources are present-day manifestations of a 230-million-year-old ecosystem. Well-marked trails would provide easy access to the Painted Desert, encouraging and allowing more visitors to experience that landscape close up and at a leisurely pace. The rim drive

would not be closed at night, so people could enjoy the views of the Painted Desert at sundown or by moonlight.

The option of reconstructing all of headquarters, including the visitor center, at the existing site would allow for a reorientation of the program presented at the visitor center, but it would not place arriving visitors in a scenic and interesting resource area where they would have easy trail access to the Painted Desert. Thus, some visitors would continue to leave the park without having an on-site resource experience. The rim drive would remain open at night, giving visitors the opportunity to view the Painted Desert at sunset and by moonlight.

Concession Operations

Concession operations within the park are provided by the Fred Harvey Company, under a 10-year concession contract that expires December 31, 1994. Any of the actions under consideration would be financially feasible for the concessioner to develop and operate. The construction costs of a new store/cafe/tertia and service station would be offset by government compensation for removal of the existing facilities. The amount of payment would be governed by concession contract provisions.

KACHINA POINT

Cultural Resources

The Painted Desert Inn was one of the park's earliest tourist facilities. This former inn/trading post on the rim of the Painted Desert is a national historic landmark recognized for its aesthetic qualities. The inn also has regionally significant historic values as a product and symbol of New Deal work relief programs. Originally constructed in the 1920s, the stone structure was gutted and rebuilt between 1937 and 1940 by the Civilian Conservation Corps. The 28 rooms were originally used for public information, restrooms, park offices, lunch and dining rooms, a soda fountain, a bar, a trading post, and six sleeping rooms.

If no action was taken, the preservation maintenance of the inn would continue; however, the building would remain unused, and this would reduce its priority for long-term maintenance funding, thus potentially resulting in further deterioration.

If the proposal was implemented the inn would be restored for interpretation and visitor services, which would increase its priority for long-term maintenance funding and provide for its continued preservation. The uses proposed for the inn – interpretation of the history of the building and the scenic vistas of Painted Desert, light refreshments, and a museum shop – would be similar to its historic uses and recapture some of the original ambiance of the building. Because this viewing area would be open at night, a state-of-the-art security system would be installed to protect the inn from trespass entry or vandalism.

See "Headquarters/Tiponi Point" for a discussion of archeological resources in this area.

Concession Operations

The proposed interpretive and concession operation in the Painted Desert Inn would be financially feasible for the concessioner to develop and operate, assuming the National Park Service funded the restoration of the inn.

CHINDE POINT

Natural Resources

The extensive ledge at Chinde Point was created by borrow operations, which destroyed all of the natural grassland and juniper woodland vegetation at the quarry site. Most of the site has naturally revegetated over the past 20 years. **If no action was taken**, the site would continue to recover slowly from the previous disturbance. **If the proposal was implemented**, the site would be recontoured and landscaped with native species, thus hastening the recovery of the natural vegetation.

Cultural Resources

See "Headquarters/Tiponi Point" for a discussion of archeological resources in this area.

PUERCO VALLEY VIEWPOINT

Natural Resources

The site of the proposed parking area and viewpoint has been disturbed by a utility right-of-way and previous road construction; no natural resources would be affected.

Cultural Resources

The historic transportation route followed by the 35th parallel survey, the Beale camel trail, the 1800s wagon and stage road, the railroad, and Route 66 crosses the park in the vicinity of the proposed Puerco Valley viewpoint. **If no action was taken**, there would be no potential for impact on historic archeological resources associated with this route. **If the proposal was implemented**, historic preservation compliance procedures would ensure that there was no adverse effect on archeological resources, or if an effect was unavoidable, that the adverse effect was mitigated by adequate documentation and salvage.

PUERCO RUINS

Cultural Resources

The Puerco ruins and petroglyphs are listed on the National Register of Historic Places. The ruins are being adversely affected by foot traffic resulting from the existing pattern of development and visitor use. There are no established trails from the existing parking lot through the ruins, so people move randomly through the resource, stepping on and over the low walls. **If no action was taken**, visitors would continue to follow numerous social trails through the Puerco ruins, accelerating the deterioration of the low walls. There would be no potential for new effects on cultural resources. **If the proposal was implemented**, a trail would be constructed from the parking lot to the Puerco ruins and adjacent petroglyphs, and visitors would be directed to stay on the trail, which would help protect the low walls and the natural setting of the ruins and petroglyphs from foot traffic. The trail would be routed to avoid significant archeological resources.

TEPEES

No known natural or cultural resources would be affected by the proposed wayside and trail development. The proposed trail to Blue Mesa would follow an abandoned roadbed for part of its length and a previous trail alignment for the remainder.

BLUE MESA

Natural Resources

The top of Blue Mesa is part of the shortgrass prairie ecosystem. Gladiator milk vetch, a candidate threatened plant, is known to occur on the mesa, and petrified wood is common. **If no action was taken**, there would be no potential for impact on natural resources. **If the proposal was implemented**, approximately 1/3 acre of shortgrass prairie vegetation and scattered petrified wood would be disturbed for construction of the picnic area and parking lot. A 1988 survey did not find any gladiator milk vetch at the site of the proposed picnic area. A preconstruction survey would be conducted at the appropriate time of year to ensure that construction activity did not affect the species. Significant petrified wood resources, such as pedestal logs, would also be avoided during construction.

Cultural Resources

Prehistoric and historic archeological sites, including Pueblo period rock art and rock shelters and the remains of the camps of early 20th century paleontologists, occur in the Blue Mesa vicinity. No archeological sites have been recorded within the proposed picnic area. **If no action was taken**, there would be no potential for disturbance of these sites. **If the proposal was implemented**, there would be a remote chance that unknown archeological resources might be disturbed by construction. Archeological surveys would be conducted prior to ground disturbance, and historic preservation compliance procedures would ensure that adverse impacts were avoided or adequately mitigated.

AGATE BRIDGE

Natural Resources

Agate Bridge is a natural petrified log bridge across a narrow ravine. In 1917 the bridge was reinforced with a concrete pier to keep it from falling into the ravine. The pier is a massive structure that overwhelms the log and destroys its significance as a natural bridge. The proposal would not affect the bridge.

Gladiator milk vetch, a candidate threatened species, is part of the shortgrass prairie ecosystem present at the site. **If no action was taken**, the lack of formalized trails would perpetuate random trampling of vegetation between the parking lot, Agate Bridge, and the rim viewpoint. **If the proposal was implemented**, the elimination of social trails and site revegetation would restore approximately 1/2 acre of native grassland. A preconstruction survey would be conducted at the appropriate time of year to ensure that construction activity did not affect gladiator milk vetch. The rare plant might recolonize the restored area, thus increasing its population.

Cultural Resources

The concrete piers constructed by the railroad in 1917 to reinforce Agate Bridge may have cultural significance. These structures would not be affected by existing or proposed development or use.

THE FLATTOPS

Natural Resources

The parking pulloff and social trails are in a sparsely vegetated portion of the badlands. **If no action was taken**, a small area would remain disturbed by these facilities. **If the proposal was implemented**, portions of a sandy knoll and about 200 yards of abandoned trail would be revegetated with native grasses.

Cultural Resources

The Flattops archeological site, listed on the National Register of Historic Places, is being adversely affected by foot traffic and probably by removal of artifacts. **If no action was taken**, these impacts would continue: Social trails would proliferate, becoming more visible from the road. Foot traffic around the ruins and the removal of small cultural artifacts would cause further degradation of the site, seriously threatening its archeological integrity. **If the proposal was implemented**, the parking pulloff would be closed and foot traffic would be greatly reduced in this part of the park, helping to preserve this archeological site.

GIANT LOGS/LONG LOGS

Natural Resources

The existing development at Giant Logs is situated in a desert scrub association on a terrace above Jim Camp Wash. The floodplain of Jim Camp Wash has not been mapped, but no flooding has been known to affect any part of the developed area except the bridge across the wash and adjacent short sections of roadway. The Giant Logs area immediately behind the visitor center contains excellent large cross sections of *Araucarioxylon*, including the largest diameter piece found to date in the park. Some of the logs have been moved from their original sites and otherwise degraded by development, including cement retaining walls and walkways. The ground through Giant Logs is littered with wood chips. A much larger area was probably covered with wood at one time, but theft and ground disturbance for development have depleted much of the original resource. Long Logs is a more natural and less disturbed wood site than Giant Logs. The existing development is a highly visible intrusion on both wood sites.

The proposed relocation site for the administrative development is a previously disturbed and grazed area of shortgrass prairie on the mesa northwest of the existing development.

The land disturbance that would occur under the proposal is compared to the existing condition (no action) and the two development options in table 4. No federally listed threatened or endangered species occur in the development area.

If no action was taken, 8.2 acres of desert scrub would continue to be disturbed. Housing and maintenance functions and facilities would continue to be a visual intrusion on the outstanding natural resources at Giant Logs and Long Logs. People would continue to drive to the edge of the Long Logs wood site, which would make it easier for them to transport and conceal stolen wood. The rate of depletion of petrified wood has not yet been established, but test plots in the summer of 1988 indicated that 20 percent of the marked wood was taken in a two-week period. **If no action was taken** to mitigate this problem, portions of the Long Logs area might eventually be depleted of petrified wood chips like the Crystal Forest area is today.

If the proposal was implemented, there would be less total acreage disturbed than is disturbed now (table 4). The new visitor center and road realignment would disturb 1.8 acres of desert scrub,

Table 4: Land Disturbance, Giant Logs/Mesa-Top Administrative Site

	<u>Existing Conditions</u>	<u>Proposal</u>	<u>Option: Retain Housing & Maint</u>	<u>Option: Adaptive Use of Structures</u>
desert scrub association				
--existing disturbance	8.2			
--new disturbance		1.8	1.7	0.6
--restoration		7.0	1.2	0.6
shortgrass prairie				
--existing disturbance	0			
--new disturbance		<u>4.6</u>	<u>0</u>	<u>4.6</u>
net change		+0.6	-0.5	-4.6

and development of new housing and maintenance facilities on the mesa top would disturb 4.6 acres of previously disturbed shortgrass prairie. Offsetting this, however, 7.0 acres of desert scrub near Giant Logs would be returned to natural conditions, leaving a net gain of 0.6 acre of area restored. Housing and maintenance would no longer be visible from either the Giant Logs or the Long Logs area. No petrified wood sites would be disturbed by construction on the terrace above Jim Camp Wash, on the mesa top, or along the new road alignment.

Closing Long Logs to vehicle access and making it a walk-in site would help deter wood theft. The proposed Long Logs trail would start at the visitor center, and all visitors returning from Long Logs would have to walk through the visitor center on their way to their cars. This added security measure would be expected to preserve more of the wood resources for enjoyment of future generations. The proximity of the ranger station to Giant Logs would provide security for that area. Large sections of wood would be avoided in siting the new trail to Long Logs and in redesigning the Giant Logs trail.

The option of retaining housing and maintenance at Giant Logs would result in a net increase of 0.5 acre of desert scrub being disturbed in the Giant Logs area (table 4). Housing and maintenance functions and facilities would be a greater visual intrusion on the outstanding natural resources at Giant Logs and Long Logs than they are currently, and a precedent would be established for continuing expansion of administrative facilities in this location. Petrified wood theft would be expected to decrease as a result of improved interpretation and education efforts throughout the park; however, the ease of access to the Long Logs wood site would remain a resource protection problem. Large sections of wood would be avoided in redesigning the Giant Logs trail.

The option of relocating housing and adaptively using the structures would result in the greatest land disturbance of all the actions under consideration. Approximately 8.2 acres of desert scrub would remain impacted near Giant Logs, and an additional 4.6 acres of shortgrass prairie would be disturbed on the mesa top (table 4). Visitor facilities would remain as visual intrusions on the outstanding natural resources at Giant Logs and Long Logs. The Long Logs wood site would remain easily accessible and vulnerable to wood theft.

Cultural Resources

The existing buildings near Giant Logs dating from the 1930s were evaluated for eligibility for listing on the National Register of Historic Places and found to be ineligible because their integrity of design, materials, and workmanship has been diminished by significant exterior and interior modifications, including room additions, changes in interior layout, and the addition of a plethora of pipes, fences, antennas, solar panels, and other amenities of modern living. All of the buildings except the concession building could conceivably be restored by removing the incompatible additions, in which case they might be eligible for the National Register. However, in their current condition they are not significant historic resources.

Prehistoric and historic archeological sites include quarry areas and surface structures dating from the Pueblo period and remains of early park development.

If no action was taken there would be no potential for impacts on archeological resources. The entire 1930s development complex would be maintained and used. Without considerable restoration work, the complex would not be a significant cultural resource.

If the proposal was implemented the integrity and significance of archeological sites would be evaluated prior to determining the exact sites of new construction. Historic preservation compliance procedures would ensure that there was no adverse effect on archeological resources, or if an effect was unavoidable, that it was mitigated by adequate documentation and salvage. All of the existing buildings except the visitor center/ranger station would be demolished. The loss of cultural resources would be insignificant, since the buildings have been determined to have low historical integrity and to be ineligible for the National Register.

The option of retaining housing and maintenance at Giant Logs would have the same impacts on archeological resources as described for the proposal. All of the existing structures except the concession building and the concessioner residence would be retained and used. It would not be possible to restore the historic integrity of the buildings without diminishing their usefulness for housing and maintenance; consequently, the complex still would not qualify as a significant cultural resource.

The option of adaptively using the structures would have the same impacts on archeological resources as described for the proposal. All of the existing structures except the concession building and the concessioner residence would be retained and used. Depending on how many of the incompatible additions could be removed during the renovation of the structures for adaptive administrative and visitor use, it is possible that they might become eligible for listing on the National Register of Historic Places.

Visitor Experience and Safety

If no action was taken the existing concession building would continue to dominate the developed area, attracting visitors' attention. Many visitors would continue to stop at the concession for information and other services and would fail to have any contact with the National Park Service at this end of the park. The existing visitor center would remain too small and out of date to adequately introduce visitors to the park and its resources. As a result, many visitors would continue to drive quickly through the park without experiencing any of the excitement of discovery or adventure the park has to offer.

Most visitors would see Giant Logs, where the petrified wood is presented in the context of museum exhibits rather than in a natural context, and for many visitors (especially those who would not walk through Long Logs or the other more natural sites) that would be their lasting impression of the resource. Handicapped people would not have access to Giant Logs. Visitors could continue to drive

their cars to Long Logs, giving all visitors the opportunity to see that resource. For visitors with the time and interest to leave their cars and visit a more remote, secluded wood site, the opportunity would not be available.

Visitors would continue to have to walk through a dangerously designed parking lot/road corridor to get to their cars.

If the proposal was implemented a new visitor center would inform visitors about their opportunities in the park, introduce them to the resources of the Rainbow Forest area, and encourage them to discover those resources on site, thus enriching their park experience.

People would no longer be able to drive their cars to Long Logs, which would deny some visitors the opportunity to see that resource; however, they would be able to drive to other wood sites in the park, including Giant Logs and Crystal Forest. Visitors with the time and interest to walk to Long Logs would enjoy a greater sense of discovery and adventure. Tying the visitor center and Long Logs together with a high-standard trail would encourage more visitors to take advantage of this opportunity. The natural setting of the resource at Long Logs would help people understand the natural history of the petrified wood. The Giant Logs area would be barrier-free from handicap access, but the trail to Long Logs would be too long for mobility-impaired visitors.

The new entrance road and parking lot configuration would be safer and less confusing for visitors.

Under the option of retaining housing and maintenance at Giant Logs administrative and maintenance functions and facilities might be seen by some visitors as a visual intrusion. Vegetative and structural screening would be used to minimize the visibility of the administrative facilities. **Neither development option** would allow for direct trail access from the visitor center to Long Logs because of the intervening parking lot. Therefore, Giant Logs would remain the focus of visitor interest in this part of the park, with the same impacts as described for no action.

Concession Operations

Any of the concession-related actions under consideration would be financially feasible for the concessioner to develop and operate. The concessioner is committed to improving employee housing if a concession operation is retained in the south end of the park. Construction costs for employee housing would be offset by government compensation for the purchase and removal of the existing store facility, the amount of which would be governed by provisions of the concession contract. In the future, the concessioner would lease space from the government.

IMPACTS OF BOUNDARY OPTIONS

The 30,440 acres of proposed additions to the park are owned by federal, state, and private interests. Land use on these proposed additions consists of grazing, transportation corridors, utility corridors, subdivisions, a remote communications station, and light mining (prospects and petrified wood mines). Grazing, subdivisions (residential development), and mining would be incompatible with park goals and would be discontinued upon annexation. Existing transportation corridors, existing utility corridors, and the single radio communications facility would be unaffected by park annexation.

Grazing is by far the most common land use on the proposed additions. Developments associated with grazing are found on all the proposed additions and consist of dirt ranch roads and approximately nine stock tank/well complexes in various states of repair. If the proposed areas were added to the park and grazing was totally excluded, there might be a temporary adjustment in number of cattle on the surrounding range until those cattle taken off the new park lands were sold at market. No long-term adverse affect on the regional cattle market would be sustained by the elimination of 30,440 acres of marginal grazing land in northeastern Arizona. The economic need to continue grazing on new park lands by permit would not be defensible from an economic viewpoint. Purchase of scenic easements on grazing land adjacent to the park would provide viewshed protection with no effect on the local grazing economy.

Two of the proposed additions have old mineral prospects or petrified wood mines. Mining of petrified wood would not be allowed on new park lands. Other commercial petrified wood sources exist outside the proposed additions, and this segment of the local economy could adjust to the new boundary changes without undue hardship. The few old prospects would have to be checked for valid claims and rights in accordance with existing laws and regulations.

Subdivision has occurred on the grassland strip parcel proposed for addition to the park, near the old Adamana townsite, and 15 roads have been bladed across an area of 2 square miles. Several homes, corrals, and barns are on the proposed additions. Development in this area is highly visible from the main park road. Unsightly development is also occurring along the access road to I-40. Parcels zoned for subdivision have not sold well around the park because the market is depressed. Purchase of the parcels by the National Park Service would not adversely affect the availability of residential development lands in northeastern Arizona. Scenic vistas seen from the main park road and from developed overlooks would be protected by annexation of the proposed additions or by scenic easements. If these parcels were not added to the park or protected by scenic easements, park vistas extending outward beyond the park boundaries onto private lands could be degraded at any time by subdivision development.

None of the proposed boundary adjustments would affect transportation on I-40 or other routes in the vicinity of the park.

A utility corridor roughly paralleling I-40, containing both power and telephone lines, passes through the northern portion of the proposed addition in Dead Wash Valley. This utility corridor would be unaffected by a boundary adjustment in this area; rights-of-way and/or easements would have to be researched before annexation.

The proposed addition on Jasper Mesas has a remote radio communications facility on a high butte along its extreme western boundary. This facility includes the park's radio repeater. No change in the operation or maintenance of this facility would occur if this area was added to the park. The park's waterline and access road cross the southern Jasper Mesas parcel. Annexation of this parcel would place the park's water distribution system totally within the park boundary.

Tourism is the main economy along the I-40 corridor and for most of northeastern Arizona as well. By providing increased protection of archeological, paleontological, and paleobotanical

resources and by securing protection and preservation of many scenic vistas in and adjacent to the park, the annexation of these proposed additions would greatly enhance the visitor experience at Petrified Forest National Park and help promote tourism in the area. If the proposed additions that are adjacent to existing park wilderness were added to the wilderness, recreational use of the expanded wilderness areas would likely increase, further enhancing tourism in northeastern Arizona.

CONSULTATION AND COORDINATION

Copies of this document will be sent to the following agencies and organizations for review.

Federal Agencies

Advisory Council on Historic Preservation

U.S. Department of Agriculture

Forest Service, Apache and Sitgreaves National Forests

U.S. Department of the Interior

Bureau of Land Management, Phoenix District Office

Fish and Wildlife Service, Phoenix Area Office

State Agencies

Arizona Governor's Office

Arizona Department of Game and Fish

Arizona Land Department

Arizona State Historic Preservation Office

Local Agencies

Apache County Board of Supervisors

Holbrook City Manager

Hopi Tribal Council

Navajo County Board of Supervisors

Navajo Tribal Council

Adjacent Landowners

Dobell Ranch

Fitzgerald Ranch

Jeffers Ranch

McCauley Ranch

New Mexico/Arizona Land Company

Rockwell Ranch

Stonewood Ranches

Sun Country Ranches

Santa Fe Railroad

Other

The Archeological Conservancy

Fred Harvey, Inc.

Ghost Ranch, Abiquiu, NM

Holbrook *Historian*

Holbrook *Tribune*

Museum of Northern Arizona

National Parks and Conservation Association

New Mexico Museum of Natural History

Northland Pioneer College, Holbrook

Petrified Forest Chamber of Commerce, Holbrook

University of California at Berkley, Museum of Paleontology

APPENDIX A: LEGISLATION

APPENDIX B: VISITOR USE DATA

Table B-1: Monthly Use, 1987-88

1987	
January	25,306
February	28,864
March	37,875
April	50,129
May	77,540
June	130,803
July	142,379
August	121,385
September	53,923
October	61,300
November	26,708
December	15,099
Total	771,311

1988	
January	18,235
February	30,485
March	50,468
April	52,796
May	75,958
June	199,693
July	142,349
August	122,670
September	64,513
October	62,233
November	30,296
December	22,391
Total	872,087

Table B-2: Total Annual Visits, Painted Desert Visitor Center

Year	Total
1979	175,304
1980	298,534
1981	313,758
1982	303,344
1983	294,970
1984	296,679
1985	298,084
1986	318,365
1987	323,509
1988	282,001

Table B-3: Total Annual Visits, Rainbow Forest Visitor Center

Year	Total
1979	154,899
1980	129,053
1981	152,260
1982	155,035
1983	174,835
1984	176,020
1985	216,420
1986	189,530
1987	183,521
1988	175,713

Table B-4: Wilderness Use Number of User Days

Year	Number of User Days
1979	702
1980	700
1981	1,400
1982	700
1983	637
1984	618
1985	745
1986	849
1987	652
1988	681

Table B-5: Vehicular Use, 1985-87

Year	South Entrance	Total	Buses	Other
1985		62,602	319	62,283
1986		66,902	429	66,473
1987		66,359	370	65,989
1988		71,724	340	71,384
1985	North Entrance	99,599	546	99,053
1986		103,164	450	102,714
1987		100,955	461	100,494
1988		107,801	474	107,327

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As the nation's principal conservation agency, the Department of the Interior has basic responsibilities to protect and conserve our land and water, energy and minerals, fish and wildlife, parks and recreation areas, and to ensure the wise use of all these resources. The department also has major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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