

Petrified Forest

NATIONAL MONUMENT

Arizona





Many Indian ruins and petroglyphs tell of the folk who lived here long before America was found by white men.

History

The first known report of the "stone trees" was made by Lt. Lorenzo Sitgreaves, an army officer who explored parts of northern Arizona in 1851, soon after Arizona was acquired by the United States from Mexico.

The petrified forest remained almost unknown, however, until the settlement of northern Arizona began in 1878 and the Atlantic and Pacific (now Sante Fe) Railway was completed in 1883.

During the following years, the existence of the petrified forest was threatened by souvenir hunters, gem collectors, and commercial jewelers. Entire logs were blasted open in search for the amethyst crystals that were often found in hollow logs, and much agate was carried away to be used in making jewelry. Alarmed, the citizens of Arizona, through their territorial legislature, petitioned Congress to make the area a national reserve so that "future generations may enjoy its beauties, and study one of the most curious . . . effects of nature's forces."

The erection of a stamp mill near Adamana, intended to crush the petrified logs into abrasives, created a threat demanding immediate action. This most imminent danger

led to special investigations by the U.S. Geological Survey, with the result that the Federal Government withdrew the lands from entry and provided statutory protection of the fossil trees to prevent their damage or removal. Decisive action by public-spirited men of vision thus saved an irreplaceable national treasure.

Finally, on December 8, 1906, President Theodore Roosevelt created Petrified Forest National Monument by proclamation, under authority granted only a short time before in the Act for the Preservation of American Antiquities.

THE GEOLOGISTS' EXPLANATION

The Forests

About 160 million years ago, in the Triassic period, much of northern Arizona was swampy lowland where shifting streams spread sand and mud on vast flood plains. Dense beds of ferns, giant horsetails, clubmosses, and swamp-growing trees grew in the marshlands and along the streams. Trees of the most common fossil species grew in scattered copses on the occasional hills and ridges that were above the water. This species resembled our modern native pines, but it is most closely related to the araucarian "pines" of the Southern Hemisphere. Remains of several other kinds of primitive trees are also found here.

How the Trees Were Buried

Natural processes, including fires caused by lightning or volcanism, ravages of insects, and fungus, or rot, are believed to have killed the trees. Most of the trees that grew on the hills and ridges of the broad flood plain simply rotted away upon the ground. Most of those that were preserved were carried by flooding streams from the south and southwest to be deposited in bays or on sandbars where rapid burial by mud and sand prevented their decay. The deposits in which these trees were buried eventually hardened into the sandstones and shales that make up what is now called the Chinle formation. These deposits were buried under at least 3,000 feet of sand and silt that was laid down later by shallow seas.

How the Logs Petrified

The sediments in which the logs were buried contained a large amount of volcanic ash, rich in silica. This silica was picked up by ground water, carried into the wood, and deposited in the cell tissues. The mineral filled the wood solidly, forming the petrified logs. Varying amounts of the original organic matter of the wood remain. The mottled color patterns were caused by oxides of iron and manganese, creating the predominant types of minerals known as agate and jasper.

How the Forest Was Uncovered

After the forest was buried, there were several periods of great mountain-making. Forces from deep within the earth slowly thrust the Rockies and Sierras upward several thousand feet, and the land between these ranges was lifted far above its former position near sea level. As a result of this mountain growth, certain areas became arid and desertlike. Then wind and rain started wearing down the deposits that covered the region, and large river systems carried away the loose sand, mud, and gravel. Thus, the sediments that once covered the forest were removed. Finally, the layers in which the logs were buried were cut

TO REMIND YOU

The removal of petrified wood from this area has been prohibited by Federal law since 1896 because, even then, public-spirited people were alarmed by its loss. If each visitor since that time had taken but one piece, there would now be none for you to enjoy. Won't you help assure the same enjoyment for the visitors who will follow you?

by canyons and ravines, revealing the great petrified logs and the many bands of colored rocks that make up the Painted Desert. As the logs washed from hillsides, the broken sections accumulated in piles at the base of the slopes.

Only a small part of the petrified forest is now exposed, for logs are scattered below the surface of the ground to a depth as great as 300 feet.

The Broken Log Sections

Rhythmic vibrations of earthquakes during the periods of uplift and subsidence of the land are believed to have produced the fine cracks that appear at more or less regular intervals across the petrified logs. As erosion of the softer material around the logs took place at the surface of the land, the exposed cracks widened, separating the logs into sections.

THE PAINTED DESERT

The part of the Painted Desert that is included in the monument exhibits practically all the usual forms of badlands erosion.

The badlands of the Painted Desert are of the same age (Triassic) as those of the Rainbow Forest to the south. They are composed of water-deposited layers of volcanic ash, interbedded with thin layers of shale, sandstone, and river gravel. The alteration of the ash has converted it into a claylike substance that is called bentonite.

Hard and strong when dry, bentonite will, however, absorb water like a sponge and with enough moisture will disintegrate into a fine flowing mud. Thus it is that in this semiarid region, with its long dry season and its torrential summer rains, the bentonitic beds are rapidly cut into tur-

Agate Bridge in 1899.



Newspaper Rock.

reted ridges, conical hills, and small steep-walled canyons and ravines.

In places, a hard covering, or caprock, of sandstone or lava may serve to protect the soft layers beneath, resulting in the formation of abrupt-sided mesas and buttes.

The most amazing property of the Painted Desert is the everchanging quality of its colors. Pure bentonite is nearly white, but here minute quantities of iron oxide in the volcanic ash have stained the layers to many shades of red, blue, brown, and yellow. These colors are most vivid immediately after a rain in the early morning or late evening, and cloud shadows create a kaleidoscope of moving colors.

A 6-mile drive along the rim of the Painted Desert has a number of overlooks from which there are superb views. Rapid erosion of the desert soils makes it impossible to maintain either roads or trails into the desert below the rim. Consequently, the Black Forest, a concentration of dark petrified wood, is virtually inaccessible. While you are not prohibited from entering the desert, you should not attempt it unless you are conditioned to desert hiking, and you must give prior notice of your trip to a park ranger.

MODERN PLANTS AND ANIMALS

Lands within the monument, which range in elevation from 5,300 to 6,200 feet above sea level, receive less than 10 inches of moisture in an average year.

The plants which have become adapted to this semiarid situation are mostly small and inconspicuous, yet many have tiny but beautiful flowers. The showy blossoms of the yuccas, mariposa-lily, and cactuses are on display only in the spring, but such common plants as the aster, painted-cup

(paintbrush), rabbitbrush, and sunflowers bloom throughout a good part of the summer.

Birds, mammals, and reptiles are far more common than you are likely to suppose. Common mammals of the area include the jackrabbit, cottontail, antelope ground squirrel, skunk, coyote, bobcat, porcupine, and pronghorn (antelope). The most noticeable resident songbirds are the horned lark, house finch, rock wren, phoebe, and several species of sparrows. There are more than a dozen species of snakes and lizards, including the prairie rattlesnake.

INTERPRETIVE SERVICE

You are invited to stop at the Painted Desert Orientation and Administration Building (near the entrance from U.S. 66), where you can obtain information about this and other National Park Service areas in the Southwest. And at the Rainbow Forest Visitor Center (near the entrance from U.S. 260) you may see exhibits which include a diorama, outstanding specimens of polished petrified wood, fossils, minerals, and diagrams that explain how wood becomes petrified and how the badlands were formed. Wayside exhibits at major points of interest along the route through the monument will also increase your enjoyment and understanding of the area, and they may provide the answers to the very questions that have come to your mind.

A GUIDE TO THE MONUMENT

The many points of interest in Petrified Forest National Monument are located along a road that extends from the Painted Desert on the north to Rainbow Forest on the south, a distance of about 28 miles. Short drives to several places back from the main road may increase the distance of the complete trip through the area to about 34 miles. The guide map on the following pages shows the principal points of interest by number, and corresponding numbers above the map refer to descriptions of these features.

No attempt is made in the guide section to give detailed information regarding the listed features. You will find a more comprehensive story in exhibits at several points along the way and in the museum at the Rainbow Forest Visitor Center. Publications available at the visitor center and at the Painted Desert Orientation and Administration Building contain additional information.

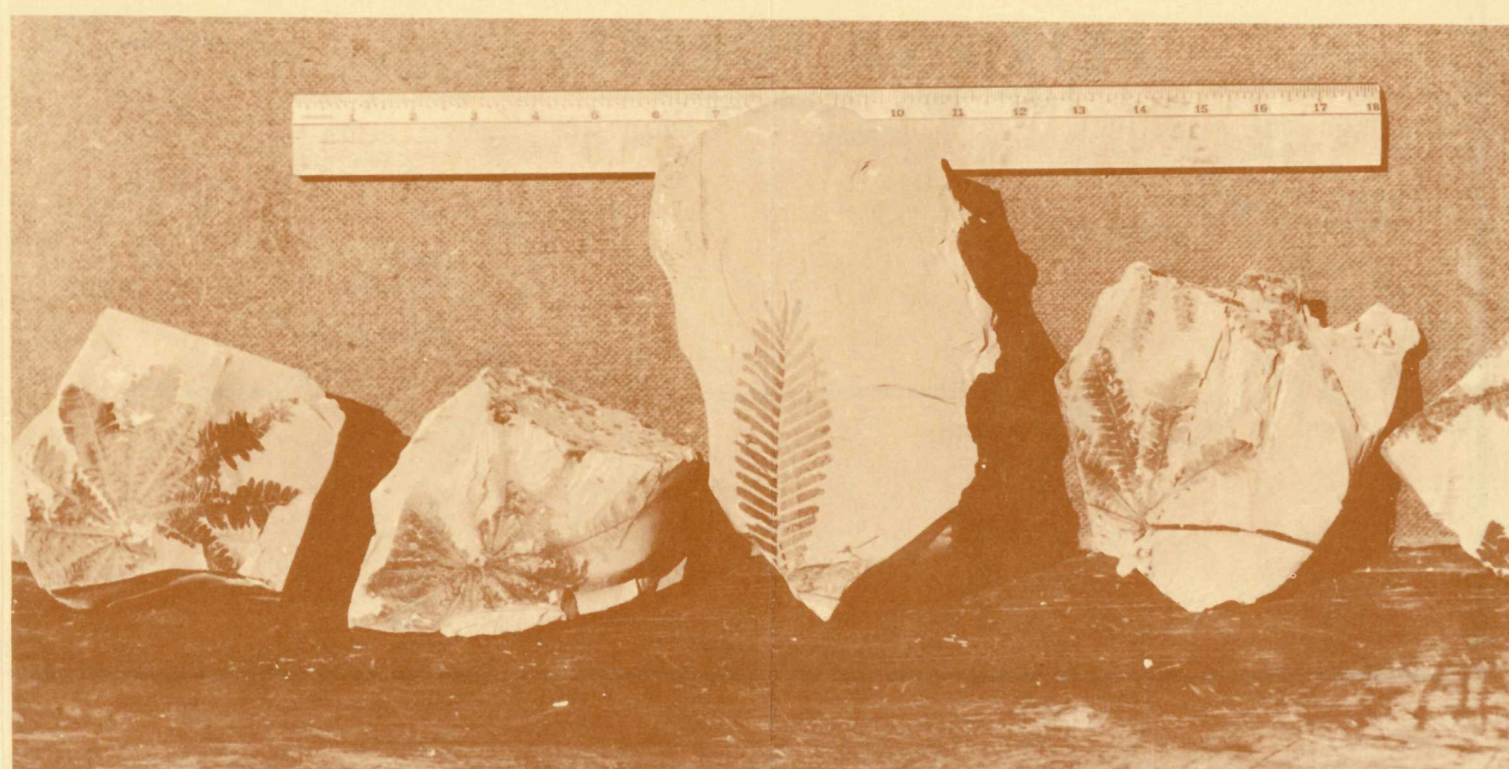
The park ranger on duty at either the Painted Desert facility (at the U.S. 66 end) or the visitor center (at the U.S. 260 end) will be happy to help you plan your tour to assure that you will see Petrified Forest without adding needless miles to your travel.

Now, turn to page 10, examine the map, and prepare for your first stop, which will be at ① if you enter the monument from U.S. 66 or at ⑭ if you enter from U.S. 260.

Painted Desert badlands.



Fossil impressions of leaves in shale.



Petrified Forest

NATIONAL MONUMENT

THE STORY OF PETRIFIED FOREST

The most wondrous display of petrified wood known in the world and some of the most colorful parts of the Painted Desert are included in Petrified Forest National Monument, in northeastern Arizona. Singular in its vivid and varied colors, the petrified wood in this area has long attracted visitors from many countries. Within the monument are six separate "forests," with great logs of agate and jasper lying on the ground and countless broken sections, fragments, and smaller chips forming a varicolored ground cover.

The area is a part of the Painted Desert of northern Arizona, a region of banded rocks of many hues, carved by wind and rain into a landscape of fantastic color and form. Here and there are beds of shale containing perfectly preserved fossil leaves of plants of a remote age. Occasionally the bones of giant amphibians and reptiles are washed from their burial places in soft rock.

The National Park System, of which this area is a unit, is dedicated to conserving the scenic, scientific, and historic heritage of the United States for the benefit and enjoyment of its people.

① *Orientation and Administration Building.* Here you may obtain information that will be helpful in making your visit to Petrified Forest National Monument more enjoyable. There are also exhibits showing the location of, and information about, other units of the National Park System in the Southwest.

The building contains the offices of the superintendent of the monument and his principal staff assistants and the facilities of one of the concessioners. Meals, refreshments, souvenirs, and film are available. A service station adjoins the parking area.

② *Painted Desert.* From several overlooks along the rim and from the observation site on Kachina Point, sweeping views offer excellent opportunities for taking color photographs of the Painted Desert. To the northwest is Pilot Rock, highest point in the monument, with an elevation of 6,235 feet. The Black Forest, a deposit of dark petrified wood in the midst of these colorful badlands, is not accessible to visitors.

A picnic area is located on Chinde Point, just west of the Kachina Point observation site. There is no water available at the picnic area.

③ *Puerco Indian Ruin.* This ancient pueblo, or village, was occupied until about 600 years ago. Remains of walls at the site indicate a rectangular village of perhaps 150 rooms completely enclosing a large courtyard. A few of the rooms have been excavated.

④ *Newspaper Rock.* A short spur road leads from the main monument road to the parking area above the prehistoric picture-writings—Newspaper Rock. The petroglyphs, pecked into the surface of a massive sandstone block, cannot be accurately interpreted. It is thought, however, that they are largely records of events in the lives of Indians who inhabited some of the nearby village sites.

⑤ *The Tepees.* This name refers to a group of small peaks resembling tepees or haystacks. These interesting formations demonstrate the results of erosion cutting through the soft, layered clay deposits.

⑥ *Blue Mesa.* A side road from the main monument road takes you to the top of Blue Mesa. Here you will see how petrified logs play a part in the constant renewal of the sculptured landscape. The soft earth erodes away, leaving a gradually narrowing ridge beneath the length of each log. Eventually, sections of the log roll off the ridge; erosion then reduces the ridge to a series of rounded pinnacles. When a section of a fossil log remains as a protecting cap atop one of these pinnacles, erosion at the base of the pinnacle often produces a pedestal-like formation, holding the log section above the surrounding surface. Sections of logs that come to rest at new locations on the soft clay after tumbling from their perches immediately start the erosional cycle all over again.

⑦ *Agate Bridge.* More than 100 feet of this famous log is exposed, but both ends are still encased in the sand-

stone in which the log was buried. A 40-foot ravine has gradually been carved into the sandstone layer, leaving the log spanning the narrow draw like a natural bridge. A concrete-beam support was placed under the heavy log in 1917 as a precaution against possible collapse.

⑧ *Jasper Forest.* A short, paved spur road winds along the base of the cliffs which form Agate Bridge Mesa. Great masses of log sections litter the valley floor on either side of the road and clog the gullies that cut into the edge of the mesa. The principal log deposit here was high above the road level. Look carefully and you will see a number of logs protruding from the topmost layer beneath the rim of the mesa. In time, these too will be fully exposed by erosion and the sections will roll to the lower levels, adding to the concentration on the valley floor. The name "Jasper Forest" derives from the opaque colors of the petrified wood found here, though this is not really distinctive of this "forest."

⑨ *Crystal Forest.* In this area there were once many fossil logs in which beautiful clear and amethyst quartz crystals filled the cracks and hollows. Before the establishment of the National Monument, collectors and souvenir hunters invaded the area and blasted many of the logs in search of these gems. It was this type of activity that prompted the citizens of the then Arizona Territory to petition Congress to establish a reserve for the preservation of Petrified Forest.

⑩ *The Flattops.* Massive remnants of a once contin-

uous layer of durable sandstone have protected a series of layered deposits which have elsewhere been utterly removed by erosion. The monument road passes through a cleft that separates the two main bodies of this remaining tableland.

⑪ *The Long Logs and Agate House.* The eastern part of Rainbow Forest is most notable for the number of exceptionally long logs, which are only partly uncovered. Here, better than anywhere else in the monument, you can observe the "logjam" character of the deposits, with the logs resting helter-skelter upon one another like jackstraws. A partially restored pueblo, now called Agate House, is at the end of the foot trail that leads to the south from the parking area.

⑫ *Rainbow Forest Visitor Center (Museum) and ⑬ the Giant Logs.* The exhibits in the visitor center building have a dual purpose: to answer questions that might have been brought to mind during your trip through the monument, and to serve as an introduction to the story for visitors just arriving at the monument. Through the rear door of the exhibit hall, you will find the Old Faithful Log and many other exceedingly large logs in the Giant Log section of Rainbow Forest.

A picnic area and concession facilities are conveniently located around the parking area near the visitor center.

⑭ *Rainbow Forest Entrance Station.* This station, located 2 miles from the monument boundary on U.S. 260, may serve either as your entrance to the monument or as your exit from it after you drive through from U.S. 66.

TO REMIND YOU AGAIN

Your cooperation in observing the regulation against removal of petrified wood—no matter how small the piece—will make it unnecessary to impose penalties of fines or imprisonment, or both, as provided under the laws of the United States Government for the protection of Petrified Forest National Monument.

You may purchase polished petrified wood from the monument concessioners, who get their supplies from private lands outside the monument.

TRAVEL INFORMATION

Petrified Forest National Monument is open during daylight hours every day of the year.

Excellent paved highways make the monument easily accessible by car. U.S. 66, crossing the monument near Painted Desert, is the approach from the east. Travelers from the southwest, south, and west enter by way of U.S. 260. The monument road connects these two main highways and leads through the more interesting parts of the area.

Travelers by airplane, train, or bus can get privately operated cars at terminals in Gallup, N. Mex., or in Holbrook and Winslow, Ariz.

ACCOMMODATIONS AND SUPPLIES

Refreshments, lunches, souvenirs, and gasoline may be purchased at the Painted Desert Inn and Rainbow Forest Lodge. These establishments, about 26 miles apart, are located near the entrances to the monument. Both are open daily throughout the year.

Small picnic areas with tables are maintained at the Rainbow Forest and the Painted Desert.

There are no overnight facilities within the monument, and camping is not allowed. The nearest campgrounds are in national forests to the southeast and west, nearly 100 miles away.

Excellent motels and restaurants are located along the highways that cross the monument and in nearby communities.

TIPS FOR A CAREFREE VISIT

The National Parks and Monuments belong to you and your neighbors. Your cooperation in observing the following rules and regulations is necessary if the areas are to be

preserved for your continued use and enjoyment and for the use and enjoyment of your children and their children.

The natural features. The monument is a sanctuary for all living things. You are asked not to molest the birds or animals nor to pick wildflowers. Fragments of petrified wood are a temptation, but please do not carry them away. The Indian petroglyphs and ruins are irreplaceable; do not deface them or damage them in any way.

Dogs and other pets. You may take a dog, cat, or other pet into the monument provided it is kept on a leash, in a crate, or otherwise under physical restrictive control.

Care in driving. The monument road is intended primarily for the enjoyment of the area—it is not a speedway. Please observe posted speed limits and practice the usual courtesies of the road. Keep to the right of the center stripe; avoid parking on curves; pass cars going in your direction only when road signs or center striping indicate that it is safe to do so.

Fees. A nominal fee is charged for each motor vehicle entering the monument, for either a 15-day permit or a 1-year permit. During the 15-day valid period of the short-term permit, it may be surrendered at either entrance station and its cost may be applied toward the purchase of the calendar year permit. A valid permit must be shown upon entering and leaving the monument. All fees are deposited in the United States Treasury and offset, in part, appropriations made for operating the monument.

General. Picnicking is permitted during open hours at designated areas only.

All accidents, injuries, and lost or found articles should be reported at the nearest ranger station.

Trash receptacles are conveniently located throughout the monument, and you may obtain trash bags at either entrance station. Please dispose of all refuse properly. Cleanliness begets cleanliness.

Broken log sections.



Agate House.

ADMINISTRATION

Petrified Forest National Monument is administered by the National Park Service of the U.S. Department of the Interior.

The office of the superintendent, who is in immediate charge, is in the Painted Desert Orientation and Administration Building. Inquiries and comments concerning the monument should be addressed to the Superintendent, Petrified Forest National Monument, Holbrook, Ariz.

MISSION 66

The new Painted Desert Orientation and Administration Building, exhibits at the Rainbow Forest Visitor Center, and other improvements that you see here are among the nationwide accomplishments that have been achieved under the Mission 66 program of the National Park Service. Mission 66 is a 10-year program, designed to be completed on the 50th anniversary of the National Park Service in 1966, to develop and staff the parks so that they may be most wisely used and best enjoyed by the increasing numbers of people, while being preserved in full value for future generations.

Cover: Jasper Forest.

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DEPARTMENT OF THE INTERIOR
Stewart L. Udall, Secretary
NATIONAL PARK SERVICE
Conrad L. Wirth, Director



Petrified Forest

NATIONAL MONUMENT

Arizona



PETRIFIED FOREST NATIONAL MONUMENT

