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Harold J. Brodrick**

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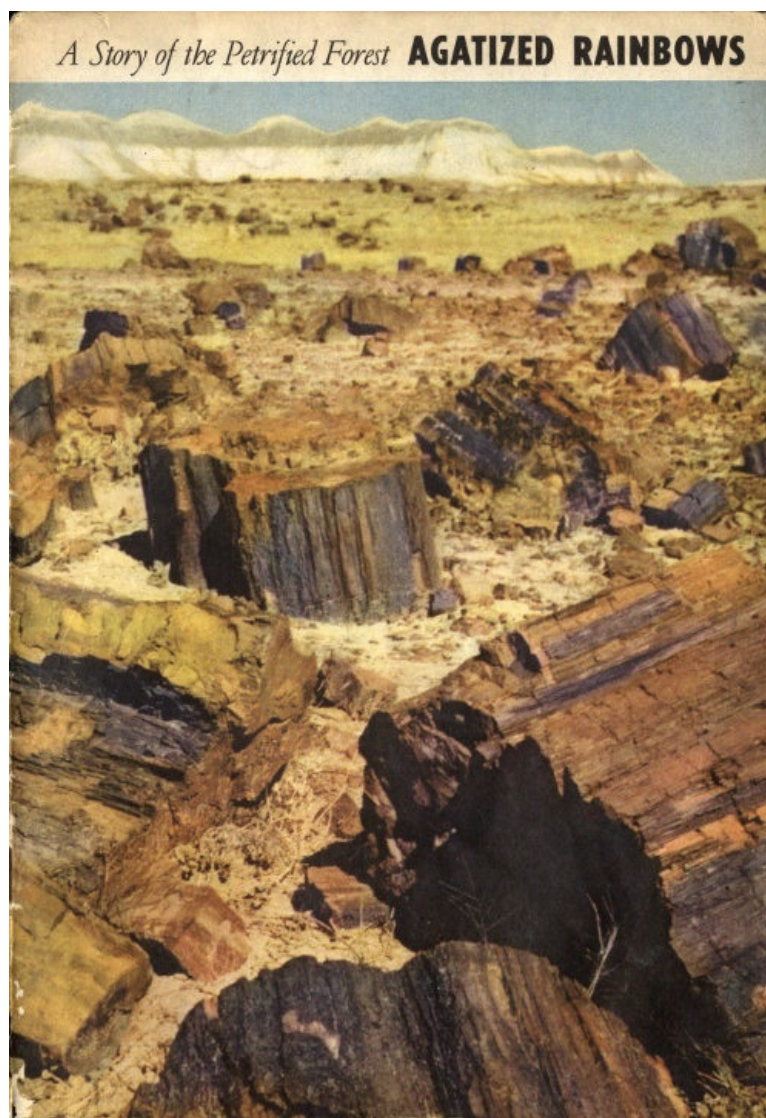
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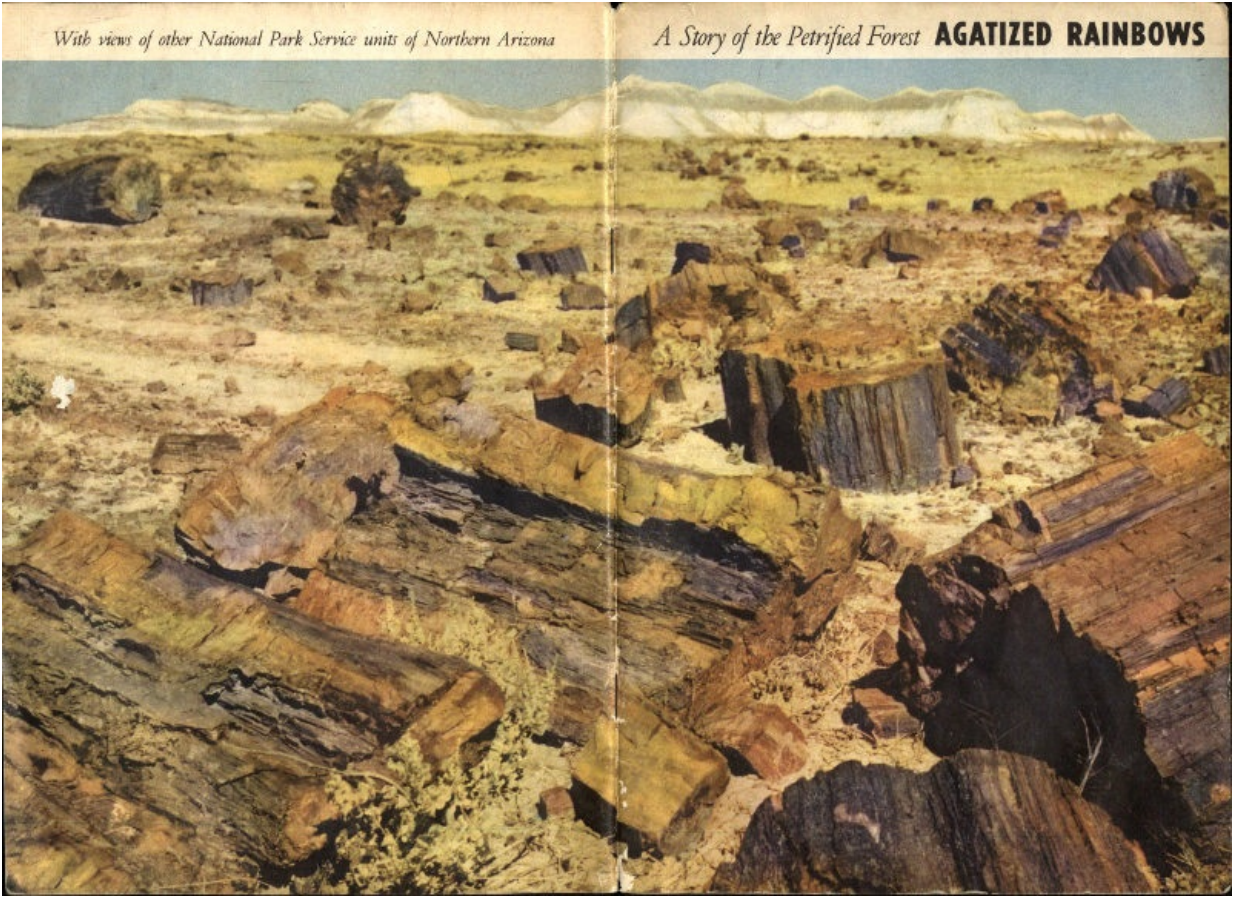
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*** START OF THE PROJECT GUTENBERG EBOOK AGATIZED RAINBOWS: A STORY OF THE PETRIFIED
FOREST ***



AGATIZED RAINBOWS
A Story of the Petrified Forest
With views of other National Park

Service units of Northern Arizona



Third Forest.

Photo by Jerry McLain.



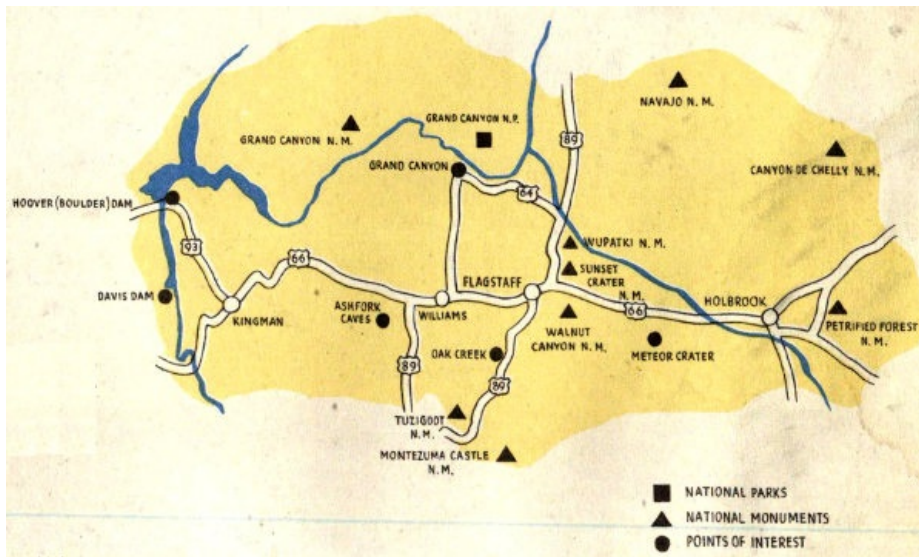
Colorful petrified log sections, typical of many found in the monument.

Photo by Esther Henderson.



Blue Forest Badlands—Colorful banded ridges, a three mile side trip.

Photo by Ray Manly.

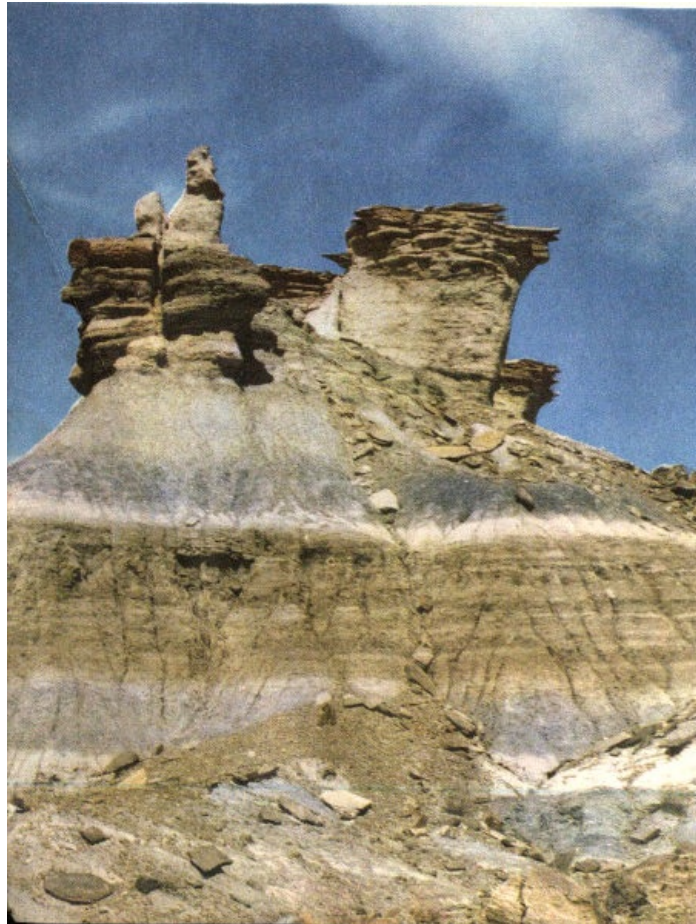




Agate Bridge. Erosion has cut out the rock from under this log leaving a span of 45 feet forming a bridge, now supported by a beam.

Photo by Leon Cantrell.

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An example of color and erosion in the First Forest.

Photo by Josef Muench.



Logs of rainbow hues in the Second Forest.
Photo by Josef Muench.



Old Faithful Log near the Museum in Rainbow Forest has the largest base diameter of those readily seen during a trip through the

Monument.



Logs in the Second Forest.

Photos by Josef Muench.



A polished specimen of wood from Rainbow Forest Museum, where many other colorful sections are on display.

Photo by Josef Muench.



Mariposa Lilies, one of the beautiful wildflowers that bloom during May, in the Forest.

Photo by Josef Muench.

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AGATIZED RAINBOWS

.... A Story of the Petrified Forest

POPULAR SERIES No. 3—1951
PRESENTED BY **PETRIFIED FOREST MUSEUM ASSOCIATION, HOLBROOK, ARIZONA**
AND THE **ARIZONA STATE HIGHWAY DEPARTMENT**
TEXT BY **HAROLD J. BRODRICK, PARK NATURALIST**

"Oh ranger, please! Just one itzy bitzy piece of petrified wood to take home to show my boy friend. You won't miss just one teeny weeny piece."

Holding in his hand an assortment of specimens of petrified wood which he had just retrieved from the young lady driving the flashy convertible, the Highway 260 checking station ranger at Petrified Forest National Monument shook his head with a wry smile. "Sorry, lady, but the rules say 'It is unlawful to injure, destroy, or remove specimens of petrified wood of any size whatsoever found within the monument boundary * * *,' and my job is to see that this and other regulations are obeyed. You're right, we would never miss these few pieces if you took them home with you, but they belong to the people of the United States, and if everyone of the 350,000 visitors who come here each year took away only a few specimens, as you wish to do, in a very few years there wouldn't be any left. It's my job, as representative of the people of this country, to see that there will always be this great natural display of petrified wood here where it was formed."

As the young lady drove off with a gay wave of her hand and "I think you're mean" tossed over her shoulder, the ranger turned to us with a rueful smile. "Happens every day," he said. "You can't blame people for wanting to take home a souvenir of the Petrified Forest, and the stuff is so pretty that kids, especially, just can't help but want to pack it off. And, with so much of it here, it's hard for them to understand that it would soon be gone, particularly along the roads and trails, if everyone carried off a handful or two."

We agreed with the ranger that it is hard to understand, until it is explained that such enormous quantities of petrified wood as are strewn over hundreds of acres in Petrified Forest National Monument could be entirely removed in a few years by souvenir-hungry American tourists. "But where," we inquired, "do these roadside stands all along Highway 66 get the huge piles of petrified wood which they offer for sale? Surely the National Park Service doesn't permit them to haul it off the monument by the truckload."

"Oh no," grinned the ranger. "All of that 'for-sale' wood comes from private lands. The national monument preserves and protects only the largest and most colorful deposits of petrified wood; but it is found in many places throughout northeastern Arizona."

The impatient toot of an automobile horn informed us that we were blocking traffic, so we thanked the ranger and continued on our way. However, the interesting conversation aroused our curiosity, and at the first opportunity we returned to the Petrified Forest to learn more about the occurrence of petrified wood, and how Uncle Sam, through the National Park Service, keeps the wood from being carried off by souvenir collectors, and how the fascinating story of wood petrification is told to visitors who take a little time to visit the monument museum at the Rainbow Forest headquarters of the superintendent. This is the way the naturalists tell it.

Believe it or not, it was the threat of souvenir hunters and raids on the fields of petrified wood by commercial jewelers, gem collectors, and abrasive manufacturers in the late 1890's and early 1900's that led thoughtful citizens of the then Arizona Territory to petition Congress for the establishment of some sort of a protectorate for the Petrified Forest. In the vicinity of the Agate Bridge and what is now known as the First Forest, enterprising abrasive makers set up a stamp mill to pulverize the great blocks of petrified wood which they found there. Here, also, many of the logs were dynamited in the search for quartz and amethyst crystals which some of them contained. 10

As a result of the petition by citizens of Arizona Territory, and in response to requests by other groups in the Southwest that steps be taken to protect great cliff dwellings and other prehistoric Indian remains which were being systematically pothunted and looted, Congress passed the Antiquities Act. This authority enabled President Theodore Roosevelt on December 8, 1906, to issue a proclamation establishing Petrified Forest National Monument for the protection and preservation of one of the world's most colorful and extensive concentrations of petrified wood "for the benefit and enjoyment of the people."

Northeastern Arizona is not the only area known to contain petrified wood, for it has been found in nearly every State and in foreign countries as well. Visitors from distant States are frequently surprised to discover, from a map in the monument's museum, that petrified wood is to be found near their own homes. It is, however, the large amount of the wood in such beautiful and varied colors that makes *this* Petrified Forest outstanding and worthy of being protected as an area of national significance.

We do not know for certain which of the early travelers was the first to see the great display of petrified wood of northern Arizona. Spanish explorers may have seen it during the 1500's, since they viewed and named the Painted Desert (Desierto Pintado), but no written account has been located that gives any indication that they noticed the wood. In fact, the earliest written report on record was not made until 1851. In that year, Lieutenant Sitgreaves, an Army officer, explored parts of northern Arizona and mentioned the petrified wood in his reports. In 1853, an Army expedition led by Lieutenant Whipple visited the present monument area, camping near the Black Forest.

It was not until the 1880's that settlement of this part of the Arizona territory really got under way with completion of the Santa Fe Railroad across it in 1883. Word about the petrified wood spread, and it was not long until the destructive activities were started.

The six separate "forests" within the monument are areas of the greatest concentration of petrified logs and have been named the First, Second, Third, Black, Rainbow, and Blue Forests. The latter was given its name because of the bluish color of much of the badlands formation in which the wood is found. There is not a great deal of difference in the wood found in the other locations, so they were apparently named by early residents in order to distinguish one location from the other.

Fortunately, this monument is easily accessible since it is crossed by two main highways, thus giving visitors to northern Arizona an excellent opportunity to enjoy the beauties of this unusual work of nature. The National Park Service of the United States Department of the Interior has been entrusted with the responsibility of protecting and administering this and all of the other national monuments and parks forming America's National Park System. It is the responsibility of all the people, as owners of these outstanding national values, to help the Service keep the wonders of this and other parks and monuments intact for the enjoyment of future generations.

Because of the name "Petrified Forest," many people who have read of it expect to find trees "turned to stone" and standing upright just as they grew. Actually, geologists who have studied the area very carefully do not believe that many of the living trees grew in this particular location, for all of the evidence indicates that fallen timber from forests a considerable distance away was carried here by flood waters of ancient streams and stranded and buried in the mud and shallows of lagoons and marshes. 11

During the latter part of what geologists call the Triassic period, about 160 to 170 million years ago, most of northeastern Arizona was apparently an extensive flood plain; low, flat, and swampy. Numerous streams, some of them quite large, flowed out from the surrounding low hills into the plain. These streams brought enormous quantities of sediments; mud, sand, and other minerals, spreading it out layer upon layer as they shifted their flow back and forth just as on present river deltas. These sediments contained huge amounts of volcanic ash which the streams apparently picked up near their sources. This ash was largely silica, the mineral which was later to be of major importance in the petrification of the wood. (Silica (SiO₂) is the oxide of silicon, a non-metallic element

making up 28 per cent of the earth's crust. The crystal form of silica is quartz, the commonest of all minerals, which is found in large amounts in many volcanic rocks.)

The flood plain was broken by an occasional ridge or high spot, apparently tree-covered, as a few petrified stumps with partial root systems have been found in the locations where they apparently grew. However, most of the trees grew in forests on the low hills through which these rivers flowed, anywhere from a few miles to 50 or 100 miles or more to the west and southwest of the present national monument. These trees died from various causes, just as trees of our modern times do. Fire, wind, insects, diseases, and other causes all took their toll. Many trees probably decayed in the forest where they fell, but others were picked up by flood waters and were eventually transported by the streams to the flood plain there to become stranded with hundreds of others and to be covered by the sediments brought in by the streams.

This transportation theory is based on several types of evidence. In the first place, the logs have been stripped of much of their original roots and limbs, and practically all of the bark has disappeared. The logs present a worn appearance, an indication of having received rough treatment. Also, very few traces of cones or foliage have been located, although the fossil remains of more than 30 species of fragile ferns, cycads, rushes, and other plants that grew in the marshes of the ancient flood plain have been found. The direction of the original drainage into this area has been established by tracing the source of the Permian gravels which are deposited here.

The deposition of these sediments over the plain continued until a layer about 400 feet thick was built up during the centuries. This deposit is now known geologically as the "Chinle Formation." One of the principal materials found in the Chinle is Bentonite, originally a volcanic ash which the streams brought. It has since decomposed into a clay-like soil which is very porous and spongy and which readily absorbs water and expands. When becoming very wet, it turns into a bluish mud and is washed away. Erosion of this Bentonite and other materials deposited with it forms the badlands area now seen on portions of the monument and in the Painted Desert. During the ages when the original layers of mud, sand, and silt were being deposited, many of the logs were washed in and buried at various levels with this Chinle material.

While all of this was slowly taking place, the land mass over this part of the continent was gradually subsiding. It continued to settle during the next geological period of millions of years, and layer after layer of sediments were washed in and deposited on top of it. Then during the next geological (Cretaceous) period, a long arm of a sea flooded this part of the country. Marine deposits accumulated on the bottom of the sea until finally the Chinle Formation containing the buried logs was covered by 3,000 feet or more of other deposits. 12

At the close of Cretaceous time, about 60 million years ago, uplift of the present Rocky Mountain system commenced. The basin in which the Petrified Forest lay buried rose with it. This gradual rising movement has continued intermittently nearly to the present time.

This uplift brought with it the activity of erosion which has continued through the ages until finally almost all of the 3,000 feet of upper layers of material have been washed away, and the many logs, that had once been so deeply buried, have again been exposed on the surface; but now as hard, colorful stone. Erosion continued to carry the soil away from the petrified logs, exposing more and more of them. As forces of erosion lowered the surface of the ground little by little, the petrified logs, too hard to be affected, settled with it, eventually accumulating with sections of other logs that had been buried on a lower level. Thus, the present surface of the ground is rather thickly covered, in many spots, with wood that was originally scattered through approximately the upper 100 feet of this Chinle Formation. In the vicinity of the Rainbow and Third Forest, at least, about 300 feet more of this formation still remains. So far as we know, wood is to be found throughout this entire layer. Therefore, theoretically at least, it may be said that 25 per cent of the petrified wood that is here is visible on the surface, the rest still remaining buried below.

Three species of trees have been found here in petrified form. The most common one is an Araucarian Pine (*Araucarioxylon Arizonicum*), a primitive member of the pine family. This species became extinct long ago, but there are still several species of modern Araucaria native to South America, Australia, New Zealand, and other South Pacific islands which are apparently very similar to this ancient form. Some of the modern types have been imported to this country and are used for ornamental purposes in certain locations in Florida and along the Pacific coast. The most common ones are known as the "Monkey Puzzle Tree" and "Norfolk Island Pine." Claims made by roadside stand operators along Highway 66 that the petrified wood offered for sale is "beach walnut," "cactus," etc., have no basis in fact.

Two other types of petrified wood are found here in smaller amounts. These are the *Woodworthia Arizonica*, a cone-bearing tree somewhat similar to the Araucaria and the *Schilderia Adamanica*, a tree with peculiar radiating rays in the wood. Paleontologists are not sure where this latter kind belongs in systematic plant classification. What happened during the millenniums that the logs lay buried in their Chinle tombs?

How did these trees turn to stone? Most of our text books tell us that the petrification of wood is a replacement process. Bit by bit, water removed wood tissue and in its place left a mineral deposit in exactly the same form as the original, so that when the process had been completed there was no wood left but in its place an exact stone duplicate. This theory was accepted for a very long time, but recently some scientists were not satisfied with it because certain chemical actions that would have to occur during such a process were difficult to explain.

Just prior to 1940, several scientists investigated the process, and from their findings decided that the wood was not petrified by *replacement* but by the *infiltration* of mineral-bearing water into the wood and the deposition of this mineral in the air spaces within the wood tissue. This process, they believe, continued until all of the microscopic spaces in the wood were filled solid with this deposit and the petrified log, composed of 98 per cent by volume of mineral deposit and 2 per cent cellulose and lignin wood tissue, was the result. The original wood tissue acted, they think, as a framework to hold the mineral deposit like the walls of a building would 13

act if the rooms and spaces between the walls were filled in solid with liquid concrete. This accounts for retention of the cell structure, annual rings, and other features of the original wood. The petrification of wood has never been studied sufficiently, and there are many questions for which satisfactory answers have not yet been advanced.

Although woods in different localities have been petrified by other minerals, the most common is silica. In the case of this petrified wood, the silica was deposited in an agatized non-crystalline form. The normal color of the silica without mineral stain is a white or gray. Sometimes small amounts of other minerals were in the solution along with silica, or in some cases were brought in during the millions of years of burial as a secondary deposit in the cracks, checks, or other openings in the petrified or partially petrified wood. Iron oxides in small quantities produced the great variety of shades of red, brown, and yellow. The black color in most cases is due to manganese oxide or carbon. Thus, the combination of minerals produced a rainbow of colors in the agatized wood.

Whenever there were small checked places, cracks, or hollows in the wood, we find that they are often either filled or lined with quartz crystals or occasionally with amethyst crystals.

The term "chalcedony" (pronounced kal-sed'-nee) is a broad one usually applied to any compact mass of silica free of definite color pattern, but it is also frequently used to describe all forms of silica whether translucent or opaque, and regardless of color. Agate, therefore, may be considered a variegated chalcedony. Agate is translucent and has a definite color or pattern. Jasper is opaque and may be either red, brown, yellow, blue, or green in color. Quartz minerals are harder than most types of steel, and there are only about 30 other minerals that exceed it in hardness. In the mineral scale of hardness, quartz is rated at 7 and diamond, the hardest of all, at 10. Petrified wood weighs about 166 pounds per cubic foot.

"Who sawed these trees" is one of the questions visitors frequently ask. It is a natural query because most of the logs are cracked into sections, in many instances of rather uniform length, and each broken face is smooth enough to appear almost like a saw cut. At first glance this does give the impression that someone, possibly a Paul Bunyan with an enormous diamond-toothed saw, had cut the logs into "stove wood" lengths. Although there may be some differences of opinion about how this fracturing occurred, the present explanation by scientists is that most of this breakage took place during the period of uplift of this section of the country. The gradual movement and elevation of the earth's crust caused numerous earthquakes. The shock waves of the tremblor traveling through the earth set up vibrations which caused the deeply buried, brittle, petrified logs to crack. The harmonic vibrations created by the rhythm of the regular shock waves caused the cracks to be rather regularly spaced. At first these cracks were tiny, but centuries later, after the logs were exposed on the surface, the weathering actions and the shifting and settling of the soil beneath them caused the cracks to widen and eventually the fractured sections separated. Occasionally breakage may also occur when soil washes out from under one end of a log and its weight causes it to sag and crack. The normal fracture line of this material is at right angles to the lineal axis, and the rather smooth face causes the broken surface to appear much like a saw cut.

Polished wood sections that are exhibited in the Rainbow Forest Museum show to best advantage the varied color pattern of this petrified wood. The piece is first cut with either a diamond or carborundum saw. Then the sawed face is ground as smooth as possible on carborundum wheels of different grits. When ground sufficiently 14 smooth, the final polish is given the surface with hard felt buffing wheels and a polishing compound. Due to the hardness of the petrified wood, it takes about an hour to cut and polish a square inch, hence is an expensive process. Some of the most colorful or "picture wood" specimens make very attractive and durable settings for rings, pins, and other jewelry.

Fossil remains of many forms of animal life that existed here during Triassic times also are found in the Chinle deposits with the petrified wood. Some parts of skeletons were mineralized and preserved in much the same manner as was the wood. The animals which lived where the trees accumulated were forms that normally inhabited muddy, marshy river bottoms, another indication of the type of environment here during that long-gone age.

Largest of these animals was the Phytosaur, a crocodile-like reptile about 18 feet long and weighing nearly a ton. Nostrils were located on top of the head. These reptiles were omnivorous feeders, and with their webbed feet and long flattened tails were at home either on land or in the water. The Phytosaur was a distant relative of the Dinosaur but became extinct before the Dinosaur reached its peak of development.

Another inhabitant of the swampy lowlands where ancient logs were stranded was the Stegocephalian, a primitive amphibian related to modern salamanders, or mud puppies, but of huge size. They were heavy, flattened creatures from six to nine feet long and probably weighed about 500 to 600 pounds. Their legs were very short, and they moved about by dragging themselves over the swampy ground, probably being carnivorous feeders. The skull was almost completely solid and had openings only for the nostrils, eyes, and a peculiar third eye in the top which probably was capable of distinguishing movement or light, but not color.

Several types of fishes, amphibians, and small reptiles probably lived along the streams and in the quiet pools of those ancient marshes. Among them were lung-fishes whose teeth or "dental plates" are now found scattered through the badlands of the Petrified Forest.

Large rushes, or horsetails, bordered the streams and matted the swamps. Their hollow stems grew to eight and ten inches in diameter and 30 to 40 feet tall. At each joint were whorls of slender branches. Large, broad-leaved ferns formed a striking contrast with the delicate foliage of the seed fern types. Club mosses probably grew in small clusters in sheltered places along the banks of the streams and pools.

How different this scene of millions of years ago was from our present-day landscape and modern plant and animal life. The climate must have been at least sub-tropical then; today it is semi-arid.

In contrast to the plants and animals of those Triassic times living in swamps and marshes, we now have plants and animals that are able to exist with a minimum of moisture. The present ground-cover is seldom over three or four feet high, but includes a wide variety of plants ranging from very small flowering herbs to the several species of gray-foliaged salt brush and other shrubs. With suitable moisture, the spring and fall wildflower displays are often very showy. The early blooms of the chimaya, phacelia, and the large, white, evening primroses are soon followed by desert mallow; vetch; a small white daisy-like Fleabane; the large yellow tulip-like flowers of the mariposa or sego lily; and as the season advances, the paint brush; asters; snake weed; golden aster; rabbit brush; and many others.

In contrast to the sluggish reptiles and amphibians in the Triassic, we now have the fleet pronghorn (American Antelope); occasional coyotes and bobcats, porcupine, prairie dogs, rabbits, and many of the smaller rodents. Several species of harmless snakes and an occasional rattlesnake; slender, striped, long-tailed race runner lizards; scaled lizards, and the bright, green-backed, yellow-footed Bailey Collared Lizard which frequently 15 brings visitors hurrying in to inquire if it is poisonous. It isn't!

Several species of birds such as the Desert Horned Larks and rock wrens make this their permanent home while many other species ranging in size from the tiny Allan Hummingbird to the mighty golden eagle either stay here during various parts of the year, or pass through in the spring and fall migrations.

Intermixed with the surface deposits of petrified wood and other remnants of the ancient Triassic time are the much more recent remains of early men. Ruins of their homes, fragments of their handiwork, and examples of their arts are to be found in many locations.

These people were pre-Columbian Pueblo Indians, ancestors of our modern Pueblo Indians, and of the same type that inhabited the other pueblo and cliff-dwelling sites in the Southwest. It is probable that there was considerable trading carried on between the people of this area and those at other locations, since many of the same pottery types are found throughout.

This somewhat desolate region was apparently fairly densely populated by little groups of farming Indians. With no survey or study of the monument area having been made, more than 300 ruin sites have been located and there are many others nearby. These ruins of stone buildings are usually from one to a few rooms in size. However, one ruin near the Puerco River Ranger Station is estimated to have had about 125 or more rooms. It is built in the form of a hollow square about 180 feet by 230 feet, around a plaza about 130 by 185 feet. Probably two stories in height, it could have housed nearly a hundred families.

A study of the pottery fragments from each site helps us to tell the approximate time that the particular site was occupied. This time varies from about 500 or 600 A.D. to 1400 A.D., some being used over a longer period than others.

In most cases, the buildings were constructed of pieces of sandstone, but in a few instances the Indians had an eye for color and used pieces of petrified wood which made a very substantial as well as colorful building. "Agate House" in the south part of the Third Forest is one example of such construction. This was partially reconstructed in 1934 in the early Pueblo style by the use of chunks of petrified wood from the heap of the ruins. Indians also used the petrified wood for making arrow-points and other tools and weapons.

These people practiced agriculture, cultivating corn, pumpkins, and beans. They probably wore simple clothing made of cotton cloth or the skins of wild animals. They also made pottery.

Tree-ring studies show that there was a great drought from 1275 to 1299 A.D. This apparently caused a great deal of shifting around among the Pueblo people. Only a few villages in the Petrified Forest area were occupied during the fourteenth century. It is not known whether the people were driven out by the predatory Apaches or because of the drought.

Where did these Indians get water? While there probably has not been any marked change in climate or rainfall since that time, there may have been more springs and seeps along the cliffs. It is possible that these failed during that great drought period.

Pottery designs of these early Indians show an artistic talent, further indicated by the many petroglyphs on the sandstone cliffs and boulders throughout the area. A petroglyph is a picture or design carved or pecked in the face of a rock. These pictures are of figures, geometric patterns, and symbols in many cases similar to those found on the pottery. Some represent hands, feet, human figures and shapes of mammals, birds, or lizards. These appear to be simply a collection of drawings made by various Indians over a period of time. In some cases, 16 they were clan symbols, each passerby adding his own much like a visitor's register such as we have today or a collection of initials or names unthinking people carve on trees or scratch on rocks. Unfortunately an occasional person nowadays, thoughtless of those that follow, either destroys this ancient art work or defaces it by adding his name or initials to those of an earlier man. "Newspaper Rock" is the most spectacular group of petroglyphs found on the monument.

Homes and tribal lands of modern Indians are located in areas to the south, east, and north of Petrified Forest National Monument—homes that were established in some cases before the first Spanish explorer entered the Southwest.

To the south in the White Mountains are the Apaches. Apparently both the Apache and the Navajo entered the Southwest only a short time before the Spaniards came. Being nomads and predatory in nature, they soon struck terror in the hearts of the peaceful Pueblo people and caused many of them to abandon their homes to seek more secluded and protected sites.

To the east are the Zuni, a Pueblo people that some of the early occupants of the Petrified Forest may have joined. When the Spaniards came, these Zuni were living in seven pueblos that became known as the historic "Seven Cities of Cibola."

To the north are the Navajo and Hopi peoples. Arizona's famous Painted Desert forms a long curving border to the Navajo Reservation—a border extending from near the New Mexico line westward to the Colorado River northwest of Cameron. A spectacular portion of it lies in the northern part of Petrified Forest National Monument.

The Painted Desert is a colorful, often fantastically eroded badlands of Bentonitic beds stained with shades of red, orange, yellow, blue, purple, and brown by iron minerals. Arid or semi-arid with only a sparse vegetative cover, these soft beds are subject to rapid erosion during Arizona's season of torrential rains.

The Painted Desert formed a barrier behind which the early Hopi people withdrew to establish their famed mesa-top villages, including Oraibi which has been continuously occupied since about 350 years before the discovery of America. These people still live in their several mesa-top villages, their reservation surrounded by that of the Navajo, their former enemies, who now lead a peaceful, semi-nomadic life.

There is much more to the fascinating story of the Petrified Forest as told to us by naturalists of the national monument. Few visitors take time from their mad rush to "get somewhere quickly" to make the effort to understand the intricate and devious ways of Nature, of which "Time is the essence," resulting in the spectacular and brilliant display, this glittering jewel of the desert, the Petrified Forest. Stopping only long enough to marvel briefly, many of them feel the urge to take something with them, some concrete reminder of the colorful scene, some bits of petrified wood. Those who successfully "get past" the checking station ranger with their illicit souvenirs usually lose these trinkets, or find them turned to sharp goads which prod their consciences in later years. How fortunate those visitors who, at the expense of an hour or so of time, gain an understanding of what lies behind the scenery at the Petrified Forest, thereby developing an appreciation of the work of Nature and of God as exemplified here. These people take with them, not merely a souvenir, but an experience which they will treasure and enjoy throughout the remainder of their lives.

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The Painted Desert from the Monument's rim drive.

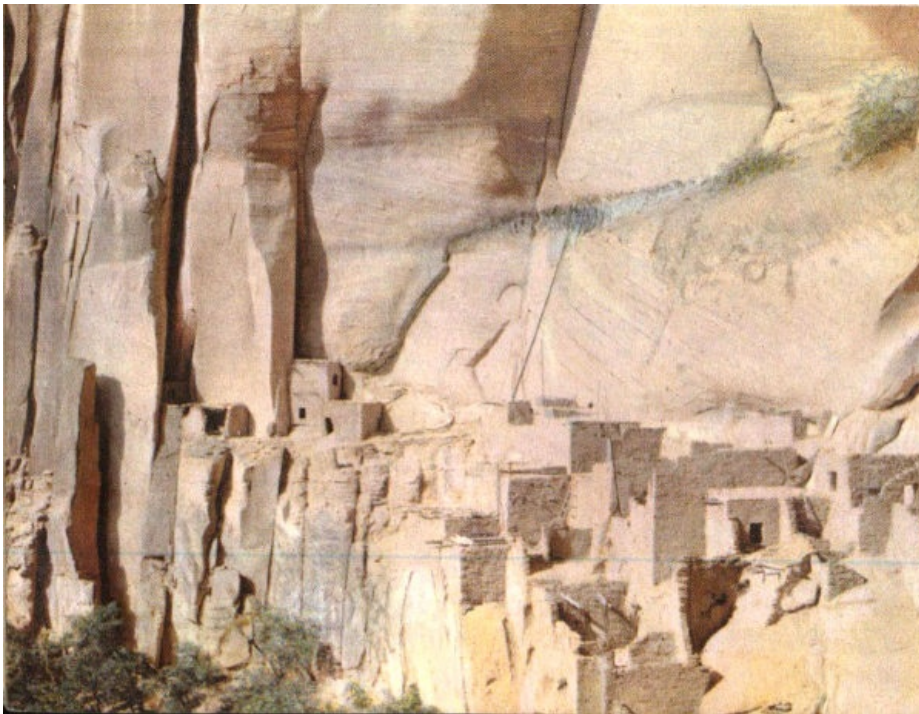
Photo by Josef Muench.



A typical scene in Petrified Forest.
National Park Service Photo.



Painted Desert from the Painted Desert Inn.
Photo by Josef Muench.



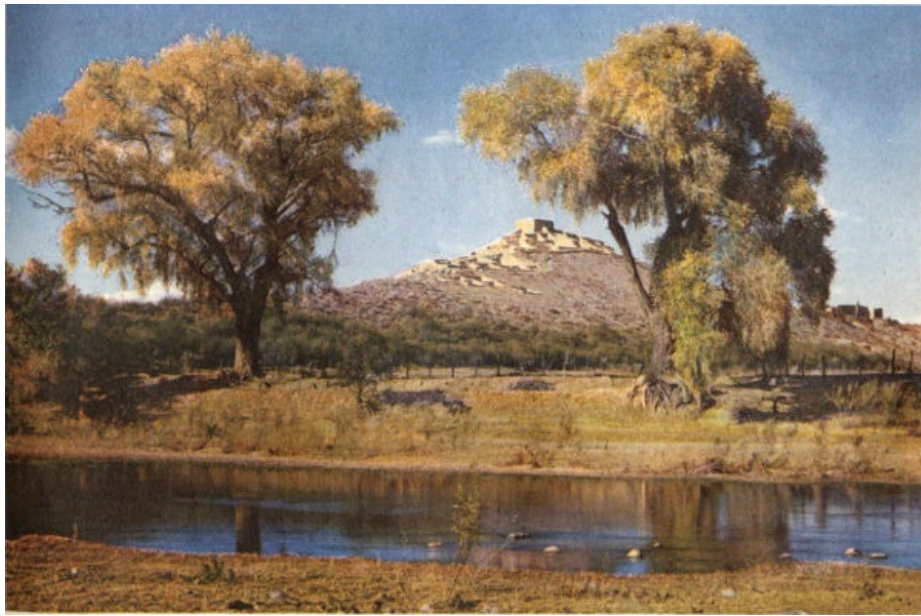
Navajo National Monument. Deep in the heart of the Navajo country is an area of cliffs, canyons, and prehistoric ruins. One of the largest is Betatakin.

Photo by Martin Litton.



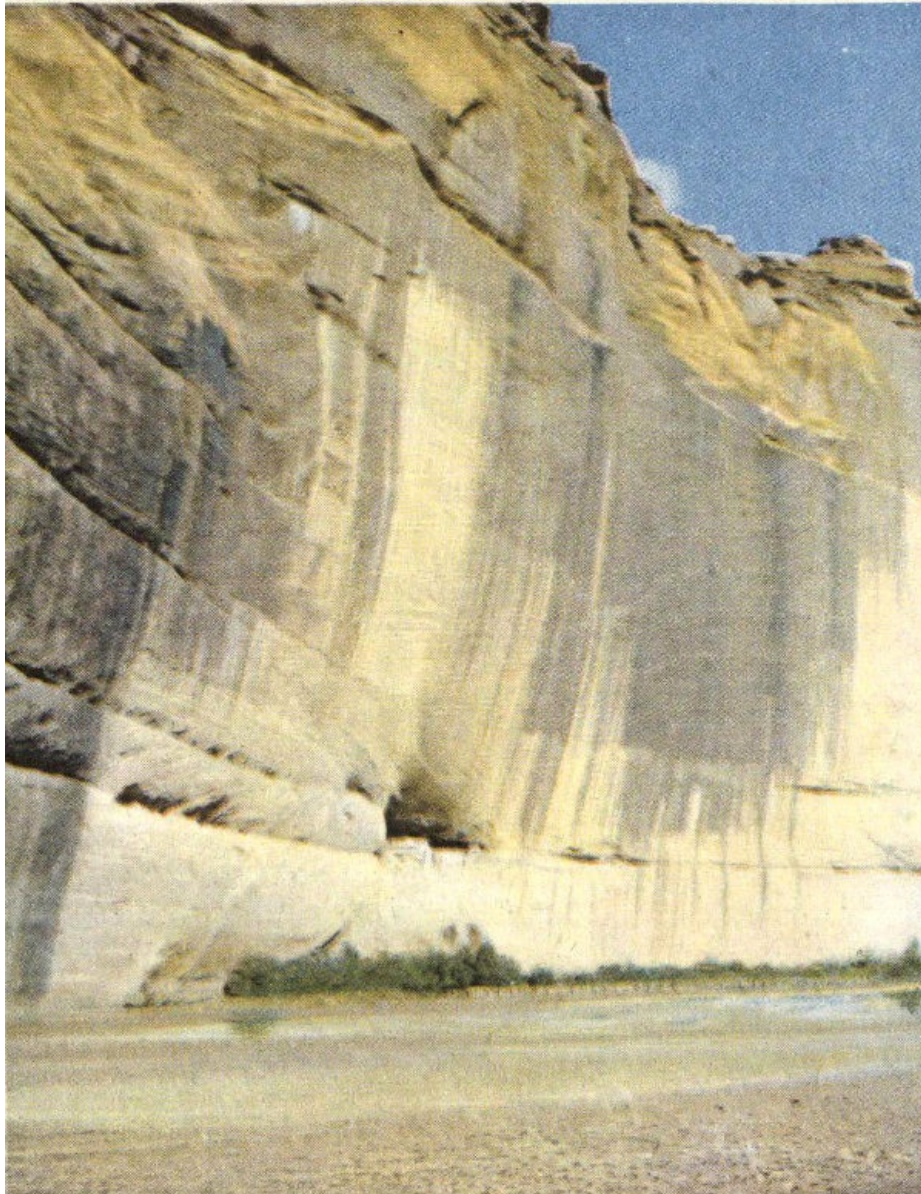
Sunset Crater. Sunset Crater National Monument, near Flagstaff, comprises an area that was the scene of volcanic activities hundreds of years ago.

Photo by Norman Wallace.

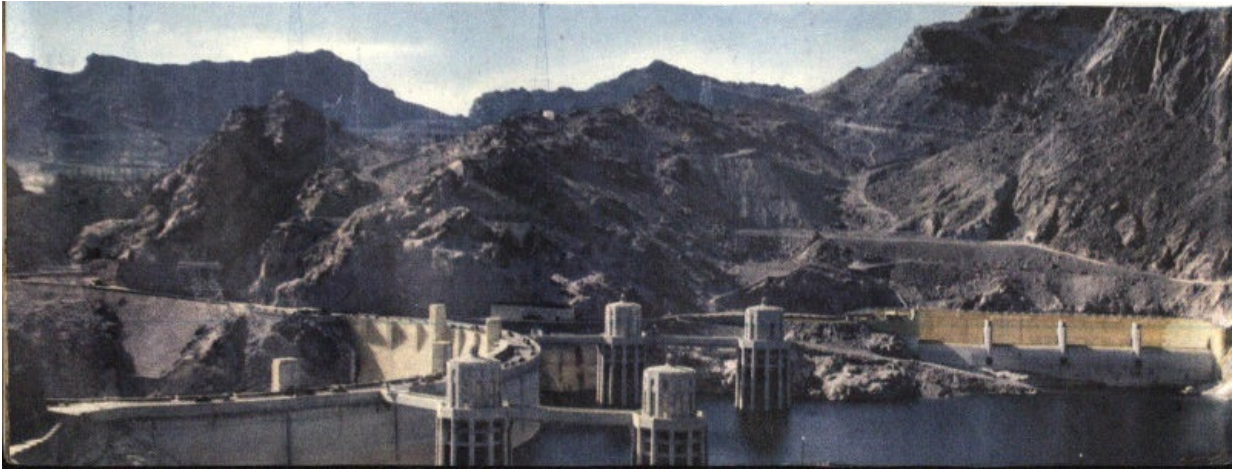


Tuzigoot—The hilltop home of an ancient, peaceful farming people, near Clarkdale, has been excavated.

National Park Service Photo.



Canyon De Chelly National Monument contains within its borders Canyon De Chelly and Canyon del Muerto, as well as many ruins. It is near



Hoover (Boulder) Dam and Lake Mead provide a fine recreational area along the Arizona-Nevada border.

Photo by Herb McLoughlin.



Grand Canyon National Park. The Grand Canyon of the mighty Colorado River defies efforts to describe it adequately.

Photo by A. C. Jackson.



Wupatki ruins in Wupatki National Monument, one of the most spectacular pueblos in Northern Arizona.

Photo by George K. Geyer.



Walnut Canyon. In the walls of this canyon, near Flagstaff, under overhanging ledges are a series of prehistoric Indian ruins.

National Park Service Photo.



Montezuma Castle, overlooking Beaver Creek in the Verde Valley, is one of the most beautiful cliff dwellings to be found in this country.

Photo by Ray Manly.

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- Silently corrected a few palpable typos.
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