Fossil Trees or Petrified Wood

Fossil tree trunk in Arizona's Petrified Forest

Petrified wood is found in numerous locations around the world and represents the remains of ancient forests. From ancient cladoxylopsids and tree fern forests that lived in the mid Devonian period 380 million years ago to relatively modern hardwood and conifer forests that lived only a few million years ago, tree and plant fossils provide a window into past environments and help us understand earth's history and evolution.

Permian forest in northern China reconstructed from fossil remains.

While we cannot do traditional dendrochronology with fossil trees, they are much too ancient, we can compare their growth rings and anatomy to modern trees in order to gain understanding of ancient environments. The fossil sections inlaid into the floor provide a window into ancient ecosystems and provide insight that links the past with the present. Also, like modern wood, fossil wood has its own special beauty and character.

Trees from the Triassic and Jurassic periods

Mixed hardwood and araucaria (*Araucaria araucana*) forest growing beneath Chile's Lliama volcano in Conguillio National Park.

Araucarias became one of the dominant conifers during the Mesozoic era, diversifying and populating many environments during the Jurassic and Cretaceous periods. Fossil araucarias are found in many parts of the world including Arizona.

Araucaria forest on the slopes of the Lonquimay volcano, Malacahuello National Reserve in central Chile.

Araucaria leaves and cones.

Fossil araucaria cone

Today they are found only in the southern hemisphere. There are 19 living species distributed between South America and the islands off northeastern Australia. Some related species including the Kauri tree are found in New Zealand and Australia.

A reconstruction of an ancient araucaria forest from the upper Shishugou Group in northern China. Jurassic period.

Araucaria trees grew up to 200’ (60m) tall and dominated these ancient forests. They have large, edible, winged seeds that likely provided a food source for dinosaurs and other animals of the time. The annual rings we see in some fossil araucarias tell us that they experienced a year with distinct seasons that included a dormant period.

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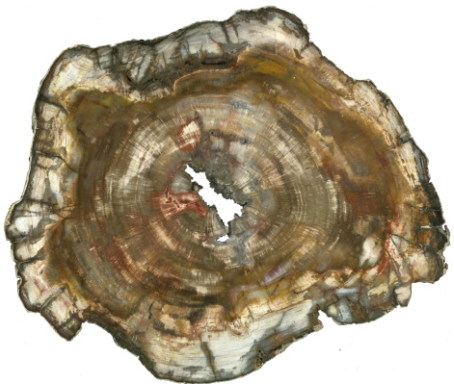
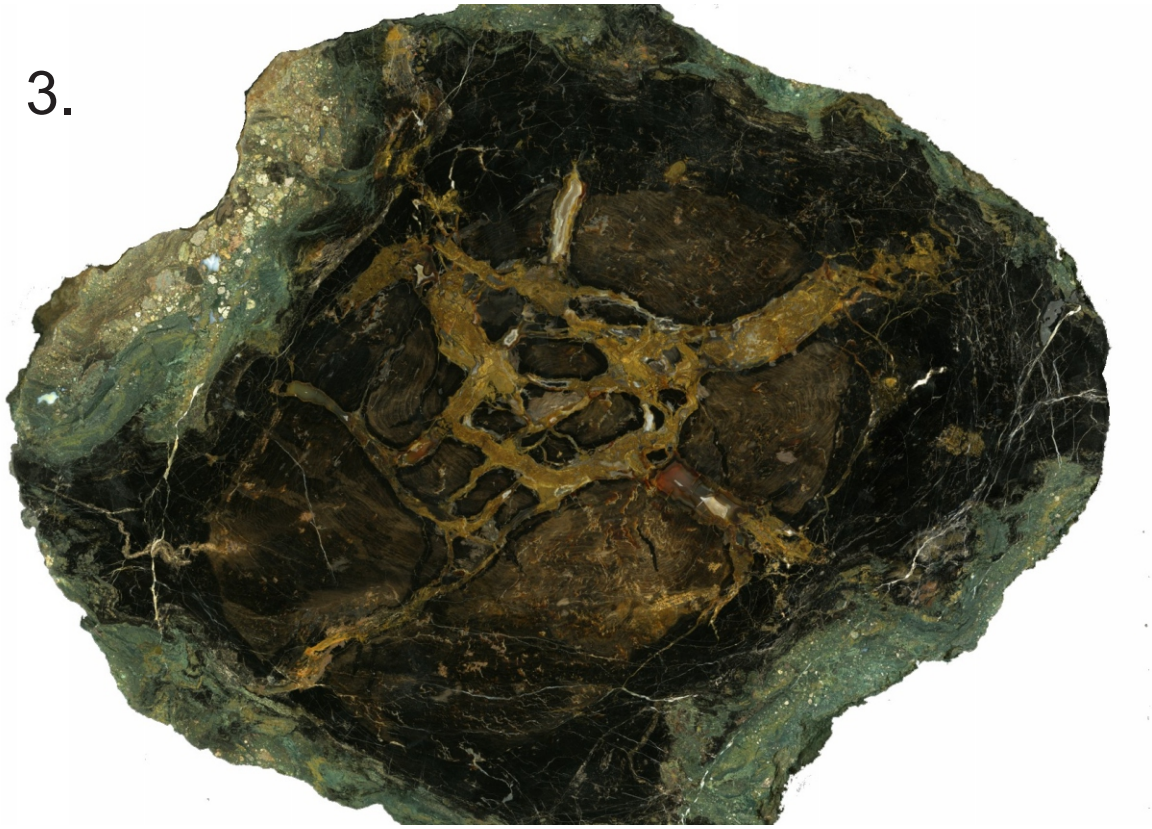


Fossil araucaria from Madagascar, Triassic period more than 200 million years ago.

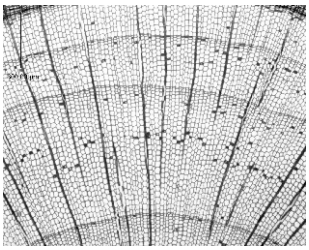
Araucaria log section from the lower Shishugou Group, late Jurassic period, about 160 million years ago. While the climate of the Jurassic period began moist and humid, by the time this tree grew the climate had become more seasonal, with a distinct dry period. The growth rings visible in the specimen were likely caused by an annual drought dormancy. This region of China has yielded many dinosaur fossils as well as petrified wood and plant fossils.

Norfolk Island pines (*Araucaria heterophylla*).

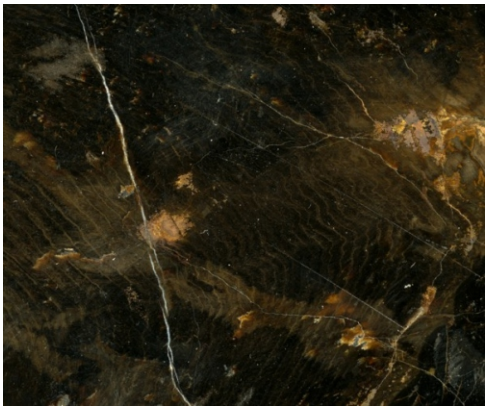
Chinese ‘tree jade’, a fossil conifer of unknown provenance collected in China.



While the source and age of this fossil log is unknown the cell structure and arrangement visible in the enlargement suggest a coniferous species, possibly a member of the Cupressaceae family that includes true cypress, junipers, sequoias, and alerce. We can tell that is lived in a habitat with distinct seasons and a climate that varied from year to year.



Bald cypress (***Taxodium distichum***)



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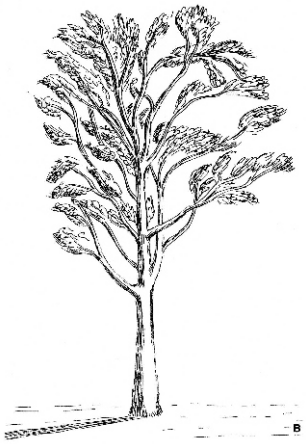
Woodworthia Arizonica fossil, late Triassic period, from the Chinle formation in northern Arizona.

The Chinle formation of northern Arizona is famous for the abundance of petrified wood found in these sedimentary rocks and mudstones. These sediments were deposited during the Triassic period more than 200 million years ago. The climate of Arizona at that time was tropical at that time so the forests were populated by tropical species of araucaria and its rarer relative Woodworthia arizonica.



Reconstruction of the form of this extinct tree based on evidence from fossil logs, branches, and leaves.

While not recognized as a distinct species at first, John Muir noted in 1905 that it differed from the larger fossil araucaria logs typical of the area.

The trunks of Woodworthia are covered with distinctive bud scars that suggest this species was capable of sprouting new branches and leaves should it be defoliated by browsing dinosaurs or volcanic ashfall. While the trees found in the Chinle formation do have growth bands they don't form clear rings because of the lack of seasonality in their tropical habitat.

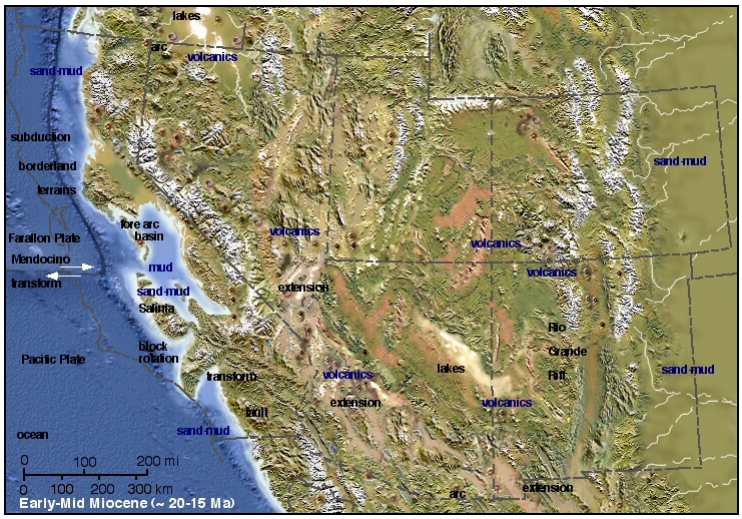
Bud scars (small bumps or warts) cover the trunk of this fossil Woodworthia log.

Trees from the Miocene period

'The Age of Mammals'

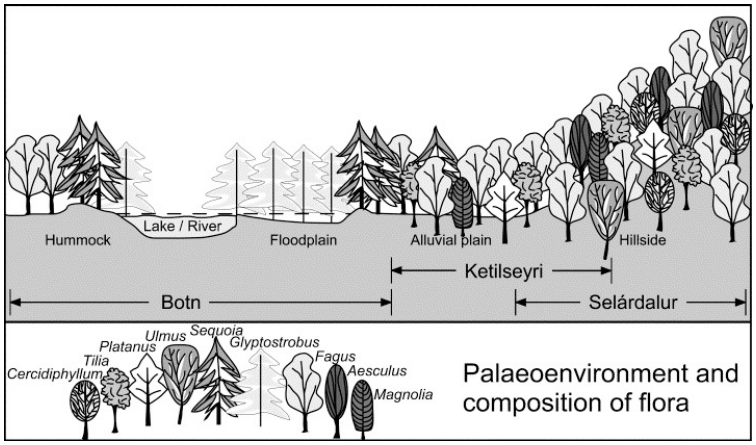
Miocene period fossil leaves.

The Miocene, commonly referred to as the age of mammals, was warmer than today although cooler than the Triassic and Jurassic periods. Plants and animals similar to those of the present evolved, although their diversity was much greater. The Sierra Nevada Mountains had not risen to block the flow of moisture from the Pacific so the Great Basin area was much wetter than we find it today. Abundant, well preserved fossils from this period provide a window into this ancient world, familiar in some respects, but foreign and exotic in others.



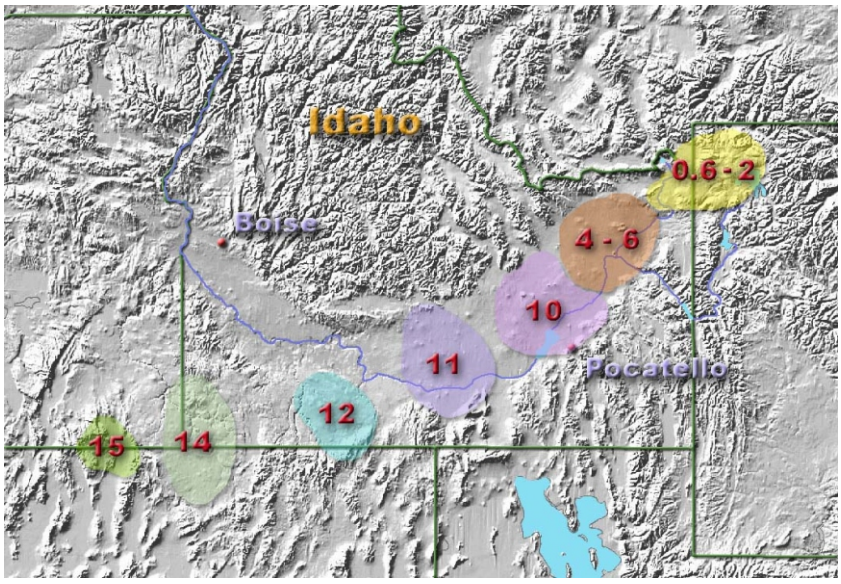
Map of western North America in the early Miocene.

The geography of this period, while recognizable to us, differed in many respects that affect climate and habitat.



Reconstructed Miocene forest from Iceland with elm, sycamore, oak, sequoia, magnolia, lime tree, glyptostrobus, and an ancient katsura tree.

Track of the Yellowstone hotspot from 15 million years ago to the present.
The McDermitt caldera is located at the lower left along the Nevada-Oregon border.



The Yellowstone hotspot responsible for the geothermal activity in Yellowstone National Park was located far to the west during the Miocene period 15 million years ago. At that time it caused the eruption and collapse of an ancient volcano near what is now the border of Oregon and Nevada. This collapsed volcano, or caldera, filled with water forming a lake. A mixed forest of hardwoods and conifers grew near the lake and trees that died and fell into the lake were first covered by a layer of tufa and then slowly buried in mud. Petrified wood found in these ancient lake sediments has a characteristic white rind and finely preserved wood structure.

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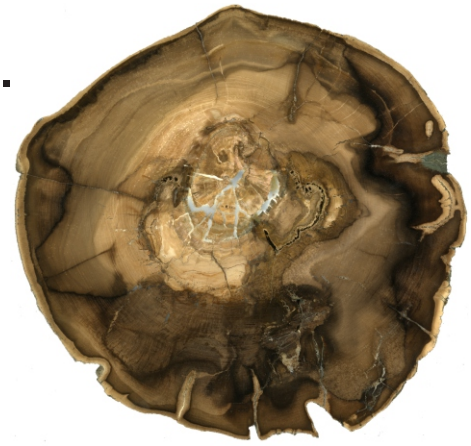

Fossil winged elm from the McDermitt caldera, Miocene period.

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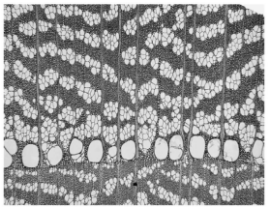
Fossil tanoak (***Notholithocarpus sp.***) from the McDermitt caldera

Many of the fossil species found in this area have closely related modern relatives, although not all remain in this region.



Modern elm (*Ulmus americana*)

Fossil elm

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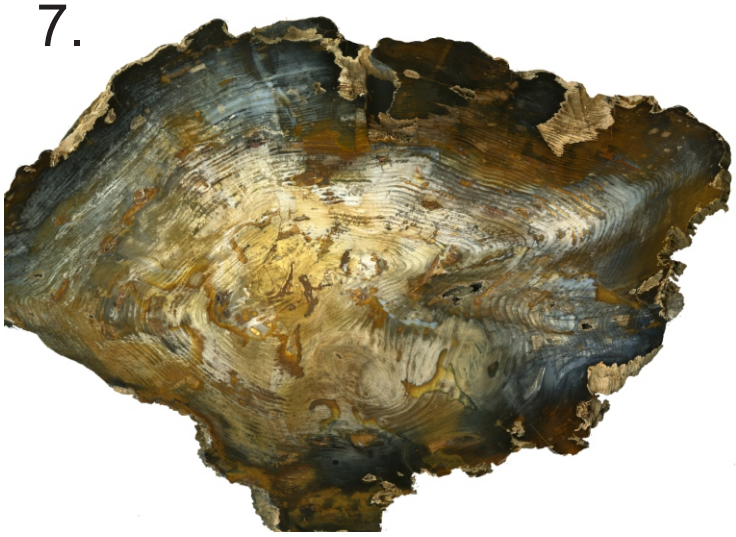

Fossil spruce from Hubbard Basin, Nevada

The Hubbard Basin site contains the remains of an ancient spruce-fir forest.

Branch knots and the annual rings are clearly visible in this fossil spruce log.

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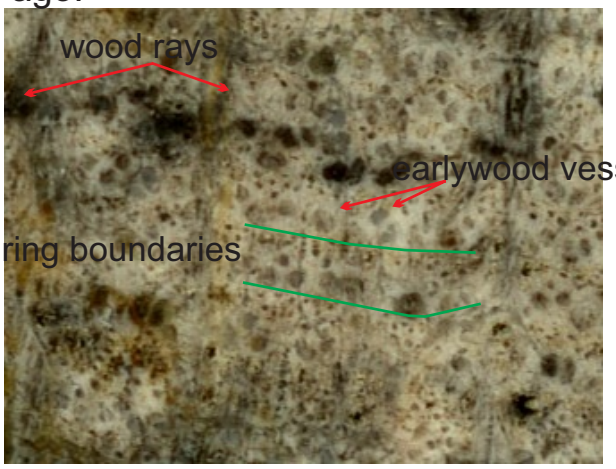
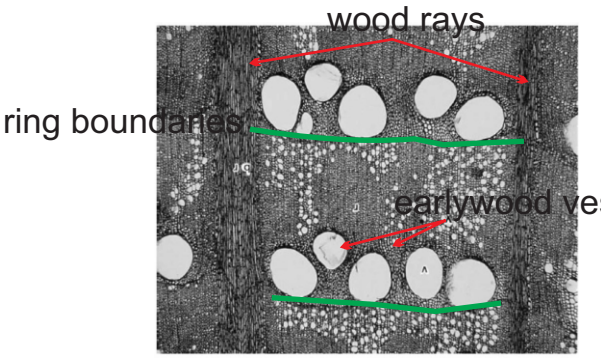
Miocene fossil oak from Swartz Canyon, Jefferson County, Oregon

Swartz Canyon contains a hardwood forest entombed by the Columbia Plateau basalts around 15 million years ago.



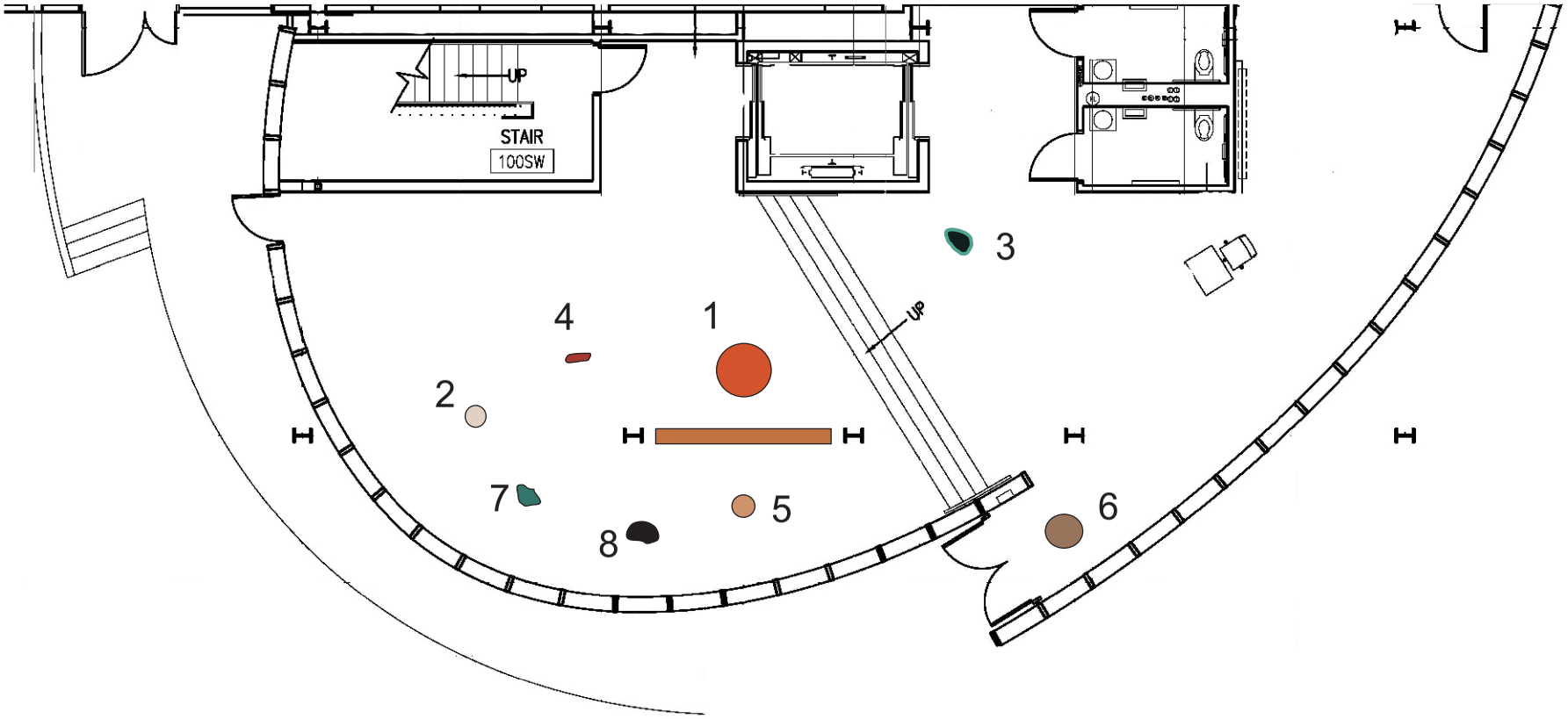
Fossil oak



Modern oak (Quercus alba)

The large earlywood vessels and rays that characterize modern oaks can also be seen in the Miocene oak fossil.

Key Map
for petrified wood specimens



Bryant Bannister Tree Ring Building