Plant Fossils Discovered in Badlands National Park

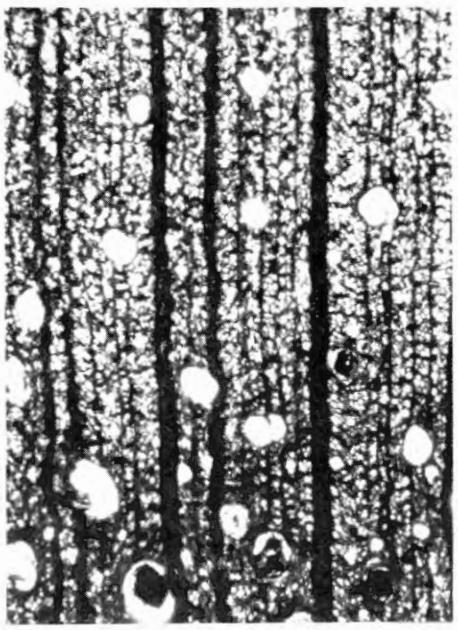
From near the contact *between the Scenic and Poleside members of the Brule Formation, an in situ fossil root with exceptionally well-preserved surface detail. This specimen has been left in place in the field.*

By Jay Shuler and Vincent Santucci

A uniquely rich Oligocene fauna was cited by Congress in the 1929 Act authorizing creation of a National Park unit in the White River Badlands of South Dakota. In taxonomy, the fossils range from snails to primates; in size, they vary from minute lizards to elephantine titanotheres; and in population and number of species, they may outrank the present day herds of the Serengeti.

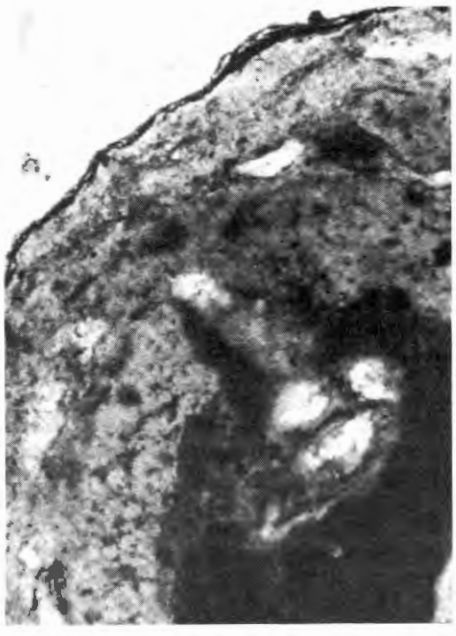
Paradoxically, except for widespread endocarps of hackberry, so few plant fossils have been reported from the White River formations that they have been little considered in constructing a view of the Oligocene environment here. Cleophas C. O'Harra in his classic *The White River Badlands* (1920) makes no mention of fossil plants, and John Clark, who to date has done field work in the Badlands for half a century, wrote in 1967 of "the absence of paleobotanical materials," and questioned the existence of fossil soils in these formations.

In a series of papers published between 1982 and 1985, Greg Retallack recognized root traces throughout these formations, and discerned 87 fossil soils. However, Retallack ventured no taxonomic conclusions about the traces, saying "vegetation has a very poor record in the Badlands."



Cross section of fossil wood *of a tropical tree resembling Diptocarpaceae. Members of this family are important timber trees in the Indo-Malayan region. This specimen came from the lowest level of the Chadron Formation.*

Closeup of the same specimen *showing tyloses (calluses or knobs). Roots and part of the stump were present when about 30 pieces were collected in the South Unit of Badlands NP in 1971 by Jim Legg of the Bureau of Indian Affairs and John Stockert of the park staff.*



At this point *in the study of these specimens, this appears to be a palm root. It is less well preserved than the wood of the tropical tree. Preservation varies by site and specimen.*

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The perception that the Badlands has a poor plant fossil record, compounded by the focus on vertebrate fossils, may have discouraged scientific search for plant fossils. Actually, it turns out that plant fossils are abundant in the Badlands Oligocene. In 1985 park personnel found fossil roots in situ (the first by seasonal interpreter Alan Scott), and petrified wood, at numerous sites in the field and also in the park museum collection. In thin section some specimens show cellular structure and original organic material.

Several of the thin sections look like fern, one like palm, and another like a tropical tree of the *Diptocarpaceae* (see photographs and captions for additional information). Collection continues. The study of these specimens by Dr. Wm. D. Tidwell of Brigham Young University will be published on its completion.

Discovery of these fossils suggests that additional research projects will be fruitful and that flora of the White River Formations will become better known.

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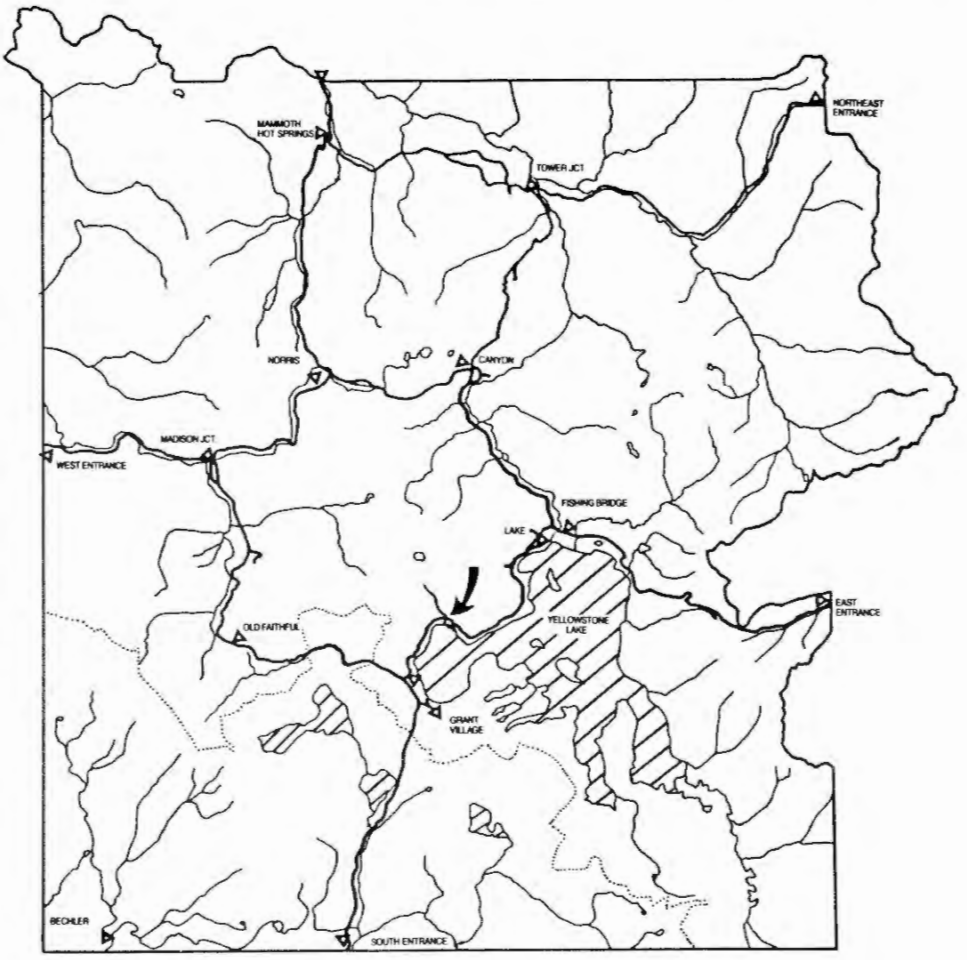
***These structures** appear to be the vascular bundles of a fern. Another thin section, not illustrated here, shows what seems to be a leaf trace arising from a fern rhizome. Both the "palm" and the "ferns" were collected from the middle of the Scenic Member of the Brule Formation.*

Yellowstone Takes Action To Avert Ecological Crisis

By Sue Consolo



Yellowstone NP added an exciting chapter to its long and varied history in fisheries management when non-native brook trout were discovered (in Spring 1985) to have been planted in a major tributary of Yellowstone Lake, a stronghold of the cutthroat trout. To save the native fishery – a major recreational resource for visitors and food resource for endangered species such as the grizzly bear and the bald eagle – the park took quick, drastic measures. An entire creek drainage was poisoned to prevent the non-native fish from taking hold, and an aggressive public information effort resulted in favorable press coverage and surprisingly little controversy. Preliminary results indicate the eradication effort was successful, and it is hoped that an ecological crisis in the ecosystem has been averted.

Poisoning park waters may seem overly severe for a park which has had exotic fish species for nearly a century. Surveys and stocking of park waters first occurred in 1889, when the U.S. Army (administering Yellowstone) and U.S. Fish Commission introduced brook, rainbow, brown, and lake trout to barren lakes and streams. For the next 70 years, fisheries management consisted mostly of stocking and hatchery operations. In 1936, an enlightened policy established that non-native fish introductions would not be expanded or allowed in waters containing native fish; but all stocking did not cease until 1959. By that time, Yellowstone had 18 fish species, 6 of which were non-native. The exotic brown, rainbow, and brook trout are well-established and popular sport fish, especially in the western half of the park, in the Gibbon, Firehold, and Madison rivers.

The native trout are several subspecies of the cutthroat *(Salmo clarki)*, which has received high levels of angling pressure and attention. Yellowstone Lake and River survived those decades of intensive management without establishment of other trout species. Today, these waters in the eastern half of the park contain the last major population of the Yellowstone cutthroat, which attracts thousands of anglers and obervers to the late spring spawning runs. The lake and its trout also are a focal point for fish predators – eagles, ospreys, white pelicans, and grizzly bears.

A 3-5 person staff of U.S. Fish & Wildlife Service biologists is stationed in Yellowstone – full-time professionals and a seasonal crew who report to the Superintendent and are responsible for fisheries monitoring and management in the park. F&WS and NPS jointly fund this activity. In May of 1985 the F&WS staff were shocked to discover eastern brook trout *(Salvelinus fontinalis)* of several age classes in

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