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ARTICLE

FOSSIL PLANTS FROM THE NATIONAL PARK SERVICE AREAS OF THE NATIONAL CAPITAL REGION

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ABSTRACT—Paleontological resource inventories conducted within the parks of the National Park Service's National Capital Region yielded information about fossil plants from 10 parks. This regional paleobotanical inventory is part of a service-wide assessment being conducted throughout the National Park System to determine the scope, significance and distribution of fossil plants in parks. Fossil plants from the Paleozoic, Mesozoic, and Cenozoic are documented from numerous localities within parks of the National Capital Region. A Devonian flora is preserved at Chesapeake and Ohio Canal National Historic Park. Fossil plants from the Cretaceous Potomac Group are identified in several parks in the region including two holotype specimens of fossil plants described by Smithsonian paleobotanist Lester Ward from Fort Foote Park. Cretaceous petrified wood and logs are preserved at Prince William Forest Park. Pleistocene plant fossils and petrified wood were found at President's Park near the White House. A comprehensive inventory of the plant fossil resources found on National Park Service administered lands in the National Capitol Region will aid in our understanding of past climates and ecosystems that have existed in this region through time.

INTRODUCTION

Fossils are an important resource because they allow us to study past organisms, ecosystems, and climates. Fossils are preserved in 245 of the 401 National Park Service (NPS) park units. Of the parks that preserve fossils, 128 have documented plant fossils. Collectively, these paleobotanical resources reflect a taxonomically diverse representation of fossil plants which span from the Precambrian to the Recent. Leaves, flowers, seeds, cones, nuts, fruits, pollen, petrified wood, amber and other types of fossil plant remains preserved in park strata all contribute to scientific understanding of paleoecology, paleoclimatology, and the evolutionary history of plants.

Recent inventories of paleontological resources from National Park Service's National Capital Region yielded information about fossil plants from 10 parks in the region (Fig. 1) (Kenworthy et al., 2005; Clites and Santucci, 2011; Santucci and Knight, 2013). This regional paleobotanical inventory is part of a servicewide assessment being conducted throughout the National Park System. Fossil plants from the Paleozoic, Mesozoic, and Cenozoic are documented from numerous localities within parks of the National Capital Region. A Devonian flora is preserved at Chesapeake and Ohio Canal National Historic Park including specimens of *Archaeopteris*, which is considered to be the first modern tree. Many of the plant fossil occurrences in the National Capitol Region are reported from the Cretaceous Potomac Group. Two holotype specimens of Cretaceous-aged fossil plants were described by Smithsonian paleobotanist Lester Ward from Fort Foote Park. Cretaceous petrified wood and logs are preserved at Prince William Forest Park. Pleistocene plant fossils and petrified wood were found at President's Park near the White House. A comprehensive inventory of the plant fossil resources found on National Park Service administered lands in the National Capitol Region will aid in our understanding of past climates and ecosystems that have existed in this region through time.

BALTIMORE WASHINGTON PARKWAY (BAWA)

Virtually the entire length of the parkway was constructed within areas mapped as the Potomac Group of Early Cretaceous age (Glaser, 1976; Crowley et al., 1976; Glaser, 2003; Kranz and Santucci, 2004). The Potomac Group (or Potomac Formation of some early authors) is a unit well-known for its fossils, and has been the subject of study since the late 1880s. In 1886, W. J. McGee first applied the name "Potomac Formation" to Cretaceous-aged sediments in and around Washington, D.C. Marsh (1888), Ward (1888, 1895, 1897), Fontaine (1889), Bibbins (1895), Clark and Bibbins (1897), Ward (1905), and Clark et al. (1911) subsequently published a number of early paleontological studies of the Potomac Group. BAWA passes near many of the historic fossil collecting localities mapped by Ward (1905).

The Potomac Group includes (from oldest to youngest) the Patuxent Formation, the Arundel Clay, and the Patapsco Formation. All three formations include sands and silt-clays that are interbedded to varying degrees in different locations. The Potomac Group is considered to be the result of deposition in a variety of fluvial environments including braided streams, river channels, floodplains, marshes, swamps, and abandoned channels (Glaser, 1969, 1976, 2003).

The Patuxent Formation contains fossils of ferns, horsetails, cycads, and conifers (Clark et al., 1911; Cooke, 1952; Johnston, 1962). The ferns commonly include species of *Cladophlebis* and *Onyhiopsis*, with a number of other genera also represented (Clark et al. 1911). Two species of the horsetail *Equisetum* were reported by Clark et al. (1911). Cycad fronds are more commonly found in the Virginia exposures of the Patuxent, but are also found in

Maryland and include species from many different genera such as *Dioonites*, *Ctenopteris*, *Ctenopsis*, *Zamiopsis*, *Nilsonia*, *Zamites*, *Cycadeospermum*, and *Podozamites* (Clark et al., 1911). The conifers are represented by species of *Sphenolepsis*, *Baiera*, *Brachyphyllum*, *Frenelopsis*, *Nageiopsis*, *Arthrotaxopsis*, *Sequoia*, and *Cephalotaxopsis* (Clark et al., 1911). Fossil pollen is also known from the Patuxent Formation (Brenner, 1963).

The most significant fossils of the Potomac Group, however, are some of the first 'advanced' angiosperms found in the North American fossil record. Approximately 25 different angiosperm species are known from the Patapsco Formation. These represent a number of genera, including *Cyperacites*, *Plantaginopsis*, *Alismaphyllum*, *Populus*, *Populophyllum*, *Nelumbites*, *Menispermites*, *Sapindopsis*, *Celastrophyllum*, *Cissites*, *Sassafras*, and *Araliaephyllum* (Clark et al., 1911). As stated by Hickey (1984), the Potomac Group flora provides the "longest and most complete sample of data on early angiosperm evolution where both pollen and megafloral [leaves, flowers, etc.] records can be examined together with the sedimentology." Doyle (1969, 1973), Doyle and Hickey (1976), Hickey and Doyle (1977), Hickey (1984), and Friis et al. (1987) described this early evolution and radiation of the angiosperms. Other plant fossils from the Patapsco Formation include lignitized stems and twigs, leaf and frond impressions, and pollen of ferns, horsetails, cycads, and conifers, including many of the same genera found in the Patuxent Formation (Clark et al., 1911; Carr, 1950; Cooke, 1952; Johnston, 1962; Glaser, 1969).

The Potomac Group sediments have also produced over 100 fragments of fossil cycadeoid assigned to the genus *Cycadeoidea* (described in greater detail by Ward, 1905). The majority were discovered at dozens of localities between Baltimore and Washington, D.C., generally within a radius of a few km/miles of what is now BAWA. For example, a number of partial cycadeoid tree trunks were collected from the J. A. Disney farm property near what is now BAWA at Hanover, Maryland. These tree trunks, originally collected between 1898 and 1899 and described by Ward (1905), are now on display in the library of the Maryland Geological Survey in Baltimore (D. Brezinski, pers. comm., 2004). Another cycadeoid fragment was discovered in Greenbelt Park (GREE) and is further described in the GREE section of this report.

Overall, the Potomac Group includes somewhere between 135 and 175 different species of plants. However there has been no attempt to update the taxonomy since the work of the late 1800s and early 1900s. The fossil pollen and spores of the Potomac Group were described by Brenner (1963) and used by Doyle and Robbins (1977) to divide the Potomac Group into palynological zones. Fossils from the Patapsco Formation are known from Fort Foote Park and indicate the potential for similar fossils in other National Capital Region Network parks.

CHESAPEAKE AND OHIO CANAL NATIONAL HISTORIC PARK (CHOH)

The Elbrook Formation consists of a sequence of gray shaly limestone and calcareous shale that occurs stratigraphically between the Waynesboro and Conococheague formations (Brezinski, 1992). Outcrops of this formation in Maryland are considered "poor" (Brezinski, 1992) but stromatolites are abundant and can be found along the

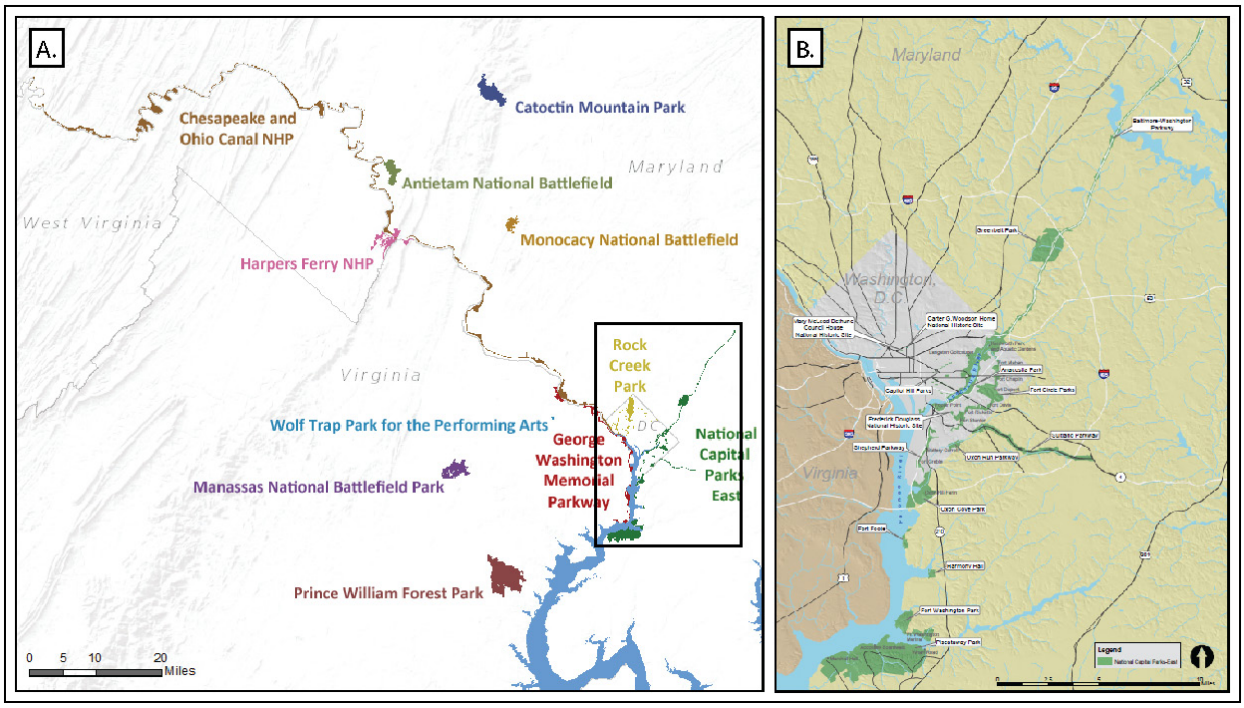


FIGURE 1. **A**, Map showing the National Park Service areas within the National Capital Region. **B**, Detail area delineated by black box in A.

FIGURE 2. Specimen of the oldest modern tree, *Archaeopteris*, collected in the Devonian Foreknobs Formation near Indigo Tunnel. Specimen number is CHOH 53648. Photograph by Tom Paradis, NPS.

Chesapeake and Ohio Canal (Southworth et al., 2001). Southworth et al. (2001, figure 114) illustrate one such stromatolite near canal mile marker MM109.5, east of McCoys Ferry.

Several outcrops of the Late Devonian age Foreknobs, Brallier, and Scherr formations are known to preserve impressions, compressions, and coalified fragments of *Archaeopteris* (Fig. 2) (Clites and Santucci, 2010; Loughney and Santucci, in prep). The Foreknobs, Brallier, and Scherr formations represent swamp and fluvial environments. Fragments of *Archaeopteris* and other plants have been found in situ at eight localities in CHOH (Loughney and Santucci, in prep., appendix C). Samples of *Archaeopteris* (CHOH 53648 and 53649) from the Foreknobs Formation were collected and placed in the Museum Resource Center in Landover, Maryland (Clites and Santucci, 2010). The genus *Archaeopteris* is considered to be the first modern tree and shows several adaptations to support large growth (achieving several meters in height), including modern wood anatomy (Meyer-Berthaud et al., 1999; Donaghue, 2005). *Archaeopteris* thrived early in the radiation of plants onto land. It is interpreted to be the dominant component of the earliest flood-plain forests during the Late Devonian (Meyer-Berthaud et al., 1999).

FORT CIRCLE PARKS (FOCE)

The Miocene Calvert Formation is mapped within forts Dupont, Davis, and Stanton. Excellent exposures of the Calvert Formation were found in the now-filled quarry west of Fort Stanton as well as on Good Hope Hill. The Good Hope Hill exposure was mapped by Darton and Keith (1950, site Number 19) and described by Carr (1950). The Good Hope Hill exposure is located just east of the Fort Davis Park boundary on the east side of Naylor Road. Marine invertebrate fossils, shark teeth (*Carcharocles*) (Carr, 1950), and plant fossils found at the Good Hope Hill exposures (Berry, 1916) indicate the potential for similar fossils to be found within Calvert Formation exposures in the Fort Circle Parks.

Fossil plants discovered within the Good Hope Hill exposures occur within a shallow marine unit, and likely indicate that the deposits near Good Hope Hill, and within the Fort Circle Parks of NACE, were closer to the Miocene shoreline than the deposits at Calvert Cliffs State Park, Maryland (D. Bohaska, pers. comm., 2004). Some of these plants include *Quercus chapmanfolia* and *Quercus lehmanni* (oak), *Ulmus basicordata* (elm), *Phyllites cercocarpifolia*, *Ilex calvertensis* (holly), *Caesalpina ovalifolia* and *Cassia toraformis* (bean), *Rhus milleri* (sumac), *Berchemia priscaformis* (supplejack), *Vaccinium* (blueberry) and *Pieres scrobiculata* (fetterbrush) (Carr, 1950).

FORT FOOTE PARK (FOFO)

Fontaine (in Ward, 1905) described the plant fossil assemblage collected within Fort Foote along Rosiers Bluff below the Notley Hall wharf. These plants are likely from the Patapsco Formation (silt-clay facies as mapped by Glaser [2003]) of the Potomac Group. USGS paleobotanist Lester Frank Ward collected 279 fossil specimens from 35 different plant species during two collecting trips to the Rosiers Bluff site in 1891. The most common specimens collected were from three species of the soapberry *Sapindopsis* (now *Lepisanthes*) which account for 146 specimens. Other genera collected include *Cycadeospermum* (cycadophyte), *Zamites* (cycadeoid), *Leptostrobus* (seed plant), *Thinnfeldia* (seed fern); the ferns *Baieropsis*, *Cladophlebis*, *Onychiopsis*, and *Thyrsopteris*; the conifers *Abietites*, *Araucarites*, *Brachyphyllum*, *Nageiopsis*, *Pinus* (including the holotype of *P. schista*; Fig. 3a), *Podozamites*, *Sequoia*, and *Sphenolepidium*; the angiosperms *Aristolochiaephyllum*, *Celastrophyllum*, *Eucalyptus* (including the holotype of *E. rosieriana*; Fig. 3b), *Ficus*, *Menispermites*, *Populophyllum*, and *Sapindopsis* (Fontaine, 1905).

Paleontologist Edward Wilber Berry also made a collection of plant fossils in 1909 from Fort Foote as recorded in the USGS Paleobotany Locality Register. These fossils came from the Potomac Group-Patapsco Formation, according to their associated specimen notes. One specimen was identified by Berry as *Brachyphyllum crassicaule* (Fig. 4). Part of this collection is located in the Cretaceous General Collection of the Paleobiology Department at the Smithsonian Institution's National Museum of Natural History (NMNH). Clark et al. (1911) also listed the fossils found at Fort Foote and include a stratigraphic section of the locality. Leo Hickey of Yale University (formerly of the Smithsonian) visited Fort Foote in the 1970s, although he did not collect or discover any plant fossils from the Patapsco Formation at this locality (L. Hickey, pers. comm., 2004).

GREENBELT PARK (GREE)

The silt-clay facies of the Potomac Group was mapped in the northeastern section of GREE (Glaser, 2003). The silt-clay facies includes the Arundel Clay and much of

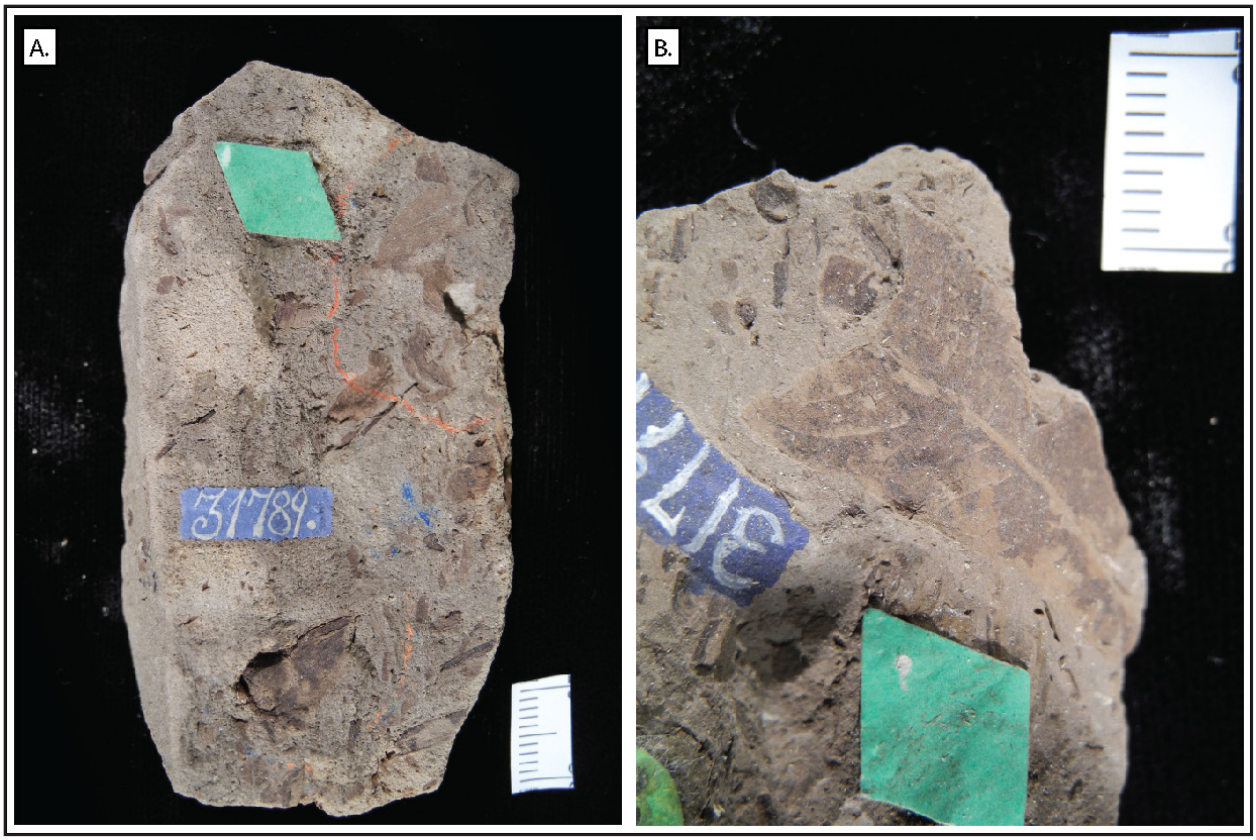


FIGURE 3. Type specimens from Fort Foote Park. *Pinus schista* (USNM 31789) (A), and *Eucalyptus rosieriana* (USNM 31799) (B). Scale bars are 1 cm (0.4 in). NPS photograph.

the lower Patapsco Formation. Fossils from this unit are well known and include significant plant and dinosaurian remains. Many of these fossils came from the Beltsville/Muirkik area a few km/miles north of Greenbelt Park, Maryland.

A partial cycadeoid tree trunk fossil was discovered within GREE on September 15, 1970 by Leo Hickey of Yale University (formerly of the Smithsonian) and NPS research biologist Dr. L. K. Thomas, Jr. (now retired) during an informal site visit to Greenbelt Park (Fig. 5) (Thomas, 1970). The hand-sized cycadeoid fossil was discovered within an area mapped by Glaser (2003) as the sand-gravel facies of the Potomac Group, likely from the Patapsco Formation (Thomas, 1970). Hickey (pers. comm., 2004) tentatively identified the specimen as *Cycadeoidea marylandica* and was accessioned into the National Park Service collections. According to Thomas (1970; pers. comm., 2004), the cycadeoid fossil was discovered near the edge of the known distribution of *Cycadeoidea marylandica* at the time of discovery. The reported range for this species extends between College Park, Maryland and Baltimore, Maryland, a distance of 56.7 km (35.5 miles), and is never more than 13.3 km (8.5 miles) in width (Thomas, 1970). The vertical distribution is no more than 91.4 m (300 feet) (Bibbins in Ward, 1905). Thomas (1970) also reported that, at the time, only about 200 pieces of *Cycadeoidea marylandica* were known. Therefore, the cycadeoid discovery was considered to be quite rare and significant. The fossil discovery was additionally the subject of a newspaper article (Fig. 6) (Lague, 1970). After its discovery, this fossil specimen remained in National Park Service possession, although it was not formally accessioned. The specimen was later found in Dr. Thomas's office in Prince William Forest Park by Museum Tech Judy Volinoski. It was obtained by National Capital Parks-East Curator Mike Antonioni in September of 2005. The specimen was accessioned and cataloged in the park's collection under catalog number GREE-12, and is currently in storage at the NPS Museum Resource Center in Landover, Maryland. Ward (1905) had previously collected cycadeoid material in the same area within what is now GREE.

Cycadeoids, the order Bennettitales that includes the genus *Cycadeoidea*, are extinct. However, a few genera of cycad trees, which are morphologically similar to cycadeoids, but not directly related to them, are still extant in some subtropical and tropical regions of the world. This discovery illustrates the excellent potential for fossils to be discovered within the Potomac Group sediments of GREE, and possibly other NACE parks.

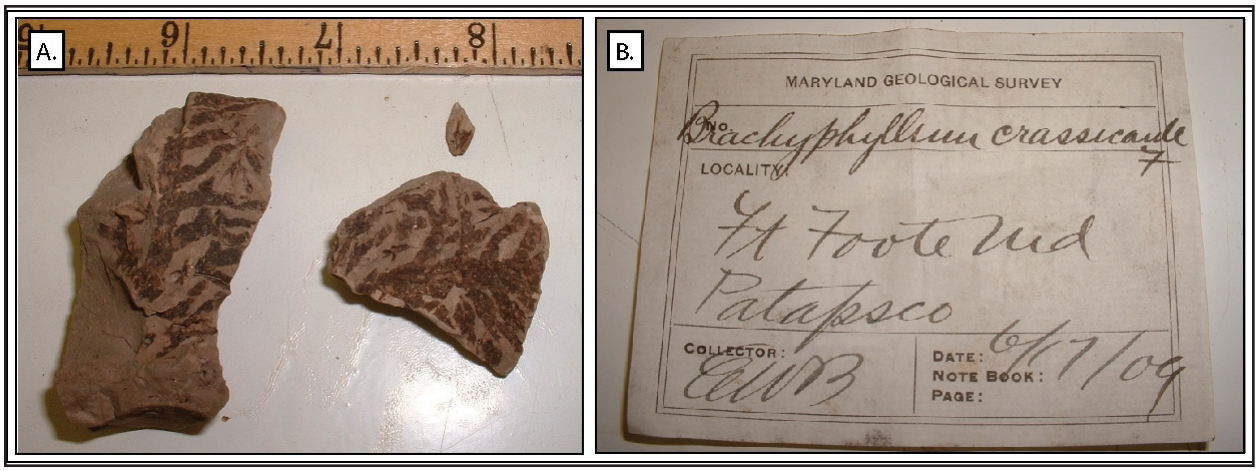


FIGURE 4. **A**. Fossil specimen of *Brachyphyllum crassicaule* from Fort Foote (USNM uncataloged). **B**, This specimen was identified by Edward Wilbur Berry (EWB), as noted on the specimen tag. NPS photograph.

MONOCACY NATIONAL BATTLEFIELD PARK (MONO)

A single ex situ plant fossil specimen is reported from MONO, and is most likely a cone impression (Fig. 7). The specimen was discovered at the L'Hermitage (Best Farm) Slave Village site during archeological excavations in 2010–2011. The specimen has been accessioned and cataloged (MONO-33815) into the Monocacy Battlefield museum collection. The slaves at the village were collecting objects that they found of interest. The fossil specimen was found amongst prehistoric artifacts, several different minerals, glass beads, silver coins, and buttons (K. Birmingham, pers. comm., 2013). Because this fossil was a found and collected object, it is possible that it was transported a great distance. The lithology of this specimen does not match any rock units that occur within MONO boundaries. Further study to identify the provenance of this specimen and better taxonomic identification of the cone impression is needed. This will offer insight into both the plant fossil record for the region the cone was found in, and the history of the family who collected it.

PRESIDENT'S PARK (WHITE HOUSE, WHHO)

Fleming et al. (1994) mapped areas of middle and late Pleistocene-aged gravel, sand, silt, and clay deposits in a narrow band immediately south of the White House and north and east of Lafayette Park. These sediments likely represent fluvial and estuarine swamp deposits. Carr (1950) describes fossils from within the swamp deposits of these gravels in Washington, D.C. Two discoveries were located just north of Lafayette Park, and indicate the potential for finds in other late Pleistocene gravels in and around Washington, D.C.

Petrified bald cypress tree trunks were discovered during hotel excavations at Connecticut Avenue and DeSales Street and at 16th and K streets (Carr, 1950) (Fig. 8). The DeSales Street excavation for the Walker Hotel (now the Marriot Renaissance Mayflower Hotel) was a significant Pleistocene paleontological locality in 1922 and 1923 (Wentworth, 1924). Many specimens from over 19 families of plants were discovered during the excavations, although the large (up to 2.4 m [8 ft] in diameter) bald cypress trunks and associated material dominated the assemblage (Wentworth, 1924; Berry, 1924). There are 28 plant species represented in this assemblage, mostly represented by fruits or seeds. These belong to the genera *Taxodium*, *Vitis*, *Sambucus*, *Rhus*, *Sparganium*, *Naias*, *Polygonum*, *Chenopodium*, *Phytolacca*, *Castalia*, *Ceratophyllum*, *Ranunculus*, *Rubus*, *Prunus*, *Acalypha*, *Ilex*, *Ampelopsis*, *Cornus*, *Leucothoë*, *Galium*, *Viburnum*, *Carex*, *Scirpus*, *Cladium*, *Dulichium*, and *Cyperus*. Seventy-eight species of diatoms were also reported from the deposit (Mann, 1924). The age of the deposit has been a source of debate (Hay, 1924), although is it generally considered middle to late Pleistocene. Similar deposits have also been found near Union Station at the excavation for the Government Printing Office and the Bellevue Hotel (now Hotel George) and are described by Berry (1933).

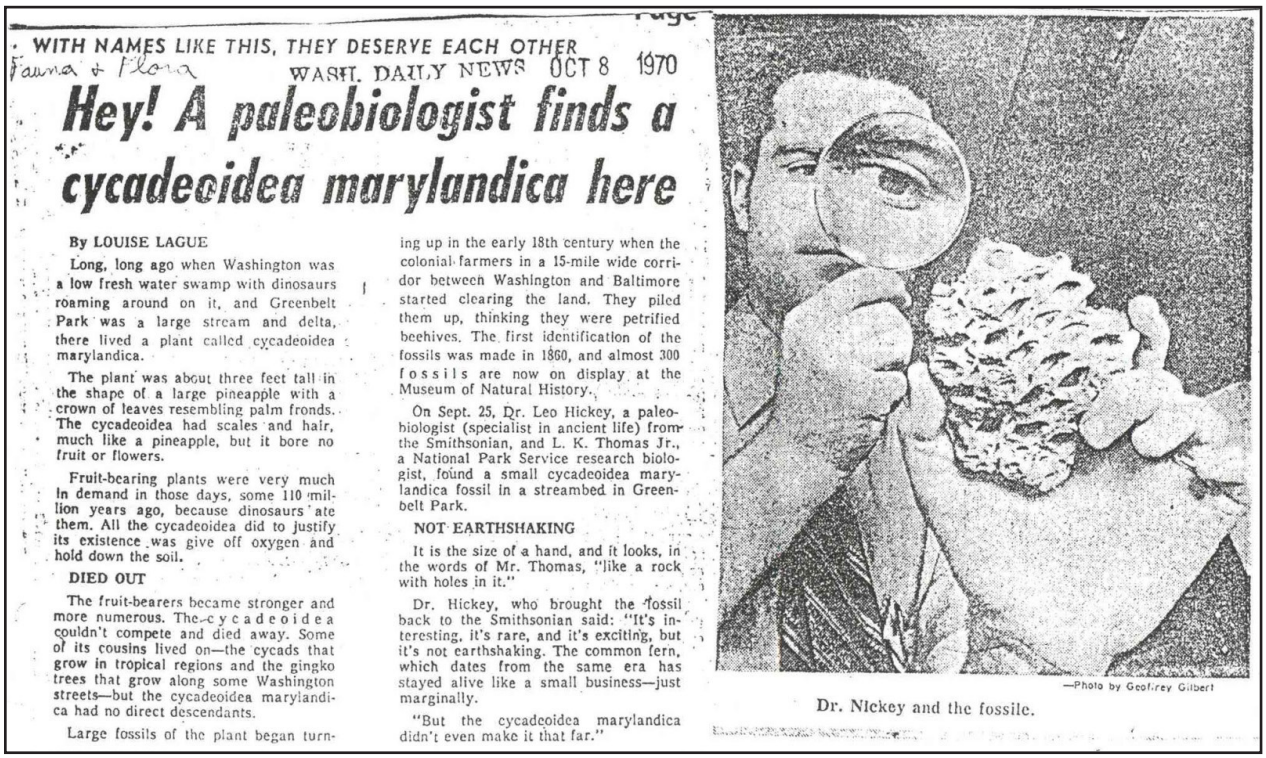
PRINCE WILLIAM FOREST PARK (PRWI)

The Potomac Group of Early Cretaceous age is a well-known sequence of fossiliferous formations found throughout Maryland, Virginia, and Washington, D.C. The geology and paleontology of the Potomac Group at PRWI and other parks of the National Capital Region are described in Kenworthy and Santucci (2004). As mapped by Mixon et al. (1972), Anonymous (1985), Mixon (1990), National Park Service (n.d.) and Jett (n.d.) in and around PRWI, the Potomac Group has variable lithologies including light-gray to pink-gray medium to very coarse grained quartz sand, a green clay-sand, and a dark yellow-brown sandy soft clay. Found within these sands and clays are abundant, but generally poorly preserved, leaf and stem impressions of ferns, cycads, and gymnosperms along with rare silicified (or petrified) tree trunks (Mixon et al., 1972).

FIGURE 5. Greenbelt Park fossil cycadeoid specimen (GREE-12), collected by Dr. L.K. Thomas in 1970. NPS photograph.

Upchurch et al. (1994) report on a fossil floral assemblage from Potomac Group sediments found in a gravel pit along Engineers Road, parallel to Chopawamsic Creek south of the U.S. Marine Corps Air Station. This assemblage contains 22 different plant species, including one species each of horsetail (*Equisetum lyellii*) and cycadophyte (*Dichotozamites cycadopsis*), eight species of conifers and 12 species of angiosperms (Upchurch et al., 1994). The conifer species include *Pseudofrenelopsis parceramosa*, *Araucarites aquiensis*, *Athrotaxopsis* sp. and *Sphenolepis sternbergiana*, indeterminate leaves (*cf. Abietites longifolius*) and *Brachyphyllum crassicaule*. The species of angiosperms present are aff. *Pabiania* sp., *Landonia cf. L. calophylla*, *Dicotylophyllum ovatodecurrens*, *Nelumbites extenuinervis, Nelumbites cf. N. minimus*, *Sapindopsis magnifolia/variabilis*, *Sapindopsis minutifolia*, and four species of *Dicotylophyllum* sp.

The only paleontological specimens cataloged within PRWI collections are various pieces and chips of petrified wood collected from Potomac Group sediments (PRWI-488-502, 2431, 7560, 7561, and 15796). Two large petrified logs are on display at the park, one outside the visitor center that is nearly 2 m (6 ft) long (Fig. 9), and one outside the Turkey Run Education Center (TREC) (C. Carmouche, pers. comm., 2013). Two smaller (<0.61 m [2 ft]) specimens of petrified wood are currently on display within the visitor center. Approximately seven of the smaller petrified wood pieces were discovered by a visitor during construction of the park's central drive. These specimens were turned over to a curator at another park, who, in turn, transferred the specimens over to PRWI (J. Lavelle, pers. comm., 1999). The largest specimens were unearthed by bulldozers in 1992 and 1993. The largest piece was discovered during construction of the Brittany Subdivision to the northeast of the park on land originally authorized for PRWI, but not included before development (J. Volonoski, pers. comm., 2004). The other piece was found west of PRWI during bridge construction over Quantico Creek. Both of these large pieces of wood were acquired by the park maintenance staff after corresponding



WITH NAMES LIKE THIS, THEY DESERVE EACH OTHER

Fauna & Flora WASH. DAILY NEWS OCT 8 1970

Hey! A paleobiologist finds a cycadeoidea marylandica here

By LOUISE LAGUE

Long, long ago when Washington was a low fresh water swamp with dinosaurs roaming around on it, and Greenbelt Park was a large stream and delta, there lived a plant called cycadeoidea marylandica.

The plant was about three feet tall in the shape of a large pineapple with a crown of leaves resembling palm fronds. The cycadeoidea had scales and hair, much like a pineapple, but it bore no fruit or flowers.

Fruit-bearing plants were very much in demand in those days, some 110 million years ago, because dinosaurs ate them. All the cycadeoidea did to justify its existence was give off oxygen and hold down the soil.

DIED OUT

The fruit-bearers became stronger and more numerous. The cycadeoidea couldn't compete and died away. Some of its cousins lived on—the cycads that grow in tropical regions and the gingko trees that grow along some Washington streets—but the cycadeoidea marylandica had no direct descendants.

Large fossils of the plant began turning up in the early 18th century when the colonial farmers in a 15-mile wide corridor between Washington and Baltimore started clearing the land. They piled them up, thinking they were petrified beehives. The first identification of the fossils was made in 1860, and almost 300 fossils are now on display at the Museum of Natural History.

On Sept. 25, Dr. Leo Hickey, a paleobiologist (specialist in ancient life) from the Smithsonian, and L. K. Thomas Jr., a National Park Service research biologist, found a small cycadeoidea marylandica fossil in a streambed in Greenbelt Park.

NOT EARTHSHAKING

It is the size of a hand, and it looks, in the words of Mr. Thomas, "like a rock with holes in it."

Dr. Hickey, who brought the fossil back to the Smithsonian said: "It's interesting, it's rare, and it's exciting, but it's not earthshaking. The common fern, which dates from the same era has stayed alive like a small business—just marginally.

"But the cycadeoidea marylandica didn't even make it that far."

—Photo by Geofirey Gilbert

Dr. Nickey and the fossile.

FIGURE 6. The article that was published in the Washington Daily News on the Greenbelt Park cycadeiod fossil discovered by Hickey and Thomas in 1970.

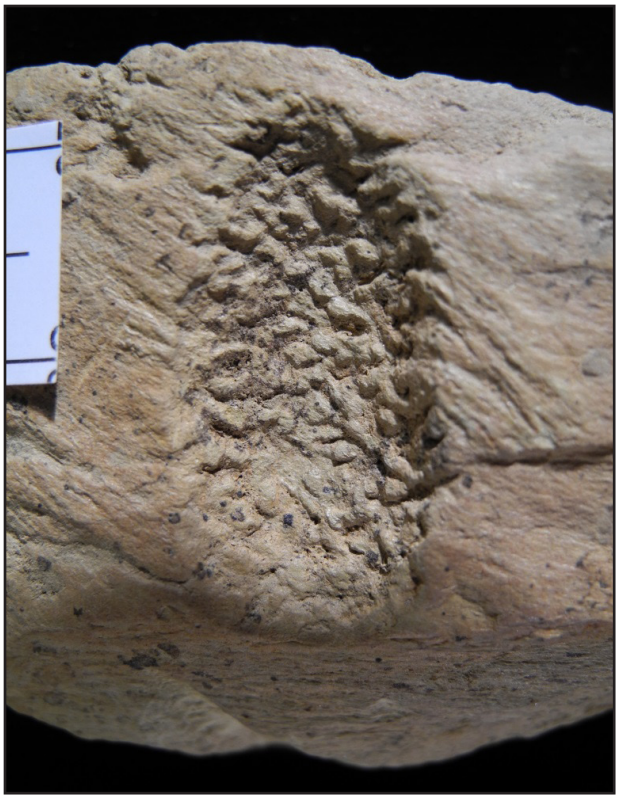


FIGURE 7. The Monocacy National Battlefield Park specimen (MONO-33815), which is likely a fossil cone impression. This specimen was collected during an archeological survey at the park in 2012 (Katherine Birmingham). Scale bar is 1 cm (0.4 in). NPS photograph.

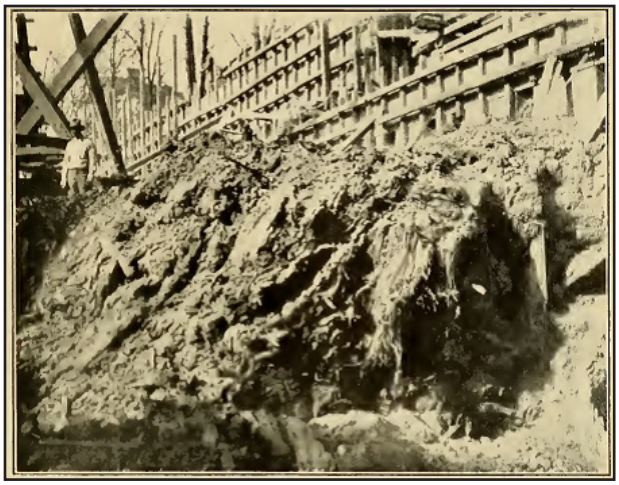


FIGURE 8. Wentworth (1924)'s figure 5, showing a petrified stump partially exposed during Walker Hotel excavations (center right of the photograph). NPS photograph.

with the respective developers (J. Volonoski, pers. comm., 2004). All of the petrified wood samples have been classified as *Taxodium distichum* (PRWI collections records). These specimens are most likely from the Cupressaceae family, in the fossil wood genus *Cupressoxylon*, closely related to modern sequoia and bald cypress (P. Kranz, pers. comm., 2004). *Cupressoxylon* is the most common Early Cretaceous-aged fossil wood in the National Capital region.

ROCK CREEK PARK (ROCR)

One large fossil, discovered outside of the park, is on display at the ROCR Nature Center and Planetarium (S. Berger, pers. comm., 2004). The three-foot (1 m) tall specimen of petrified wood was discovered during excavation for the Ronald Reagan Building and International Trade Center, located in the Federal Triangle just north of the National Mall. According to its label, the specimen has been identified as a 100-million year old cypress tree. Cypress tree fossils are common in Early Cretaceous Potomac Group sediments (approximately 100 million years old) throughout Washington D.C. and the surrounding area. Petrified logs, specifically cypress, have also been found in younger Pleistocene swamp deposits in Washington, D.C. as described in the Presidents Park section of this report.

Additionally, ROCR has a fossil fern, *Pecopteris* sp. in their collections (catalogued as ROCR-464). This specimen comes from the lower Pennsylvanian Kerbs Group in Wagoner Co., Oklahoma. The catalog records for this specimen does not provide any information regarding how or why this fossil plant was added to the park collection. The assumption is that the fossil plant was part of a teaching collection available for education at the Nature Center

WASHINGTON MONUMENT (WAMO)

The 193 commemorative stones within WAMO serve as a virtual geologic tour of the United States, as each state, and many organizations, contributed unique stones from their respective states. A number of these stones are fossiliferous. Sonya Berger (National Mall Ranger), Vincent Santucci, and Jason Kenworthy performed an initial inventory of fossils within the commemorative stones in July of 2004. The Arizona Memorial Stone was identified by Berger, Santucci, and Kenworthy as the single memorial stone to contain plant fossils. Future observations may identify additional memorial stones that contain paleobotanical material. The WAMO website (National Park Service, 2003) contains basic information about all 193 stones.

Arizona's state stone is located on the 98-m (320-ft) level and is the most dramatic of the fossil-bearing commemorative stones. The stone consists of three large sections of one petrified log with the state's name engraved across them (Fig. 10). The log, weighing approximately 2,722 kg (6,000 pounds) when installed in the monument, was originally collected near Chalcedony Forest around Holbrook, Arizona (National Park Service, 2003). Numerous outstanding examples of the same type of Triassic-aged petrified wood (*Araucarioxylon arizonicum*) in the Holbrook area led to the creation of Petrified For-

FIGURE 9. **A**, Petrified bald cypress log found in Prince William Forest Park (PRWI) outside the Visitor Center, with a modern bald cypress tree planted next to it (at left). **B**, Close up view of the petrified wood. NPS photograph.

est National Monument (PEFO; now a national park) in 1906. The log that is now the commemorative stone was collected outside of PEFO some time prior to 1920, and was dedicated by President Calvin Coolidge at WAMO on April 15, 1924 (National Park Service, 2003; Author unknown, 1924a, 1924b). A copy of paleontologist Frank H. Knowlton's publication on the petrified wood of Arizona (likely Knowlton, 1889) is incorporated within the stone, as is a photograph of petrified trees near Holbrook (Author unknown, 1924a). Petrified logs like those from PEFO rarely have any original woody material. It has been replaced by minerals such as quartz, with various iron-rich minerals creating the rainbow of colors. Examples of *Araucarioxylon arizonicum* petrified wood are visible outside at the National Mall entrance to the Smithsonian National Museum of Natural History.

FIGURE 10. Arizona State Stone in the wall of the Washington Monument which contains specimens of *Araucarioxylon* from the famous Petrified Forest of Arizona. NPS photograph.

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