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The price of neglect: Revisiting Fossil Cycad National Monument (1922–1957)

Vincent L. Santucci, Justin S. Tweet, and Tim Connors, *National Park Service*

ABSTRACT

The history associated with the discovery, research, preservation, protection, and loss of the fossil cycadeoid locality near Minnekahta in the southern Black Hills of South Dakota—which for 35 years was designated as Fossil Cycad National Monument—has gained considerable public attention. Several publications have attempted to capture portions of this history through the assimilation of information from archives, reports, correspondence, photographs, and other records associated with the monument. Previously unknown records continue to emerge, helping to expand and reshape the understanding of the monument's unfortunate history, and also raising new questions. Some of the newly uncovered information is presented here. Additionally, several questions are identified that hopefully might be advanced through communication with individuals who are able to share additional information or historical records to fill in some of the gaps related to the history of Fossil Cycad National Monument.

INTRODUCTION

During October 2022, paleontologists gathered at the Museum of Geology of the South Dakota School of Mines and Technology (SDSMT) in Rapid City to commemorate the 100th anniversary (centennial) of the establishment of Fossil Cycad National Monument. Cycads are plants with woody trunks and a crown of large evergreen leaves that resemble palm fronds; however, the fossils of Fossil Cycad were actually the similar-looking extinct cycadeoids. In the past, fossil cycads and cycadeoids were frequently lumped together. The major difference between the two groups is the presence of flower-like reproductive structures on cycadeoids.

The discovery of fossil cycadeoids in the southern Black Hills, near Hot Springs, South Dakota, captured scientific attention during the 1890s. Exceptionally well-preserved specimens of Cretaceous cycadeoids represented one of the world's greatest concentrations of these paleobotanical specimens (Figure 1). Conservation and preservation of the fossil locality was ambitiously advocated by Yale paleontologist George Wieland. On October 21, 1922, using the authority within the Antiquities Act (1906), President Warren G. Harding proclaimed Fossil Cycad National Monument, to be administered by the National Park Service (NPS).

The rich history of discovery, collection, research, preservation, and protection associated with this fossil locality has been carefully documented by NPS (Santucci and Hughes 1998; Santucci and Ghist 2014). The monument was never developed to accommodate visitation by the public, and full-time park rangers were not assigned to manage and protect it. Over the course of three decades most of the fossils for which the monument was established were damaged or destroyed by vandalism or outright theft. The loss of the paleontological resources for which the monument was established eventually led to discussions about the value of retaining the site under the administration of NPS. In the absence of the exposed petrified plant remains, the primary justification for the monument was gone. Interest in potential uranium deposits during the Cold War was also a consideration in the decision to abolish the monument. On September 1, 1957,

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the US Congress voted to deauthorize Fossil Cycad National Monument as a unit of NPS and re-assign the land to the Bureau of Land Management (BLM).

DISCOVERY AND STUDY OF THE FOSSIL CYCADEOIDS IN THE BLACK HILLS

The earliest reports of fossil cycadeoids from the Black Hills of South Dakota date back to the Custer Expedition of 1874, or shortly after the area was opened for Euroamerican settlement. Two cycadeoid localities are reported from this period: the Black Hawk locality, discovered by miners heading to Deadwood, South Dakota, in 1878; and a second site, which became known as the Minnekahta locality because it was near the town of Minnekahta, just west of Hot Springs.

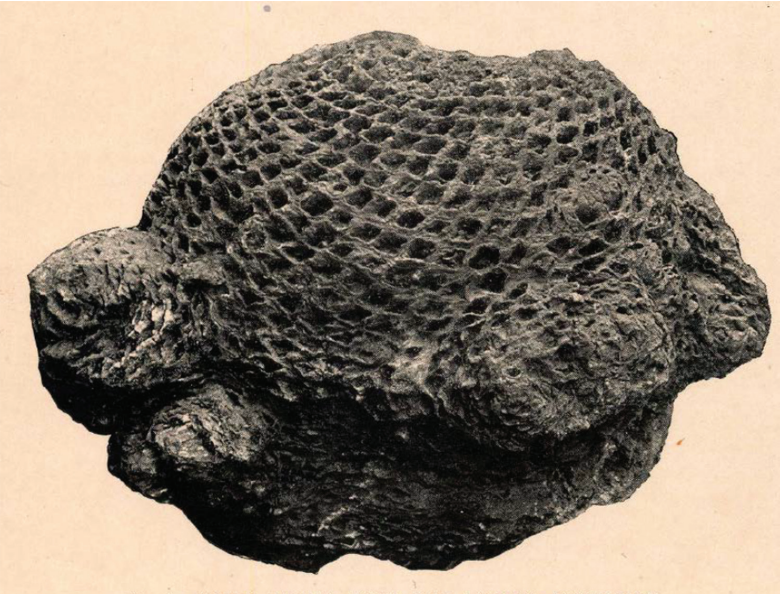


FIGURE 1. A portion of a fossil trunk from the area that became Fossil Cycad National Monument, illustrated in Darton and Smith (1904). The species, *Cycadeoidea pulcherrima*, is one of 19 cycadeoid species named from specimens probably collected from the future site of the monument. At the time, cycads and outwardly similar cycadeoids were not known to be as distinct as they are now (Darton and Smith 1904).

The pre-monument history of the locality that became Fossil Cycad National Monument is best documented through the scientific investigations and fossil collections made by paleontologists Thomas H. Macbride (University of Iowa), Lester Ward (Smithsonian National Museum of Natural History), and George Wieland (Yale University) (Macbride 1893a, 1893b; Ward 1898, 1899a, 1899b, 1900; Wieland 1906, 1916, 1937, 1944). An additional collection of 20 cycadeoid specimens was made by field teams from the American Museum of Natural History during 1900 and 1901.

In February 1893, the US National Museum (Smithsonian) received a letter, which was forwarded to paleobotanist Lester Ward, from Mr. F.H. Cole of Hot Springs, South Dakota. Cole was a dealer in fossil specimens and sent photographs of "cycad specimens" that were collected from the Minnekahta locality (Ward 1899b). Ward wrote back to Cole recommending that a specimen be shipped to him in Washington for examination. Cole offered six cycadeoid specimens to Ward for sale, which were purchased and arrived at the Smithsonian in May 1893. One of the cycadeoid specimens was later named *Cycadeoidea colei* in recognition of Cole.

Ward visited the Minnekahta cycadeoid locality on two occasions in 1893 and 1895, where he reported large numbers of fossil cycadeoids, primarily in the hands of fossil dealers offering them for sale. Ward attempted to secure those specimens, which were unique and potentially representing distinct species not previously described. There were other specimens in the possession of private collectors who he described as "making no pretensions to science and who wish such specimens merely as curiosities, but who hold them in high esteem and are unwilling to part with them, or in most cases are so situated that no scientific man ever sees the specimens again…" (Ward 1899b). Ward later learned that O.C. Marsh, another Yale paleontologist (best known for his work in vertebrate paleontology), had also purchased a large number of fossil cycadeoids from a fossil collector named H.F. Wells that were curated into the collections at Yale University.

Professor Thomas H. Macbride, from the State University of Iowa, also visited the Minnekahta locality during the summer of 1893. During this visit Macbride collected cycadeoid specimens to study and place on display in the University of Iowa Museum of Natural History. One of the specimens was published as the type specimen of *Bennettites dacotensis* (Macbride 1893a, 1893b), becoming the first of 19 cycadeoid species named from Minnekahta specimens (Table 1).

Wieland first visited the Minnekahta cycadeoid locality in 1898. Wieland was encouraged by Marsh to consider the study of the Black Hills cycadeoids in the Yale collections. These fossils and the fossil locality became the obsession of Wieland's career.

TABLE 1. Fossil cycadeoid species named from Minnekahta, likely from sites within Fossil Cycad National Monument.

Bennettites dacotensis	Macbride 1893a	Cycadeoid, now *Cycadeoidea dacotensis,* based on a University of Iowa specimen from valley of Minnekahta Creek
Cycadeoidea colei	Ward 1898	Cycadeoid, based on USNM P8805 or YPM PB 151216 from Minnekahta, probably a synonym of *C. marshiana* (Wieland 1916)
Cycadeoidea colossalis	Ward 1898	Cycadeoid, based on USNM P8807, probably from Minnekahta
Cycadeoidea furcata	Ward 1898	Cycadeoid, based on YPM PB 151166 from Minnekahta, probably a synonym of *C. marshiana* (Wieland 1916)
Cycadeoidea insolita	Ward 1898	Cycadeoid, implied by Wieland (1916) to be based on a YPM specimen from Minnekahta
Cycadeoidea marshiana	Ward 1898	Cycadeoid, based on YPM PB 151159 (Trunk 11) from Minnekahta
Cycadeoidea mcbridei	Ward 1898	Cycadeoid probably based on a University of Iowa specimen probably from Minnekahta
Cycadeoidea minima	Ward 1900	Cycadeoid, based on YPM PB 151201 from Minnekahta, probably a juvenile of another species (Wieland 1916)
Cycadeoidea minnekahtensis	Ward 1898	Cycadeoid, based on a USNM specimen, now considered a synonym of *C. dacotensis* (Wieland 1916)
Cycadeoidea nana	Ward 1898	Cycadeoid, based on YPM PB 151231, probably from Minnekahta
Cycadeoidea occidentalis	Ward 1898	Cycadeoid, implied by Wieland (1916) to be based on a YPM specimen from Minnekahta, possibly a synonym of *C. superba* (Wieland 1916)
Cycadeoidea paynei	Ward 1898	Cycadeoid, based on YPM PB 151288 (or a USNM specimen) from Minnekahta
Cycadeoidea protea	Ward 1900	Cycadeoid, based on YPM PB 151180 from Minnekahta
Cycadeoidea pulcherrima	Ward 1898	Cycadeoid, based on USNM P8806 probably from Minnekahta, probably a growth stage of another species (Wieland 1916)
Cycadeoidea reticulata	Ward 1900	Cycadeoid, based on YPM PB 151500 from Minnekahta
Cycadeoidea superba	Ward 1900	Cycadeoid, based on YPM PB 151891 from Minnekahta
Cycadeoidea turrita	Ward 1898	Cycadeoid, based on YPM PB 151232 from Minnekahta, probably the same as *C. wielandi* or *C. colei* (Wieland 1916)
Cycadeoidea wellsii	Ward 1898	Cycadeoid, based on YPM PB 151169 from Minnekahta
Cycadeoidea wielandi	Ward 1899	Cycadeoid, based on YPM PB 151551 from Minnekahta

PROCLAIMING AND PLANNING A NEW NATIONAL MONUMENT

Documents created during the seven years prior to the proclamation of Fossil Cycad National Monument in 1922 clearly demonstrate the drive and determination of Wieland to ensure the protection of the Minnekahta cycadeoid locality. Wieland composed a large number of letters, many handwritten, to members of Congress, leadership in the Department of the Interior, the scientific community, and others, expressing his desire to preserve and protect the important fossil plant locality in South Dakota. Some of the letters were passionate prose elaborating on the scientific importance of protecting the fossil site. Other letters expressed urgency, frustration, and impatience associated with delays in protecting the fossil locality from the widespread fossil collecting that he believed was taking place.

President Woodrow Wilson's use of the Antiquities Act in 1915 to establish Dinosaur National Monument in Colorado and Utah was an important precedent in protecting a significant fossil locality. A year later Congress enacted the National Park Service Organic Act, creating a bureau within the Department of the Interior to oversee the administration of the national parks and monuments in the US.

In 1920, in order to facilitate the protection of the Minnekahta fossil cycad locality, Wieland submitted an application under the authority of the Enlarged Homestead Act (1909) to obtain 320 acres (129 ha) of the cycad-producing land, which he was granted. Within two years, Wieland offered to return the land to the federal government, in order that a national monument could be established to further protect the fossil cycadeoid locality. According to E.C. Finney (Department of Interior), in a letter of October 18, 1922, to President Harding prior to the establishment of the monument, "The area is probably one of the most interesting fossil plant localities and is known amongst scientific men the world over."

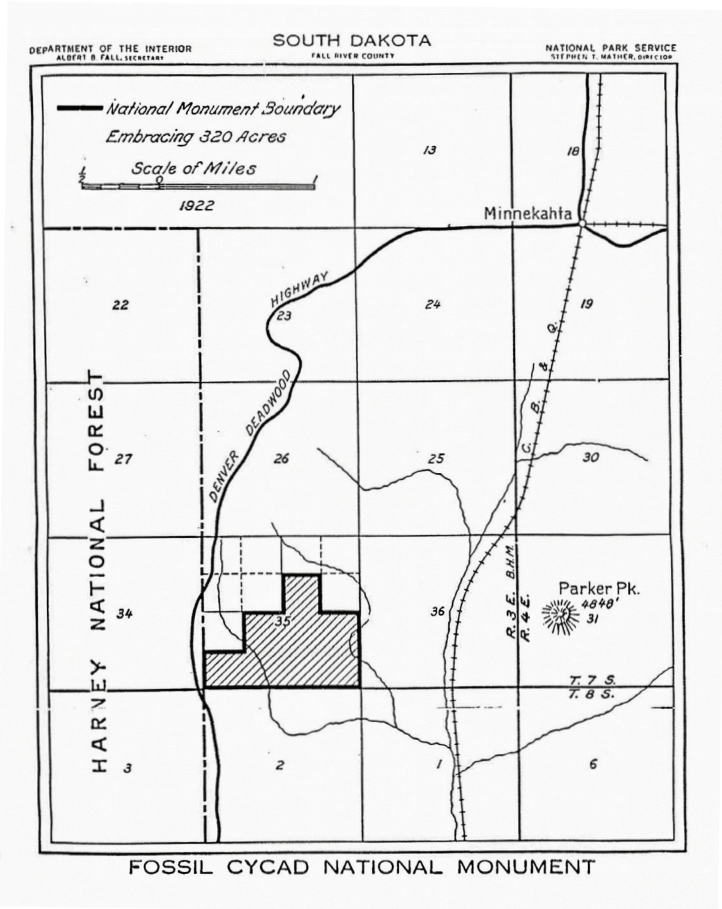
Four days later, President Harding proclaimed Fossil Cycad National Monument in Fall River County, South Dakota. The monument consisted of Wieland's 320 acres, transferred back to the federal government (Figure 2). The monument's proclamation included the following language: "Warning is hereby expressly given to all unauthorized persons not to appropriate, injure, destroy or remove any of the fossils of this monument."

Despite the establishment of the monument, funding was not appropriated to NPS to develop it or to hire staff. This fact further frustrated Wieland, and motivated him to proceed with planning for Fossil Cycad. Wieland widely communicated his interest in the protection and development of the monument and independently advanced some activities to further planning. For example, he engaged architectural students at Yale University to develop conceptual drawings for a visitor center design for the monument (Figure 3). Ultimately, a visitor center was never constructed.

ABOLISHING THE MONUMENT AND UNANSWERED QUESTIONS

Management of Fossil Cycad was assigned to the superintendent of nearby Wind Cave National Park, but only brief and sporadic visits to the fossil site were undertaken by NPS staff during the 1920s. Additionally, there are almost no references to the monument in any of the Wind Cave National Park superintendent's annual reports until 1933.

The first official visit to the monument by NPS was undertaken by Roger Toll, superintendent of Yellowstone National Park, on October 20, 1929. Toll prepared a memo for NPS Director Horace Albright, stating, "All available specimens have been picked up, and there is nothing left that is of interest to visitors," and offered his opinion: "The present reputation of the national parks and monuments, as places worthy of a considerable journey, is well worth maintaining. So far as I can find out, the Fossil Cycad National Monument has nothing to protect, and perhaps no bed of fossils. If it has no value, present or future, it is a liability, not an asset, to the rest of the system. Unless Professor Wieland, or someone, can furnish information indicating some purpose to be served by the area, it would seem to be desirable to discontinue it as a national monument" (Toll to Albright, November 20, 1929).



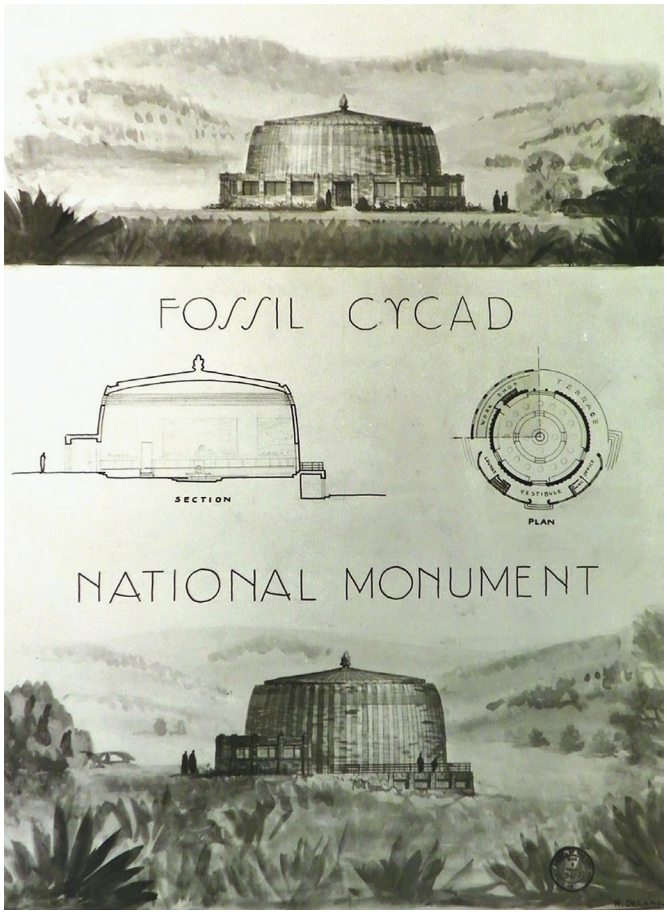


FIGURE 2. UPPER RIGHT A map of the legislated boundaries of Fossil Cycad National Monument. George Wieland had purchased the land under the Homestead Act and donated it back to the federal government for the creation of a monument. US Highway 18 now runs through the southern part of the former monument.

FIGURE 3. LOWER RIGHT Conceptual drawings used in planning for a proposed, but never-constructed, visitor center at Fossil Cycad National Monument. Yale University paleobotanist George Wieland, the foremost advocate for the monument, commissioned the plans, envisioning an *in situ* component similar to the quarry wall at Dinosaur National Monument.

As years passed and NPS provided no direct support for or protection of the monument, communications between Wieland and Department of Interior staff became increasingly contentious (Figure 4). Questions were raised regarding the circumstances and time frame of the loss of the fossil cycadeoids from the monument. The museum accession records at the Yale Peabody Museum indicate that all the Minnekahta cycadeoid specimens were obtained entirely between 1891 and 1911, before the national monument was established. There is no firm evidence to date that establishes whether the surface exposures of fossil cycadeoids were depleted prior to or after the establishment of the monument in 1922. Charles Walcott, director of the US Geological Survey and secretary of the Smithsonian, was requested by the Department of Interior for his assessment before Fossil Cycad's establishment. Walcott reported that he had heard there were no fossils at the surface, but that more would be exposed by erosion and the monument should go forward (Walcott 1922).

Although at first glance it seems counterintuitive, given Wieland's strong desire and efforts to protect the fossil locality, it is an open question whether he bears some responsibility for the loss of the *in situ* occurrences of the monument's fossil cycadeoids. As noted above, he had title to the lands for a short period of time before the monument's proclamation. As landowner, Wieland would have been able to collect any of the paleontological resources from the locality without the need for a permit or other permission. Much later, in 1939, Wieland admitted to removing more than 1,000 specimens from the Minnekahta locality prior to the monument's proclamation (Trager 1939).

Were these the entirety of the surface fossils at the locality? It seems unlikely that the proclamation of the monument in October 1922 would have proceeded if no fossils were still present at the surface. If that is so, was it possible that due to the frustrations Wieland experienced with the lack of protection or development of the monument by the federal government, he decided to remove the remaining fossils himself for their protection? The only evidence supporting this conjecture is the likelihood that Wieland may have maintained fossil cycadeoids at his home, using them for decoration as part of a personal collection. There is no indication that the fossils maintained at Wieland's home in New Haven, Connecticut were specimens catalogued into the Yale collections; therefore, it seems likely that they were taken by him directly from the locality to his home.

In 1935, NPS asked Wieland to assist with a test excavation at Fossil Cycad to see if fossil cycadeoids were present beneath the surface. NPS geologist Caroll Wegemann helped to coordinate this excavation, with the assistance of members of the Civilian Conservation Corps (Wegemann 1936). As it happened, fossil cycadeoid specimens were indeed uncovered during this excavation (Figure 5). However, the interaction between Wegemann and Wieland led to a feud, with Wegemann accusing Wieland of removing all the original surface specimens from the area prior to donating the land to the government. As discussed above, this seems unlikely, but ultimately these are questions that can only be answered by uncovering more information on when and by whom the fossils were fully removed from the surface at Fossil Cycad.

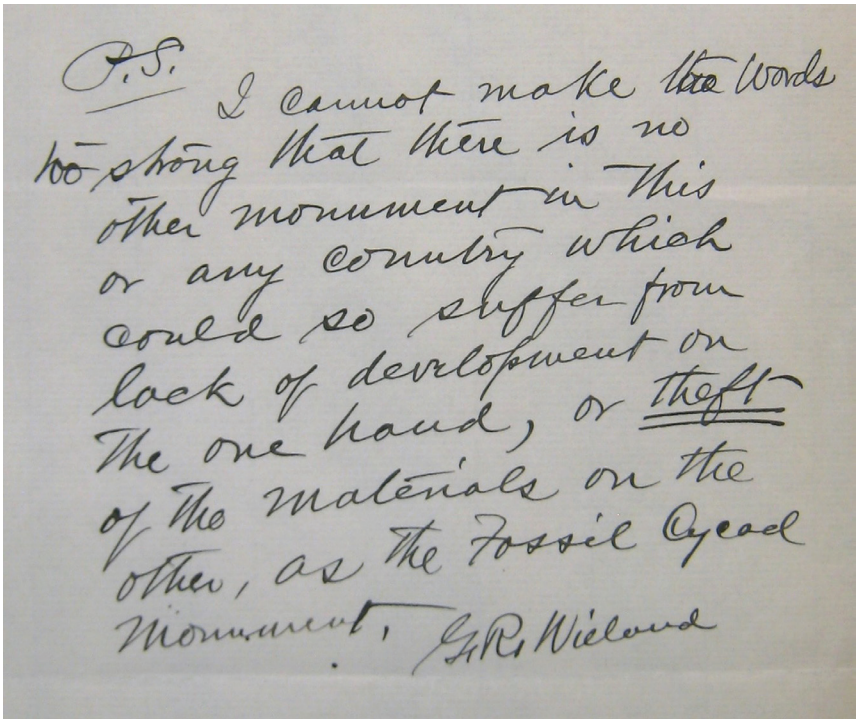

P.S. I cannot make the words too strong that there is no other monument in this or any country which could so suffer from lack of development on the one hand, or theft of the materials on the other, as the Fossil Cycad Monument. G.R. Wieland

FIGURE 4. Postscript to an undated handwritten letter by George Wieland expressing his criticism about the lack of development of Fossil Cycad National Monument and the theft of the fossils at the locality. NATIONAL PARK SERVICE

Wieland died in 1953, depriving the monument of its most vocal advocate at a time when the lack of development, absence of surficial resources, and changes in government attitudes and priorities



FIGURE 5. George Wieland (far left) supervises an excavation at Fossil Cycad National Monument during 1935. Wieland had a complex relationship with the site. He recognized its scientific significance and advocated for protected status, going so far as acquiring the land under the Homestead Act. NATIONAL PARK SERVICE

left it vulnerable to deauthorization. After World War II the demand for uranium and other minerals increased with the onset of the Cold War. The geology preserved within and around Fossil Cycad included units known to have uranium minerals. The Department of the Interior's role in managing mineral and mining claims on federal lands may have played a role in the deauthorization of Fossil Cycad National Monument. In 2014, the senior author met with Vernon Bump, son of renowned paleontologist James Bump, at the 10th Conference on Fossil Resources hosted at SDSMT (Figure 6). During the conversation, Bump shared information that he and his father wanted to visit Fossil Cycad one last time the day before it was scheduled to be officially abolished by Congress on September 1, 1957. The Bumps decided to camp at the monument that night. Vernon reported that as the sun set on Fossil Cycad National Monument one last time, they observed many campfires appear around the outside of the boundary. Vernon recalled his conversation with his father that these campfires were likely associated with individuals interested in filing uranium mining claims once the monument was abolished (Vernon Bump, pers. comm., 2014).

POST-MONUMENT ROAD CONSTRUCTION UNCOVERS ADDITIONAL CYCADS

There is a significant postscript to the story of Fossil Cycad National Monument. Following its deauthorization, the monument's land was turned over to BLM. In the early 1980s, US Highway 18 was rerouted, with its new alignment cutting through the former monument. Per Dale Hanson, retired BLM Paleontologist (pers. comm., November 2023), BLM, which had permitted the work, required that the South Dakota Highway Department stockpile any fossils found during the work and notify BLM (BLM 1997). Although discoveries were not expected due to the previous surface clearance, the highway crew began to find fossils during excavation. They stockpiled the fossils but apparently BLM was not immediately notified. Cycadeoid fossils stockpiled during the day would disappear by the following morning, likely removed by rock shop owners and the general public. When BLM became aware of the situation, Hanson, another BLM employee, and a professor from Black Hills State College were dispatched to the site and assessed the discoveries. Further discoveries

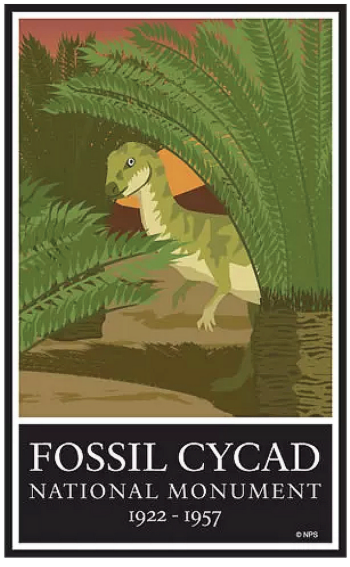


FIGURE 6. Graphic artwork used to create a logo for the abolished Fossil Cycad National Monument. The artwork was used to make pins and patches that were distributed to participants at the 10th Conference on Fossil Resources hosted in Rapid City, South Dakota, in 2014. The dinosaur also has a connection to the history of the site: it is *Hypsilophodon wielandi*, named for George Wieland. NATIONAL PARK SERVICE

were placed in a locked, fenced area to be picked up by SDSMT (Dale Hanson, pers. comm., November 2023). A number of specimens were collected by Philip Bjork for SDSMT (James Martin, retired professor of paleontology, SDSMT, pers. comm., July 2020).

PRESERVING THE HISTORY OF THE MONUMENT

Fossil cycadeoids from the southern Black Hills, collected from localities in and around what was Fossil Cycad National Monument, are maintained in several museum collections. The repositories that maintain the majority of the fossil specimens include: National Museum of Natural History (Smithsonian); Peabody Museum of Natural History of Yale University; Museum of Geology of SDSMT; and University of Iowa Museum of Natural History. There are one or more fossil cycadeoid specimens in other museum collections and in private collections. The Black Hills Museum of Natural History in Hill City, South Dakota, obtained a small collection of fossil cycadeoids collected from locations in the southern Black Hills (Peter Larson, President, Black Hills Institute of Geologic Research, pers. comm., 2023).

Hundreds of archives and a few dozen photographs associated with the history of Fossil Cycad National Monument have been compiled by the senior author and colleagues since 1985. The largest collection of records related to the abolished monument were obtained from the National Archives and Records Administration in College Park, Maryland, within Record Group 79: Records of the National Park Service. Additional archives were obtained from the NPS Harpers Ferry Center Library, Wind Cave National Park Museum Collection, BLM, Yale University Libraries, Yale-Peabody Museum of Natural History, Smithsonian US National Museum archives, University of Iowa Museum of Natural History, SDSMT Museum of Geology and Library, South Dakota State Historical Society, and other sources. During late 2023, NPS formally began scanning and archiving the records associated with Fossil Cycad National Monument at the Harpers Ferry Center in Charles Town, West Virginia.

Since the monument did not receive funding for development of park infrastructure or hiring dedicated staff, there are very few historic artifacts or objects that exist from the period of NPS administration between 1922 and 1957. Two original monument boundary markers were removed by BLM in November 2021 from where they were originally installed at the monument during 1935, and officially transferred back to NPS (Figure 7). Two original wooden Fossil Cycad signs were discovered in the collections of the SDSMT Museum of Geology and were donated back to NPS. The signs were hand-routed with the words "Fossil Cycad Natl. Mon. No Prospecting" (Figure 8). The two boundary markers and one wooden monument sign have been catalogued into the NPS museum collections at Harpers Ferry Center.



FIGURE 7. One of the boundary survey markers that was installed during the 1930s to delineate the boundary of Fossil Cycad National Monument. It was recently collected to preserve in NPS collections. NATIONAL PARK SERVICE

During October 2022—coincidentally during the month marking the 100th anniversary of the establishment of Fossil Cycad National Monument—a small collection of fossil cycadeoids were discovered in a cabinet in the museum collections of Wind Cave National Park, which, as noted earlier, was responsible for the administration of the monument (Figure 9).

A GEOLOGIC MAP FOR FOSSIL CYCAD NATIONAL MONUMENT

Several geologic maps of the Fossil Cycad National Monument area, at various scales, have been produced over the years. In 1904 the USGS published the "Edgemont Folio" (Darton and Smith 1904; Figures 10 and 11). Over the monument area, the





▲▲ **FIGURE 8.** This wooden sign is one of the few original objects from the NPS presence at Fossil Cycad National Monument. It was discovered in the collections of the SDSMT and donated back to NPS. The monument never had facilities or a formal ranger presence and was administered through Wind Cave National Park. NATIONAL PARK SERVICE

▲ **FIGURE 9.** Fossil cycadeoid specimens from the abolished Fossil Cycad National Monument in the Wind Cave National Park Museum Collection. NATIONAL PARK SERVICE

map shows map unit "Klk" (Lakota Formation; massive "buff" sandstone with clay intercalations and local coal beds). It shows "Cycad Flat" as a mapped feature, as well as Matias Peak and Parker Peak to the east. It should be noted that Darton's stratigraphy has been revised numerous times since this publication. The description of the Lakota Formation included the following information:

> A characteristic feature of the Lakota sandstone is the occurrence of numerous fossil vegetal remains. Large numbers of cycads have been found in its middle beds west of Payne and Arnold's ranch (see fig. 8, illustration sheet); petrified tree trunks are also of frequent occurrence. One of these, near the cycad locality above referred to, is shown in fig. 7 of the illustration sheet. They are abundant in the wide plateau of Lakota sandstone extending east of Parker Peak. On the evidence of its fossil plants the Lakota formation is classed in the lower Cretaceous.

FIGURE 10. Published in 1904, this seminal volume (Darton and Smith 1904) was the first encompassing treatise on the geology of the Fossil Cycad area. It contains mapped areal geology, topography, and structure sessions, as well as excellent photos still showing logs and cycadeoids at the site before it was picked over.

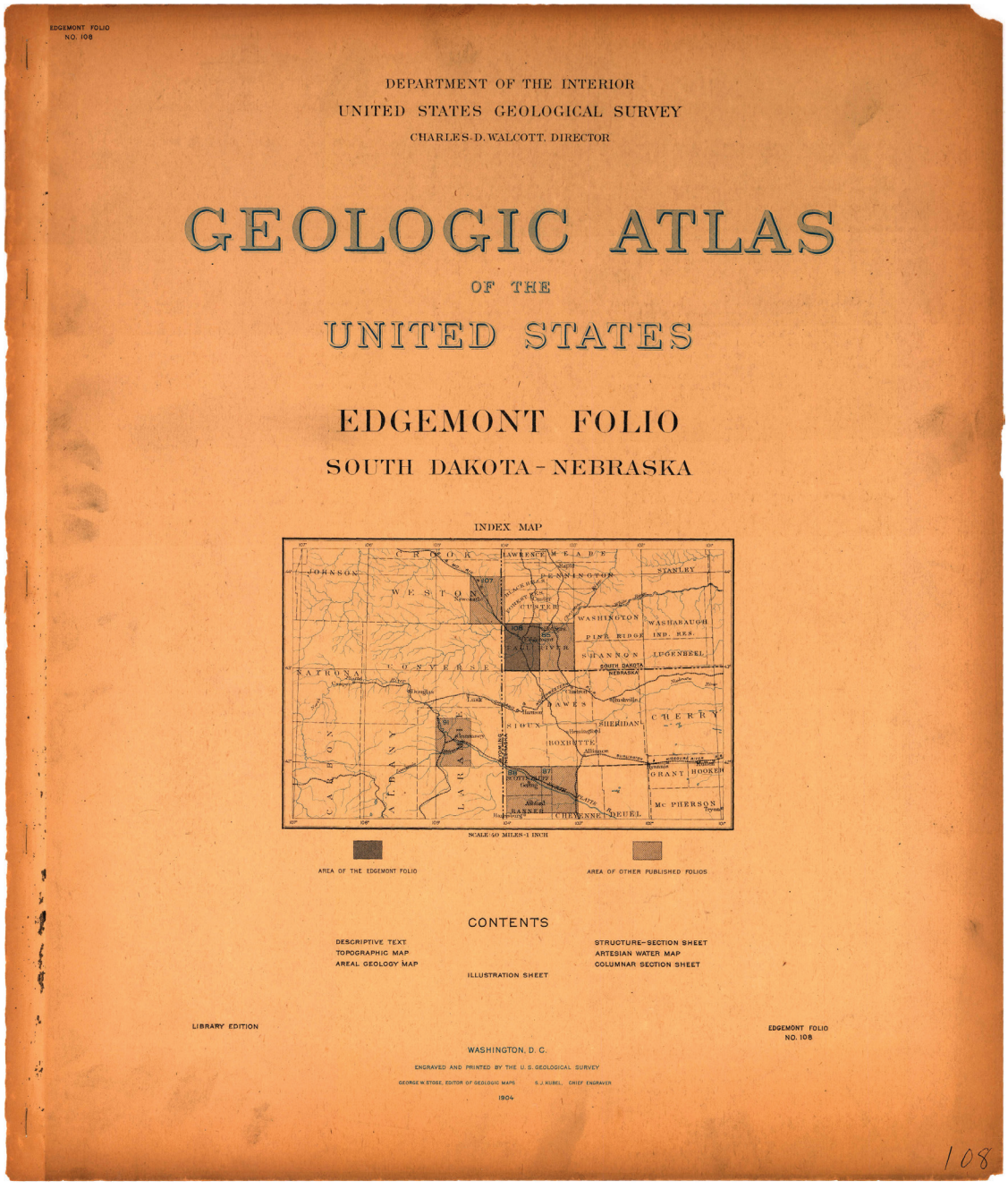




FIGURE 11. Originally presented as Figure 7 in the Edgemont Folio (Darton and Smith 1904) with the caption "Fossil Tree from Lakota Sandstone. Three miles southwest of Minnekahta, S. Dak., looking east toward Parker Knob," this figure shows what was encountered at the surface in the Fossil Cycad area in the early 1900s prior to fossils being removed over the years, eventually leading to the deauthorization of Fossil Cycad National Monument in 1957.

A half-century later, USGS published a map by Wilmarth and Smith (1957). This map is the most detailed yet published to include the monument area, with a scale of 1:7,200. Mapping took place during 1953–1955, with the focus being on uranium deposits. The map was published the same year that Congress decommissioned Fossil Cycad National Monument and delegated the land to BLM, which has administrated it ever since. The large-scale mapping and fine splitting of geologic units for the Fuson–Minnewaste Limestone–Lakota Sandstone pinpoints lithologies. The map is also notable for depicting the boundaries of the monument, although it should be noted that the boundaries are inaccurate in a few places compared to the authorized boundaries.

In 2012, the NPS Geologic Resources Division used the 1957 map to create a digital map of the former monument (NPS GRI 2012; Figure 12). It is available online at https://irma.nps.gov/DataStore/Reference/Profile/2190505, and include GIS files as geodatabase, shapefiles, and a Google Earth output .KMZ file. This digital version of the map is a useful tool in examining the geology of the deauthorized monument as well as depicting the locations of the now-lost paleontological resources. The GIS map can be used to overlay with Google Earth images of today's landscape as well as other historical imagery to better understand the science of the abolished Fossil Cycad National Monument.

Since 1957, two other notable maps have been published. A major contribution to overall Black Hills geology was published in 1989, with a synthesized USGS map of the Black Hills region (DeWitt et al. 1989), portraying the whole region on one large mapped sheet. In 2008, the USGS released an improved version of the overall Black Hills geologic map as USGS SIM-2777 (Redden and DeWitt 2008); an added benefit is that it is also GIS-based.

CONCLUSION

Ongoing research into the history of Fossil Cycad National Monument continues to reveal information that enlightens our understanding of this unfortunate story. The hope is that additional records, correspondence, or other information may be uncovered and help to further fill in the gaps related to the history of the Minnekahta fossil cycadeoid locality and the associated national monument. Through this and other publications, we can ensure that Fossil Cycad National Monument and the lessons it teaches us are not forgotten.

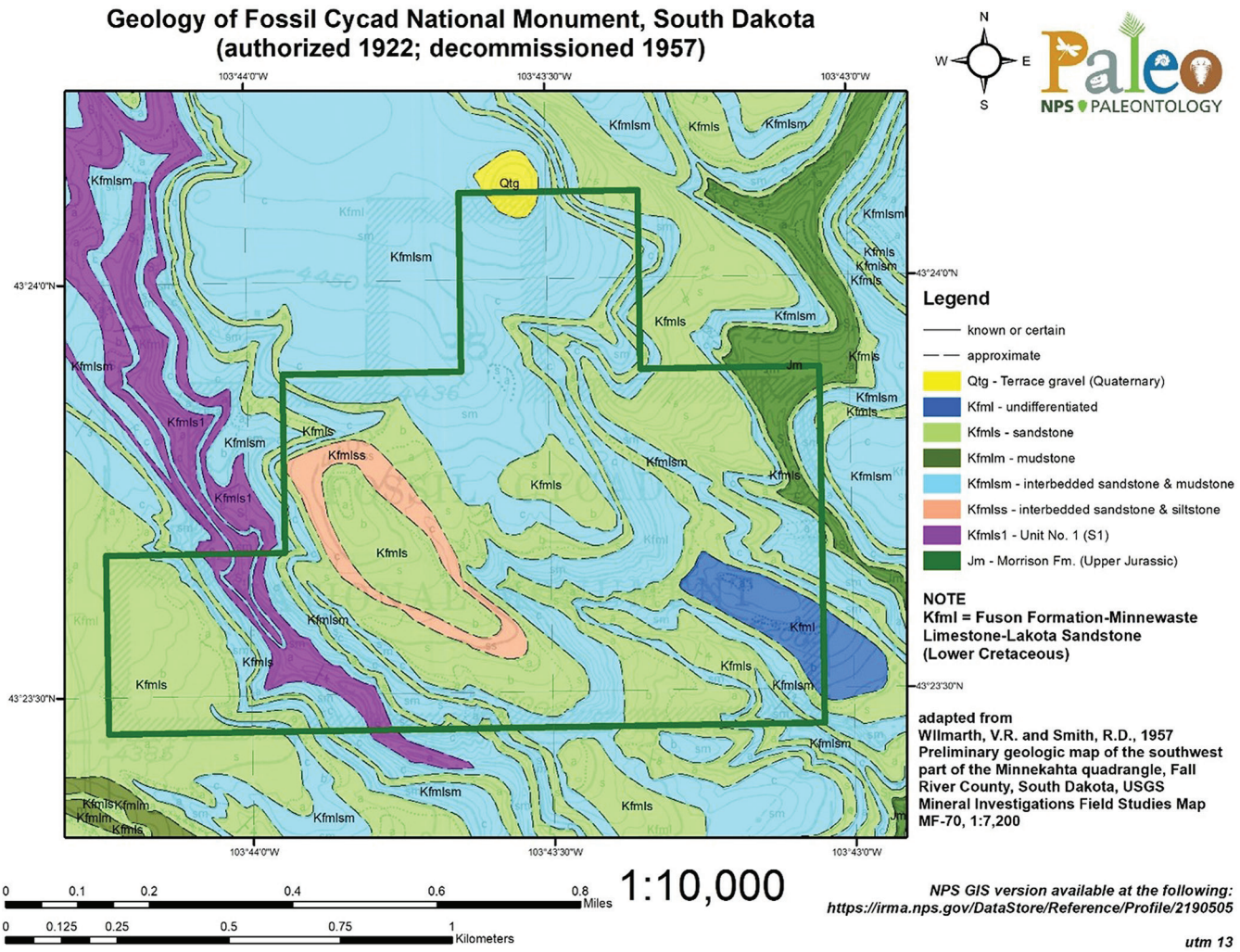


FIGURE 11. Geologic map of Fossil Cycad National Monument, South Dakota. Data modified from digital geologic map data at https://irma.nps.gov/DataStore/Reference/Profile/2190505 and https://ngmdb.usgs.gov/Prodesc/proddesc_2975.htm from the original source map of Wilmarth and Smith (1957).

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