

CURECANTI

NATIONAL RECREATION AREA, COLORADO

By Anthony R. Fiorillo and Richard L. Harris

Curecanti National Recreation Area encompasses the eastern portion of the Black Canyon of the Gunnison and shares a common boundary with the Black Canyon of the Gunnison National Park in west-central Colorado. The park contains three dams comprising the Wayne N. Aspinall Unit of the Upper Colorado River Storage Project. The largest reservoir created by the dams, Blue Mesa Lake, serves as a major recreational resource for fishermen and boating enthusiasts.

Geologically, the park is recognized for having exposures of rocks that date to over 1.7 billion years in age, making these rocks among the oldest in western North America. In addition to these well recognized resources, Curecanti National Recreation Area also contains fossil resources that have significant scientific and educational value. The most important of these fossil finds is in the Upper Jurassic Morrison Formation in the park (fig. 1).

Perhaps most significant of these fossil finds is the discovery of a quarry, which has been discussed elsewhere (Fiorillo et al. 1996; Fiorillo and May 1996), containing the remains of at least two dinosaurs. Excavation of this fossil site continued for three years, and the preparation of the fossil material continues. Continued surveying of the paleontological potential within this park has shown that the Morrison Formation is rich in other fossil resources as well. We briefly report here the occurrence of various fossil traces of invertebrates also from the Morrison Formation, described in more detail elsewhere (Fiorillo 1999), and describe the management, education, and exhibit uses of these important newly discovered resources. These additional sites, along with the previously described dinosaur quarry, emphasize the point that significant management issues may include resources not traditionally recognized within individual parks (see *Park Science* 16[4]:14–15). Further, like the great diversity in the types of remains found in the fossil record, there is also diversity in management techniques that can be employed to document these occurrences. Finally, park visitors are interested in learning about natural resources, including park paleontology. In a telephone conversation on 6 November 2000 with the second

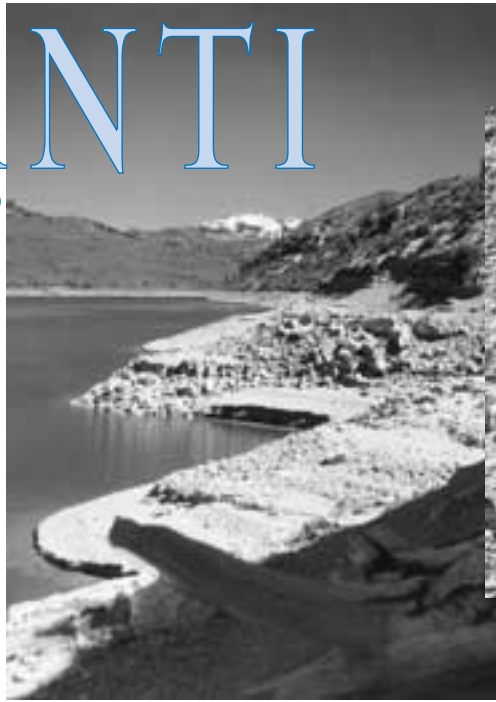
Perhaps most spectacular of these fossil traces are the remains of ancient termite nests.

author, Gary Machlis, the NPS Visiting Chief Social Scientist, agreed with this assertion. He noted that there are many examples from surveys of park visitors conducted under the Visitor Services Project that show that information about park resources, including natural resources, is an important and highly sought after service provided by the National Park Service.

BACKGROUND

The Morrison Formation of the western United States has produced the vast majority of the Jurassic dinosaurs from North America; hence, most of the paleontological work on this fossil unit has focused on fossil vertebrates, particularly dinosaurs. This important fossil unit, composed largely of ancient stream, floodplain, and lake deposits, is found at the surface or in the subsurface from Montana to New Mexico and from Oklahoma to Utah. The youngest part of the Morrison Formation is the Brushy Basin Member, which is the source of most of the vertebrate remains from this formation. Underlying the Brushy Basin Member is the Salt Wash Member of the Morrison Formation. The age of this formation has traditionally been considered to be Late Jurassic. Historically climatic interpretations for Morrison Formation deposition range from wet to dry, and most specialists have invoked a strong seasonality during Morrison times.

A new dinosaur locality was discovered in the Morrison Formation during recent paleontological fieldwork at Curecanti National Recreation Area and Black Canyon of the Gunnison National Park (Fiorillo et al. 1996; Fiorillo and May 1996). Continued survey of these parks has pro-



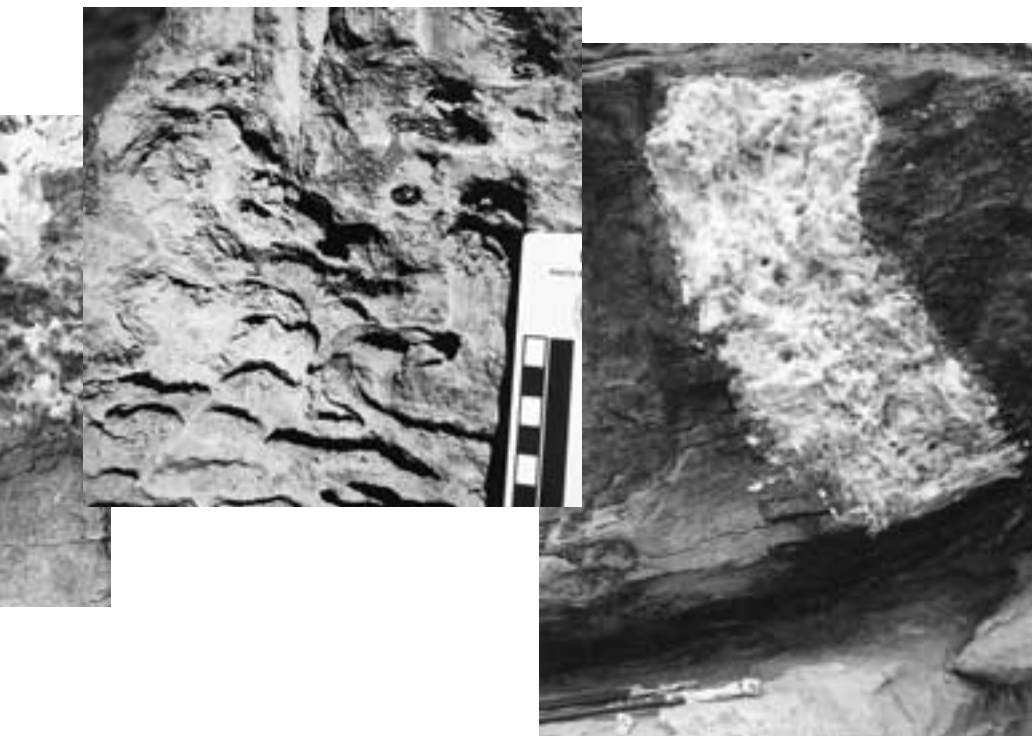


Figure 1 (clockwise from far left). Exposures of the fossil-rich Morrison Formation are evident in this view of the West Elk Arm of Blue Mesa Lake in Curecanti National Recreation Area. These shoreline exposures are very low, and therefore old, in the layering sequence of the Morrison Formation section.

Figure 2. Placed for scale, the handle of a rock hammer runs alongside a Jurassic termite nest from a Morrison Formation exposure in Curecanti National Recreation Area. Notice the pattern of chambers in the nest.

Figure 3. Modern *Spinifex* termite nest from Western Australia. Notice the similarity in pattern of chambers in this nest compared to the fossil nest in figure 2.

Figure 4. Impractical to move because of its size and weight, the recently discovered Jurassic termite nest was left in situ where paleontologists coated the fossil (shown in figure 2) with latex. The resulting "peel" is used as a mold to cast the fossil in plaster for educational and scientific needs. The paintbrush at the bottom provides scale.

vided new insights into the trace fossils within the fluvial, or stream channel and floodplain, portions of the Morrison Formation, and the overall Jurassic paleoecosystem within these parks. Trace fossils are typically defined as fossilized equivalents of the structures produced in rocks, sediments, and grains by the life processes of organisms, with the study of these features referred to as ichnology (Bromley 1996). The most common trace fossils include burrows and footprints.

LOCAL SETTING

Several types of invertebrate trace fossils have now been identified in the upper part of the Morrison Formation of Curecanti National Recreation Area. These trace fossils record important information regarding the paleohydrologic and paleoecologic setting of this fossil unit in this park. Hundreds of traces occur in fluvial sandstone and mudstone deposits. The traces include crayfish burrows, termite nests, homopteran (an insect order that includes cicadas and aphids) burrows, bee cells, and earthworm burrows (Fiorillo 1999; Fiorillo and Hasiotis 1996). Also present are various sizes of rhizoliths, or plant root traces (Fiorillo and Hasiotis 1996). The invertebrate trace fossils predominantly occur in sandstones, whereas the plant root traces can occur in either the mudstones or the sandstones. Stratigraphically, these fossil traces appear to be confined to the lower part of the Brushy Basin Member or the upper part of the Salt Wash Member of the Morrison Formation. Perhaps most spectacular of these fossil traces are the remains of ancient termite nests (figs. 2 and 3).

The distribution and shape of these traces are related to paleoenvironmental conditions such as variations in water table and soil moisture levels that these burrowing organ-

isms experienced during the Late Jurassic. For example, the length of the crayfish burrows delineates the depth of the water table level. The traces in Curecanti National Recreation Area with the greatest vertical component are the termite nests, which occur within the confines of large fossil root traces. The restriction of this ichnofossil to within a few meters of the Salt Wash/Brushy Basin contact suggests a time of greater aridity during the highly seasonal climate than in other portions of the Morrison Formation in the park.

MANAGEMENT ISSUES

The occurrence and distribution of these trace fossils has scientific importance, as well as public education potential. These fossils are largely located along the shores of the Blue Mesa Reservoir in Curecanti National Recreation Area, in large sandstone blocks that weigh in excess of 1,000 pounds each. Given the logistical difficulty in moving such large blocks, or alternatively, attempting to utilize diamond-bladed rock saws to cut the fossils of interest out of the sandstone, it was deemed most appropriate to follow a third alternative. This third alternative was to produce latex peels of select fossil features. These peels would then be used as molds for making plaster casts that can be used for educational and exhibit needs.

One example of such a process for making a peel of a termite nest is illustrated in figure 4. This particular termite nest shown in this figure has been subsequently cast in plaster, painted, and used as part of a highly successful exhibit entitled "Six Legs Over Texas: the infestation continues" at the Dallas Museum of Natural History.

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Similarly, casts are available to the National Park Service for its educational and exhibit needs. Further these casts provide researchers the opportunity to study accurate reproductions of these fossil features, features that would otherwise be lost due to erosion. The National Park Service has provided the logistical support and framework for the excavation while the Dallas Museum of Natural History has provided the technical expertise for the molding and casting. This partnership has produced a successful model of cooperation between the Park Service and a private institution, and has yielded important scientific, preservation, and educational results from a previously unrecognized resource. **P**
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ABOUT THE AUTHORS

Anthony Fiorillo is the Curator of Paleontology at the Dallas Museum of Natural History, P.O. Box 150349, Dallas, TX 75315.

Richard Harris is the former Chief of Resource Stewardship and Science at Curecanti National Recreation Area and Black Canyon of the Gunnison National Park. He is currently the NPS Director of the Office of Strategic Planning, 12795 W. Alameda Parkway, P.O. Box 28287, Denver, CO 80225.