

Clayton Lake State Park

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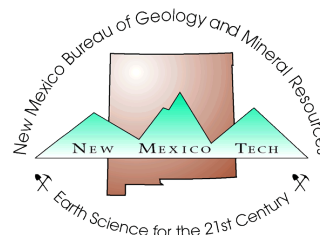
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Clayton Lake State Park is approximately 12 mi northwest of Clayton on NM-370 in northeastern New Mexico (Fig. 1). Unlike most lakes in New Mexico, Clayton Lake was established in 1955 specifically as a recreational site by the State Game and Fish Commission after construction of the dam. In 1967 the site became Clayton Lake State Park. The lake offers excellent fishing and is stocked with rainbow trout, walleye pike, crappie, bluegills, bullheads, large-mouth bass, and channel catfish by the State Game and Fish Department. Boating is prohibited after the fishing season ends, so from October through April the park is a refuge for waterfowl.

Clayton Lake State Park lies on the northern edge of the Kiowa section of the Panhandle National Grasslands. This area has been administered by the U. S. Forest Service since the 1930s to assist in the rehabilitation of grassland agriculture in the area and provide outdoor recreation, watershed protection, and game and bird habitats. Mule deer, antelope, coyotes, badgers, and foxes along with ducks, geese, and many other bird species including hawks and eagles are found in the grasslands; Barbary sheep from Africa were introduced into the region in 1950. Many of these animals can be observed while enroute to Clayton Lake.

The Clayton Lake earthen dam impounds water from Seneca Creek (also known as Cieneguilla Creek, Fig. 1), a tributary of the Cimarron and Canadian Rivers. The dam is 92 ft high, 150 ft wide at the crest, and 150 ft long at the spillway (Foster, 1983; Young, 1984). It contains 400,000 yds³ of dirt and is covered with basalt riprap. The lake covers 170 acres at capacity, impounding over a billion gallons of water.

Facilities

The 400-acre park (Fig. 2) includes small shelters for picnicking and camping and one large group shelter. Showers, rock garden, and playground are also available. The playground houses a dinosaur-shaped slide. A dinosaur pavilion and boardwalk (Fig. 3) with exhibits provide information on the tracks and behavior of the dinosaurs. Although hunting is not allowed in the state park, hunters commonly use the camping facilities and hunt in the surrounding area. Hiking, camping, bird watching, and fishing are popular activities in the park, where the elevation ranges from 5,160 to 5,320 ft.

History

Long after the dinosaurs roamed the region, about 8,000-10,000 yrs ago, prehistoric men hunted large bison in the area (Scott, 1986). The remains of extinct bison were found near Folsom, New Mexico, just east of Clayton, by a local cowboy in about 1908 and were studied by archaeologists in 1926-1927 (Folsom, 1974). This ancient bison species (*Bison antiquus*) weighed more than 2,250 lbs and was killed by projectile points or arrowheads, now called Folsom points. The prehistoric hunters are called Folsom man. The bones of 23 bison and 19 projectile points were recovered, but bones of Folsom man still elude archaeologists.

Later, Ute, Comanche, and Apache Indians roamed the area before and after the Spanish explorers came in the 1500s and 1600s. Rabbit Ear Mountain (elevation 6,058 ft) was the site of a battle between the Cheyenne and Spanish colonists about 1717. The mountain, actually two summits, was named after a Cheyenne chief with frozen ears, who was later killed and possibly buried near the mountain. Rabbit Ear Mountain was an important landmark on the Cimarron cutoff, a waterless shortcut to the Santa Fe Trail used by settlers traveling west. The Cimarron trail lies just north of the state park, and ruts from the wagon trains can still be seen along the trail today. This was the shortest, hardest original

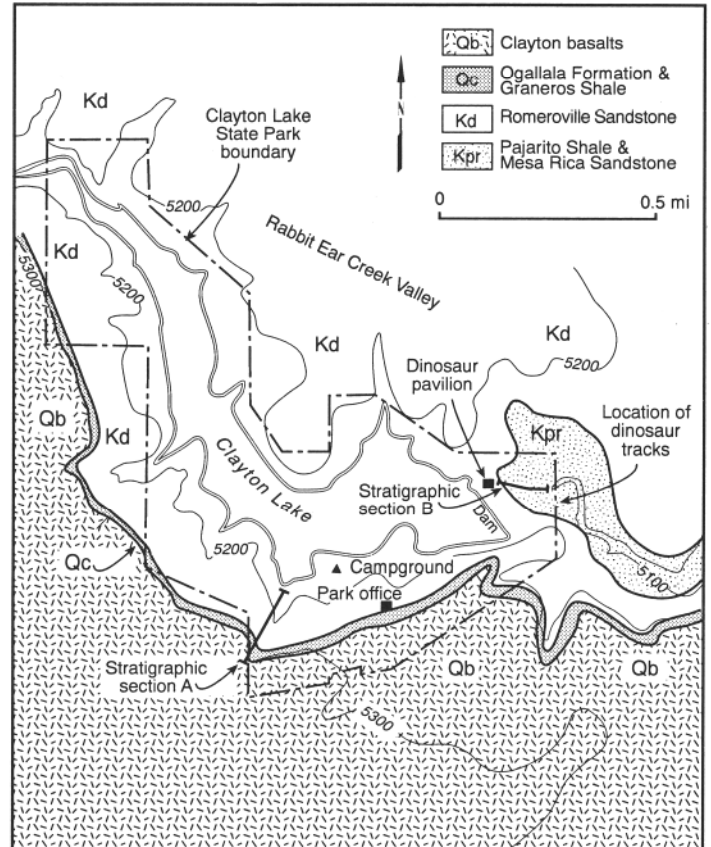
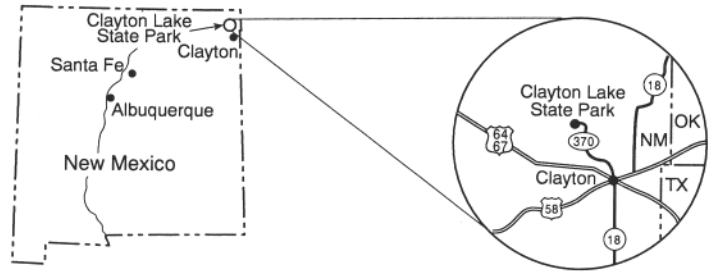


FIGURE 1—Location and geologic map of Clayton Lake State Park (modified from Baldwin and Muehlberger, 1959; Lucas et al., 1986; Lucas, 1990).

route between Santa Fe and Missouri because there was no reliable source of water. Raids by Native Americans were also common. Most of the travel along the trail occurred from 1822 to 1880 and ended with the arrival of the railroad.

Cattlemen drove their cattle in the 1880s westward from Texas into northern New Mexico and southern Colorado and passed through the Clayton area (Foster, 1983). They often camped at Apache Springs, near the current site of Clayton. Rabbit Ear Mountain was also an important landmark for travelers on the cattle trails.

Clayton was established near Apache Springs about 1886 by Stephen W. Dorsey, a former U.S. senator from Arkansas (Julyan, 1996). Dorsey settled in the area in the 1880s and was involved in ranching and making Clayton a stop on the Colorado and Southern Railroad, a subsidiary of the Denver and Fort Worth Railroad. Earlier, Homer Byler, a storekeeper, established a Post Office near-



FIGURE 2—Clayton Lake, looking north from entrance to state park.

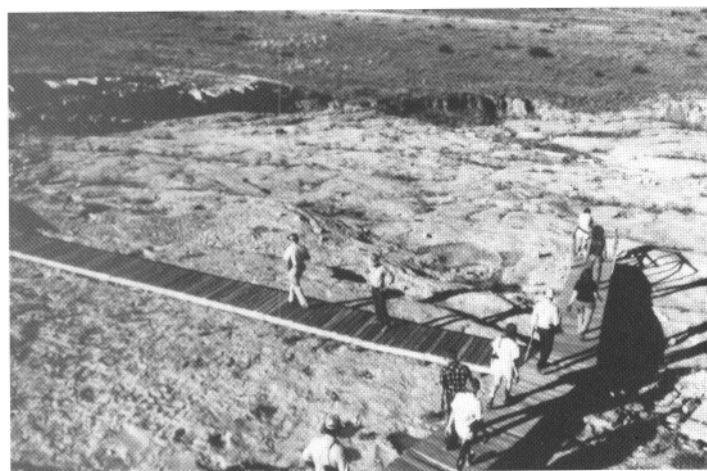


FIGURE 3—Boardwalk through the area of dinosaur tracks.

by at Perico, and about 1888 he moved it to the townsite built by Dorsey. On March 23, 1888, three days after the first train arrived on newly laid tracks, the town was renamed Clayton, in honor of Dorsey's son, Clayton Dorsey, named after Senator Clayton of Arkansas.

Clayton is also the final resting place of Thomas Edward Ketchum, better known as Black Jack. Black Jack Ketchum had a bad habit of robbing the railroad. He was tried, found guilty, and hung on April 26, 1901.

Geology

Clayton Lake State Park offers a diverse geologic setting (Fig. 1). It lies in the Raton section of the Great Plains physiographic province, which is characterized by rolling hills, flat plains, and mesas that were intruded by numerous volcanoes forming lone mountain peaks and cones of various heights above the plains. The southern end of the Raton section is formed by the Canadian escarpment, north of the Canadian River. Basalt flows from the volcanoes protected the underlying sedimentary rocks from erosion and formed the tops of the mesas and flat plains.

The uppermost mesa above Clayton Lake is formed by Quaternary basalt flows that probably erupted from Rabbit Ear Mountain (Figs. 1, 4, 5). Rabbit Ear Mountain is actually two summits that were once part of a single volcano, now largely eroded, similar in lithology and emplacement to the younger Capulin Mountain now protected as the Capulin National Monument east of Clayton. The

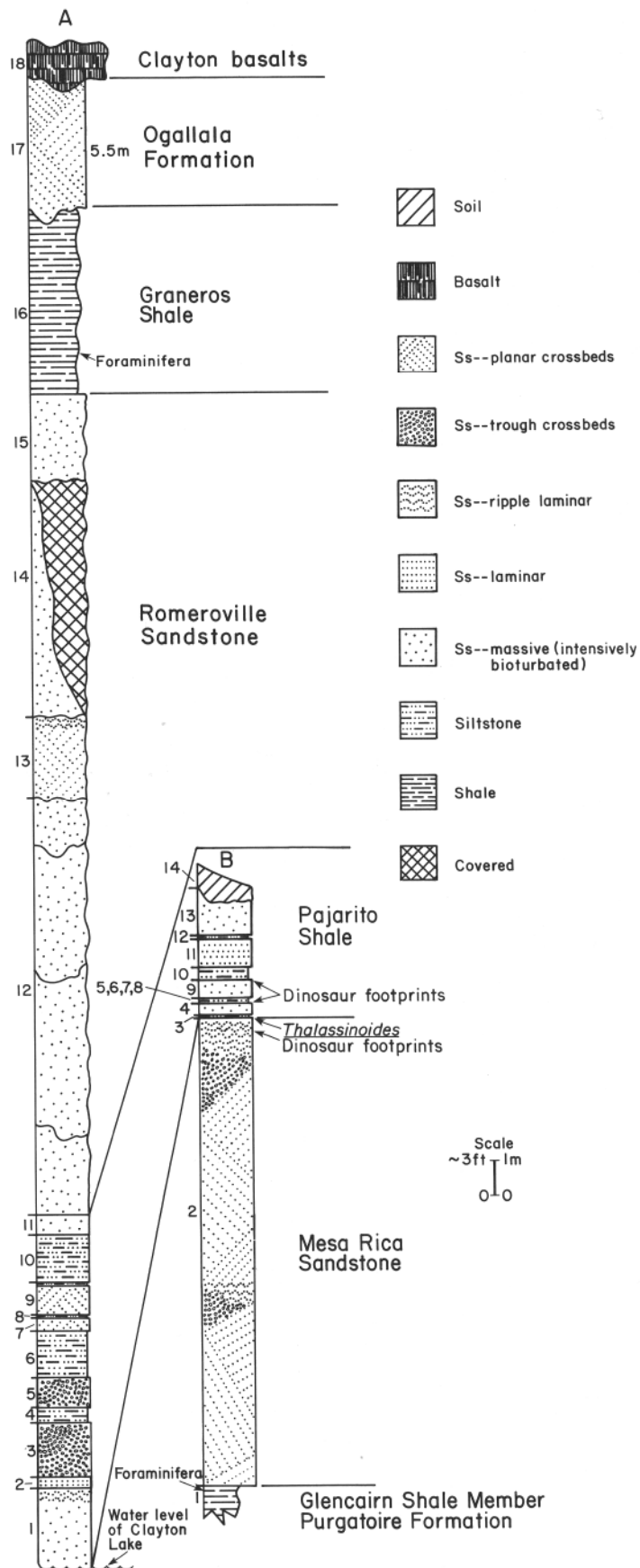


FIGURE 4—Measured stratigraphic sections at Clayton Lake State Park (from Lucas et al., 1986). See Fig. 1 for location.



FIGURE 5—Quaternary basalt overlying red mudstone of the Ogalla Formation.

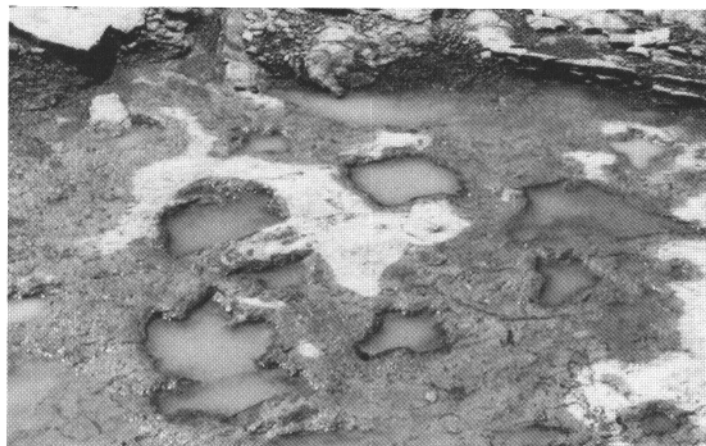


FIGURE 8—Every depression is a dinosaur track.



FIGURE 6—Trail to the dinosaur tracks begins at a parking lot and crosses Clayton Dam.



FIGURE 9—Worm burrows.

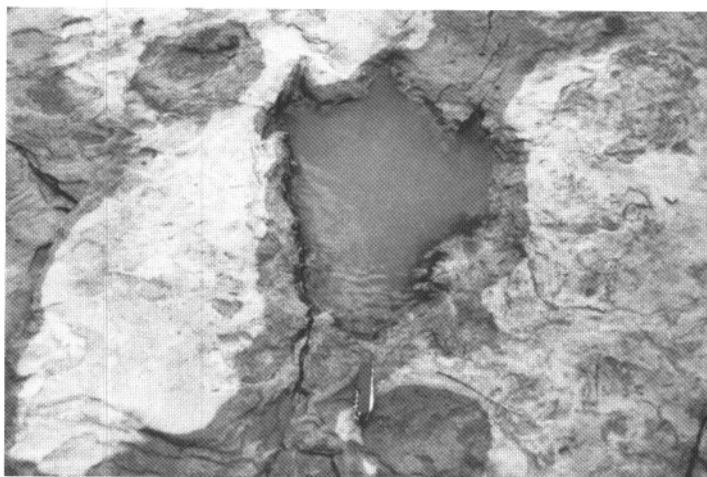


FIGURE 7—Kite-shaped tracks were made by dinosaurs with claws or webbed toes, walking on their heels.

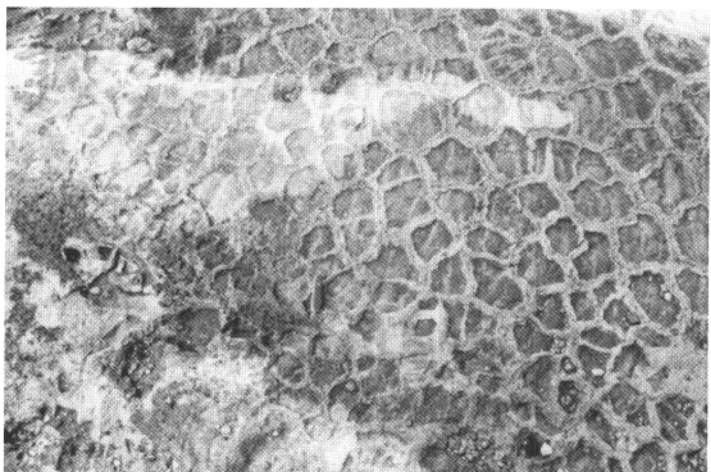


FIGURE 10—Mud cracks, indicating exposure to the air.

basalts were erupted as continuous flows 9 to 100 ft thick composed of olivine (green spheres), plagioclase (white to clear laths), and augite (black laths) phenocrysts (mineral crystals) in a microscopic groundmass of augite, plagioclase, olivine, and magnetite. Many vesicles or small cavities or voids in the basalt formed by gas bubbles as the lava cooled. Some vesicles are filled with calcite crystals. These basalts are part of the Raton-Clayton volcanic field and are about 1.8 million years old (Stormer, 1972). As the visitor descends into the park, the contact between the basalt flow and underlying sediments can be observed along the road.

The basalt flows overlie the red to brown caliche sands of the Ogallala Formation of mid-Miocene to early Pliocene (4-12 million yrs ago) age (Fig. 5; Frye et al., 1978). The Ogallala Formation is one of the most widespread units in the United States, extending from South Dakota to southern New Mexico and northwestern Texas, forming the Llano Estacado. It is the primary reservoir of ground water throughout the region that is responsible for man changing the appearance and character of the Great Plains. The Ogallala is 0-15 ft thick at Clayton Lake and consists of eolian sand and silt and fluvial sandy clay, siltstone, sandstone, and local gravel derived from the Rocky Mountains about 4-12 million yrs ago (Reeves, 1971; Hawley, 1984). Caliche beds are common throughout the unit. Caliche is composed of fractured and permeable deposits of gravel, sand, silt, and clay that is cemented by calcium carbonate (McGrath and Hawley, 1985).

The Ogallala Formation unconformably overlies the Cretaceous Graneros Shale, which forms covered slopes in the park. The Graneros Shale is predominantly gray shale found in local arroyo cuts and was deposited by the Cretaceous marine sea about 97.591 million yrs ago. Local invertebrate microfossils shaped like grains of rice, called Foraminifera, are found in the shale beds and confirm the Late Cretaceous (Cenomanian) age (Lucas et al., 1986).

The Graneros Shale unconformably overlies the Cretaceous Dakota Group. The Romeroville Sandstone, the upper unit of the Dakota Group, consists of a thick quartzose sandstone unit that forms the lowest benches along the lake. It is yellowish orange to brown, fine to coarse grained, poor to well sorted, and bioturbated. Crossbeds and ripple marks are common locally, indicating fluvial deposition. Most of the beds surrounding the lake and above the spillway belong to the Romeroville Sandstone.

The Romeroville Sandstone overlies the Pajarito Shale. The Pajarito Shale, the middle unit of the Dakota Group, is approximately 12 ft thick and consists of interbedded gray silty shale, shaly siltstone, and quartzose sandstone (Lucas et al., 1986). The upper two horizons of dinosaur footprints are in the Pajarito Shale.

The Pajarito Shale overlies the Mesa Rica Sandstone, the basal unit of the Dakota Group. The Mesa Rica Sandstone is approximately 40 ft thick and consists of grayish-orange, medium- to coarse-grained, poorly sorted, quartzose sandstone (Lucas et al., 1986). Local beds contain crossbeds and ripple marks, indicating fluvial deposition. This unit also contains the stratigraphically lowest horizon (oldest) of dinosaur footprints. It overlies a micaceous shale belonging to the Cretaceous Glencairn Shale.

The most exciting geological feature at Clayton Lake State Park is the dinosaur footprints found in sandstone at the dam spillway about 1982 (Figs. 1, 6). Approximately 500 tracks of at least three species are found at the spillway; most of them pertain to ornithomimid dinosaurs (*ichnogenus Caririchnium*) and theropods (Hunt and Lucas, 1996). The dinosaurs ranged in size from a baby Iguanodont that was approximately 1 ft long to adults that were 30 ft long. Most of the tracks are of bipedal herbivores or plant eaters (Iguanodonts or Hadrosaurs). The kite-shaped tracks were made by Iguanodonts walking in wet mud (Fig. 7, 8). Worm borrows (Fig. 9), fossilized impressions of plants, ripple marks from waves, and mudcracks (Fig. 10) are also common.

These tracks present excellent examples of the behavior of the dinosaurs. One set of prints was made by a swimming crocodile (Hunt and Lucas, 1996). Individual dinosaur tracks are along a single line, indicating that the dinosaur walked with his legs beneath him and not out to the side like modern reptiles. At one spot, the

tracks suggest that a large plant eater slipped in the mud and used his tail to keep his balance.

Earlier studies suggested that the host rocks belonged to the Romeroville Sandstone, but more detailed studies by Lucas et al. (1986; Hunt and Lucas, 1996) showed that the host rocks belong to the Pajarito Shale and underlying Mesa Rica Sandstone, both of which are older than the Romeroville. These stratigraphic studies suggest that the footprints are about 91-100 million yrs old.

Summary

Clayton Lake State Park protects one of the state's unique geologic treasures; numerous dinosaur footprints and tracks are preserved at the dam's spillway and testify to creatures traveling through the area long before Native Americans, Spanish, and subsequent settlers. The park was originally established as a recreational site by the State Game and Fish Department after construction of the dam forming Clayton Lake. The park offers fishing, picnicking, camping, hiking, examining dinosaur footprints, and bird watching. It is also a refuge for water fowl in the winter.

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