

City of Rocks State Park

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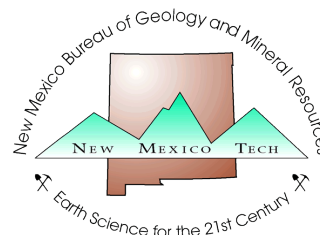
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Introduction and facilities

City of Rocks State Park is truly a geologic monument; it is formed by large sculptured rock columns (pinnacles) or boulders rising as high as 40 ft and separated by paths or lanes resembling city streets. About 34.9 million years ago a large volcano erupted, forming the rocks in an instant (geologically speaking); then erosion over millions of years slowly formed the sculptured columns that now provide a natural playground for children and adults alike. City of Rocks State Park was established in May 1952 to preserve this geologic wonder.

The park consists of 680 acres at an elevation of 5,000 ft northeast of Deming, New Mexico north of the junction of NM-61 and US-180 (Fig. 1); only 49 acres are occupied by the sculptured volcanic rocks. Facilities include camp sites, hiking trails, picnic areas, a playground, and a desert botanical garden; water and showers are also available (Fig. 2). Firewood is not available. Climbing the rocks is a favorite pastime (Fig. 3). More than 50,000 people visit the park each year during all four seasons; the winters are mild, and trees and rocks provide shade to cool the visitors during hot summers. The rocks act as baffles, preserving the solitude and quietness of the park even when it is filled with people.

City of Rocks State Park is in the Mimbres Valley of the Chihuahuan Desert, and typical desert vegetation abounds. Mimbres is

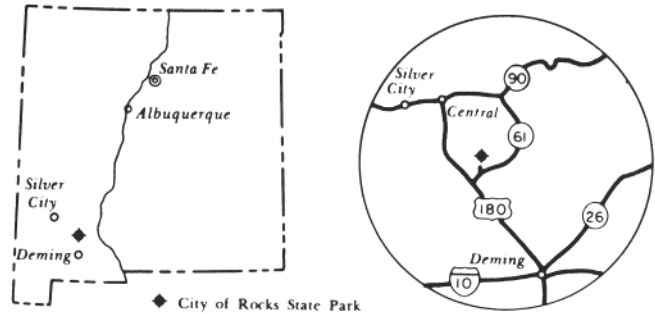


FIGURE 1—Location of City of Rocks State Park. Please note that NM-90 has been renamed NM-152.

Spanish for willow. Yuccas, cacti, ocotillo, and juniper and evergreen oak trees are common in the park (Fig. 4). The botanical garden near the entrance contains common and exotic species of desert plants, especially cacti. After a wet winter or after a rain-storm, wildflowers abound. The park is also home to many animals. At least 35 species of birds call this rock city their home, including bald eagles, golden eagles, hawks, horned owls, cactus wrens, roadrunners, and finches. Many of these birds live in cavi-

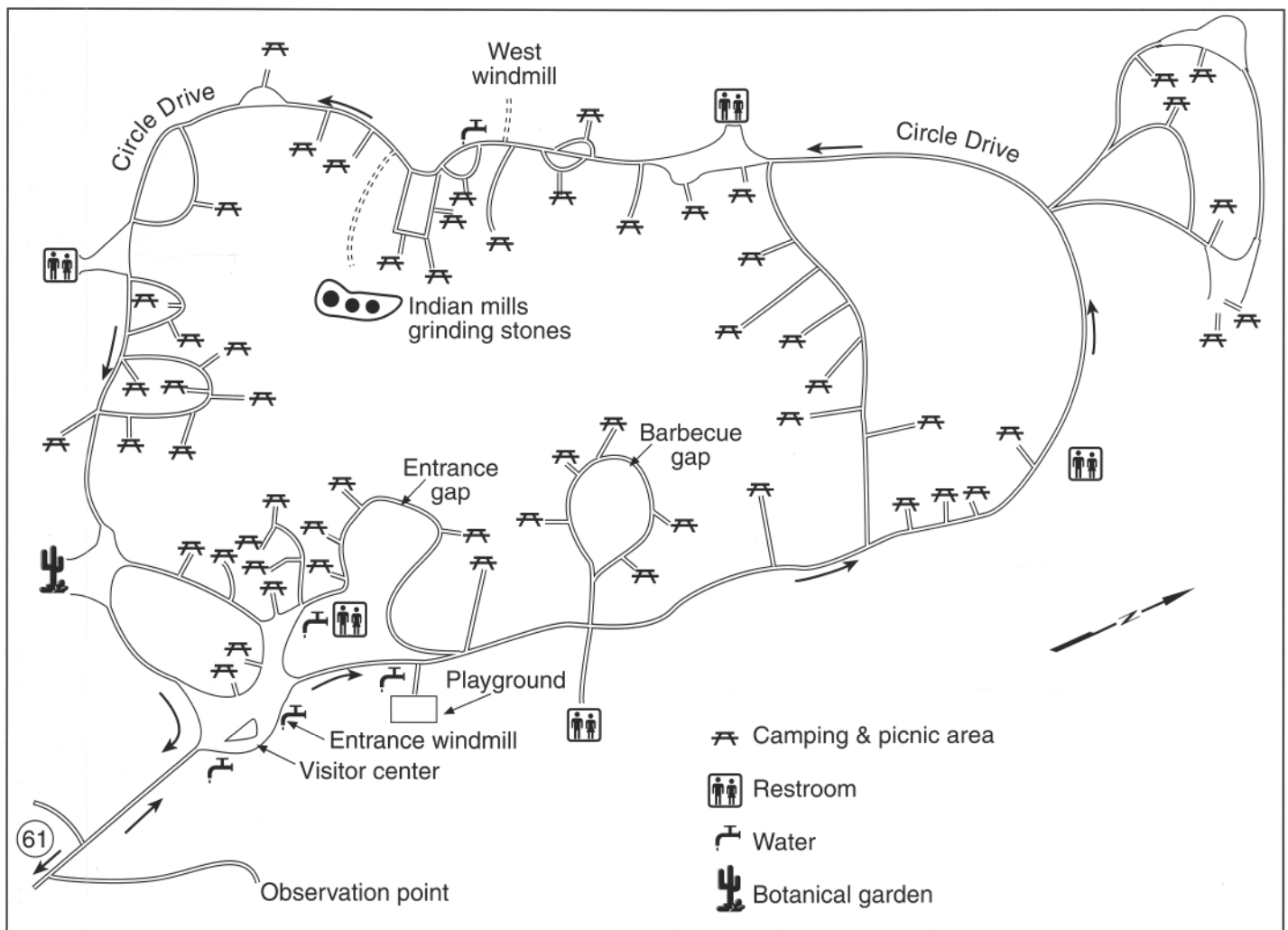


FIGURE 2—Map of City of Rocks State Park.

ties and crevasses in the rocks. Watch your campground carefully because ground squirrels, chipmunks, rabbits, or pack rats may invade and eat your supplies. Reptiles (rattlesnakes and lizards) and scorpions are also residents of City of Rocks, so keep young children close at hand.

History

Prehistoric people most likely camped thousands of years ago beneath the rocks that provided shelter from the elements and predators. The Mimbres or Mimbreno Indians settled in the area about 750-1250 AD (Weber, 1980). Arrowheads and pottery shards are still found today, reminding us of their former presence. Mortars, small smooth-sided cylindrical to conical holes, are found in the rocks along the trail in the northern part of the park (Figs. 2, 5), as well as elsewhere. These mortars are sometimes called "Indian wells" because water collects in the holes. These were formed over many years by prehistoric Indians grinding seeds with stone manos. Indian grinding stones are also found along the trails.

Later, Apache Indians moved into the area. Spanish explorers and settlers arrived in the 1500s. In 1804, Col. Manuel Carrasco, a Spanish army officer, began mining the copper at Santa Rita

(McLemore, 1996). Mule trains loaded with copper from the mine passed near what is now the state park on their way to Chihuahua in 1804-1834 (Weber, 1980).

After the Mexican War of 1846-1847, the Mormon Battalion under Captain Philip St. George Cooke blazed a trail south of the park to link newly acquired New Mexico and Arizona with the eastern United States. The mountain range southeast of City of Rocks is named Cooke's Range after Captain Cooke; the prominent peak in the southern part of the range is Cooke's Peak (Fig. 6). The Butterfield Overland Mail Route began in 1858 and passed south of the park (Weber, 1980); it ceased to operate in 1861 because of the Civil War. Fort Cummings was established in 1863 at Cooke's Spring near the park to protect travelers from Apache Indians. The fort was abandoned in 1886 when danger from the Indians ended. The railroad reached Deming in 1881 bypassing City of Rocks, although settlers coming into the area camped and picnicked at the site for decades, just as people do today.

Faywood Hot Springs lies south of City of Rocks State Park, but unlike City of Rocks, it is private property. The Mimbres Indians also left their pottery and other artifacts at this site. In the 1850s, the springs were known as Ojo Toro or Bull Spring because wild bulls would graze at the site (Julyan, 1996). Stagecoach lines stopped at the springs during the mid-to late-1800s. In 1862, Col.



FIGURE 3—The boulders offer excellent bouldering, testing climbing skills near the ground. Note the difference in shape and color of the boulder from an upper steep-sided dark gray to a lower flared cream to reddish brown, suggesting that most of the weathering occurred in the subsurface (Mueller and Twidale, 1988a).



FIGURE 4—Yucca plants in front of sculptured rocks at City of Rocks State Park.



FIGURE 5—Mortars, small smooth-sided cylindrical holes, are found in the rocks along the trail in the northern part of the park (Fig. 2).



FIGURE 6—A smaller "city" lies south of the main park and is open for day use. Cooke's Peak is in the skyline to the left.



FIGURE 7—Map of City of Rocks showing the road and vertical fracture pattern compiled from air photos (from Mueller and Twidale, 1988a).

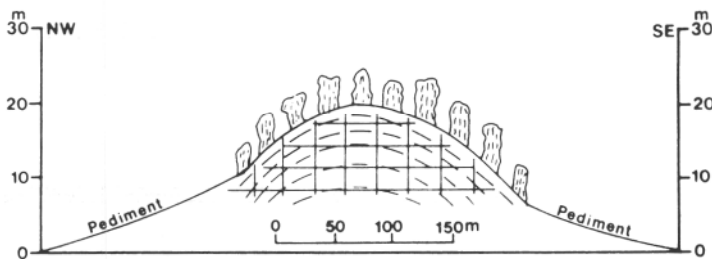


FIGURE 8—Diagrammatic section through City of Rocks (from Mueller and Twidale, 1988a). Vertical exaggeration is 6.2 times.

Richard Hudson settled in the area and built a resort at the springs known as the Hudson Hot Springs Sanitarium Company. The resort became one of the most famous spas in the west; the water was even bottled and shipped out of state (Weber, 1980). The hotel burned down in 1891. New owners, J. C. Fay and William Lockwood, rebuilt the complex and renamed it Faywood after both men. The new hotel could accommodate 100 guests. Visitors traveling on the Atchison, Topeka, and Santa Fe Railroad could disembark at Faywood Station, which is abandoned now. Eventually, the resort lost popularity, and by the 1950s it was closed and abandoned.

Geology

The rocks forming City of Rocks are predominantly ash-flow tuffs or ignimbrites that formed by a violent volcanic eruption of pumice, volcanic ash, gas, and coarser material. The ash-flow tuff at City of Rocks is part of the Kneeling Nun Tuff, which erupted 34.9 million years ago from the Emory cauldrea (McIntosh et al., 1991). The Emory cauldrea forms much of the southern Black Range east of the park. The volcanic ash was still hot and nearly molten when it was compacted and consolidated, forming a horizontal continuous layer of hot pumice and ash. In many areas, the ash fragments in the layer were hot enough to compact and weld together, forming the solid lava-like rock exposed at the park. Cooling and contraction of the tuff formed a pattern of vertical cracks called columnar jointing; these features can be seen in the cliffs forming Table Mountain, northeast of City of Rocks.

The Kneeling Nun Tuff represents only one of dozens of huge ash-flow tuff eruptions that occurred between 36 and 24 million years ago in southwest New Mexico. Many of these eruptions were larger than any eruptions known from recorded human history; the Kneeling Nun Tuff eruption was more than one thousand times larger than the 1980 eruption of Mt. St. Helens. Three other ash-flow tuffs, ranging in age from 34.4 to 33.4 million years (McIntosh

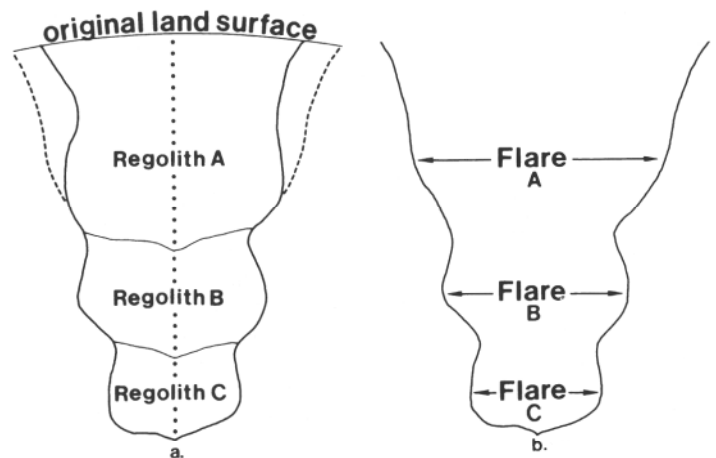


FIGURE 9—Episodic development of flared slopes along a deeply weathered boulder (from Mueller and Twidale, 1988a).

et al., 1991), are exposed on the slopes of Table Mountain, immediately north of City of Rocks State Park. The source calderas for some of these ash-flow tuffs were south of Lordsburg, N.M.

The ash-flow tuff that forms City of Rocks is of rhyolite composition. A close look will reveal phenocrysts or mineral grains surrounded by a finer groundmass or matrix. The shiny, black laths are hornblende crystals. The platey black crystals are biotite. The grayish-white to clear rounded crystals are quartz. White to clear, glassy laths or cubes are feldspar crystals. The matrix is too fine grained to be seen with the naked eye, but a microscope reveals that it is comprised of small grains of pumice (volcanic glass or ash), feldspar, quartz, and hornblende.

Some of the larger, clearer feldspar crystals are potassium-rich sanidine, an ideal mineral for dating with the $^{40}\text{Ar}/^{39}\text{Ar}$ method. Very precise ages have been determined for ash-flow tuffs in the City of Rocks area by using a CO_2 laser to melt single sanidine crystals and release argon gas, then measuring argon isotopes in a mass spectrometer (McIntosh et al., 1991). These ages range from 35.2 million years for an ashy sandstone beneath the Kneeling Nun Tuff to 33.4 million years for the ash-flow tuff that forms the top of Table Mountain. The precise age determinations help in understanding the history of this sequence of rocks, originally mapped as Sugarlump Tuff by Elston (1957) and Seager et al. (1982).

The "streets" in City of Rocks are formed by orthogonal fractures (Figs. 6, 7; Mueller and Twidale, 1988a, b). More than one mechanism formed the fractures that trend north-northeast, east-northeast, and northwest (Figs. 7, 8; Mueller and Twidale, 1988a, b). Some fractures may be columnar jointing formed as a result of cooling; others may be associated with the release of gravitational load as younger overlying rocks were eroded (Mueller and Twidale, 1988a, b). Some fractures may have formed during erosion.

Weathering of the ash-flow tuff at City of Rocks, in part by freeze-thaw action and wind, formed the rocks as we now see them. Water seeps into the cracks, expands upon freezing, and widens the crack. Vegetation grows in the cracks and further widens the crack. Wind removes the finer-sized material. Although the surficial weathering processes are important, the difference in shape and color of the rocks from an upper steep-sided dark gray to a lower flared cream to reddish brown suggests that much of the weathering occurred in the subsurface (Fig. 3; Mueller and Twidale, 1988a, b). Subsurface weathering by water and humic acids in the soil horizon slowly dissolved and eroded the rocks, forming the flared bottoms. Several periods of weathering occurred as evidenced by multiple flares (Fig. 9). The combination of freeze-thaw, vegetation, wind, and surface and subsurface weathering over millions of years finally produced the landforms known today as City of Rocks. Surface runoff has stripped the former soil mantle and revealed the bare rock below. The rocks at City of Rocks are actu-

ally columns or pinnacles because they have weathered in place and have not been moved. Boulders are detached blocks of rocks that gravitational forces have moved.

Summary

City of Rocks is the largest of several intricately sculptured groups of ash-flow tuffs in southern New Mexico (Mueller and Twidale, 1988a, b) and has been protected as a state park since 1952. About 35 million years ago, a large volcanic eruption formed the rocks in an instant (geologically speaking), then erosion over millions of years slowly formed the sculptured columns that now provide a natural playground for children and adults alike. The park is in the Chihuahuan Desert, and facilities include camp sites, hiking trails, picnic areas, a playground, and a desert botanical garden. It is well worth a visit any time of the year; the winters are mild, and trees and rocks provide shade to cool visitors during hot summers.

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