

OKLAHOMA

ROCKS!

State Parks 2.0

Oklahoma is currently home to 39 state parks. These parks are located across Oklahoma and showcase a vast array of geological features. In this issue of Oklahoma Rocks! we will visit 5 of these state parks and learn about the specific landscape of each.

Black Mesa State Park

Great news for people who love to embrace the great outdoors, our state is full of many wonderful natural attractions. Oklahoma is a relatively low state, with the high point only being 4,973 feet above sea level at the Black Mesa Nature Preserve. This preserve encompasses roughly 1,600 acres of land traced with trails for visitors to enjoy. Rare flora and fauna are prevalent, including 23 rare plants and eight rare animal species. This is because the Rocky Mountain biome meets with that of the prairies. Most of the animals here are at the limits of their natural habitats, making the area truly unique. For those that love nature, but would rather not be "in it", there is a 4.2-mile one-way road that illustrates the beauty and diversity of the preserve. On the trail, visitors will begin in the Sloan Canyon Formation and Sheep Pen Sandstone (Triassic age, 251-199 million years [Myr]) that are rich in small fossils like dinosaur teeth and small bones. The beds then transition into sand dunes of the Jurassic Exeter Formation, which gives way to the Jurassic Morrison Formation. The Morrison Formation was deposited in lakes and by slow-moving, silt heavy rivers. This gradual and consistent deposition allowed a diverse collection of smaller bones and teeth to be preserved.



Between 1935 and 1942, J.W. Stovall was working at the fledgling Oklahoma Museum of Natural History and opened 17 dinosaur bone quarries in this area; one is along Hwy 325 southeast of the preserve. In this quarry alone, 3,500 bones were discovered, including those from Apatosaurus, Stegosaurus, Saurophaganax Maximus (Oklahoma's State Fossil), and others. The University of Oklahoma is currently assisting in the excavation of a new quarry.

The final section of bedding exposed on the preserve trail is three prominent Cretaceous Period layers: Cheyenne Sandstone, Kiowa Shale, and Dakota Sandstone. The most interesting of these is the Cheyenne Sandstone because of the petrified logs that can be up to 85 feet long! Also, if one day is not enough to explore at the Black Mesa, there is a beautiful

campground on site that has great fishing opportunities! The trail to the top crosses rocks that record about 115 Myr of the panhandle's geologic history and ends on a lava flow that erupted only 5 Myr ago. Five million years ago, a volcano 35-miles west of present-day Black Mesa erupted, the lava flowed east, away from its eruption point and left a different type of meandering line on the primarily sedimentary landscape. Geologically speaking, five million years is a very short time. Erosion is continuous, but the rates at which rocks erode can vary drastically. At the time the lava erupted, it was at the bottom of a valley. However, the rock that created the valley was much more susceptible to weathering and erosions than the lava flow. As the "softer" walls of the canyon eroded, the bottom stayed as it was. The erosion continued but the lava flow resisted weathering and erosion. The lava flow is still resisting today, as the highest point in Oklahoma. Dakota Sandstone, which is 105 Myr, holds secrets of ancient river beds and even dinosaur footprints. There is also the outlaw hideout at Robbers Roost that was used by Captain William Coe and his band of outlaws in the 1860's!

Lake Eufaula State Park

There is something refreshingly special about jumping into cool water on a hot summer day. Many people in Oklahoma live on or near a large body of water. "Hey do you want to go to the lake on Saturday?" friends invitingly ask. However, that is not always where they go. They actually go to man-made reservoirs! Lakes occur naturally in five major regions of the United States: the Upper Midwest, Northern Appalachians, Temperate Planes, Coastal Planes, and the Western Mountains. Lakes are formed over long spans of time, and their history stems from a geological standpoint. On the other hand, reservoirs are man-made and their history is recent enough to be documented on paper. Reservoirs can be created for a variety of reasons, like generating renewable energy from the dam, or regulating water for irrigation purposes, or even protecting structures downstream that are in the flood plain. Areas that do not receive enough rainfall to support crop growth on their own can take advantage of reservoirs by minimizing water flow during wet seasons and increasing the water level. On the other hand, during a time of drought, the reservoir can let out more water so that the communities below do not experience as intense of a dry season. Compared to lakes, reservoirs

have a larger zooplankton population, more total phosphorus, higher chlorophyll risk, and excess lakeshore disturbance. Lakes commonly exhibit more total mercury and methylmercury, which is a dangerous type of mercury pollution. When mercury is released, it eventually settles into the bottom of the drainage basin. Bacteria in the water can then change the already dangerous mercury into methylmercury, which is then absorbed by tiny organisms.

In 1964, the United States Corps of Engineers completed a 975-meter long dam, stoppering the Canadian River in Eufaula, Oklahoma. This dam would hold over four hundred square kilometers of water back to create Eufaula Lake. Now known as Lake Eufaula, it is a popular recreational attraction, boating, water sports, fishing, and camping are common attractions. Years ago, before the water levels rose drastically due to the dam, there was a large sandstone boulder called "Standing Rock." Some people say it was 25 feet tall, while others exclaim it was over 60 feet of rock standing straight up into the air. The legend of "Standing Rock" goes back to the very first white settlers in the region. Tribal stories tell of many Spanish settlers coming into the area and becoming so sick that they could no

longer carry their gold. So, they buried piles of gold and valuables under the rock and marked it with a turtle and a triangle. Some interpreters believe that these symbols meant "disaster" which would make sense because the Native American legend ends with all of the settlers dying from sickness.

This year, Oklahoma received record amounts of rain and the reservoirs were affected by the influx of flow. Boaters were leery of going out on the lake because of the shift in underwater trees and not being familiar with where the beaches began. Fish spawning times were affected which altered the usual routine of folks who were fishing. On the shore, new bedding was exposed and small fossilized snails, cephalopods, and brachiopods are prevalent all along the lakeshore. Reservoir or lake, Eufaula has many opportunities to visit, stay, and learn!



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Little Sahara State Park

Maybe the Saharan Desert is a little too far away for a weekend trip, but good news! There are natural sand dunes in Little Sahara State Park that is located in northeast Oklahoma, south of Waynoka. The Little Sahara's sand dunes are one of the most unique, scenic areas in the State of Oklahoma. The dunes formed about 11,000 years ago. This was the end of the Pleistocene epoch. Glaciers reaching down through North America went as far down as Kansas. Rivers formed by glacier runoff meandered into the Gulf of Mexico. The Cimarron River in Oklahoma was formed during this time. The deposits this ancient Cimarron River left behind were quartz sand that the dunes are made up of.

The migration of the dunes have caused US Highway 287 to be moved east three times since 1940. Geologists have measured the migration of the dunes to be a foot per year. Little Sahara was originally a city park founded in the early 1950s before becoming a state park in the 1960s.

Little Sahara is known as one of the best ATV riding spots in the Midwest! Riding dune buggies is the best way to see the state park. There are over 1,600 acres of dunes dedicated to off-roading. Sand dunes at Little Sahara can reach heights of 75 feet! The park brings in over 100,000 off-road vehicles each year. It costs only \$10 a day for drivers and passengers that visit to drive on the sand dunes, and passengers

under 10 are free! You can bring your own, or rent a buggy from an outside vendor.

Little Sahara is equipped with RV hook up sites and 143 tent sites with basic amenities like showers and electricity.

Angle of Repose Experiment.

The angle of repose is the angle that sediment grains can rest at. Sand has a very unique angle of repose of 30 to 35 degrees. When you visit Little Sahara State Park, you can measure the angle yourself!



Roman Nose State Park

Roman Nose State Park is a 540-acre state park located in central Blaine County just outside Watonga. The state park is within the Roman Nose Canyon Valley system. It is one of the seven original Oklahoma State Parks. The park offers a wide range of activities like an 18-hole golf course, swimming pools, hiking trails, two lakes, trout fishing (in season), canoeing, paddle boats, mountain biking, horse stables and hayrides by reservation.

Roman Nose is also home to some gypsum caves. At Big Spring, rain water falling in the area above the spring seeps into the ground and dissolves some of the underlying gypsum to form caves. The caves are sources for springs which emerge on hillsides and form springs; at Big Spring, hundreds of gallons per minute of highly gypsiferous water flows to the surface 24-7.

220 million years ago the land where the state park now lies was under a



shallow sea extending up from the Gulf of Mexico. Sediment was deposited into the shallow sea. The deposited sediment became shale rock. When the sea evaporated large deposits of gypsum, anhydrite, and dolomite formed. Clam shell fossils are often found in the shale and salt layers.

Underground water seeps through cracks and reaches the evaporite deposits. The water dissolved the salts and creates caves and chasms. Little,

Big, and Middle Springs at the park are natural springs from groundwater seeping through the rock formations. At the end of the Permian Period the deposits were elevated above sea level and rivers and streams eroded canyon and valley features into the area.

Sink holes occur in the area as well, they form because groundwater dissolves rock producing caves and the overlying rock collapses.

1) What are some other uses for gypsum? The chemical formula for gypsum is $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ or hydrated calcium sulfate. Does your bread or toothpaste at home contain gypsum?

2) Use resources such as books and the Internet to learn where gypsum is found, what it looks like, and how it's used by humans.

Great Salt Plains State Park

The Great Salt Plains State Park lies about 8 miles north of Jet, OK, and serves as a gathering place to enjoy all of nature's wonder. The state park lies right next to the Great Salt Plains Lake, a tourist attraction for all sportsmen who partake in boating, fishing, or other watersports. However, the state park is not only good for sportsmen as the Salt Plains hold a treasure trove for the geologically inclined. The Great Salt Plains has its quirks, such as the management actually encouraging visitors to take home an hourglass selenite crystal as a souvenir. The crystals, in their purest form, are made from a mineral known as gypsum, ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) or Calcium Sulfate Dihydrate. The two water molecules in its chemical formula are what make gypsum unique, as without them, the chemical structure is the same as anhydrite. For those who are new to geology, gypsum is the second softest material on Moh's hardness scale. Gypsum is so soft, in fact, that its surface can be scoured by keratin, the material your fingernails are made of.

The original layer of selenite is suspected to have been formed when the water level of a shallow ocean repeatedly rose and receded many years ago. Obviously, in present day Northern Oklahoma, the crystals no longer have an ocean to recede and leave a thin layer of salt behind to help them grow and replenish. Because of this, someone might ask, "Why isn't the park worried about crystal depletion, since



they're inviting people to come take the crystals home?" While this is a completely reasonable question to ask, it's not a concern the park has because new crystals are grown every day by the saline groundwater just a few feet below the surface of the salt bed. When this groundwater comes into contact with gypsum, new crystals are seeded, and as the water evaporates the gypsum is left behind, growing the crystals. The real attraction to these crystals comes not from how they were formed, or why they formed, but the shape they formed into, as Oklahoma's Great Salt Plains is the only documented area in the world that selenite crystals in the shape of an hourglass can be found. This makes the crystal dig area one of the most popular attractions of the plains.

While the Salt Plains Crystal Dig is the most famous attraction of the park, the area has plenty of activities for a family day trip if one gets tired of digging for

crystals. Adjacent to the dig is a dammed saltwater lake, which, amazingly, is home to numerous species of freshwater fish such as channel catfish and saugeye. The lake has been prone to mass fish kills, due to a reduced water level, and consequential higher brine concentration. Most of the lake is not suitable for watersports, as it has an average depth of four feet, which would be dangerous to operate many large marine motors in. However, closer to the dam, the lake is much deeper and suitable for more high-octane activities.

As bright and fun as the Great Salt Plains State Park and surrounding area are, the history of the area is just as interesting. This is because the land was granted to the Cherokee Tribe in the Treaty of New Echota after years of battles because of the value of salt at the time. The Cherokees petitioned for the opportunity to lease the Salt Plains to private investors, but this venture fell through, and the area was converted into a state park.

1) Go online and read more about the Great Salt Plains. This is one of the few natural places where visitors are encouraged to collect souvenirs – in this case hourglass selenite, Oklahoma's State Crystal. What are Oklahoma's State Fossil and State Rock?



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