

High Plains: Rocks and Minerals

In Kansas, the High Plains region comprises almost all of the western one-third of the state. It is an area of vast flatlands and gently rolling hills, with topographic relief largely restricted to streams and river valleys, such as the Arikaree Breaks in Cheyenne County or along the Cimarron River in Seward County.

The High Plains developed on sediments that originated in the Rocky Mountains to the west. The Rocky Mountains were formed by deformations of the earth's crust at intervals during the last part of the Cretaceous Period and continuing into the Tertiary Period, which lasted from approximately 66 to 1.6 million years ago. By late Tertiary time, just a few million years ago, the Rockies were being eroded by wind and water. Streams flowing eastward out of the Rocky Mountains were full of sand, gravel, silt, and other rock debris. Over millions of years, this mass of eroded material filled the stream valleys and eventually covered the hills, creating a huge, gently sloping floodplain. The remnants of that region (which extends far beyond the Kansas border) is the region we call the High Plains.

The great wedge of sand and gravel that lies below the surface is the Ogallala Formation. The Ogallala is made up of the unconsolidated deposits (sands, gravels, clays, and other materials) that eroded off the face of the Rockies. Some of this material was cemented together to form porous sandstones, which are known as mortar beds. Most of the Ogallala is underground, but it crops out in many places, such as at Scott County State Lake. The Ogallala is one of the chief sources of ground water in western Kansas.

The High Plains get less precipitation than other parts of the state, averaging between 15 and 25 inches a year. The combination of low precipitation, windiness, and abundant sunshine makes for a dry, or semiarid, climate in much of the High Plains. Short, drought-tolerant grasses cover the uncultivated areas, trees are scarce, and desert-type plants (such as cactus and yucca) are common.

Rocks and Minerals

Loess.—Loess covers much of the uplands in northern and western Kansas, concealing many of the rocks near the surface. Loess is a finely ground silt that is deposited by the wind. In the High Plains of Kansas, loess was deposited by the wind during the glaciations of the past million years. This finely ground silt was formed as glaciers advanced over the continent, pulverizing rocks and sediments in their path. When the glaciers melted, this silt



Elephant Rock in northwestern Decatur County is an eroded outcrop of the Ogallala Formation.

was deposited on the floodplains by streams coming from the melting ice sheet. Geologists think that temperature differences between the snow-covered regions to the north and the bare ground to the south may have created large differences in atmospheric pressure, which produced strong winds capable of moving large amounts of silt a considerable distance.

More than 90 percent of the soil in Thomas, Sherman, Cheyenne, Greeley, Wichita, Scott, Hamilton, and Lane counties has developed in loess deposits. In some places the loess has been eroded away by streams. The resulting draws and canyons have extremely steep sides. Loess can maintain a nearly vertical face without slumping or caving in. Along the Arikaree River in Cheyenne County, canyons carved into thick loess deposits form a rugged landscape called the Arikaree Breaks.



Arikaree Breaks, Cheyenne County.

Sandstone.—A common sedimentary rock, sandstone is made up largely of quartz grains that are held together by some natural cement such as calcium carbonate, iron oxide, or silica. In the High Plains, the most common rock in the Ogallala Formation is a porous sandstone made up of quartz and feldspar grains that are cemented by very fine-grained calcium carbonate. Because these rocks look like concrete, they are known locally as mortar beds. Sandstones in the Ogallala crop out in the bluffs around Scott County State Lake and near the town of Cedar Bluffs in Decatur County.

Another kind of sandstone—a hard, dense, gray-green rock—also occurs in some parts of the Ogallala Formation, especially in southern Phillips County, but also in Graham, Hodgeman, Ness, Norton, Rawlins, Rooks, and Smith counties. The sandstone is cemented with opal. This opaline sandstone is occasionally used as a building material.

Opal.—Opal is found in the Ogallala Formation in Clark, Ellis, Logan, Ness, and Rawlins counties. Opal consists of silicon dioxide (SiO₂), like quartz, plus an indefinite amount of water. It never forms as crystals and cannot be scratched by a knife, though it is slightly softer than quartz.

Kansas opals are not the precious variety. The opals from the Ogallala may be colorless, white, or gray and are found with a white, cherty calcareous rock. Some of it is called “moss opal” because it contains an impurity (manganese oxide) that forms dark, branching deposits like small mosses in the opal. Moss opal has been found in Trego and Wallace counties.

Jurassic Rocks.—The Jurassic Period occurred between 208 and 144 million years ago, just before the Cretaceous Period. During the Jurassic, sandstones and shales were deposited over the western one-third of Kansas. These Jurassic formations were then covered during the Cretaceous and are found only in the subsurface, except at a few locations in the southwest corner of the state. One of these, known as Point of Rocks, overlooks the Cimarron River in west-central Morton County. This outcrop of Jurassic and Tertiary rocks is capped by the Ogallala Formation.

Places to Visit

Arikaree Breaks.—The rugged landscape of the Arikaree Breaks was carved by water in the windblown loess deposits that blanket this part of the High Plains. To see the Breaks, take Kansas Highway 27 north of its junction with U.S. Highway 36 (the junction is two miles west of the town of St. Francis).

Scott County State Lake.—This is a good place to see outcrops of the Ogallala Formation, which is an important underground aquifer throughout the High Plains. Here at Scott Lake, the Ogallala crops out at the surface as hard, dense sandstones cemented with calcium carbonate, known locally as mortar beds. At the south end of the park, the Ogallala forms a long ridge called Devil’s

Backbone. For more information, contact Scott County State Park, 520 W. Scott Lake Drive, Scott City, KS 67871-1075 (316-872-2061) or visit the Kansas Department of Wildlife and Parks website at

<http://www.kdwp.state.ks.us/parks/parks.html>.

Point of Rocks.—Located in Morton County, Point of Rocks is one of the few places where Jurassic rocks are exposed at the surface in Kansas. Capped by the Ogallala Formation, Point of Rocks was an important landmark on the Santa Fe Trail’s Cimarron Cut-off (known as the Dry Route). Near this landmark, Middle Spring offered a reliable source of water to thirsty travelers. Numerous wagon ruts are still visible in the vicinity. Point of Rocks is located west of Kansas Highway 27, about 10 miles north of the town of Elkhart in the Cimarron National Grasslands.



Point of Rocks, Morton County.

Fick Fossil and History Museum.—This museum features Cretaceous fossils, most of which were collected within a 50-mile radius of Oakley. Included in the fossil exhibits are sharks’ teeth, mosasaurs, and plesiosaurs, as well as other representatives of the Cretaceous seas. The museum also houses exhibits of mammalian and plant fossils, rocks and minerals, and archeological pieces. The museum is open year-round, Mondays through Saturdays, 9:00 to 5:00; from Memorial Day to Labor Day, it is also open Sundays, 2:00 to 4:00 pm (785) 672-4839.

Sources

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