

Red Hills: Rocks and Minerals

The rugged topography of the Red Hills doesn't fit the stereotypical portrait of the Kansas landscape. Located in southern Kansas, mostly in Clark, Comanche, and Barber counties, the Red Hills are part of the Permian deposits that geologists call red beds. They get their color from iron oxide (rust), which turns bright red when exposed to oxygen.



Permian red beds in Clark County.

During the latter part of the Permian Period, about 260 million years ago, several thousand feet of brick-red shales, siltstones, and sandstones—along with interbedded layers of gypsum and dolomite—were deposited in Kansas. These Permian deposits have been exposed by erosion along the southern border of the state, forming a series of relatively flat-topped red hills, capped by light-colored gypsum or dolomite.

The Red Hills were known as the “Medicine Hills” to the Plains Indians, who called the major stream that flows from them the “Medicine River.” They believed that spirits in the hills and streams helped to cure their illnesses and hastened the healing of wounds. In fact, the Indians were on the right track: the waters of the springs and streams contain calcium and magnesium sulfates and other natural salts dissolved from the abundant gypsum and dolomite deposits in the region. Many of these chemical compounds have therapeutic and healing effects. For example, before antibiotics were discovered, a solution of magnesium sulfate, better known as Epsom Salts, was used to draw infection from wounds and to promote healing.

Sinkholes are common features of the Red Hills region. These sinkholes were probably formed by the dissolution

of salt and gypsum beds several hundred feet below the surface. The land above then collapsed into the empty space, leaving a dip or sinkhole at the surface. Big Basin and Little Basin are two well-known sinkholes in western Clark County.

Common Rocks and Minerals

Gypsum.—A common mineral in Kansas, gypsum is calcium sulfate with two molecules of water ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$). (Calcium sulfate without water is the mineral anhydrite.) It is colorless or white to light gray (or, rarely, bright red), and is so soft that it can be scratched by a fingernail.

Gypsum is divided into three varieties. The first, selenite, consists of flat, clear, diamond-shaped crystals. Excellent selenite crystals can be found throughout the Red Hills.

Another variety of gypsum is called satin spar. It is white or pink, fibrous, and has a silky luster. It is found as thin layers in beds of rock gypsum and in certain shales. The third variety, called massive or rock gypsum, is common in the Red Hills.

Rock gypsum is coarsely to finely granular, white to gray, and contains varying amounts of impurities. A good outcrop of rock gypsum, part of the Blaine Formation, can be seen near milepost 213 on U.S. Highway 160, about 10 miles west of Medicine Lodge. The Blaine Formation, which includes layers of gypsum, dolomite, and red shale, is the source of the massive gypsum that is mined near Sun City in northwestern Barber County. The Gyp Hills near Medicine Lodge take their name from the gypsum in the Blaine Formation.

The Red Hills are home to numerous caves that have formed in the gypsum. In Barber County alone, there are 117 such caves. These caves are among the youngest in the state, and because they are formed in soft gypsum, they will be among the first to crumble and wash away. Closely associated with the caves are features called natural bridges. In the Red Hills, natural bridges form when a cave collapses but a section of the cave roof remains standing. South of Sun City are the remains of a



Satin spar.

natural bridge that collapsed in 1964. Before its collapse, the bridge was 35 feet wide and 55 feet long and stood 12 feet above the stream that cut through it.

The gypsum in the Red Hills (and throughout the state) was deposited during the Permian, when an arm of the inland sea was cut off from the main body of the ocean. That sea evaporated, leaving behind thick layers of sodium chloride (salt) and calcium sulfate (gypsum and anhydrite). These deposits are called evaporites, because they formed from the evaporation of water.



Gyp Hills, Barber County.

Anhydrite.—Made up of calcium sulfate (CaSO_4), anhydrite occurs commonly as light-gray crystalline masses, though some has a fibrous structure. It also occurs as individual crystals, particularly in dolomite. It has a glassy luster, and is translucent. It is harder and

heavier than gypsum; it can be scratched with a knife but not with a fingernail. Anhydrite may change into gypsum if it comes into contact with water, a common occurrence in near-surface exposures.

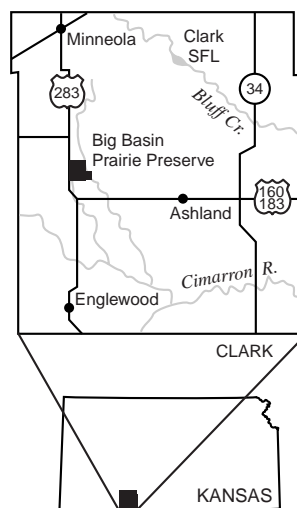
In the Red Hills, anhydrite is found in Permian deposits associated with gypsum, dolomite, and red silt. It is mined along with gypsum near Sun City in northwestern Barber County.

Dolomite.—A sedimentary rock, closely related to limestone, dolomite is made up of calcium magnesium carbonate, $\text{CaMg}(\text{CO}_3)_2$, whereas pure limestone is made up of calcium carbonate without the magnesium. Dolomite is a fine- to coarse-grained rock that is generally gray or light in color in its unweathered state; it weathers to a buff or tan color when exposed to the elements. It is used in much the same way as limestone.

In Kansas, dolomite is not nearly so common at the surface as limestone. In the Red Hills it is found in the Day Creek Dolomite, a formation that is about two-and-a-half feet thick in Clark County. This dolomite, which crops out at Clark County State Lake, formed in the enclosed evaporating basin of the Permian sea.

Places to Visit

Big Basin and Little Basin.—Two of the best known sinkholes in the Red Hills are Big Basin and Little Basin, located in western Clark County within the Big Basin



Big Basin Prairie Preserve.

Prairie Preserve. Big Basin is about one mile across and 100 feet deep. Little Basin is about 280 yards in diameter and 35 feet from rim to floor. Both probably were formed by the solution of salt and gypsum beds several hundred feet below the surface. From the age of the rocks in the basin walls, geologists estimate that Big Basin formed fairly recently (in geologic time, that is), probably within the last few thousand years. A spring in the floor of Little Basin, St. Jacob's Well, is one of several springs found in the

hills east of U.S. Highway 160. The entrance to the preserve is off U.S. Highway 160-283, about 15 miles northwest of Ashland or 15 miles south of Minneola.

Gyp Hills Trail.—This road winds through some of the rugged territory in Barber County. A starting point, which leads south from U.S. Highway 160, is about 3 miles west of Medicine Lodge.

Clark County State Lake.—Situated in northeastern Clark County, the lake is in a deep canyon created by Bluff Creek. This is a good place to see a variety of rock formations, including the Ogallala Formation mortar beds, Day Creek Dolomite, and Permian red beds.

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