

## Flint Hills: Rocks and Minerals

The Flint Hills are familiar to many travelers since this part of the state is traversed by both I-70 and the Kansas Turnpike. Despite disagreement about the exact boundaries of the Flint Hills, most geologists agree that the hills extend from Marshall County, in the north, to Cowley County, in the south. (Of course, the hills don't end abruptly at the state line; they continue into Oklahoma, where they are known as the Osage Hills.)

The Flint Hills were formed by the erosion of Permian-age limestones and shales. During the early part of the Permian Period (which lasted from about 286 to 245 million years ago), shallow seas covered much of the state, as they did during Pennsylvanian times. Unlike the Pennsylvanian limestones to the east, however, the limestones in the Flint Hills contain numerous bands of chert, or flint. Because chert is much less soluble than the limestone around it, the weathering of the limestone has left behind a clayey soil full of cherty gravel. This gravel-filled soil covers the rocky uplands and slows the process of erosion. Most of the hilltops in this region are capped with this cherty gravel.

Because of the cherty soil, the land is better suited to ranching than farming. Because of this, the Flint Hills is still largely native prairie grassland, one of the last great preserves of tallgrass prairie in the country.

The tall grasses in this region are mostly big and little bluestem, switch grass, and Indian grass. Except along stream and river bottoms, trees are rare. The streams in the Flint Hills have cut deep, precipitous channels. Streams cut in chert-bearing strata are narrow, boxlike channels, whereas those cut in weaker shales are wider, more gently sloping valleys.

### Common Rocks and Minerals

**Chert.**—Commonly known as flint, chert is found in many Kansas limestones as nodules or continuous beds. It is a sedimentary rock composed of microscopic crystals of quartz (silica,  $\text{SiO}_2$ ). It is opaque and ranges in color from white to dull gray or brown to black. Chert breaks with a shell-like (conchoidal) fracture, and the edges of the broken



*Chert in limestone, Riley County.*



*Springtime in the Flint Hills, Greenwood County.*

pieces are sharp. Because of this, people have used chert for thousands of years to make tools and weapons. In the Flint Hills, a bluish-gray chert is commonly seen in roadcut exposures of the Florence Limestone Member (part of the formation called the Barneston Limestone).

**Limestone.**—Limestone is a sedimentary rock composed mostly of calcite (calcium carbonate,  $\text{CaCO}_3$ ). It is formed (largely in marine environments) by organic means—that is, from the remains of animals or plants—or by chemical deposition. Many animals and plants (such as oysters, corals, some sponges, sea urchins, plankton, and algae) take calcium carbonate out of the water and secrete it to form shells or skeletons. As these organisms die, they drop to the bottom of the ocean, lake, or river. Over time, the organic parts decay and the calcium carbonate accumulates to form limestone. Chemically deposited limestones are formed when calcium carbonate dissolved in water falls out of solution and settles to the bottom.

One of the prominent limestones in the Flint Hills is the Fort Riley Limestone Member (the lowest member of the Barneston Limestone). Known in southern Kansas as Silverdale limestone, the Fort Riley is 30 to 45 feet thick and is riddled with caves and solution cavities. At Silverdale, where it is quarried in southern Cowley County, the Fort Riley is nearly 60 feet thick. The Cowley County courthouse in Winfield, Kansas, is built out of this limestone.

Another characteristic limestone in the Flint Hills is the Florence Limestone Member (of the Barneston Limestone). Ranging from 12 to 45 feet in thickness, this limestone often contains a variety of fossils, including brachiopods, pelecypods, bryozoans, and fusulinids.

**Kimberlites.**—One of the rare examples of native igneous rock in the state, kimberlites occur at the surface in Riley County. Kimberlite is a soft, dull-gray rock with thin white veins of calcite and magnetite. Associated with ancient volcanic activity, kimberlites are called intrusive igneous rocks because they were forced through other rocks as they pushed to the surface of the earth. Because



*Core sample of Riley County kimberlite.*

kimberlites are the only known source of diamonds, the Riley County kimberlites have generated much interest. To date, however, no diamonds

have been found in association with these kimberlites. Even without diamonds, kimberlites are interesting because they provide a glimpse of the rocks that come from deep underground, perhaps as deep as 150 miles. These rocks pushed to the surface about 100 million years ago, during the Cretaceous Period. Garnet, a mineral with many faceted crystals and a glassy luster, has been found in Riley County kimberlites and in streams flowing near the kimberlites.

## Places to Visit

**Pillsbury Crossing.**—South of the town of Zeandale in Riley County, Deep Creek flows over a ledge in the



*Pillsbury Crossing, Riley County.*

Elmont Limestone Member (of the Emporia Limestone). Known as Pillsbury Crossing, the waterfall is nearly 40 feet wide and has a drop of approximately five feet. To get to Pillsbury Crossing from I-70, take Deep Creek Road (exit 316) north to Pillsbury Crossing Road. Follow Pillsbury Crossing Road to the east approximately 2 miles.

**Scenic Drives in the Flint Hills.**—The Flint Hills Scenic Byway is an 80-mile stretch of Kansas Highway 177 between Cassoday in northeastern Butler County and the junction with I-70 in Geary County. The road passes through Cottonwood Falls (home of the Chase County Courthouse described above) and goes by the Z Bar Ranch at the Tallgrass Prairie National Preserve. Two miles north of Strong City, the Tallgrass Prairie National Preserve protects a portion of pristine grassland. The ranchhouse and many of the buildings on the preserve are built with Cottonwood Limestone, which contains numerous fusulinids, a one-celled animal with a shell shaped like a grain of wheat.

**Roadcut near Council Grove.**—A roadcut on U.S. Highway 56 is a good place to see limestone and shale strata. Between highway markers 353 and 354, three different units are exposed: the Funston Limestone is at the bottom, overlain by the Speiser Shale and the Threemile Limestone Member (of the Wreford Limestone). The Funston Limestone is a light-gray to bluish-gray limestone that occasionally contains layers of shale and chert. It is quarried near Onaga and was used in the Eisenhower Museum in Abilene and in the Topeka Public Library. The Speiser Shale comes in a variety of colors and varies in thickness from 18 to 35 feet. The Threemile member is one of the chert-bearing limestones that crop out to form the Flint Hills.

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