Tallgrass Prairie

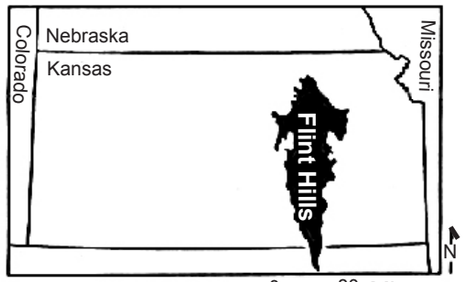
National Park Service
U.S. Department of the Interior

Tallgrass Prairie National Preserve
Strong City, Kansas

Flint Hills Geology

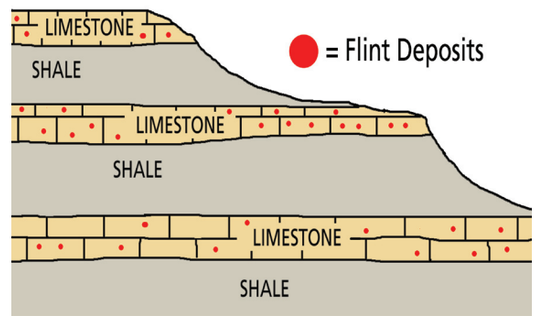
Few places illustrate the connection between life and landscape better than the tallgrass prairie of the Kansas Flint Hills. The region's geology, unseen yet immensely influential, forms the foundation for the life and lifestyle of all the plants, animals, and people who lived, currently live, and will live here in the future, closely connecting them all together.

The Flint Hills of Kansas



Courtesy of KS Geological Survey

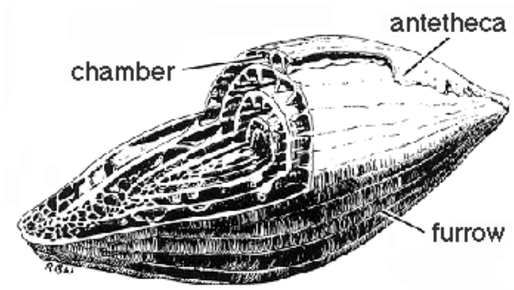
The Flint Hills cross east central Kansas from the north near the Nebraska border and extend south into Oklahoma, where they are called the Osage Hills. The region consists mainly of alternating layers of limestone and shale. Many of the limestones contain concentrations of chert (also called flint)—a hard, dense microcrystalline quartz. As the limestone erodes, angular fragments of flint accumulate at the surface, giving the Flint Hills their name. The native peoples of the region, the Pawnee, Osage, Wichita, and Kansa, collected the exposed flint to make a wide variety of tools and weapons.



The unique, stairstep landscape of the Flint Hills was formed through a geological process called differential erosion. The limestone, with concentrations of flint, is harder and more erosion resistant than the softer layers of shale in between. The tougher limestones and flint form promenent benches on the hillsides and cap the hilltops, while the softer shales in between are slowly worn away, making thin, gravelly soil. These geological characteristics, rolling hillsides and rocky soil, saved the Flint Hills from wide-scale plowing and helped to preserve more native tallgrass prairie here than anywhere else on earth.

Abundant Fossils

A closer look at the rock reveals many fossils. Most of these marine fossils are invertebrates (animals without backbones) such as corals, clams, snails, bryozoans (colonies of animals resembling sea fans), sea urchins, crinoids (a stalked animal distantly related to starfish and sea urchins), and clam-like animals called brachiopods. Particularly abundant in some limestones are fusilinids, small, one-celled animals shaped like wheat grains. These fossils can be seen in many of the limestone blocks used in the buildings at the preserve.

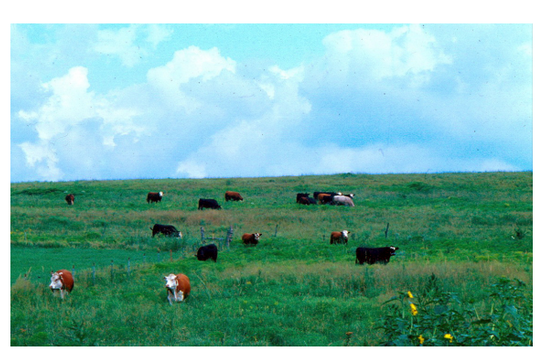


Cutaway view of fusilinid showing interior structure. Courtesy of Kansas Geological Survey

Geology, Soil, and Land Use

The Flint Hills region is characterized by thin soils, limestone outcrops, vegetation-covered shale intervals between the limestones, and deeply cut valleys, exposing the geology beneath the soil. The thin, rocky soils and steep slopes of the Flint Hills limited crop cultivation to river and stream bottoms, such as along Fox Creek just east of the historic ranch headquarters area. These rare bottomland prairie areas are covered by a layer of river-deposited sediments that have developed thick soils that are especially valuable for cultivation.

However, the same rocks which made crop cultivation difficult helped to preserve the native characteristics of the Flint Hills and made the area ideal for cattle grazing. The calcium in the limestone, in fact, erodes into the soil, making the native prairie plants extra nutritious for grazing animals. Cattle ranching remains the dominant agricultural activity in the Flint Hills, with a legacy of cattle ranching extending back for over 100 years in the region.



Building with limestone

Wood was scarce when European-American emigrants settled the tallgrass prairie in the mid-1800s, so the abundant limestone became an important source of building material. The Cottonwood Limestone, a rock layer that occurs on the preserve near the base of the hills in the Fox Creek valley, is a common building stone in Kansas. It is a thick layer of limestone, nearly white in color, even-textured, durable, and contains numerous fusilinids. Blocks of stone three or more feet thick and several feet in length and width can be taken from a single ledge. The ranch house, portions of the schoolhouse and barn, and many other structures on the preserve were built with this type of limestone, as well as numerous buildings in the state, including the Chase County Courthouse in Cottonwood Falls, and most of the Kansas State capitol building in Topeka.

Chase County Courthouse, Cottonwood Falls, Kansas

Formation of rocks at the preserve

The rocks of the Flint Hills, alternating layers of limestone (with flint) and shale, were deposited during the Permian Period of geologic history, around 280 million years ago. At that time, the region's climate was warm and tropical and a shallow ocean covered the surface most of the time. Limestone formed as the remains of marine organisims rich in calcium fell to the bottom of this ocean and became stone (lithification). Shale formed as clay and mud were deposited on the ocean floor and lithified.

Chert (flint) can occur within limestone as roughly spherical concentrations (nodules) or as layers (laminated). Some geologists feel that the nodules of chert may have formed as the remains of marine organisims rich in silica fell to the ocean floor, which then migrated together as the limestone formed. The layers of chert may have formed as the silica material fell to the ocean floor and recrystallized, chemically replacing the limestone. Geologists continue to conduct research and study into these processes.

Classification of rocks at the preserve

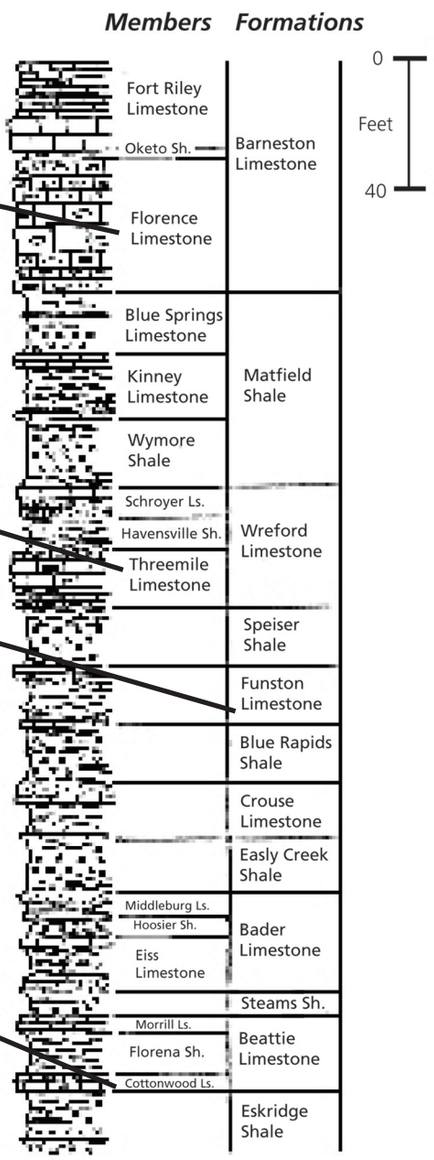
The rock layers are named after the towns, streams, or other nearby landmarks where each rock layer was first found and described by geologists.

Florence Limestone is found at top of the highest hills on the northern end of the preserve. A large amount of flint occurs at this level.

Threemile Limestone forms a prominent bench on the hillsides and caps the tops of the hills on the south end of the preserve.

Funston Limestone makes up most of the massive, three-level barn.

Cottonwood Limestone is the primary building material used in the construction of the main ranch house.



For More Information

The preserve may be contacted at:

Tallgrass Prairie National Preserve
P.O. Box 585, 226 Broadway
Cottonwood Falls, KS 66845

Phone: 620-273-8494
E-mail: TAPR_Interpretation@nps.gov
Web: www.nps.gov/tapr

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