

## Glaciated Region: Rocks and Minerals

True to its name, this part of Kansas was glaciated—that is, it was covered by at least two of the eight or nine glaciers that encroached upon much of the northern United States during the Pleistocene Epoch (1.6 million to 10,000 years ago). The first of these covered just the northeastern corner of Kansas. The second, which encroached on Kansas about 600,000 years ago, extended almost to Manhattan, and beyond Topeka and Lawrence in a line roughly parallel to the present-day Kansas River. In places this ice sheet was 500 feet thick.

The underlying bedrock in the Glaciated Region is Pennsylvanian and Permian limestones and shales that dip gently to the west and northwest. These rocks, however, have been covered by thick glacial deposits—silt, pebbles, and boulders—that were left behind when the ice melted. In some places, the thick deposits, which geologists call glacial drift, have formed deep soils.



*The glacier that extended into Kansas approximately 600,000 years ago is known as one of the Pre-Illinoian glaciations. This map shows the approximate southern limit of the glacier, which carried quartzite boulders and glacial drift into northeastern Kansas.*

Except for the glacial drift, most of the evidence of glaciation has been erased from the Kansas landscape by erosion. In other parts of North America, such as Wisconsin, the glaciation was more recent and the landscape still bears the marks of the advancing and retreating ice sheet.

During the Pre-Illinoian glaciation in Kansas, the force of the advancing ice was strong enough to break large boulders off outcrops in South Dakota, Iowa, and Minnesota and carry them into Kansas. Reddish quartzite boulders, known as Sioux quartzite, are common throughout the region.

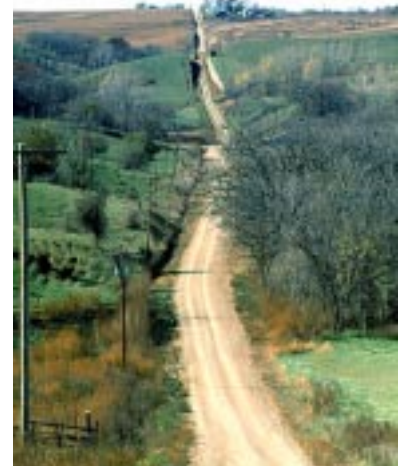
### Glacial Deposits in Northeastern Kansas

**Loess.**—A widespread, fine-grained blanket deposit, loess consists predominantly of silt. Silt, as geologists define it, is a rock fragment or mineral particle smaller than a very fine sand grain and larger than clay: its diameter is between 1/16 mm and 1/256 mm. Windblown silt deposited during the Pleistocene is known as loess.

As glaciers advanced, they pulverized rocks and sediments in their path. As they melted, this pulverized rock (silt) was deposited on the floodplains by streams coming from the melting ice sheet. 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, resulting in strong winds capable of moving large amounts of silt.

Thick deposits of loess, more than a hundred feet thick in places, occur

along the bluffs of the Missouri River. The loess in this region is typically a yellowish-buff, porous silt that crops out with steep faces along hillsides and valley walls. Small, white shells of snails also may be found in the loess. In northeastern Kansas a very rich soil has developed on the loess, especially in Brown and Doniphan counties



*Loess hills, Doniphan County.*

and along the bluffs of the Missouri River as far south as Kansas City. Loess hills in Doniphan County are some of the highest in the state. One of these, Lookout Mountain north of Sparks, is more than 350 feet above the floodplain of the Missouri River.

**Glacial erratics.**—The boulders and pebbles that were carried by the glacier are of many different types, including limestone, sandstone, quartzite, granite, and basalt. Rocks that have been transported into an area from far away are called erratics.

Among the glacial erratics in northeastern Kansas, quartzite is one of the most common. Quartzite, a metamorphic rock, is quartz sandstone that is so thoroughly cemented with silica (SiO<sub>2</sub>) that the rock breaks through the grains as easily as around them. It is harder than sandstone and can not be scratched by a knife. The quartzite boulders in the Glaciated Region are known as Sioux quartzite because they come from the area where Sioux quartzite crops out in the area around Sioux Falls, South Dakota.



*Large quartzite boulder, Marshall County.*

## Places to Visit

*Scenic Drive from Sparks and White Cloud.*—In the northeastern corner of the state, Kansas Highway 7 makes its way along the banks of the Missouri River and through the vast loess hills adjacent to the river. From Sparks, K-7 passes through the old river towns of Iowa Point and White Cloud before terminating at the Nebraska border.

*Quartzite boulders in Wabaunsee County.*—Although boulders of Sioux quartzite are found throughout the Glaciated Region, a hillside in northern Wabaunsee County has more than most places. These quartzite boulders are metamorphic rocks—sandstone that has been metamorphosed into quartzite.



*Sioux quartzite on hillside, Wabaunsee County.*

Because of the amount of time that has elapsed since the glaciers moved into Kansas, most other evidence of the glaciation has since been erased by erosion. Geologists have long known about and commented on these glacial erratics in Kansas. The first state geologist of Kansas, Benjamin Franklin Mudge, thought they floated into Kansas on the backs of icebergs, and fell to the seafloor when the bergs melted.

Today's geologists think these boulders represent the southern edge of the glacier's advance into Kansas; no erratics have been found south of this location. Geologists aren't sure why so many quartzite boulders wound up on the same hilltop. One explanation (called topographic reversal) is that this ridge may have been a valley floor in the past that filled up with boulders. The boulders may have made the valley more resistant to erosion than the surrounding rock, so that erosion broke down the valley walls until they were lower than the valley, leaving the boulder-choked valley standing as a ridge. Geologists call this area a *felsenmeer*, which is German for "sea of rocks." To see this *felsenmeer*, take Kansas Highway 99 north from I-70 for 4.5 miles. Park on the county road to the west.

*KU Museum of Natural History.*—Entering the museum, visitors encounter a wonderful hanging display of a mosasaur, a giant reptile that swam in the Cretaceous seas of Kansas. Other exhibits include fossils of dinosaurs, fishes, birds, mammals, reptiles, and invertebrates; naturalistic dioramas of birds, mammals, and plants; live bees (in a working hive), snakes, and fishes; and The Panorama—which depicts animals, plants, and natural environments from the Arctic Circle to the tropics. Located at The University of Kansas in Lawrence, the museum is open 8:00 to 5:00 (Mondays through Fridays), 10:00 to 5:00 (Saturdays), and noon to 5:00 (Sundays). For more information call the museum (785) 864-4450 or go to their website at <http://nhm.ku.edu/>.

## Sources

- Buchanan, Rex C., and McCauley, James R., 1987, *Roadside Kansas—A Traveler's Guide to Its Geology and Landmarks*: Lawrence, Kansas, University Press of Kansas, 365 p.
- Buchanan, Rex C., and McCauley, James R., 1988, *Field Trip Through the Geology of Northeastern Kansas*: Kansas Geological Survey, Open-file Report 88-46, 27 p.
- Buchanan, Rex C., Tolsted, Laura L., and Swineford, Ada, 1986, *Kansas Rocks and Minerals*: Kansas Geological Survey, Educational Series 2, 60 p.
- Evans, Catherine S., 1988, *From Sea to Prairie—A Primer of Kansas Geology*: Kansas Geological Survey, Educational Series 6, 60 p.
- Jackson, Julia A., editor, 1997, *Glossary of Geology* (Fourth Edition): Alexandria, Virginia, American Geological Institute, 769 p.
- Schoewe, W. H., 1949, *The Geography of Kansas*: Transactions of the Kansas Academy of Science, v. 52, no. 3, p. 261-333.
- Wilson, Frank W., 1978, *Kansas Landscapes—A Geologic Diary*: Kansas Geological Survey, Educational Series 5, 50 p.