GEOFACTS from the Kansas Geological Survey

Arkansas River Lowlands and Wellington-McPherson Lowlands: Rocks and Minerals

The Arkansas River Lowlands and the Wellington-McPherson Lowlands, though separated into different physiographic regions, are geologically similar. Both regions are relatively flat alluvial plains, made up of sand, silt, and gravel that was dumped by streams and rivers.

The Arkansas River Lowlands is made up of rocks deposited by the Arkansas River during the last 10 million years as the river flowed through Kansas from its source high in the Rocky Mountains. In the Rockies, the Arkansas is supplied with runoff, snowmelt, and rock debris that weathers from the mountains, but as it moves out onto the High Plains, it receives little in the way of additional water. In fact, it loses water to its sandy riverbed. As its flow decreases, the river's ability to carry sediments also diminishes and it begins to dump its sediment load. It changes from a degrading stream (one that cuts downward in its channel) to an aggrading stream (one that builds up the riverbed).

The Wellington-McPherson Lowlands of south-central Kansas is also developed on alluvial deposits. This sand, silt, and gravel was eroded from slightly older rocks in the High Plains to the north, then carried by streams flowing south into the Arkansas River between one and two million years ago, during the Pleistocene Epoch.

The Wellington-McPherson Lowlands sit on top of one of the largest salt deposits in the world. Known as the Hutchinson salt bed, this deposit underlies much of central Kansas and is as much as 400 feet thick in places.

Another important underground feature of the Wellington-McPherson Lowlands is the Equus Beds aquifer. The Equus Beds is made up of thick (more than 250 feet) deposits of silt, sand, and gravel, in many places saturated with water. This aquifer is an important source of water for Wichita, McPherson, Newton, and other communities in this region. These Pliocene- and Pleistocene-age deposits were named for fossils of Ice Age horses that were found among the unconsolidated deposits (*equus* is the Latin word for horse).

Sand dunes, formed by wind and water, occur in many places in both regions. Most of these dunes are covered with grass and other vegetation, which keeps the sand from shifting. Such sand dunes are considered inactive—that is, they are no longer moving in response to wind and water.

Common Rocks and Minerals

Gypsum.—A common mineral in Kansas, gypsum is made up of calcium sulfate with two molecules of water ($CaSO_4 \cdot 2H_20$). (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. The second variety 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 coarsely to finely granular, white to gray, and contains varying amounts of impurities.

Gypsum Creek, Wichita.

In the Wellington-McPherson Lowlands and the Arkansas River Lowlands, gypsum is found in the shales of the Wellington Formation. In the Arkansas River Lowlands, gypsum crops out in Wichita along Gypsum Creek, which drains the eastern part of the city. Both selenite and satin spar can be collected from these shales.

Sand.—Found abundantly in Kansas, sand is a loose, unconsolidated material formed from the breaking down or weathering of older rocks and from the transportation and sorting of rock fragments by moving water or by wind. Sand particles range in size from 0.625 mm and 2 mm, larger than silt particles but smaller than pebbles.

Kansas sand is composed mostly of quartz. Sand also contains igneous and metamorphic minerals formed outside the state and transported here by running water. Sand is common throughout the Arkansas and Kansas river valleys.

In the Arkansas River Lowlands, sand dunes are common south of the river but rare north of the river. This leads geologists to speculate that the prevailing winds were from the north during the time of deposition, which was during the glaciations of the Pleistocene Epoch (1.6 million to 10,000 years ago). At that time, huge ice sheets to the north may have created winds from the north, the opposite of today's patterns, in which winds generally come from the south.

Salt.—Halite, common table salt, is composed of sodium chloride (NaCl). Most salt crystals are transparent and colorless cubes, but impurities may impart a brilliant red, blue, or yellow color. Broken fragments may be very nearly cube-shaped. Halite is easy to identify because it has a salty taste and dissolves easily in water.

Salt is an evaporite, which means it is formed by the evaporation of water. (Other evaporites are gypsum and anhydrite.) Salt rarely forms outcrops because rain and ground water dissolve salt that is exposed at the surface.

In Kansas, salt is found in thick beds in Permian rocks deep underground, the largest of which is the Hutchinson salt bed, which underlies approximately 37,000 square miles in central Kansas. This salt was deposited by the evaporation of a shallow arm of the Permian sea, which was cut off from the open ocean. When that shallow arm evaporated, it left behind thick layers of gray shale, salt, and gypsum. These deposits were subsequently buried by younger sediments and remained hidden for millions of years until salt was accidentally discovered near Hutchinson in 1887 by drillers looking for oil and gas.

Salt was also discovered in Wellington in 1887. However, because this Sumner County town is near the eastern edge of the Hutchinson salt bed, the salt was only about 50 feet thick and the salt mine that opened there soon failed. Today salt mines operate in Rice, Reno, and Ellsworth counties.

Places to Visit

Gypsum Creek.—To see examples of gypsum in the Wichita area, go to Gypsum Creek's intersection with South Woodlawn Street, just north of the Kansas turnpike (I-35) overpass. Walk eastward up the creek bed for about 200 yards. As you walk along the gypsum ledge overhanging the creek, note the sulfuric smell. Washing from the shale bottom of Gypsum Creek, along the creek bottom and sand bars, are good selenite crystals and some satin spar. Specimens may be collected at this location.

Sand Hills State Park.—A good place to see sand dunes in the Arkansas River Lowlands is Sand Hills State Park, a few miles northeast of Hutchinson in Reno County. The water table underneath these grass-covered dunes is so close to the surface that you can almost hit water by digging with your hands. To get to the park, follow Kansas Highway 81 north out of Hutchinson for approximately two miles.

Quivira National Wildlife Refuge.—This wildlife refuge in northeastern Stafford County lies in the transition zone between the relatively lush vegetation of the eastern prairie and the more arid grasslands of the western prairie. Big and Little Salt marshes, located within the refuge, provide food, cover, and a resting place for thousands of waterfowl migrating between breeding and wintering areas. The salty surface waters and salt flats at Quivira are caused by natural saltwater in the underlying bedrock, which is discharged in the vicinity. The average salinity of Little Salt Marsh is approximately 2,500 parts per million (ppm); that of Big Salt Marsh ranges from 5,000 to 10,000 ppm. (The salinity of seawater is 19,000 ppm, and the upper limit for drinking water is about 250 ppm).

Salt flats at Quivira National Wildlife Refuge, Stafford County.

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., 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.

Sawin, Robert S., and Buchanan, Rex C., eds., 1996, Field Guide—Kansas Water Issues: Kansas Geological Survey, Open-file Report 96-23, 65 p.

Sawin, Robert S., and Buchanan, Rex C., eds., 1997, Field Guide—Urban Expansion and Natural Resources—Land Use, Water, and the Environment: Kansas Geological Survey, Open-file Report 97-37, 53 p.

Skelton, Lawrence, 1997, Wichita's Building Blocks—A Guide to Building Stones and Geological Features: Kansas Geological Survey, Educational Series 11, 28 p.

Wilson, Frank W., 1978, Kansas Landscapes—A Geologic Diary: Kansas Geological Survey, Educational Series 5, 50 p.

This fact sheet was compiled by Kansas Geological Survey staff (April 1999). More information is available on the World Wide Web:
http//:www.kgs.ku.edu/Extension/