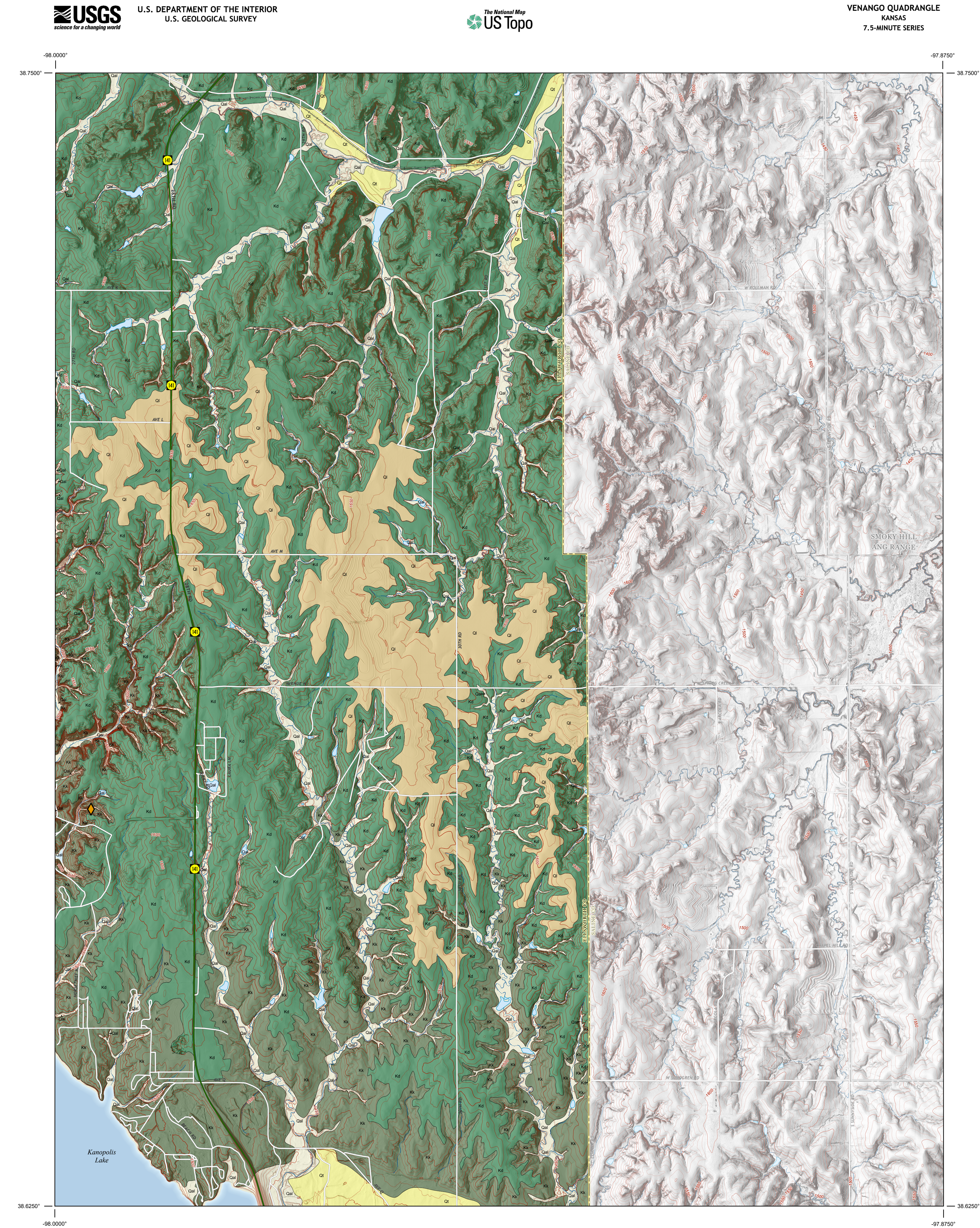


Geology by Kate A. Andrzejewski

GIS compilation and cartography by Kolbe D. Andrzejewski

2026



CORRELATION OF UNITS

The diagram illustrates the relationship between geological epochs and soil types. On the left, three nested brackets represent the Cenozoic, Quaternary, and Pleistocene/Holocene epochs. The Quaternary epoch is further divided into the Pleistocene and Holocene. On the right, three colored boxes represent soil types: Qal (yellow), Ql (brown), and Qt (green). The Qal soil type corresponds to the Quaternary epoch, Ql to the Pleistocene, and Qt to the Holocene.

UNCONFORMITY

The diagram illustrates a geological column with three stages labeled on the left: MESOZOIC, CRETACEOUS, and LOWER CRETACEOUS. To the right of these labels are two stacked rectangular blocks representing rock units. The top block is labeled 'Kd' and the bottom block is labeled 'Kk'. The 'Kd' block is positioned under the 'CRETACEOUS' stage, and the 'Kk' block is positioned under the 'LOWER CRETACEOUS' stage. The 'MESOZOIC' label spans both the 'Kd' and 'Kk' blocks.

These descriptions are a compilation of several sources, including field notes and measured sections, Kansas Department of Transportation geological reports and profiles, and lithologic descriptions in Bettis et al. (2003), Bayne et al. (1971), and Plummer and Romary (1941).

GEOLOGIC UNITS

Floodplain and low terrace deposits

Alluvium that is beneath floodplain and low terrace surfaces is found along major river valleys and upper reaches of small tributaries that feed into the Smoky Hill River valley. Floodplain and low terrace deposits are inset against older terrace deposits (Qt) in the major river valley system, but unconformably overlie Cretaceous bedrock in the smaller tributaries. Deposits are composed of sand, silt, and clay.

Terrace deposits

Q1 terrace deposits occur along major stream and river valleys of the county. In the Smoky Hill River valley, the Q1 surface is approximately 15–20 ft (4.6–6.1 m) above the elevation of the modern river channel. The Q1 terrace deposits are composed primarily of sand and silt with some clay. The total thickness of alluvium can be up to 50 ft (15.2 m) in the Smoky Hill River valley and 15 ft (4.6 m) in other major tributaries.

Loess

Deposits of reddish-brown loess with silt loam textures blanket hilltops and slopes. Mapped loess units typically range between 3.0–6.5 ft (1–2 m) in thickness. Previous research has identified regional loess units belonging to the Gilman Canyon Formation (44,000–24,000 years old), the Peoria Loess (25,000–12,000 years old), and the Bignell Loess (11,000–9,000 years old) (Bettis et al., 2003).

Dakota Sandstone

[illegible]

Kiowa Formation

The Kiowa Formation is present along the shoreline of the Kanopolis Reservoir. Researchers previously noted the contact between the Kiowa Fm. and the underlying Permian units as being located near the base of the reservoir dam, but it has since been covered by rip-rap stabilization. Thickness of the Kiowa Fm. varies with a maximum of 10 m (33 ft) in the south and 1 m (3 ft) in the north. The Kiowa Fm. is composed of a massive, medium to fine grained, quartz dominated sandstone and is interpreted as marine deposits. Cone-in-cone laminations are often present with the shale units as well as shell "bush" or coquina deposits consisting of bivalves and *Turritella* sp. gastropod shells. Thickness of sandstone deposits varies drastically from lateral sheets less than 1.5 ft (0.5 m) to 10 ft (3 m) thick. Sandstone occurring over 12 m (40 ft) into the Helderberg Canyon shows ramp to shore facies. Kanopolis Reservoir. Locally some of the sandstones are calcite-cemented while other areas consist of easily weathered sandstones that can contain barite roots.

SOURCES

Barker, W. L., 1989, Soil Survey of Ellsworth County, Kansas: Washington, D.C., U.S. Department of Agriculture, Soil Conservation Service and Kansas Agricultural Experiment Station, 100 p.

Bayne, C. K., Franks, P. C., and Ives, W., 1971, Geology and ground-water resources of Ellsworth County, central Kansas: Kansas Geological Survey, Bulletin 201, 84 p.

Bettis, E.A., Muhs, D.R., Roberts, H.M., and Wintle, A.G., 2003, Last Glacial loess in conterminous USA: Quaternary Science Reviews, v. 22, p. 1907-1946.

Hattin, D. E., 1965, Stratigraphy of the Graneros Shale (Upper Cretaceous) in central Kansas: Kansas Geological Survey, Bulletin 178, 83 p.

Kansas Geological Survey. 2022. "Water Well Completion Records (WWC5) Database" <http://www.kgs.ku.edu/Magellan/WaterWell/index.html>.

Plummer, N. and Romary, J.F., 1947, Kansas Clay, Dakota Formation: Kansas Geological Survey, Bulletin 67, 243 p. <https://doi.org/10.17161/kgsbulletin.no.67.21986>.

Elevation contours are included for general reference. They are used in the Geological Survey's current US Topo 1:24,000-scale topographic map series. Elevation contours were generated from hydrographically-improved 1/3 arc-second National Elevation Dataset (NED) data and smoothed during processing for use at a 1:24,000 scale. In some places, the contours may be more generalized than the base data used in compilation of geologic outcrop patterns. Outcrop patterns on the map typically reflect topographic variation more accurately than the associated contour lines. Repeated fluctuation of an outcrop line across a contour line is an indication that the mapped rock unit is maintaining a relatively constant elevation along a generalized contour.

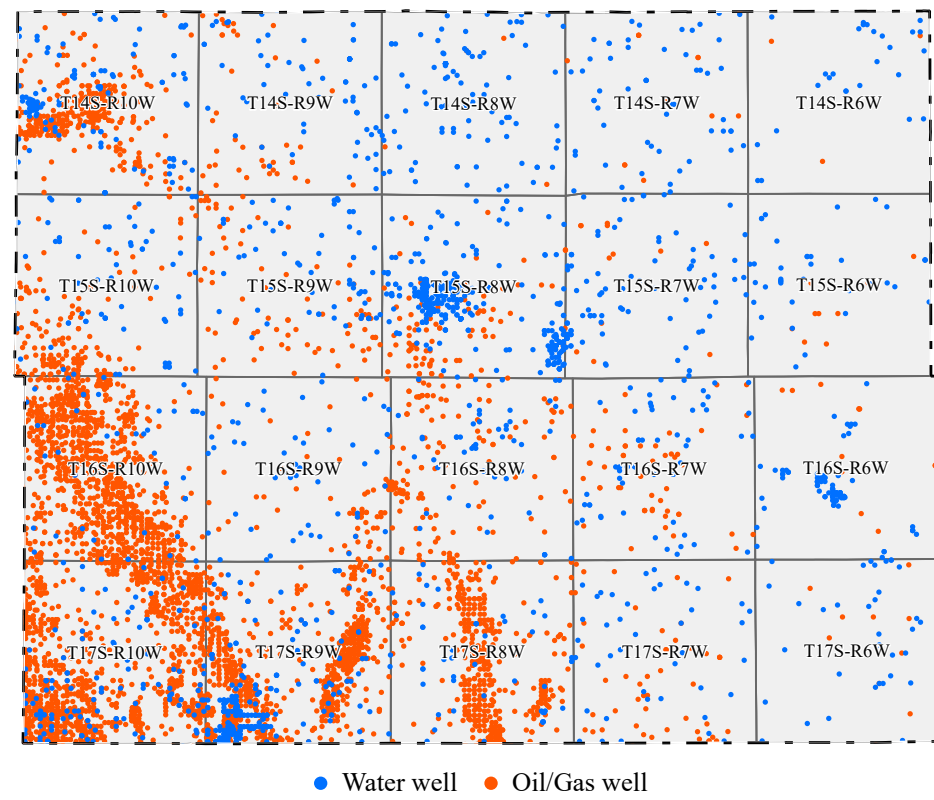
References used in the digital mapping include 1-meter LiDAR hillshades and 1-m 2020 U.S. Department of Agriculture – Farm Services Agency (USDA-FSA) National Agriculture Imagery Program (NAIP) digital imagery. USGS 7.5-min 1:24,000-scale topographic maps, USDA Natural Resources Conservation Service (NRCS) soil surveys and other geologic maps and bulletins were used as supplementary references. Roads and highways are shown on the base map as represented by data from the Kansas Department of Transportation (KDOT), U.S. Census Bureau, and other sources. Additionally, USDA FSA NAIP imagery was used to check road locations.

Shaded relief is based on 1-meter hydroflattened bare-earth DEMs from the state Kansas LiDAR database. The DEM images, in ERDAS IMAGINE format, was mosaicked into a single output DEM and reprojected to decimal degrees. The output DEM was then converted to a hillshade, a multidirectional shaded-relief image using angles of illumination from 0°, 225°, 270°, and 315° azimuths, each 45° above horizon, with a 4x vertical exaggeration.

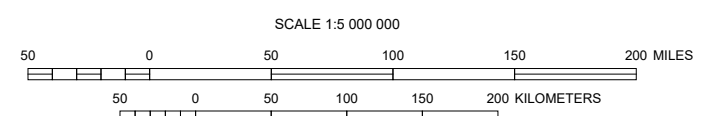
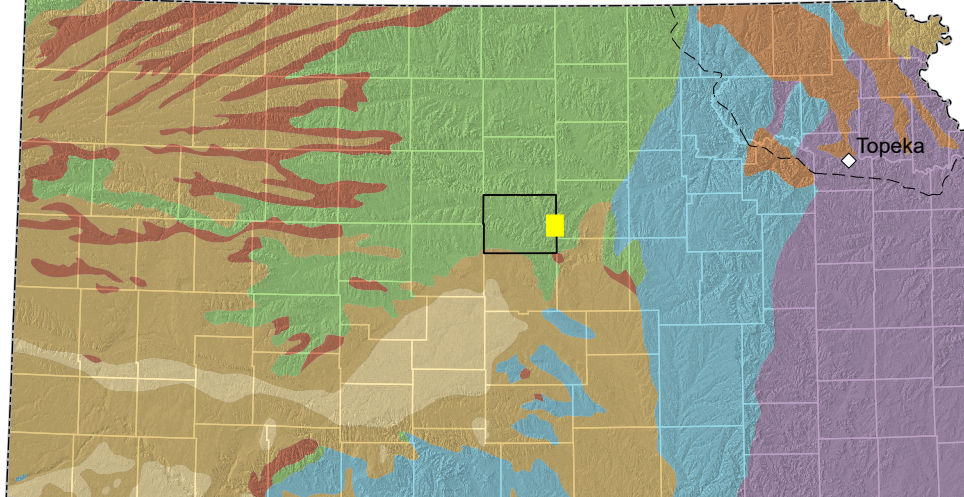
This map was funded in part by the USGS National Cooperative Geologic Mapping Program, STATEMAP award number G25AC00518 (FY2025).

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OIL/GAS AND WATER WELL DENSITY FOR ELLSWORTH COUNTY



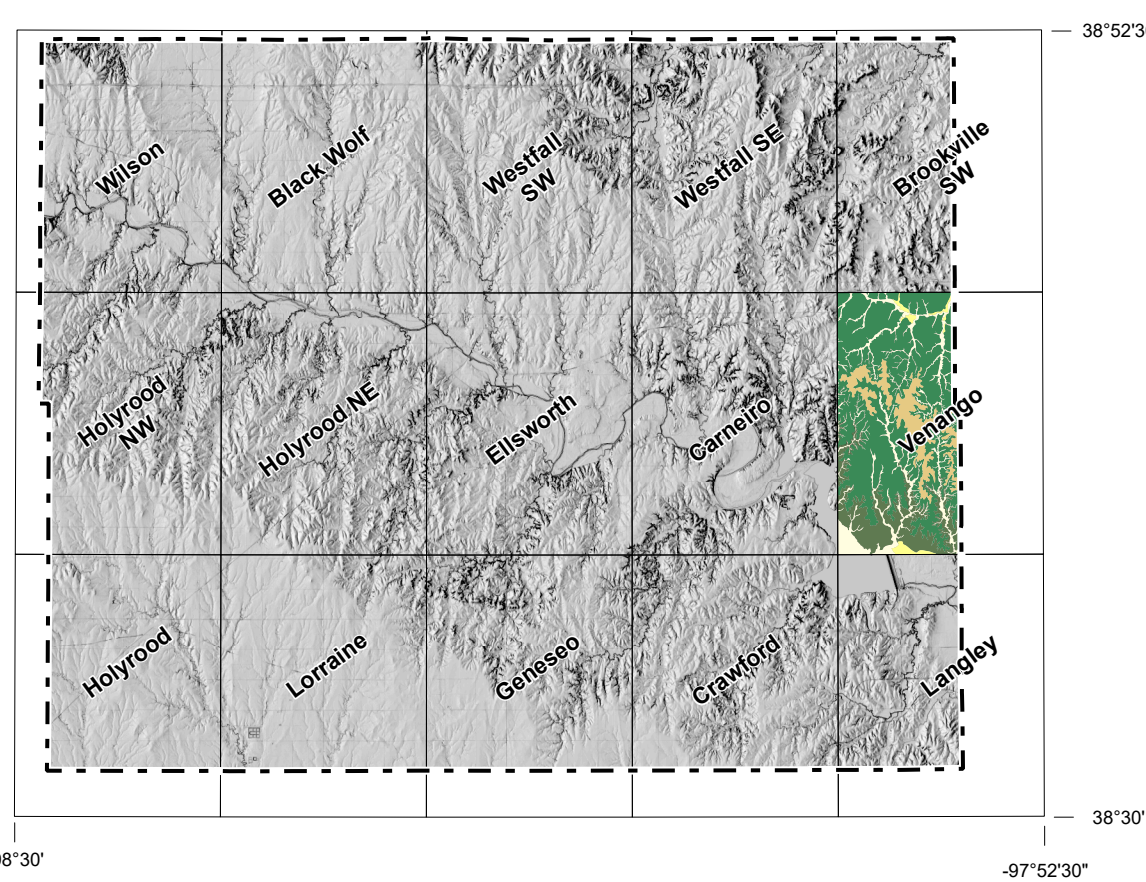
MAP LOCATION



GENERALIZED GEOLOGY OF KANSAS

QUATERNARY SYSTEM	NEOGENE SYSTEM	CARBONIFEROUS SYSTEM
Holocene - Pleistocene Series	Oligocene - Miocene Series	
Loess and river-valley deposits	Ogallala Fm	Pennsylvanian Subsystem
Sand dunes	CRETACEOUS SYSTEM	Mississippian Subsystem
Glacial-drift deposits	PERMIAN SYSTEM	
Limit of glaciation in Kansas		

QUADRANGLE INDEX MAP FOR ELLSWORTH COUNTY



SUGGESTED REFERENCE TO THE MAP

Andrzejewski, K. A., 2026, Preliminary surficial geology of the Ellsworth County portion of the Venango quadrangle, Kansas: Kansas Geological Survey, Open-File Report 2026-6, scale 1:24,000, unpublished.