PRELIMINARY SURFICIAL GEOLOGY OF THE LINCOLNVILLE QUADRANGLE, MARION COUNTY, KANSAS

Geology by Jon J. Smith

GIS compilation and cartography by Kolbe D. Andrzejewski

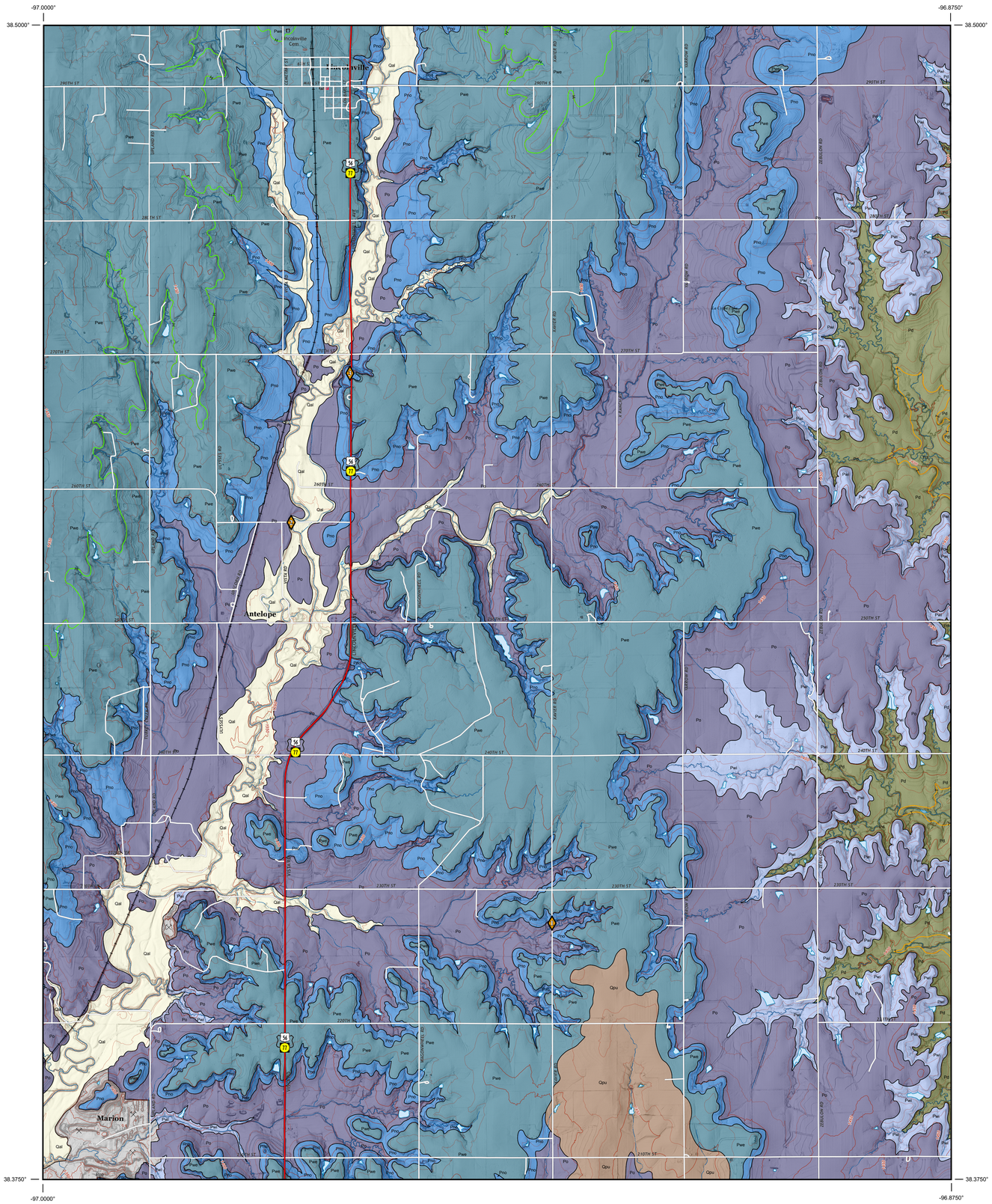
Open-File Report 2026-19

Funded in part by the USGS National Cooperative Geologic Mapping Program

2026

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

LINCOLNVILLE QUADRANGLE
KANSAS - MARION COUNTY
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid:Universal Transverse Mercator, Zone 14S
This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.
Imagery.....NAIP, July 2017 - September 2017
Roads..... U.S. Census Bureau, 2015 - 2018
Names.....GNIS, 1978 - 2021
Hydrography.....National Hydrography Dataset, 2001 - 2018
Contours.....National Elevation Dataset, 2014
Boundaries.....Multiple sources; see metadata file 2019 - 2021
Public Land Survey System.....BLM, 2018
Wetlands.....FWS National Wetlands Inventory 1985 - 1986

MN
GN
3°14'
57 MILS
1°17'
23 MILS
UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
PH
Grid Zone Designation
14S

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard.

EXPLANATION

Transportation
- Paved road
- U.S. and State Highway
- Railroad

Hydrology
- Perennial stream
- Intermittent stream
- Perennial waterbody

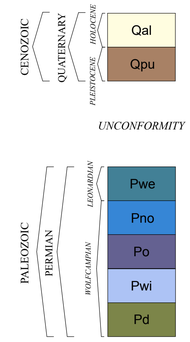
Topography
- Index elevation contour (50 feet)
- Elevation contour (10 feet)

Geology
- Observed contact
- Hollenberg Limestone Member
- Towanda Limestone Member
- Photo location
- Quarry

SUGGESTED REFERENCE TO THE MAP

Smith, J. J., 2026, Preliminary surficial geology of the Lincolnville quadrangle, Marion County, Kansas: Kansas Geological Survey, Open-File Report 2026-19, scale 1:24,000, unpublished.

CORRELATION OF UNITS



The following descriptions consist of a compilation of several sources, including field notes and measured sections; U.S. Department of Agriculture Natural Resources Conservation Service databases; and lithologic and other data in Swineford (1955), Byrne et al. (1959), Lane (1960), Zeller (1968), and McCauley (2014).

GEOLOGIC UNITS

Undifferentiated floodplain alluvium

Qal

These deposits are found along major rivers and smaller streams in Marion County. The floodplain sediments of the largest river in the county, the Cottonwood River, consist of clay, silt, sand, and gravel that probably do not exceed 60 ft (18 m) in thickness. The smaller streams draining the uplands, such as Doyle Creek, Mud Creek, and Clear Creek, are dominated by clay and silt and range up to 20 ft (6 m) thick.

Alluvial and eolian deposits (upland)

Qpu

Mixed eolian (loess) and alluvial sediments were originally components of floodplain deposits but subsequently redeposited by wind. Though fairly common in upland areas well above and distant from modern stream floodplains, these deposits are also generally thin and only accumulations known to exceed 10 ft (3 m) were mapped. This unit is composed chiefly of silt, but sandier deposits are also present. Upland alluvium ranges in thickness from 0 to potentially 30 ft (9 m) in Marion County.

Wellington Formation

H
Pwe

Much of the outcrop area of the Wellington Formation is under cultivation and the formation is generally poorly exposed. The unit consists of predominantly tan-gray to green-gray, silty shale with thin beds of gypsum, anhydrite, and limestone. The Hollenberg Limestone Member (H) consists of a gray to tan, coarsely crystalline, dolomitic limestone that is less than approximately 7 ft (2 m) thick and an inconsistent ledge-former. The Wellington Formation below the Hollenberg may contain thin-bedded maroon to dark green calcareous beds of shale. The Carlton Limestone Member is a light gray to tan, thin-bedded, platy, lenticular limestone that crops out approximately 90 ft (27.5 m) from the base of the formation in the central portion of the county. Although the Wellington Formation can be up to 700 ft (213 m) thick in some parts of Kansas, only about 150 ft (46 m) is exposed in Marion County.

Nolans Limestone

Pno

At the base of the Nolans is the Kidder Limestone Member which consists of one or two beds of hard, gray to yellowish-brown, nodular, and dolomitic limestone with a "sugary" rough texture and containing bivalves and brachiopods. The Kidder has a total thickness of approximately 2 ft (0.6 m). Above the Kidder limestone is the Paddock Shale Member consisting of olive to gray-green argillaceous, blocky shale near its base transitioning to a tan-gray shale towards the top. The Paddock shale is approximately 15 ft (4.5 m) thick in Marion County. At the top of the Nolans is the Herington Limestone Member which consists of a light gray to grayish-brown, massive, dolomitic limestone with locally present calcite geodes, concretions, and bivalve fossils. The Herington is up to 8 ft (2.5 m) thick and has been extensively quarried for building construction in Marion County. The total thickness of the Nolans Limestone in Marion County is approximately 25 ft (7.5 m).

Odell Shale

Po

The Odell Shale is composed of silty, calcareous, nonfossiliferous mudrock. The lower part is yellow to gray in color, while the upper two-thirds are variegated with maroon, green, purple, and bluish-gray beds. The Odell Shale is up to 30 ft (9 m) thick in Marion County.

Winfield Limestone

Pwi

The Winfield Limestone consists of two limestone members separated by a shale member. The basal Stovall Limestone Member is a single bed of gray to tan, dense, fossiliferous limestone up to 2.5 ft (0.8 m) thick. The Stovall is a prominent ledge-forming unit that is easily recognized by its large (up to 6 inch, 15 cm in diameter), bluish-gray nodules of chert. The chert is more resistant to weathering than the limestone matrix and commonly forms stone lines in fields. Above the Stovall is the Grant Shale Member, a yellow-gray, fossiliferous, and slope forming shale that is approximately 10 ft (3 m) thick. The uppermost Cresswell Limestone Member is up to 15 ft (4.6 m) thick and is also a ledge-forming unit. The lower part of the Cresswell is composed of massive beds of yellowish-brown to gray, vuggy or cherty, fossiliferous limestone (echinoid spines are characteristic). The upper part consists of thin-bedded, platy, argillaceous, medium-gray to yellowish limestone containing calcite geodes. The Cresswell limestone has been quarried extensively in Marion County for crushed rock used in gravel and asphalt roads, riprap fill, and building stones. The average thickness of the Winfield Limestone is approximately 25 ft (8 m).

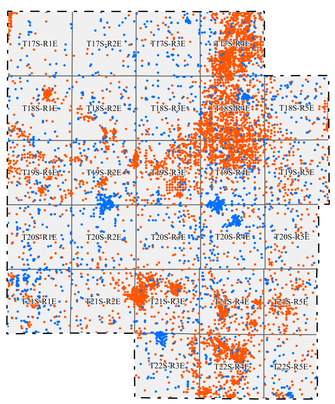
Doyle Shale

Pd
T

The Doyle Shale consists of two shale members divided by a prominent limestone bed. The lowermost Holmesville Shale Member is a predominantly gray to gray-green, calcareous mudstone, though maroon, yellow, and green beds of shale may be present and thin limestone beds are common throughout. The Holmesville Shale Member averages approximately 16 ft (5 m) in thickness. The Holmesville shale is overlain by the Towanda Limestone Member (T), an approximately 10 ft (3m) thick bed of medium-bedded, platy to blocky, gray to yellow-brown limestone. The Towanda forms a prominent bench and is easily traceable on the landscape in eastern Marion County. The Towanda has been quarried in Marion County for crushed stone for gravel and asphalt roads. The Gage Shale Member at the base of the Doyle Shale is gray to buff, calcareous, fossiliferous shale. The lower two-thirds are variegated with red, green, purple, and dark brown colors. The Doyle Shale ranges up to 65 ft (20 m) in Marion County.

Figure 1. Approximately 8 m of the Nolans Limestone exposed in washed out section of road; Kidder Limestone in foreground overlain by Paddock Shale Member with Herington Limestone Member on the crest of road in background. Photo credit: Jon J. Smith, University of Kansas.

OIL/GAS AND WATER WELLS FOR MARION COUNTY



SOURCES

Byrne, F. E., Walters, C. P., Hill, J. L., and Riseman, L., 1959, Geology and construction-material resources of Marion County, Kansas: U.S. Geological Survey, Bulletin 1060-B, pp. 63-95.

McCauley, J. R., 2014, Surficial geology of Dickinson County, Kansas; text, geologic-unit descriptions, and cross-section geology by C. M. Phillips-Lander: Kansas Geological Survey, Map M-124, scale 1:50,000.

Sawin R. S., and West, R. R., 2016a, Surficial geology of Morris County, Kansas: Kansas Geological Survey, Map M-125, scale 1:50,000.

Sawin, R. S., and West R. R., 2016b, Data control pPoints used to construct the Surficial Geology Map (M-125) of Morris County, Kansas: Kansas Geological Survey, Open-file Report 2016-2 (revised 27 July 2022), 255 p.

Swineford, A., 1955, Petrography of Upper Permian rocks in south-central Kansas: Kansas Geological Survey, Bulletin 111, 179 p.

Zeller, D. E., ed., 1968, The stratigraphic succession in Kansas: Kansas Geological Survey, Bulletin 189, 81 p., http://www.kgs.ku.edu/Publications/Bulletins/189/index.html.

Elevation contours are included for general reference. They are used in the U.S. 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 for 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.

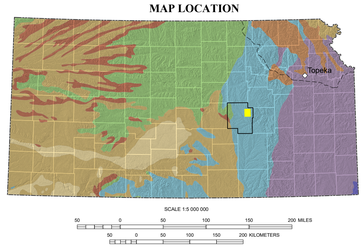
References used in the digital mapping include 1-meter LiDAR hillshades and 1-meter 2020 U.S. Department of Agriculture – Farm Services Agency (USDA-FSA) National Agriculture Imagery Program (NAIP) digital imagery. USGS 7.5-min 1:24,000-scale topographic maps, USDA Natural Resources Conservation Service (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 of Kansas LiDAR database. The DEM images, in ERDAS IMAGINE format, were 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 the 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).

This map was produced using ArcGIS® software by Esri. ArcGIS® is the intellectual property of Esri and is used herein under license. Copyright © Esri. All rights reserved.
This map is a preliminary product and has had less scientific and cartographic review than the Kansas Geological Survey's M-series geologic maps. The KGS does not guarantee this map to be free from errors or inaccuracies and disclaims any responsibility or liability for interpretations made from the map or decisions based thereon.

MAP LOCATION



GENERALIZED GEOLOGY OF KANSAS

QUATERNARY SYSTEM
- Holocene - Pleistocene Series
  - Loess and river-valley deposits
  - Sand dunes
  - Glacial-drift deposits
  - Limit of glaciation in Kansas

NEOGENE SYSTEM
- Pliocene - Miocene Series
  - Ogallala Fm

CRETACEOUS SYSTEM

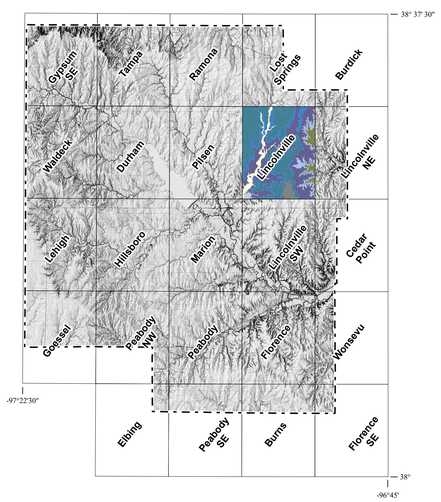
PERMIAN SYSTEM

CARBONIFEROUS SYSTEM
- Pennsylvanian Subsystem
- Mississippian Subsystem

Figure 2. Cresswell Limestone Member at the top of the Winfield Limestone cropping out in stream bank along Clear Creek northeast of Marion, KS. The Cresswell Limestone Member is heavily quarried in and around the City of Marion. Photo credit: Jon J. Smith, University of Kansas.

Figure 3. Approximately 3 m of the Herington Limestone Member of the Nolans Limestone exposed in a roadcut north of Marion, KS. Photo credit: Jon J. Smith, University of Kansas.

QUADRANGLE INDEX MAP FOR MARION COUNTY



Last updated: 9/9/2026