PRELIMINARY SURFICIAL GEOLOGY OF THE MARION COUNTY PORTION OF THE LOST SPRINGS QUADRANGLE, KANSAS

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KANSAS GEOLOGICAL SURVEY
The University of Kansas

Open-File Report 2026-21

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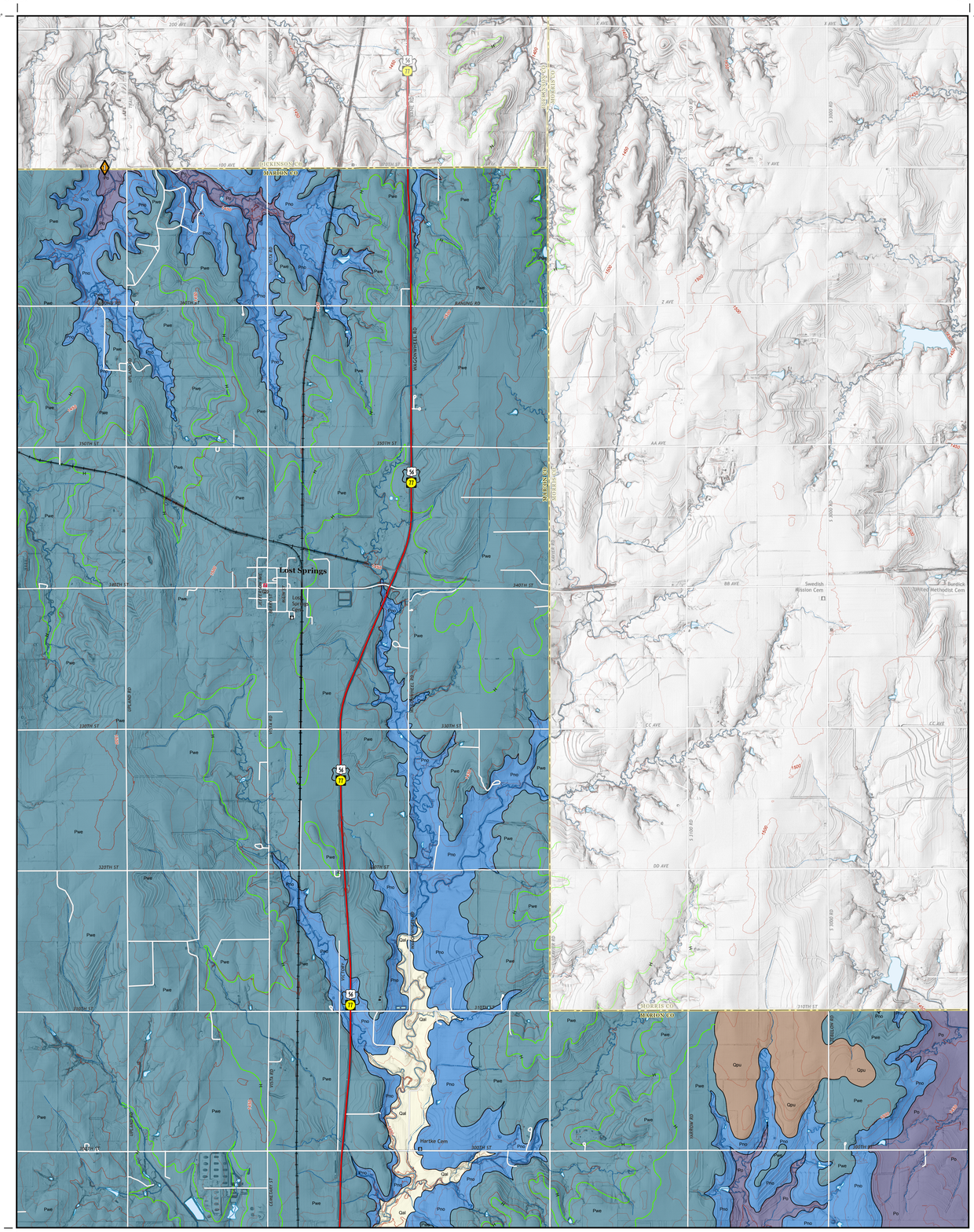
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map US Topo

LOST SPRINGS QUADRANGLE
KANSAS
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, August 2017 - September 2017
Roads.....U.S. Census Bureau, 2015 - 2018
Names.....GNIS, 2008 - 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°13'
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
- US highway
- Railroad

Hydrology
- Perennial stream
- Intermittent stream
- Waterbody

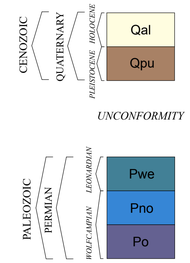
Topography
- Index elevation contour (50 feet)
- Elevation contour (10 feet)

Geology
- Observed contact
- Hollenberg Limestone Member
- Photo location

SUGGESTED REFERENCE TO THE MAP

Smith, J. J., 2026, Preliminary surficial geology of the Marion County portion of the Lost Springs quadrangle, Kansas: Kansas Geological Survey, Open-File Report 2026-21, scale 1:24,000, unpublished.

CORRELATION OF UNITS



SOURCES

Aber, J. S., 1991, Surficial geology of Butler County, Kansas, final report: Kansas Geological Survey, Open-File Report 91-48, p. 1–31.

Aber, J. S., 1994, Geologic map, Butler County, Kansas: Kansas Geological Survey, Map M-30, scale 1:50,000.

Byrne, F. E., Walter, 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, p. 63–95.

Kansas Geological Survey, 2022, Water well completion records (WWC5), http://www.kgs.ku.edu/Magellan/WaterWell/index.html.

Moore, R. C., Jewett, J. M., O'Connor, H. G., 2004, Geologic map of Chase County, Kansas: Kansas Geological Survey, Map M-56, scale 1:50,000.

Zeller, D. E., ed., 1968, The stratigraphic succession in Kansas: Kansas Geological Survey, Bulletin 189, 81 p., https://doi.org/10.17161/kgsbulletin.no.t189.22214

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

Qal — Undifferentiated floodplain alluvium

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.

Qpu — Alluvial and eolian deposits (upland)

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.

Pwe — Wellington Formation

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.

Pno — Nolans Limestone

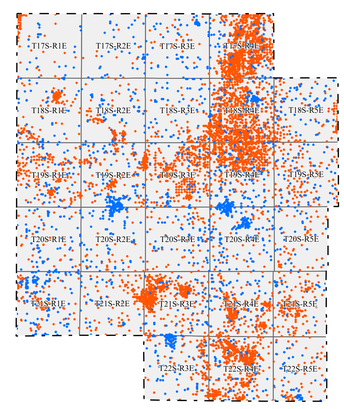
At the base of the Nolans is the Kidder Limestone Member which consists of one or two beds of hard, gray to yellowish-brown, nodular, and dolomitic limestone with a "sugary" rough texture and containing bivalves and brachiopods. The Kidder has a total thickness of approximately 2 ft (0.6 m). Above the 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).

Po — Odell Shale

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.

Figure 1. Contact between the Krider Limestone Member of the Nolans Limestone and the underlying gray-green Odell Shale. Photo credit: Jon J. Smith, University of Kansas.

OIL/GAS AND WATER WELLS FOR MARION COUNTY



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).

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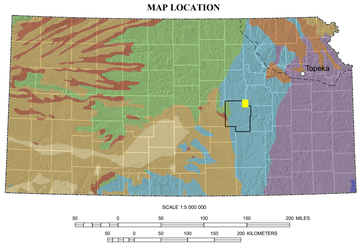
MAP LOCATION



GENERALIZED GEOLOGY OF KANSAS

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

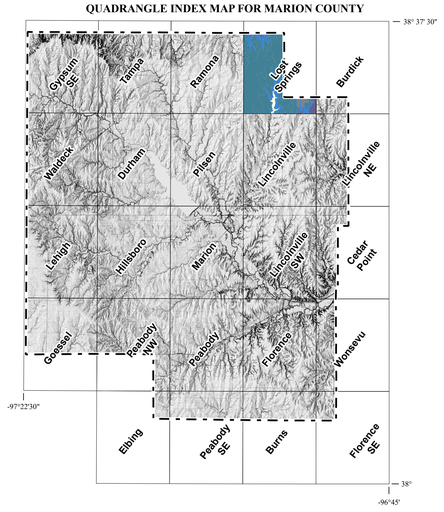
NEOGENE SYSTEM
- Pliocene - Miocene Series
  - Ogallala Fm

CRETACEOUS SYSTEM

PERMIAN SYSTEM

CARBONIFEROUS SYSTEM
- Pennsylvanian Subsystem
- Mississippian Subsystem

QUADRANGLE INDEX MAP FOR MARION COUNTY



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