KANSAS GEOLOGICAL SURVEY
The University of Kansas

PRELIMINARY SURFICIAL GEOLOGY OF THE PARKER QUADRANGLE, LINN COUNTY, KANSAS

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GIS compilation and cartography by Kolbe D. Andrzejewski

2026

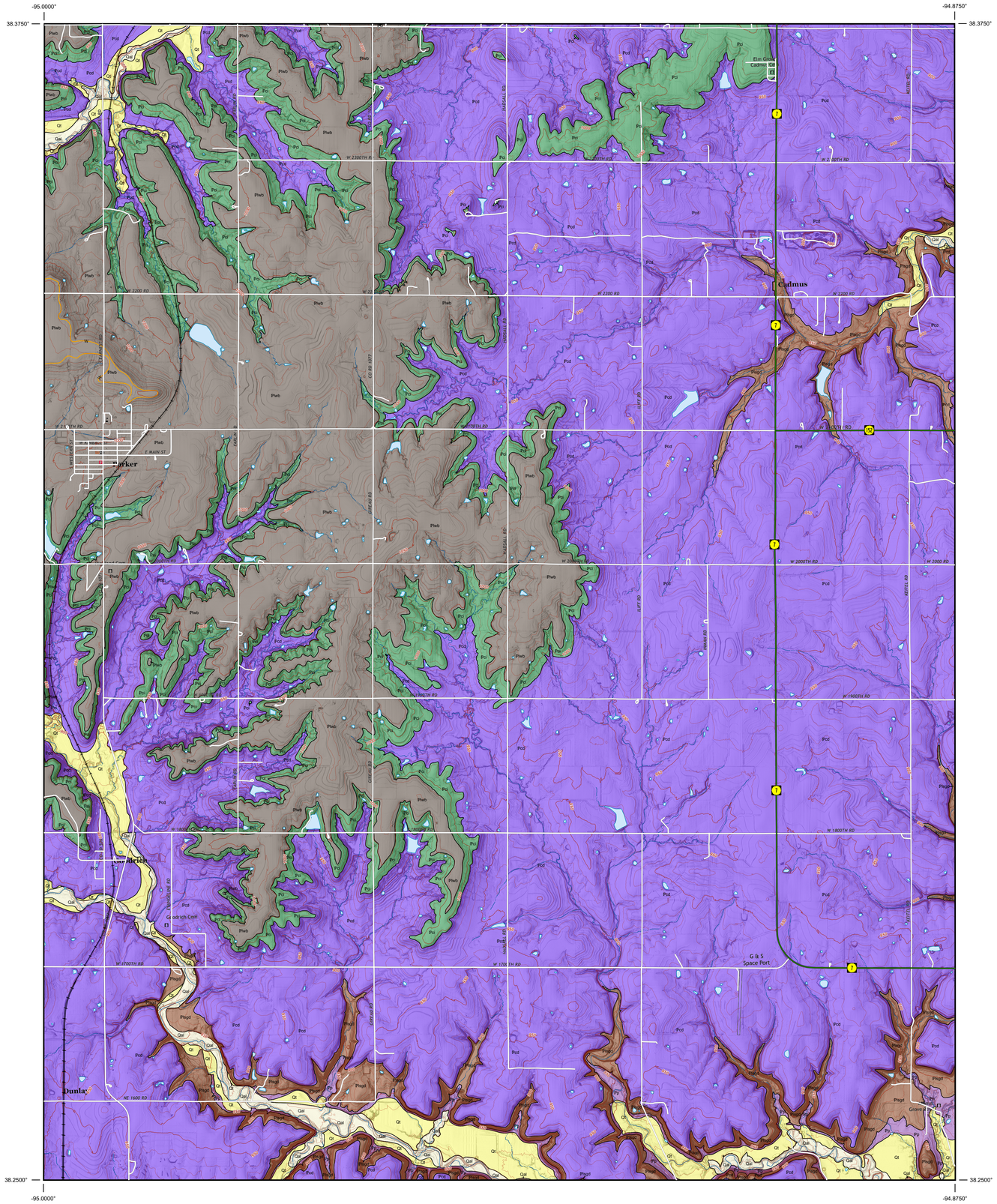
Open-File Report 2026-10

Funded in part by the USGS National Cooperative Geologic Mapping Program

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

The National Map US Topo

PARKER QUADRANGLE
KANSAS - LINN 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 15S

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, 1978 - 2021
Hydrography.....National Hydrography Dataset, 2000 - 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
1°52' 33 MILS
1°12' 21 MILS

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
UC
Grid Zone Designation
15S

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
- State highway (4)
- Railroad

Hydrology
- Perennial stream
- Intermittent stream
- Waterbody

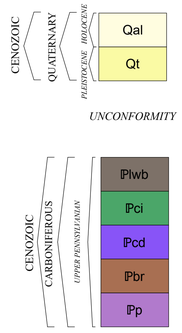
Topography
- Index elevation contour (50 feet)
- Elevation contour (10 feet)

Geology
- Observed contact
- W — Wyandotte Limestone marker bed

SUGGESTED REFERENCE TO THE MAP

Peterson, A.E., 2026, Preliminary surficial geology of the Parker quadrangle, Linn County, Kansas: Kansas Geological Survey, Open-File Report 2026-10, scale 1:24,000, unpublished.

CORRELATION OF UNITS



The following unit descriptions are derived from a compilation of several sources including field notes and measured sections, geological reports from Linn and surrounding counties, water well drillers logs, soil survey data, high resolution imagery, and LiDAR.

GEOLOGIC UNITS

Undifferentiated floodplain alluvium

Qal

This unit is composed of silt, clay, sand, and gravel in and adjacent to present day rivers and streams. Coarser sediment is typically found in the lowest few feet of the alluvial valley fill. These sediments are likely less than 60 ft (18 m) thick in the Marias Des Cygnes River Valley and less than 30 ft (9 m) in stream valleys in Linn County.

Alluvial terrace deposits

Qt

This unit is composed of silt, clay, sand, and gravel underlying a low terrace adjacent to major streams. Within the major river valleys and streams it is 3 - 6 ft (1 - 2 m) higher than the modern floodplain.

Bonner Springs Shale, Wyandotte Limestone, and Lane Shale

Plwb
w

The Bonner Springs Shale is a gray to buff shale with a persistent sandstone bed at the base. The Bonner Springs Shale varies in thickness along the outcrop belt in Kansas as does the Wyandotte Limestone. In eastern Kansas where the Wyandotte Limestone thins, the Liberty Memorial Shale generally thickens. The Bonner Springs Shale varies in thickness in Miami County from 0.5 to 64 ft (0.15 - 19.5 m) and is approx. 50 ft (15 m) thick in Allen County. The Wyandotte Limestone varies in thickness in Miami County from 2.6 to 66.8 ft (0.8 - 20.4 m). North, in Miami County, it has five members including the Island Creek Shale, Lower Farley Limestone, Middle Farley Shale, Upper Farley Limestone, and Bonner Springs Shale. In Linn County, the limestone beds pinch out making member identification difficult. The Wyandotte Limestone is approx. 27 feet thick in the northwest corner of Linn County and thins to the south where it disappears and the accommodation space is filled by the Liberty Memorial Shale. The Wyandotte Limestone is a light bluish-gray, wavy-bedded limestone. The Lane Shale Formation is a bluish-gray, clay shale in Linn County. The total thickness of the Lane Shale there is approx. 56 ft (17 m) where the Argentine Limestone is present so that a measurement is possible.

Chanute Shale and Iola Limestone

Pci

In Linn County, the thickness of the Chanute Shale Formation ranges from 30 to 40 ft (9 – 12 m). The upper portion of the Chanute shale is composed of sandstone while the lower portion is composed of olive-green, clay shale. A coal bed of up to 1 ft in thickness separates the upper and lower portions of the Chanute Shale. The Iola Limestone is 11 to 16 ft (3.4 - 4.9 m) in the county. It is composed of three members. The Paola Limestone Member is a dense, dark blue limestone that ranges between 2 and 3 ft (0.6 – 1 m). It is not continuous across Linn County. The Muncie Creek Shale Member is a phosphatic black, platy shale ranging in thickness from a few inches to approx. 3 ft (0.1 – 1 m). The Raytown Limestone Member is a yellowish-brown to nearly white limestone unit that has distinctive limonite staining along bedding planes within the wavy-bedded unit. Its thickness ranges from 9 to 13 ft (3 – 4 m).

Cherryvale Shale and Drum Limestone

Pcd

The Cherryvale Shale Formation ranges in thickness from 40 to 70 ft (12 – 21 m). It is composed of five members: Fontana Shale, Block Limestone, Wea Shale, Westerville Limestone, and Quivira Shale. In Linn County, the Westerville Limestone is absent, so the Wea and Quivira Shale Members are not distinguishable. The Block Limestone thins from 1 to 7 ft (0.3 – 2.1 m) in the north portion of the county to a thin, discontinuous bed in the south portion of the county making individual shale units within the Cherryvale Shale difficult to distinguish. The Drum Limestone is composed of two limestone members locally separated by several inches of shale. The massive-bedded, deep brown Dewey Limestone Member averages approx. 1.5 ft (0.5 m). The crystalline Dewey Limestone is bluish-gray on a fresh break. The Corbin City Limestone Member forms the upper portion of the Drum Limestone where present and is a cross-stratified, oolitic limestone that ranges in thickness from 0.2 to 6 ft (0.1 – 1.8 m). The Drum Limestone varies in thickness from several inches to 9 ft (0.2 – 2.7 m) across Linn County.

Bronson Subgroup

Pbr

The Bronson Subgroup, making up the lower portion of the Kansas City Group, is composed of five constituent formations. From bottom to top, they are: the Hertha Limestone, Elm Branch, Swope Limestone, Galesburg Shale, and Dennis Limestone Formations. The Hertha Limestone Formation averages approx. 20 ft (6 m) and is composed of three members. The Critzer Limestone Member is variable in thickness in Linn County but averages about 4 ft (1.2 m). The Critzer is variable in composition throughout the county ranging from fossiliferous and clastic in some locations to algal and fine–grained. The Mound City Shale Member is a calcareous dark gray shale with a thin limestone bed in the middle portion. The Mound City averages 6 ft (1.8 m) in Linn County. The Snabar Limestone Member forms the upper bench of the Hertha Limestone. It weathers rust brown and ranges in thickness from 2 to 6 ft (0.6 – 1.8 m). The Elm Branch Formation is a brown, calcareous shale that ranges in thickness from 5 to 13 ft (1.5 – 4 m). The Elm Branch is exceptionally fossiliferous near the upper contact. The Swope Limestone Formation is composed of three members including the Middle Creek Limestone Member, Hushpuckney Shale Member, and the Bethany Falls Limestone Member. The Middle Creek Limestone Member is remarkably uniform in thickness at about 2 ft (0.6 m). It weathers light yellowish-gray and is gray to bluish-gray on a freshly broken surface. The Hushpuckney Shale Member is a black fissile shale near the base, and brown clay shale near the top of the interval that averages 5 ft (1.5 m). The Bethany Falls Limestone Member ranges between 11 to 21 ft (3.4 – 6.4 m) in Linn County. It weathers light gray to light yellow and has an oolitic bench forming bed at the top. The Galesburg Shale Formation averages a uniform 2 ft (0.6 m) and is primarily gray and unfossiliferous. Locally, it may be nodular and fossiliferous near the top. The Dennis Limestone Formation forms a prominent escarpment along the length of its outcrop belt in Linn County. The Dennis Limestone is composed of three members. In ascending order, they are the: Canville Limestone Member, Stark Shale Member, and Winterset Limestone Member. The average thickness in the county is approx. 35 ft (10.7 m). The Canville Limestone Member is a dense, blue, massive limestone that ranges in thickness from 0 to 2 ft (0 – 0.6 m). Where the limestone in this unit is absent within the county, it is typically replaced by a dark calcareous shale. The Stark Shale Member is composed of a lower black platy shale and an upper gray blocky shale. Both of these units together average 4 ft in Linn County. The Winterset Limestone Member ranges in thickness from 30 to 40 ft (9 – 12 m) in the county. The Winterset is characterized by wavy beds separated by thin shale partings. It is cherty near the top of the unit.

Pleasanton Group

Pp

The Pleasanton Group is primarily composed of gray to buff, thin–bedded, micaceous siltstone. Locally, intermittent sandstone bodies outcrop and a more continuous sandstone bed termed the Hepler is found at the base of the Pleasanton Group. In the southern portion of Linn County, flaggy limestone beds outcrop near the top of the Pleasanton Group called the "Bourbon Flags." These beds range from a few feet in Linn County to approx. 60 feet in Bourbon County to the south. The Pleasanton Group ranges from approx. 100 to 150 ft (30 - 46 m) in thickness in Linn County.

SOURCES

Heckel, Philip H., and Cocke, J. M., 1969, Phylloid algal-mound complexes in outcropping Upper Pennsylvanian rocks of Mid-Continent: AAPG, Bulletin 53.5 , p. 1058-1074.

Jewett, John M., Emery, Philip A., Hatcher, David A., 1965, The Pleasanton Group (Upper Pennsylvanian) in Kansas: State Geological Survey of Kansas, Bulletin 175, Part 4, https://www.kgs.ku.edu/Publications/Bulletins/175_4/.

Kansas Geological Survey, "Water Well Completion Records (WWC5) Database." Accessed 2025 and 2026. https://www.kgs.ku.edu/Magellan/WaterWell/index.html.

Layzell, Anthony L., Newell, David K., Oborny, Stephan C., Mandel, Rolfe D., Dunham, John W., 2022, Surficial geology of Miami County, Kansas: Kansas Geological Survey, Map M-126, scale 1:50 000, https://www.kgs.ku.edu/General/Geology/County/klm/miami.html.

Merriam, Daniel F., and Anita P. Merriam, [1903] 1991, Geology of the Merriam Limestone (Upper Pennsylvanian) at Merriam, Kansas: Transactions of the Kansas Academy of Science , p. 160-167.

Miller, Don E., 1969, Geology and ground-water resources of Allen County, Kansas: State Geological Survey of Kansas, Bulletin 195, https://www.kgs.ku.edu/General/Geology/Allen/index.html.

Oborny, Stephan C., et al., 2017, Development of phylloid-algal carbonate mounds during regression: Expanding the build-and-fill model: Journal of sedimentary research, v. 87.7 , p. 688-706.

Seevers, William J., 1969, Geology and ground-water resources of Linn County, Kansas: State Geological Survey of Kansas, Bulletin 193, https://www.kgs.ku.edu/General/Geology/Linn/index.html.[KA1.1]

Zeller, D.E., ed., [1968] 2008, Classification of rocks in Kansas, revised by Kansas Geological Survey Stratigraphic Nomenclature Committee; in The Stratigraphic Succession in Kansas: Kansas Geological Survey, Bulletin 189, 81 p., chart.

Elevation contours are presented for general reference. Used in the U.S. Geological Survey's current US Topo 1:24,000-scale topographic map series, they were generated from hydrographically-improved 1/3 arc-second National Elevation Dataset (NED) data and smoothed during processing for use at 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 will typically reflect topographic variation more accurately than the associated contour lines. Repeated fluctuation of an outcrop line across a contour line should be interpreted as an indication that the mapped rock unit is maintaining a relatively constant elevation along a generalized contour.

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 were used as references in the digital mapping. 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 to supplement the mapping. 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. USDA-FSA NAIP imagery also was used to check road locations.

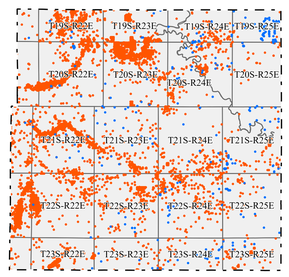
Shaded relief is based on 1-meter hydroflattened bare-earth DEMs from the state of Kansas LiDAR database. The DEM images, in ERDAS IMAGINE format, were mosaicked into a single output DEM and reprojected to decimal degrees. The output DEM was then converted to a hillshade, a multidirectional shaded-relief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

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

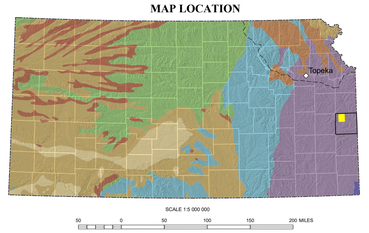
This map was produced using the ArcGIS system developed by Esri (Environmental Systems Research Institute, Inc.).

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.

OIL/GAS AND WATER WELLS FOR LINN COUNTY



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

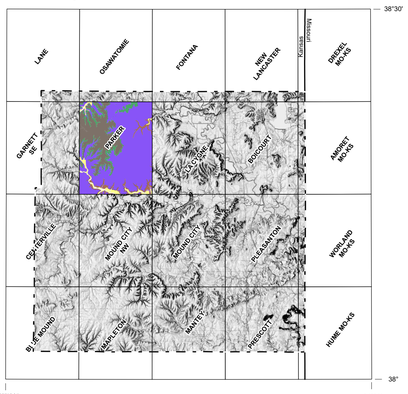
NEOGENE SYSTEM
Pliocene - Miocene Series
- Ogallala Fm

CRETACEOUS SYSTEM

PERMIAN SYSTEM

CARBONIFEROUS SYSTEM
- Pennsylvanian Subsystem
- Mississippian Subsystem

QUADRANGLE INDEX MAP FOR LINN COUNTY



Last updated: 9/25/2026