

PRELIMINARY SURFICIAL GEOLOGY OF THE LYONS QUADRANGLE, RICE COUNTY, KANSAS

Geology by William C. Johnson and Andrew R. Philbin
2016

Computer compilation and cartography by John W. Dunham and Sarah F. Child

Open-file Report 2016-16

Funded in part by the
USGS National Cooperative
Geologic Mapping Program

The following descriptions consist of a compilation of several sources including field notes and measured sections, data from shallow (<10 m) cores collected during the course of mapping, Kansas Department of Transportation geologic reports, USDA NRCS databases, and lithologic and other data in Bayne and Ward (1974).

GEOLOGIC UNITS

CENOZOIC

Quaternary System Holocene

Floodplain alluvium — Floodplain deposits are associated with the Arkansas River and its tributaries and are Holocene in age. These deposits consist of clay, silt, sand, and gravel. In the Arkansas River sand-to-gravel size sediment consists to a large extent of material derived from the Rocky Mountains, whereas in its tributaries (e.g., Little Arkansas River, Cow Creek, Little Cow Creek, and Rattlesnake Creek) the coarse sediment is derived primarily from local shale and sandstone, with the exception of Rattlesnake Creek, which is dominated by sand-sized material derived from reworked Holocene sediments. Core data indicate that the thickness of the floodplain alluvium ranges from 0 to 45 ft (0-14 m) and averages about 25 ft (8 m).

Terrace valley fill — Terrace valley fill is recognized only within the Arkansas River valley. These deposits consist primarily of sand and gravel, but do contain bodies of silt and clay locally. The age of these deposits is primarily Holocene. Older (late-Pleistocene) terraces exist but are not mapped due to a mantle of aeolian sand. Well-log and core data indicate that the thickness of the terrace valley fill ranges up to about 100 ft (30 m) (Fent, 1950).

Eolian dune and sheet sand — Eolian sand deposits occur in scattered bodies on the floodplain (Qal) and terrace (Qt) deposits. The dune sediments consist of moderately well-sorted quartz grains with lesser amounts of silt and clay. The primary source of the dune sediments is the Arkansas River channel. Luminescence dating of selected aeolian dunes mantling the Arkansas River alluvium indicates they were last active about 2200 to 220 years ago, ages which are consistent with those reported from Reno County by Halfen et al. (2012). Arbogast (1998) reported an age range of 22,000 to 11,000 years ago for the sandy alluvium underlying the dunes and sand sheets in the Great Bend Sand Prairie, including southwestern Rice County. The dunes are stable with grass or crop cover except for a few isolated areas where livestock and other disturbance have encouraged activation. Dune sand thickness is highly variable but ranges up to 50 ft (15 m).

Pleistocene

Loess — Uplands in the northern and eastern parts of the county are mantled with loess, which consists of wind-transported silt with minor amounts of clay and very fine sand. The loess is buff in color and calcareous. The age of the loess is primarily late Pleistocene and is recognized as the Peoria Formation throughout the midcontinent; it ranges up to 13 ft (4 m) in thickness. The older, underlying Loveland Formation is a loess unit ranging up to 2.5 m (8 ft) in thickness. Additionally, minor loess deposition occurred in the early and middle Holocene but could not be differentiated from terminal Peoria Formation deposits in Rice County. Loess has a total thickness ranging up to 21 ft (6.5 m).

Neogene System Miocene-Pliocene

Ogallala Formation — The Ogallala Formation is Miocene and earliest Pliocene in age and is limited to two isolated localities in the county. The formation consists of silt, sand, and gravel transported and deposited by ancestral rivers flowing eastward from the Rocky Mountains. These sediments are variously cemented, ranging from unconsolidated to caliche-type deposits. Throughout the Ogallala, thick caliche beds, colloquially referred to as "mortar beds," are irregularly and discontinuously exposed. Silt units are common and usually occur as poorly sorted and lenticular bodies. The outcrops, which are poorly preserved, range in thickness up to 10 ft (3 m), whereas total thickness is at least 20 ft (6 m).

MESOZOIC

Dakota Formation — The Dakota Formation is well-exposed in Rice County, particularly in the northeastern part of the county. The formation consists of silt, sand, and gravel transported and deposited by ancestral rivers flowing eastward from the Rocky Mountains. These sediments are variously cemented, ranging from unconsolidated to caliche-type deposits. Throughout the Ogallala, thick caliche beds, colloquially referred to as "mortar beds," are irregularly and discontinuously exposed. Silt units are common and usually occur as poorly sorted and lenticular bodies. The outcrops, which are poorly preserved, range in thickness up to 10 ft (3 m), whereas total thickness is at least 20 ft (6 m).

CITED REFERENCES

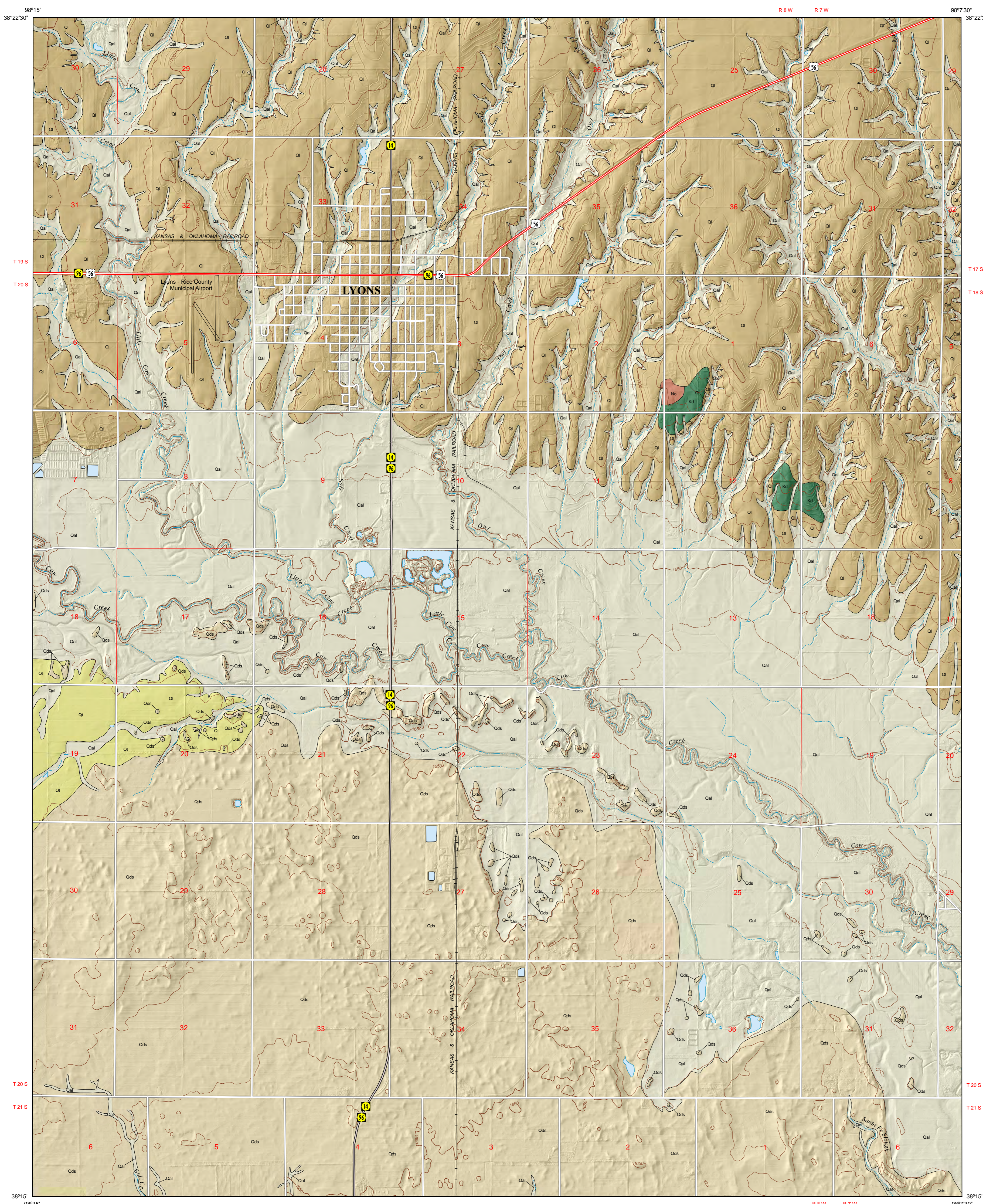
- Bayne, C. K., and Ward, J. R., 1974, Geology and hydrology of Rice County, central Kansas: Kansas Geological Survey, Bulletin 206, pt. 3, 17 p.
- Bayne, C. K., Franks, P. C., and Ives, William, Jr., 1971, Geology and ground-water resources of Ellsworth County, central Kansas: Kansas Geological Survey, Bulletin 201, 84 p.
- Fent, O. S., 1950, Geology and ground-water resources of Rice County, central Kansas: Kansas Geological Survey, Bulletin 85, 142 p.

ADDITIONAL SOURCES

- Arbogast, A. F., 1998, Late Quaternary paleoenvironments and landscape evolution on the Great Bend Sand Prairie: Kansas Geological Survey, Bulletin 242, 74 p.
- Halfen, A. F., Johnson, W. C., Hanson, P. R., Woodburn, T. L., Ludvigson, G. A., and Young, A. R., 2012, Activation history of the Hutchinson dunes in east-central Kansas, USA during the past 2200 years: Aeolian Research 5: 9-20.
- Plummer, N. V., and Romary, J. F., 1947, Kansas clay, Dakota Formation: Kansas Geological Survey, Bulletin 67, 241 p.

EXPLANATION

- | | |
|---------------------------------|---|
| Boundaries and Locations | Hydrology and Topography |
| — Township/range line | — Intermittent stream |
| — Section line | — Water body |
| Transportation | — Water body - manmade shoreline |
| — U.S. and state highway | — Elevation contour (50-foot interval) |
| — Local road | — Elevation contour (10-foot interval) |
| — Railroad | — Depression contour (50-foot interval) |
| Geologic Unit Boundaries | — Depression contour (10-foot interval) |
| — Observed contact | |



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-m LiDAR hillshades and 1-m 2010 and 2012 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. U.S. Department of Agriculture - Farm Services Agency (USDA-FSA) National Agriculture Imagery Program (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, downsampled to 2-meter resolution, 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.

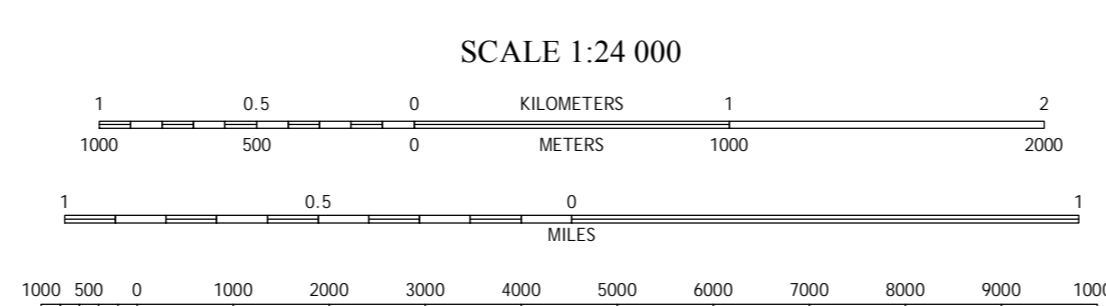
This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program, award number G15AC00225 (FY2015).

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. 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.

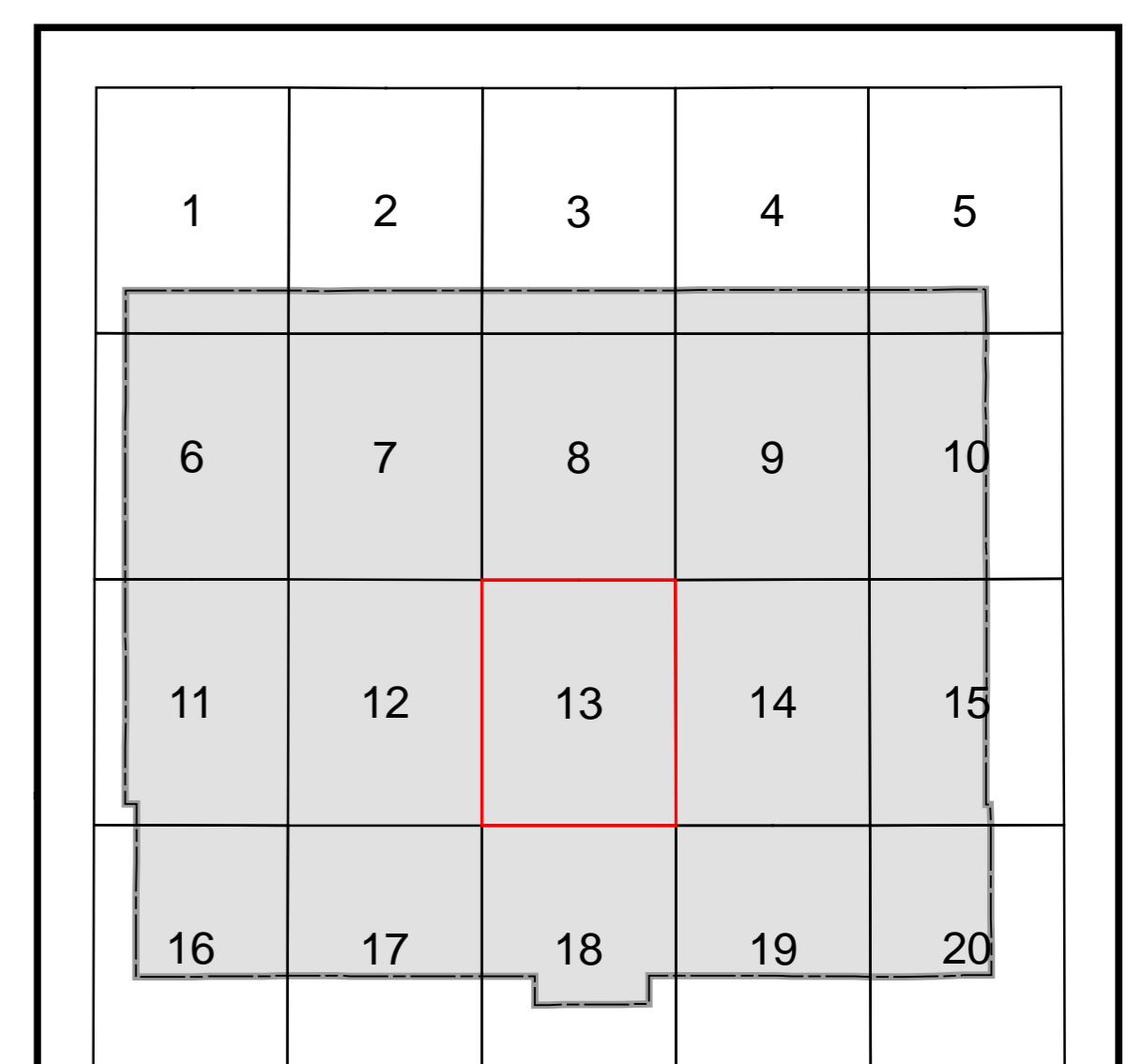
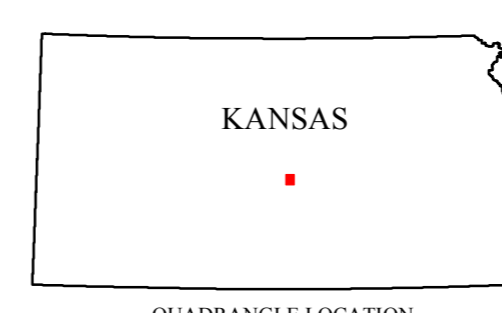
SUGGESTED REFERENCE TO THE MAP

Johnson, W. C., and Philbin, A. W., 2016, Preliminary surficial geology of the Lyons quadrangle, Rice County, Kansas: Kansas Geological Survey, Open-File Report 2016-16, scale 1:24,000, unpublished.



UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 14
NORTH AMERICAN DATUM OF 1983

4°29'
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN
DECLINATION, 2016



RICE COUNTY QUADRANGLES

- | | |
|----------------|------------------|
| 1 Holyrood | 11 Raymond |
| 2 Lorraine | 12 Chase |
| 3 Genesee | 13 Lyons |
| 4 Crawford | 14 Lyons SE |
| 5 Langley | 15 Windom SW |
| 6 Chase NW | 16 Alden NW |
| 7 Chase NE | 17 Alden |
| 8 Lyons NW | 18 Sterling |
| 9 Little River | 19 Nickerson |
| 10 Windom | 20 Hutchinson NW |