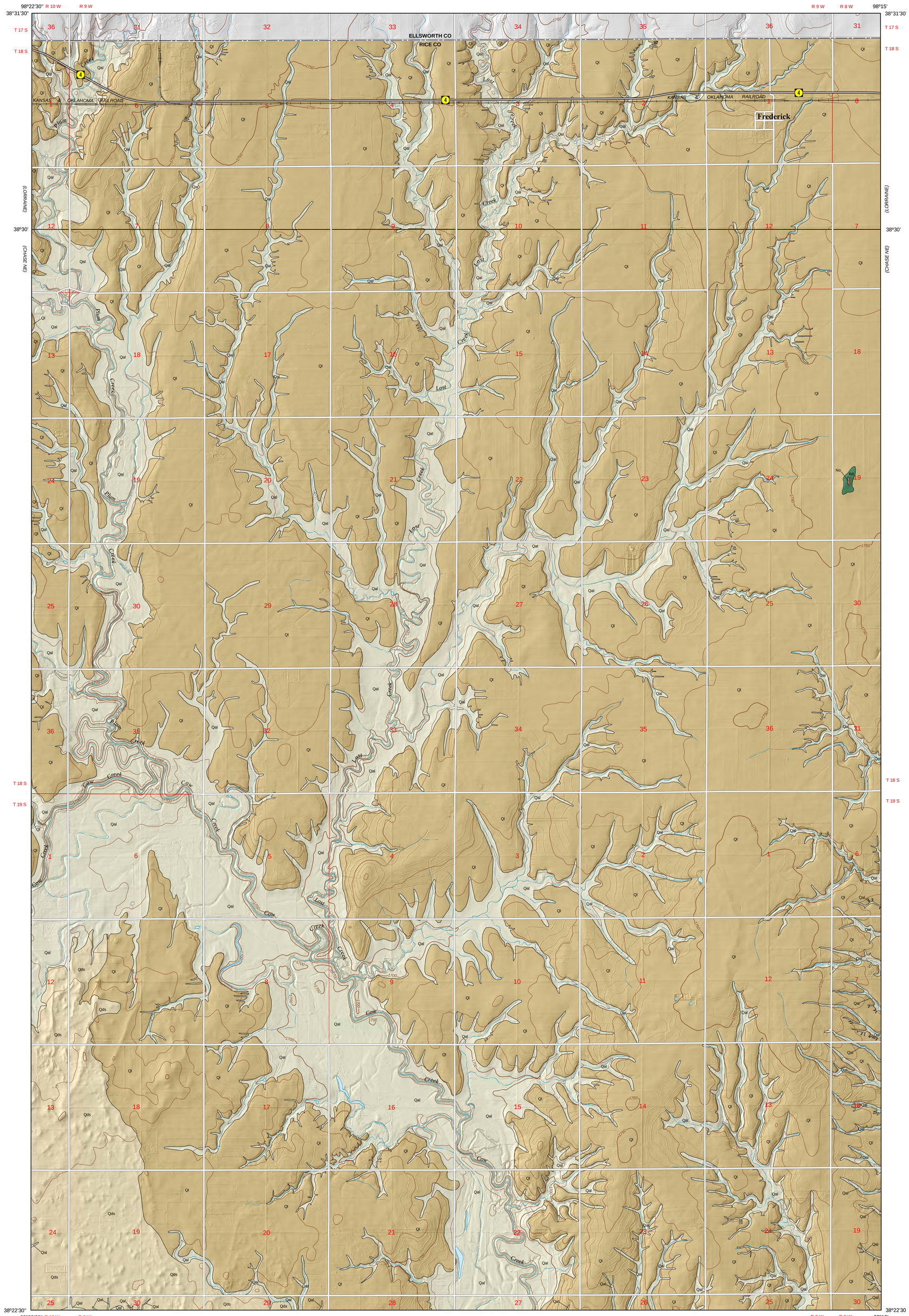
PRELIMINARY SURFICIAL GEOLOGY OF THE CHASE NE QUADRANGLE AND THE RICE COUNTY PORTION OF THE LORRAINE QUADRANGLE, KANSAS

Geology by William C. Johnson and Andrew R. Philbin

2016

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



KANSAS GEOLOGICAL SURVEY
The University of Kansas

Open-File Report 2016-14

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).

Qal

Aeolian dune and sheet sand — Aeolian sand deposits occur in scattered bodies on the floodplain (Qal) and terrace (Qt) deposits. The dune sediments consists of moderately well-rounded 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 area where livestock and other disturbance have encouraged activation. Dune sand thickness is highly variable but ranges up to 50 ft (15 m).
Pleistocene

Qds

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 8 ft (2.5 m) 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).

Ql

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).

No

MESOZOIC

Dakota Formation — The Dakota Formation is well-expressed in Rice County, with particularly in the northeastern part of the county. The Dakota Formation consists of two members: the Terra Cotta Clay Member and the overlying Janssen Clay Member (Plummer and Romary, 1947), with only the former occurring in Rice County. The Terra Cotta Clay Member is composed primarily of interbedded red-mottled, light-gray to greenish-gray clay and siltstone, and coarse-grained and conglomeratic sandstone. Though it contains lentils of cross-bedded sandstone, the member consists mostly of clay and siltstone (Bayne et al., 1971). Topographic expression is variable and depends on the degree of cementation. Maximum thickness of the Dakota Formation in Rice County is about 75 ft (23 m) (Fent, 1950) and maximum exposed thickness is about 55 ft (17 m).

Kd

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
- County boundary
- Township/range line
- Section line

Transportation
- State highway
- Local road
- Railroad

Geologic Unit Boundaries
- Observed contact

Hydrology and Topography
- Perennial stream
- Intermittent stream
- Water body
- Elevation contour (50-foot interval)
- Elevation contour (10-foot interval)
- Depression contour (10-foot interval)

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 Mappin g 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

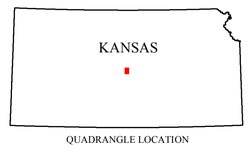
Johnson, W. C., and Philbin, A. W., 2016, Preliminary surficial geology of the Chase NE quadrangle and the Rice County portion of the Lorraine quadrangle, Kansas: Kansas Geological Survey, Open-File Report 2016-14, scale 1:24,000, unpublished.

SCALE 1:24 000

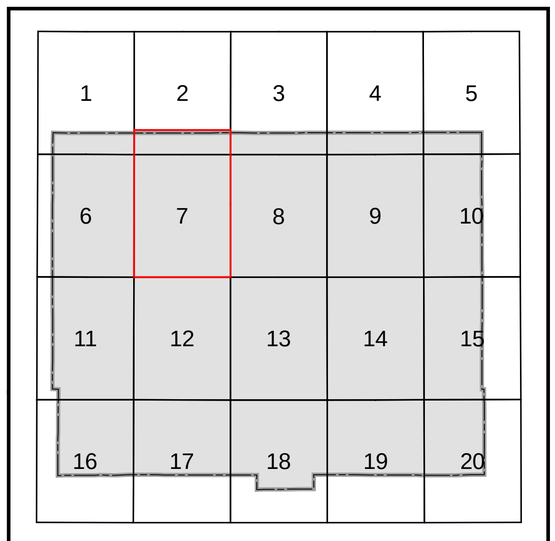
1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 500 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

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

4°23'
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 2016



QUADRANGLE LOCATION



RICE COUNTY QUADRANGLES

1	Holyrood	11	Raymond
2	Lorraine	12	Chase
3	Geneseo	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