

# PRELIMINARY SURFICIAL GEOLOGY OF THE RICE COUNTY PORTION OF THE ALDEN QUADRANGLE, KANSAS

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2015

Computer compilation and cartography by John W. Dunham, Hillary C. Crabb, and Aaron N. Koop

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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).

**Aeolian dune and sheet sand** — Aeolian 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

### CITED REFERENCE

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.

### 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.

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.

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

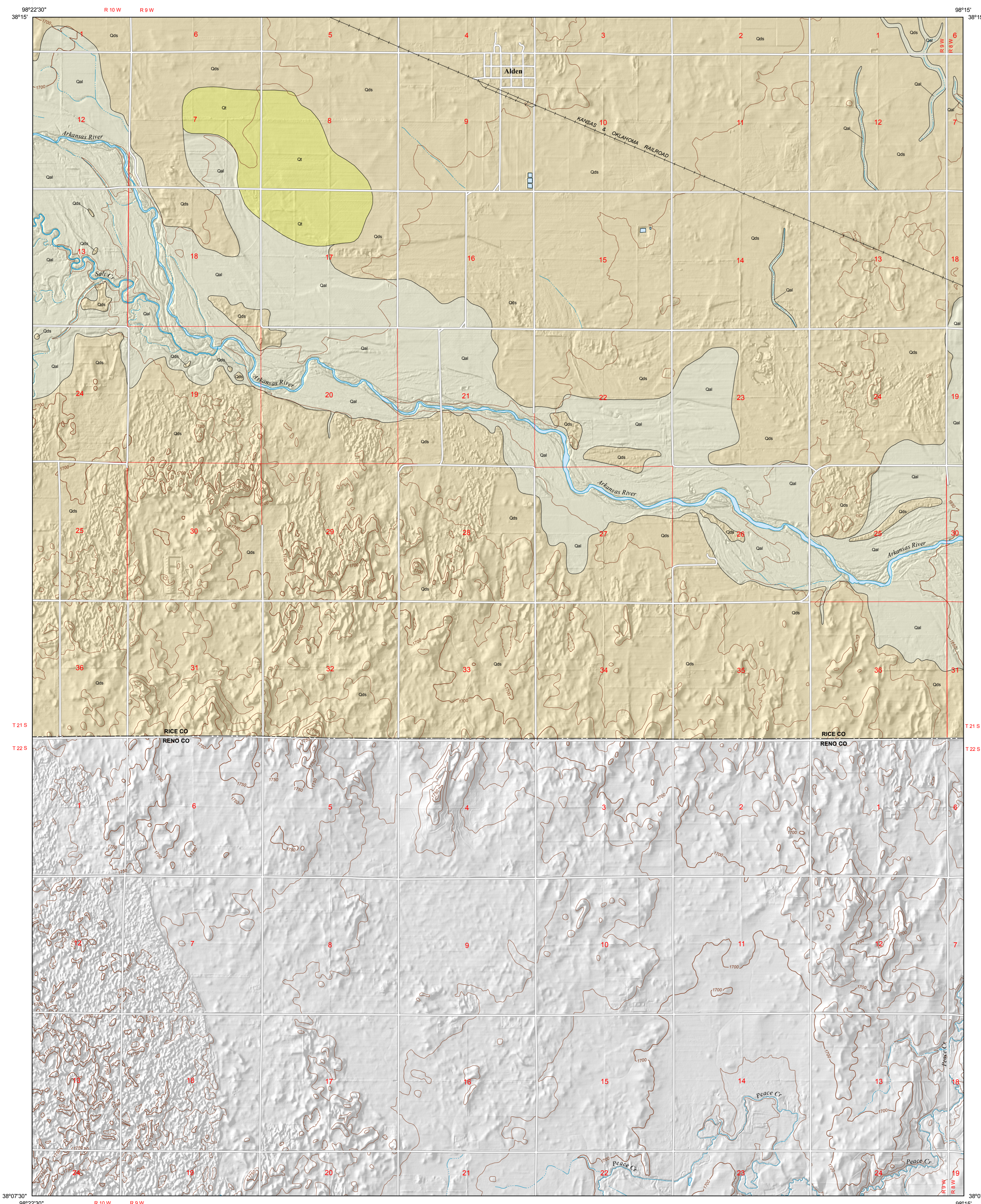
- Local road
- Railroad

### Geologic Unit Boundaries

- Observed contact

### Hydrology and Topography

- Perennial stream
- Intermittent stream
- Water body
- Water body - manmade shoreline
- Elevation contour (50-foot interval)
- Elevation contour (10-foot interval)
- Depression contour (50-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 5-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 G14AC00226 (FY2014).

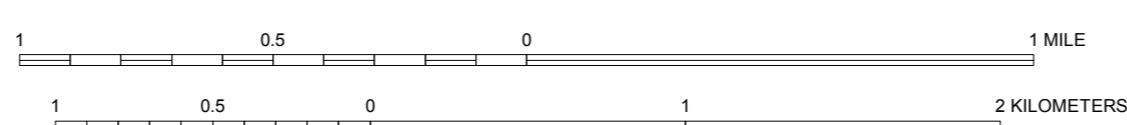
This map was produced using the ArcGIS system developed by Esri (Environmental Systems Research Institute, Inc.).

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 Koop, A. N., 2015, Preliminary surficial geology of the Rice County portion of the Alden quadrangle, Kansas. Kansas Geological Survey, Open-file Report 2015-5, scale 1:24,000, unpublished.

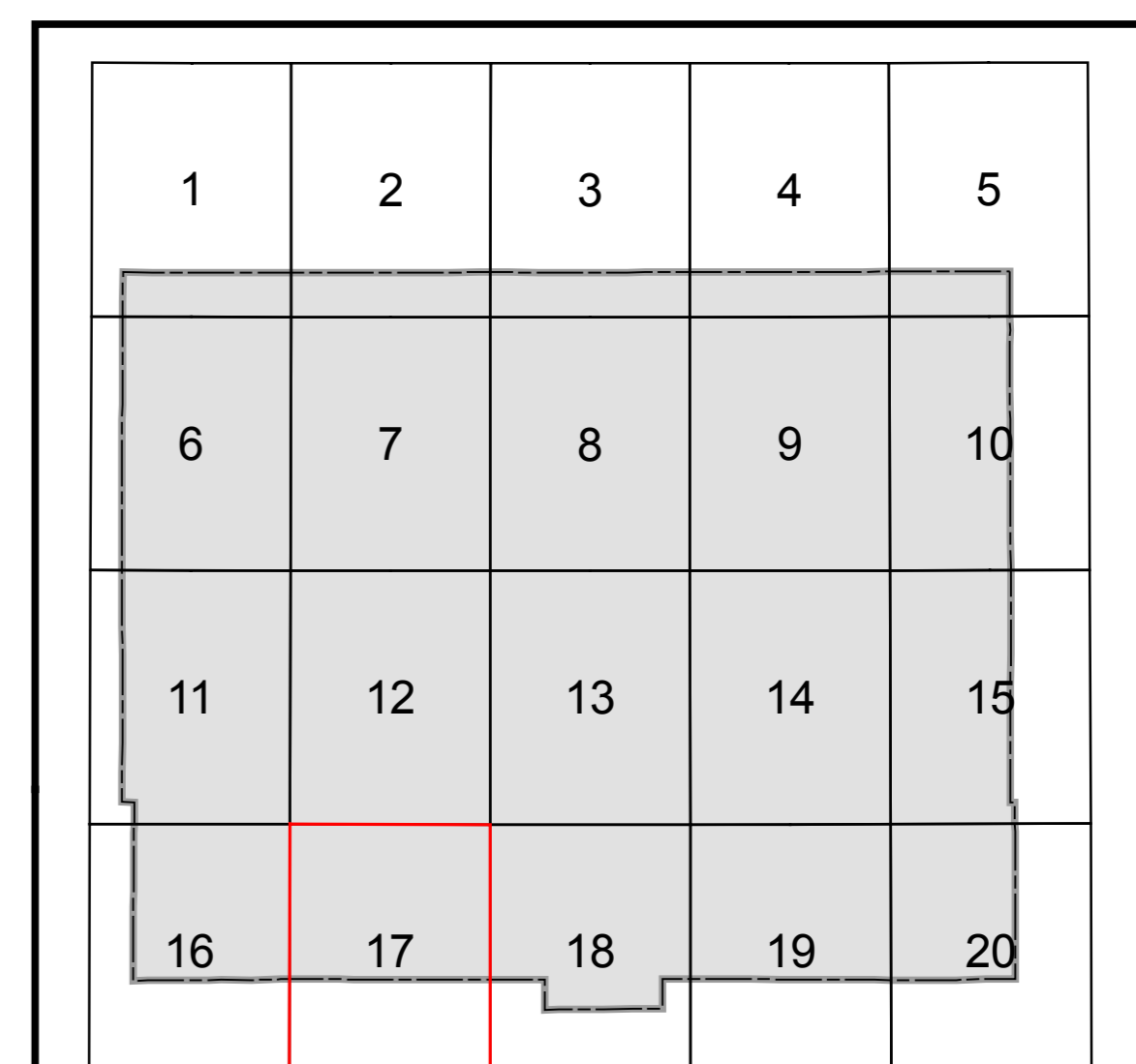
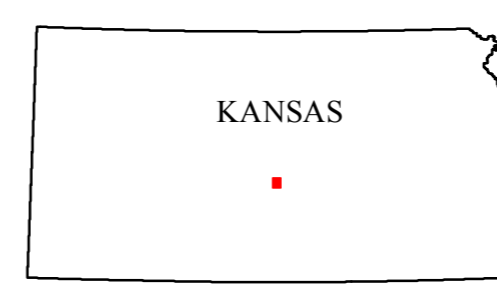
SCALE 1:24 000



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



APPROXIMATE MEAN  
DECLINATION, 2015



### 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 |