

# PRELIMINARY SURFICIAL GEOLOGY OF THE HARPER COUNTY PORTION OF THE RAGO QUADRANGLE, KANSAS

by Jon J. Smith

2022

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Open-File Report 2022-21

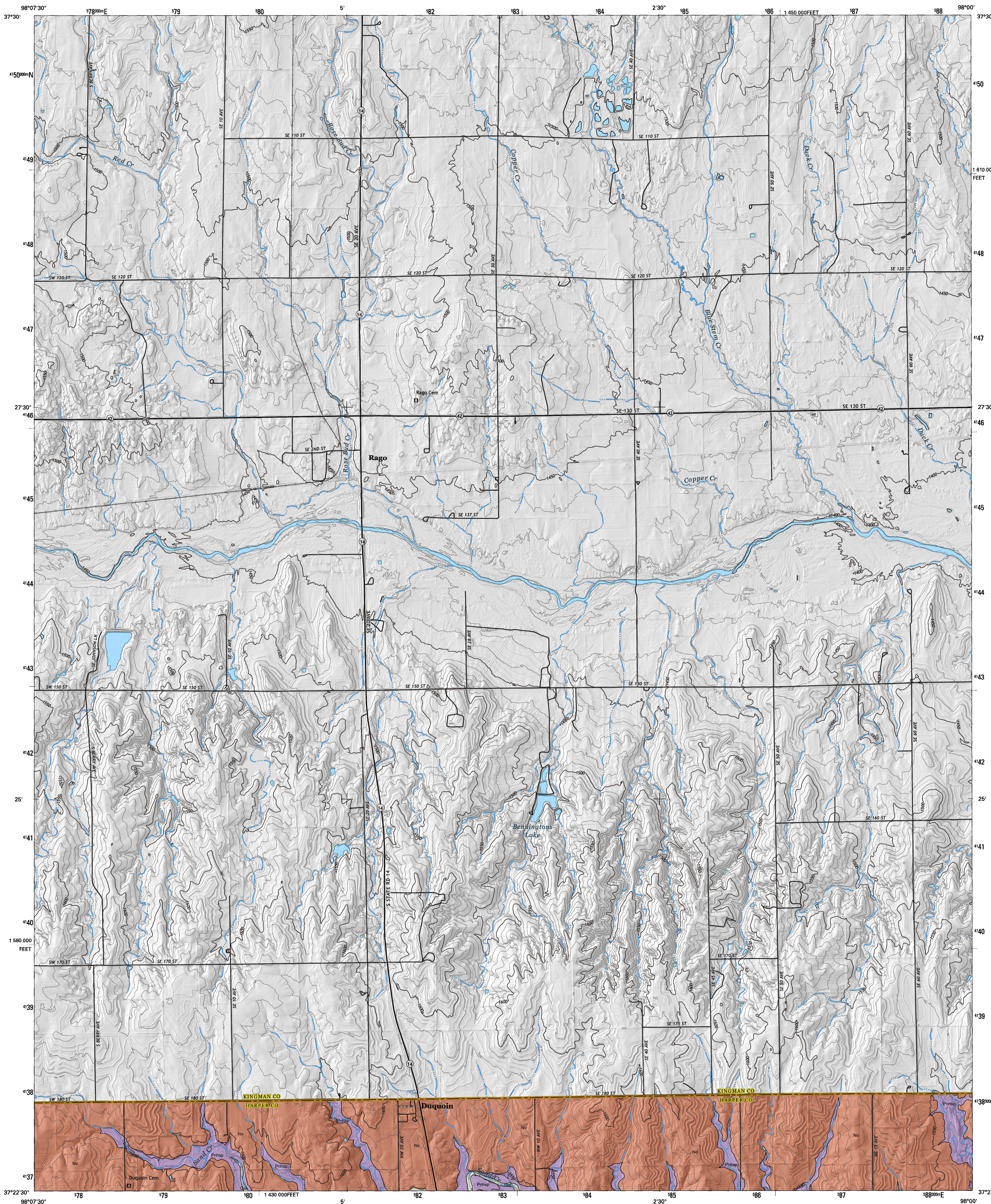
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U.S. DEPARTMENT OF THE INTERIOR  
U.S. GEOLOGICAL SURVEY



RAGO QUADRANGLE  
KANSAS  
7.5-MINUTE SERIES



## GEOLOGIC UNITS

### CENOZOIC

#### Quaternary System

##### Holocene

**Qa1** Undifferentiated floodplain alluvium

#### Neogene System

**No** Ogallala Formation and undifferentiated overlying Quaternary alluvium

### PALEOZOIC

#### Permian System Leonardian Series

**Pnhsp** Harper Sandstone and Salt Plain Formation

## EXPLANATION

### Geologic Unit Boundaries

— Observed contact

## SOURCES

- Bayne, C. K., 1960. Geology and ground-water resources of Harper County, Kansas: Kansas Geological Survey, Bulletin 143, 183 p.
- Cragin, F. W., 1896. The Permian System in Kansas: Colorado College Studies, v. 6, p. 1-48.
- McCaughey, J. R., 2007. Geologic map of Barber County, Kansas: Kansas Geological Survey, Map M-106, 1 sheet, scale 1:50,000.
- Norton, G. H., 1939. Permian redbeds of Kansas: Bulletin of the American Association of Petroleum Geologists, v. 23, n. 12, p. 1,751-1,819.
- Sawin, R. S., Franseen, E. K., West, R. R., Ludvigson, G. A., and Watney, W. L., 2008. Clarification and changes in Permian stratigraphic nomenclature in Kansas; in: Current Research in Earth Sciences: Kansas Geological Survey, Bulletin 254, part 2, <http://www.kgs.ku.edu/Current/2008/Sawin/index.html>.
- Swineford, A., 1955. Petrography of Upper Permian rocks in south-central Kansas: State Geological Survey, Bulletin 111, 179 p.
- Zambito, J. J., Benison, K. C., Foster, T. M., Soreghan, G. S., Soreghan, M. J., and Kane, M., 2012. Lithostratigraphy of Permian red beds and evaporites in the Rebecca K. Bounds core, Greeley County, Kansas: Kansas Geological Survey, Open-File Report 2012-15, 45 p.
- Zeller, D. E., ed., 1968. The stratigraphic succession in Kansas: Kansas Geological Survey, Bulletin 189, 81 p., <http://www.kgs.ku.edu/Publications/Bulletins/189/index.html>.

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 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 G20AC00241 (FY2020).

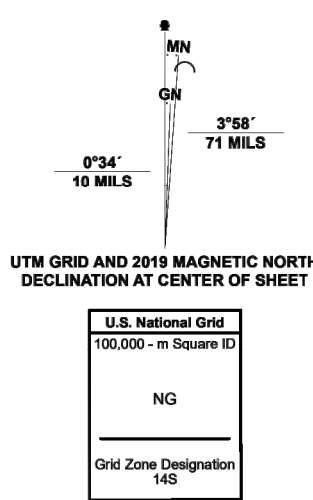
This map was produced using the ArcGIS system developed by Esri (Environmental Systems Research Institute, Inc.).

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.

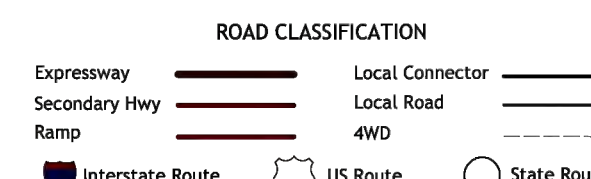
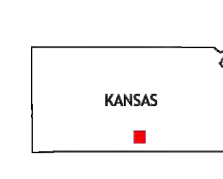
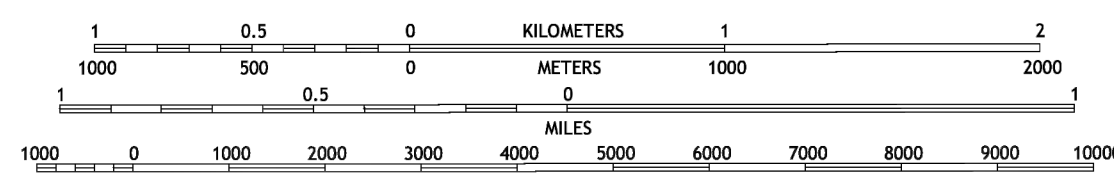
## Produced by the United States Geological Survey

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  
Names:.....GNIS, 1978 - 2019  
Hydrography:.....National Hydrography Dataset, 2006 - 2018  
Contours:.....National Elevation Dataset, 2016  
Boundaries:.....Multiple sources; see metadata file 2019 - 2021  
Public Land Survey System:.....BLM, 2018  
Wetlands:.....FWS National Wetlands Inventory 1985 - 1985



## SCALE 1:24 000



1	2	3	1 Cleveland
4	5	6	2 Alameda
7	8	7	3 Murdock
		8	4 Spivey
			5 Adams
			6 Crystal Springs
			7 Harper
			8 Danville

RAGO, KS  
2022

## SUGGESTED REFERENCE TO THE MAP

Smith, J. J., 2022. Preliminary surficial geology of the Harper County portion of the Rago quadrangle, Kansas: Kansas Geological Survey, Open-File Report 2022-21, scale 1:24,000, unpublished.