PRELIMINARY SURFICIAL GEOLOGY OF THE DANVILLE QUADRANGLE AND THE HARPER COUNTY PORTIONS OF THE ADAMS AND NORWICH QUADRANGLES, KANSAS

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KANSAS GEOLOGICAL SURVEY
The University of Kansas

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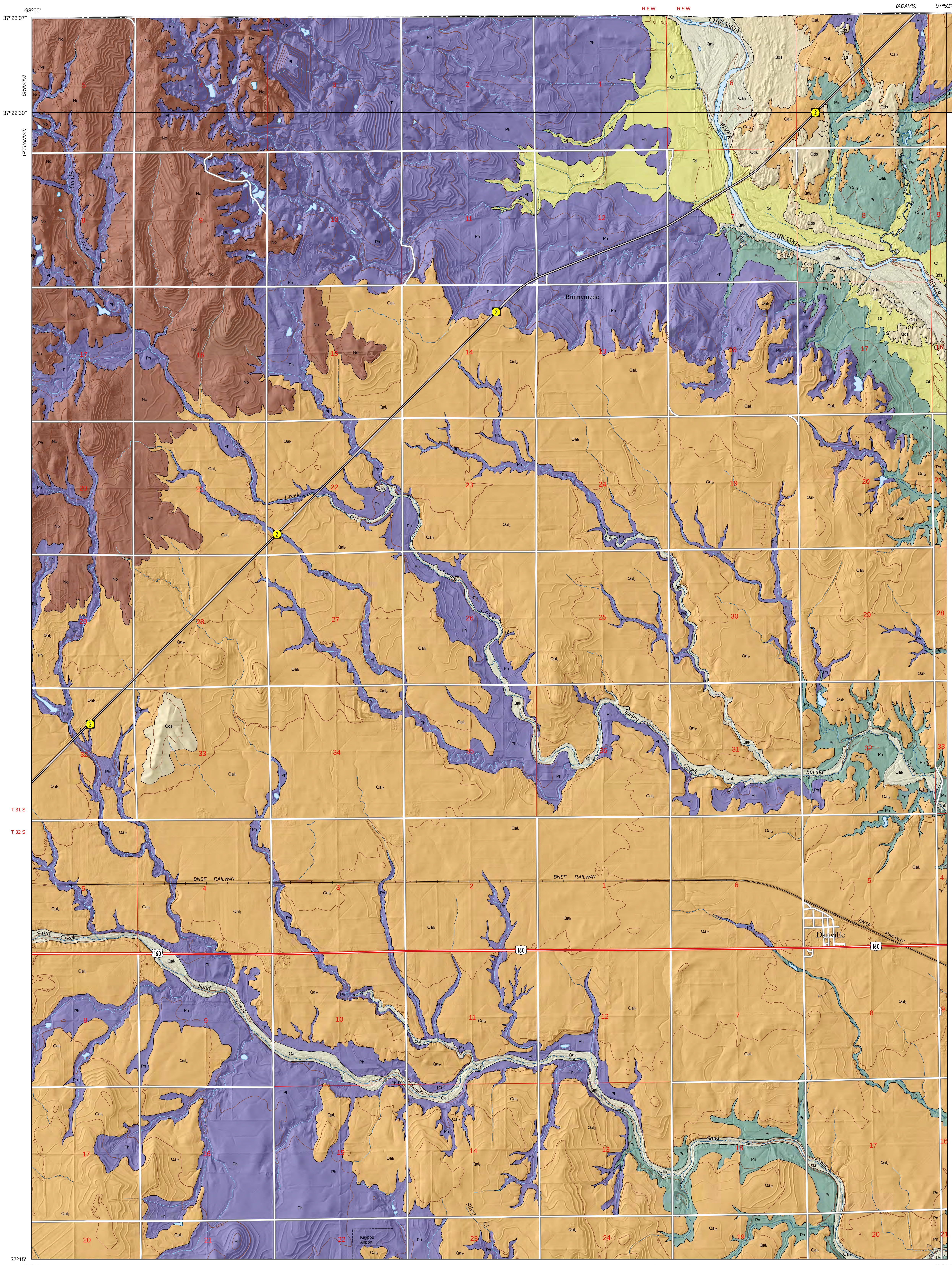
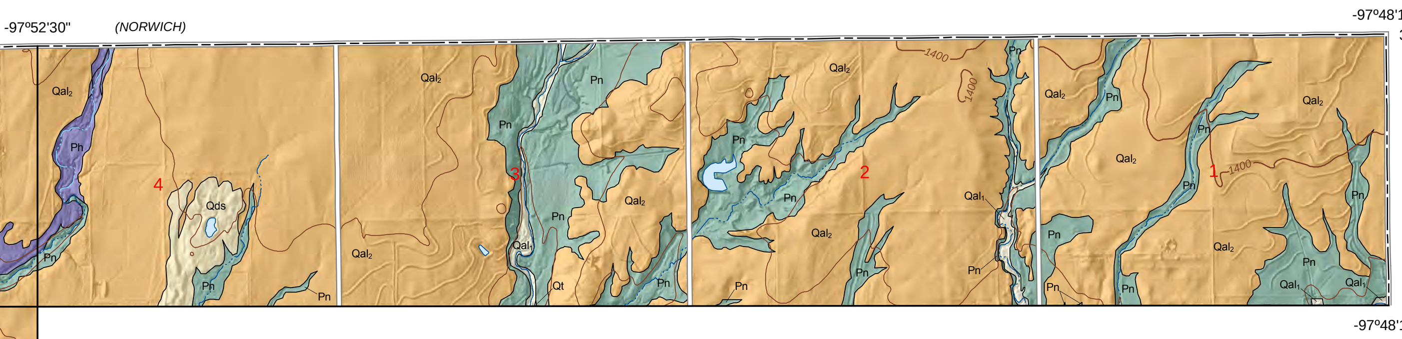



The following descriptions consist of a compilation of several sources, including field notes and measured sections, data from shallow (<10 m) cores collected during the course of mapping, U.S. Department of Agriculture Natural Resources Conservation Service databases, and lithologic and other data in Swineford (1955) and Walters (1961).

GEOLOGIC UNITS

CENOZOIC

Quaternary System
Pleistocene-Holocene

Qal1

Undifferentiated floodplain alluvium—These alluvial deposits make up the modern floodplain in most of the principal streams in Harper County. The main stems of streams in the county underwent deep incision during the latest Holocene and have recently re-established floodplains within the incised channels in some areas. Floodplain alluvium is composed of silt, sand, and gravel and is relatively thin, probably not exceeding 20 ft (6 m) in thickness.

Qt

Alluvial terrace deposits—Terrace deposits, generally found adjacent to and slightly above stream floodplains in Harper County, are numerous along Bluff Creek, Big Sandy Creek, and the Chikaskia River and its tributaries. These deposits are composed of clay, silt, sand, and gravel and likely do not exceed 50 ft (15 m) in thickness.

Qal2

Upland alluvium—Upland alluvial deposits are mostly confined to the eastern portion of Harper County, well above and often distant from stream floodplains. Composed chiefly of Pleistocene silt, sand, and gravel, these deposits are reddish brown in color and contain rocks with various provenances, including considerable material derived locally. Upland alluvium ranges from 0 to perhaps 50 ft (15 m) in thickness.

Qds

Dune sand—The most extensive deposits of windblown sands in Harper County are adjacent to Big Sandy Creek in the western part of the county. A smaller dune field is located on the east side of Bluff Creek northwest of Anthony. Smaller, scattered dune fields occur along Bluff Creek and the Chikaskia River and tributaries. Dune-sand deposits create a hillocky terrain and are stabilized for the most part by vegetation. Dune sand is generally less than 20 ft (6 m) thick in most areas, though it may reach 50 ft (15 m) thick in the area of Big Sandy Creek.

Neogene System

No

Ogallala Formation—The Neogene Ogallala Formation underlies the High Plains physiographic region along the north-central to northwestern border of Harper County. The formation may contain Pleistocene sediments that are lithologically very similar to the Ogallala and overlie the Ogallala in some areas. This unit is a mixture of cobbles, gravel, sand, silt, loess, clay, and caliche beds. The color ranges from white caliche beds to buff to reddish brown. The thickness of the Ogallala reaches 150 ft (46 m) in the north-central and northwest parts of the county. This unit is an aquifer where it is thick enough to maintain a usable saturated thickness and supplies water to several center-pivot irrigation systems in the northern parts of the county.

PALEOZOIC

Permian System
Leonardian Series

Ph

Harper Sandstone—The Harper Sandstone is the lowest formation within the Permian Nippewalla Group and consists of 240 ft (73 m) of reddish-brown argillaceous siltstone, silty sandstone, and beds of red shale and white sandstone. Though mapped as undifferentiated, the Harper Sandstone contains two members: the Chikaskia Sandstone Member below and the Kingman Sandstone Member above. The Chikaskia Sandstone Member is composed of 160 ft (49 m) of reddish-brown sandstone and siltstone grading upsection to silty shale. The Kingman Sandstone Member consists of 80 ft (24 m) of reddish-brown slabby siltstone containing beds of silty shale and light-gray to white silty sandstone. The base of the member is marked by a white silty sandstone about 3 ft (1 m) thick.

Pn

Ninnescah Shale—The oldest rock unit exposed in Harper County is the Ninnescah Shale of the Permian Sumner Group. The Ninnescah is composed mostly of blocky brownish-red dolomitic or calcareous silty shale but also contains some gray shale, argillaceous limestone and dolomite, and calcareous siltstone. The different colors of the beds give the outcrops a banded appearance. The unit's maximum thickness is 450 ft (137 m), but probably only the upper 100 ft (30.5 m) crops out in eastern Harper County. The Ninnescah Shale is marked at the top by the Runnymede Sandstone Member, an approximately 8 ft (2.5 m) thick, very fine-grained, gray to grayish-green siltstone and sandstone. North of Harper County, the upper limit of the Ninnescah Shale is demarcated at the base of the Stone Corral Formation, but in Harper County, the Stone Corral is absent.

CITED REFERENCES

Swineford, A., 1955, Petrography of Upper Permian rocks in south-central Kansas: Kansas Geological Survey, Bulletin 111, 179 p.

Walters, K. L., 1961, Geology and ground-water resources of Sumner County, Kansas: Kansas Geological Survey, Bulletin 151, 198 p.

ADDITIONAL SOURCES

Bayne, C. K., 1960, Geology and ground-water resources of Harper County, Kansas: Kansas Geological Survey, Bulletin 143, 183 p.

McCauley, J. R., 2007, Geologic map of Barber County, Kansas: Kansas Geological Survey, Map M-106, 1 sheet, scale 1:50,000.

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.

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.

EXPLANATION

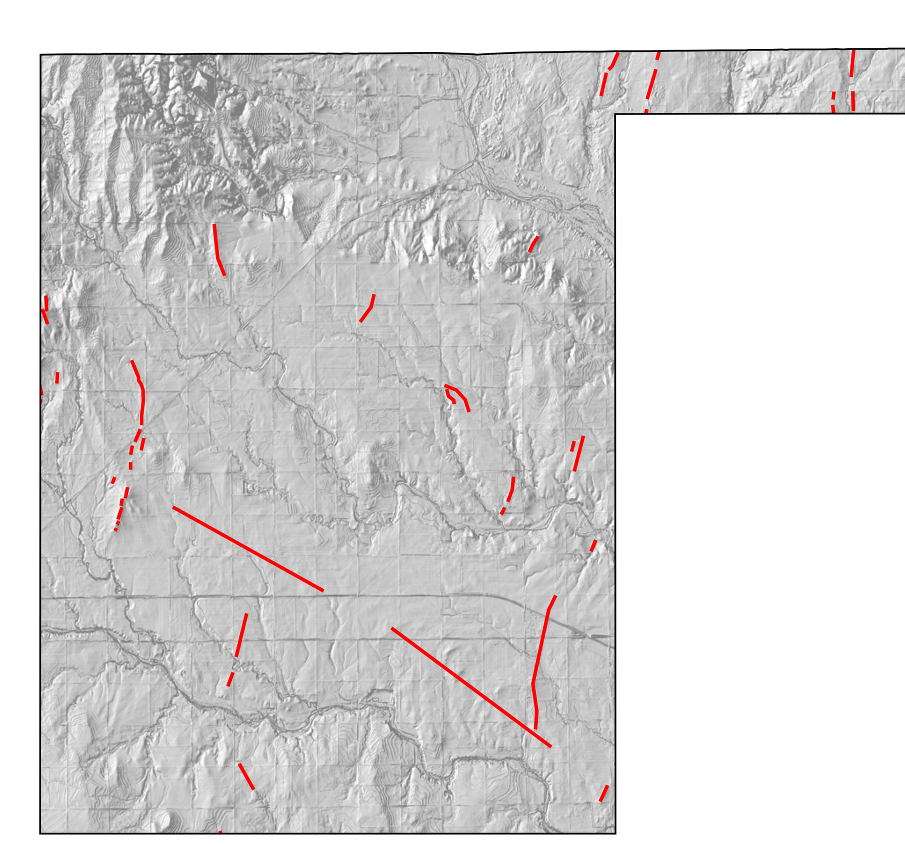
Boundaries and Locations
- Township/range line
- Section line

Transportation
- U.S. highway
- State highway
- Local road
- Railroad

Hydrology
- Perennial stream
- Intermittent stream
- Water body
- Water body - manmade shoreline

Geologic Unit Boundaries
- Observed contact

Topography
- Elevation contour (100-foot interval)
- Elevation contour (20-foot interval)
- Depression contour (20-foot interval)
- Depression contour (100-foot interval)



Inset showing mapped lineaments as potential surface expressions of structural features (e.g., faults, folds, joints, ridges). South-central Kansas, like other parts of the central and eastern United States, resides in a region of relatively low historical and instrumentally recorded seismicity. Despite this, the state has experienced approximately 3,500 earthquakes since 2013, with more than 130 of the events recorded as magnitude 3.0 or greater. This recent spate of seismicity raises concerns about the potential risk that structural features (faults, folds, joints, and ridges) may pose for moderate to large earthquakes. Investigations into the size or extent of these faults include mapping previously unrecognized surface features, such as lineaments, that may reflect more deeply seated structural features.

Lineaments were mapped using aerial photography and bare-earth LiDAR Digital Elevation Models (DEMs), based on one or more of the following criteria: (1) Visible offset in marker beds; (2) relatively low- to high-relief linear ridges that are not obvious geomorphic features due to erosion, slumping, subsidence, or dune formation; (3) linear ridges that cross drainage divides; (4) ridges that display curvilinear or backstepping (en echelon) configurations; (5) rectilinear or parallel drainage patterns; and (6) linear drainage patterns that align across drainage divides.

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 (2010 imagery), 1-meter U.S. Department of Agriculture – Farm Services Agency (USDA-FSA) National Agriculture Imagery Program (NAIP) digital imagery (2015 imagery), and 1-foot Kansas NG911 digital imagery were used as references in the digital mapping. USDA Natural Resources Conservation Service (NRCS) SSURGO data and other geologic maps and bulletins were used to supplement the mapping. Field mapping was undertaken from July to November 2019. Roads and highways are shown on the base map as represented by data from the U.S. Census Bureau. 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 G19AC00231 (FY2019).

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

SUGGESTED REFERENCE TO THE MAP

Smith, J. J., and Dunham, J. W., 2020, Preliminary surficial geology of the Winfield quadrangle, Cowley County, Kansas: Kansas Geological Survey, Open-File Report 2020-12, scale 1:24,000, unpublished.

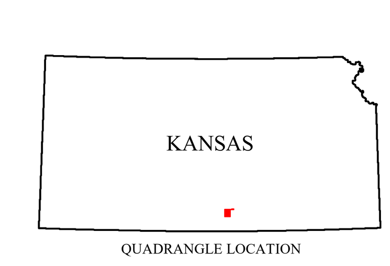
SCALE 1:24 000

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

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

3°8'
TRUE NORTH
MAGNETIC NORTH

APPROXIMATE MEAN DECLINATION, 2020



QUADRANGLE LOCATION

Rago	Adams	Norwich
Harper	Danville	Argonia
Anthony	Bluff City NW	Freeport

ADJOINING 7.5' QUADRANGLES