PRELIMINARY SURFICIAL GEOLOGY OF THE SPRING QUADRANGLE, HARPER COUNTY, KANSAS

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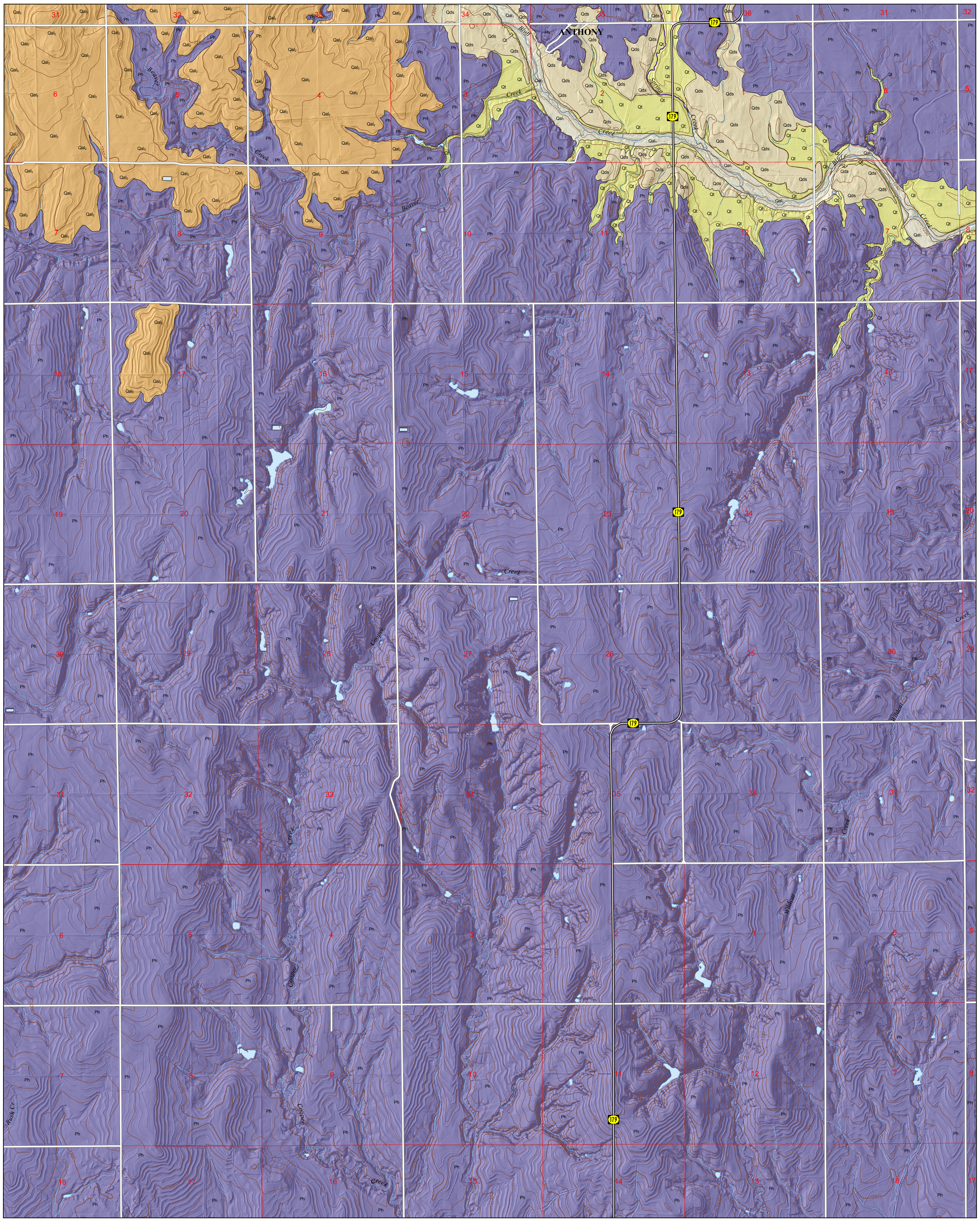

GEOLOGIC UNITS

CENOZOIC

Quaternary System
Pleistocene-Holocene

Qal_1 — **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.

Qal_2 — **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 may reach 50 ft (15 m) thick in the area of Big Sandy Creek.

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.

SOURCES

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

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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. Kansas Geological Survey, Bulletin 111, 179 p.

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EXPLANATION

Boundaries and Locations

Township/range line

Section line

Transportation

State highway

Local road

Geologic Unit Boundaries

Observed contact

Hydrology

Perennial stream

Intermittent stream

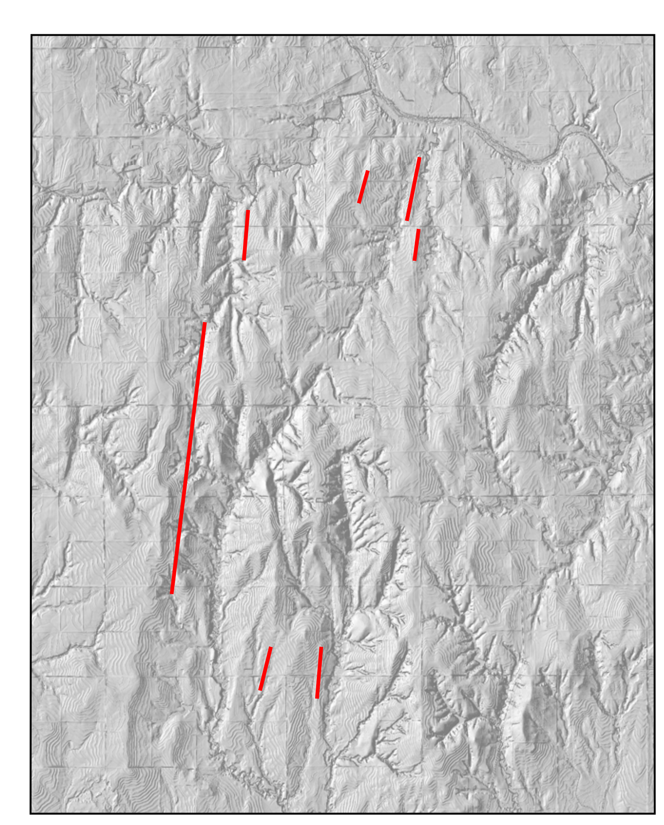
Water body

Water body – manmade shoreline

Topography

Elevation contour (50-foot interval)

Elevation contour (10-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 October, 2017 to May, 2018. 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.

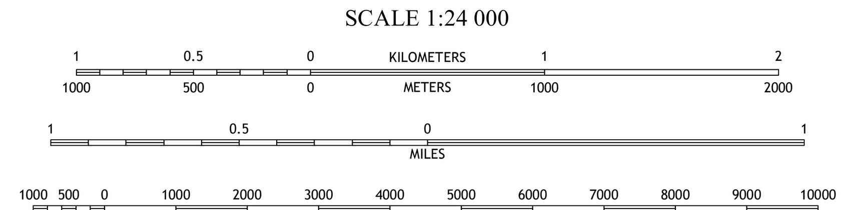
This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program, award number G17AC00261 (FY2017).

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

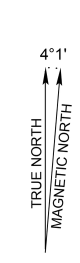
SUGGESTED REFERENCE TO THE MAP

Smith, J. J., and Dunham, J. W., 2018, Preliminary surficial geology of the Spring quadrangle, Harper County, Kansas: Kansas Geological Survey, Open-File Report 2018-14, scale 1:24,000, unpublished.

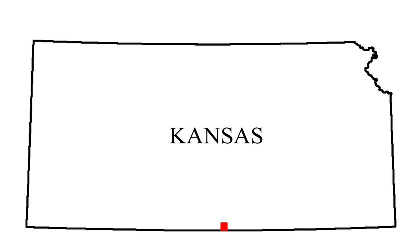
SCALE 1:24 000



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



APPROXIMATE MEAN DECLINATION, 2018



QUADRANGLE LOCATION

Attica	Anthony	Bluff City NW
Waldron	Spring	Bluff City West
Manchester NW	Manchester	Wakita

ADJOINING 7.5' QUADRANGLES