KANSAS GEOLOGICAL SURVEY
The University of Kansas

MAP M-62 (Revised)

SURFICIAL GEOLOGY OF KEARNY COUNTY, KANSAS

Original geology by William C. Johnson (2003)

Playa deposits and Arkansas River terrace deposits by William C. Johnson and Terri L. Woodburn

2011

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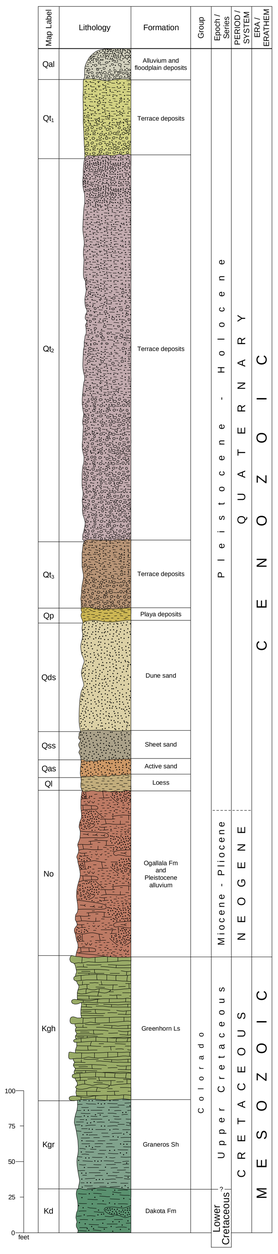


CENOZOIC ROCKS

Undifferentiated floodplain alluvium – Alluvium is found in the Arkansas River valley and its tributaries. This sediment ranges from coarse gravel to clay with thicknesses up to 20 ft.

Alluvial terrace deposits – Terrace deposits within the county occur along the Arkansas River valley and major tributaries. Coarse gravels dominate the deposits, with some sand, silt, and clay. The Ogallala Formation is the primary source of this material. The terrace deposits date from the late Pleistocene to the middle Holocene or later. Three terrace deposits are found within the Arkansas River valley: Qt_1 adjacent to the floodplain through the entire length of the county; Qt_2 primarily in the eastern part of the valley and lower reaches of Mattox Draw; and Qt_3 adjacent to the south valley wall in the eastern part of the county. The principal terrace of the Arkansas River valley (Qt_1) is up to 54 ft thick. Depths of Qt_2 deposits can be 273 ft or more, while Qt_3 depths only reach 47 ft.

Upland intermittent lake (playa) deposits – Shallow basins, also known as playas, lagoons, or buffalo wallows, have developed in the upland loess deposits north of the Arkansas River valley and in the Bear Creek lowland in the south-central part of the county. The origin of these features is usually attributed to wind deflation, animal activity, dissolution, or some combination of these processes. Age of the features appears to range from at least the early Holocene to the historic period. The basins range in size from less than an acre to hundreds of acres. Fill within these basins has an average thickness of 6 ft and consists of redeposited silt and fine sand from the loess. In the larger basins, a carbonate layer (caliche) typically develops 10-20 ft below the basin floor.

Dune sand – Sand dunes occur immediately south of the Arkansas River valley. The sand is derived from the Pleistocene and Holocene terraces of the Arkansas River. Dune crests reach a height of about 75 ft.

Sheet sand – The sand sheet surface takes the form of subdued undulating swells and swales. Sand sheets occur south of the Arkansas River and in some small areas north of the river. The origin of the sand is the Pleistocene and Holocene terraces of the Arkansas River valley. Sheet sand may reach a thickness of about 20 ft.

Active sand – Areas of blow sand as they existed at the time of mapping. Active sand areas are typically expressed as blowouts within the dune sand map units.

Loess – Wind-deposited silt, with minor amounts of clay and fine sand, comprises the loess, which mantles the uplands north of the Arkansas River valley and southwest of the sand region. The loess is calcareous and a buff color, and ranges in thickness up to 10 ft. The age of the deposits in the county ranges from the late Pleistocene to the late Holocene.

Ogallala Formation – Ogallala sediments are thought to be primarily Miocene and earliest Pliocene in age and are composed of calcareous gravel, sand, silt, and clay deposited by streams transporting sediments eastward from the Rocky Mountains. Ogallala outcrops commonly contain thick calcrete beds, regionally referred to as "mortar beds." The unit mapped as Ogallala in Kearny County also includes early Pleistocene and older alluvial deposits of the same Rocky Mountain gravel and sand materials. Ogallala outcrops occur along the north side of the Arkansas River valley, and along the smaller tributaries in the north and southwest parts of the county. Most of the county is underlain by the Ogallala, which ranges in thickness from a few feet to about 400 ft (well-log data) in the southeast part; surface exposures range up to 120 ft thick.

Greenhorn Limestone – The Upper Cretaceous Greenhorn Limestone is exposed directly north of the Arkansas River valley in the western third of the county. Greenhorn deposits consist of calcareous shale with thin limestone beds and bentonitic clay, and thin chalky limestone beds separated by chalky shale. A characteristic fossil clam, *Inoceramus* sp., is found throughout the upper member. Outcrop thickness ranges up to 100 ft.

Graneros Shale – Graneros Shale is a gray-black, fissile, argillaceous Upper Cretaceous shale. Outcrops are found directly north of the Arkansas River valley in the western third of the county, with a thickness up to 62 ft.

Dakota Formation – Dakota Formation exposures occur at the base of the south wall of the Arkansas River valley in the western half of the county. Deposits consist of gray to buff irregularly bedded sandstone with varicolored clay. This is the oldest formation cropping out in the county, with an outcrop thickness of up to 30 ft.

Bear Creek Fault – This is the approximate location of the fault; the source for its location is: Gutentag, E. D., Lobmeyer, D. H., and McGovern, H. E., 1972, Ground water in Kearny County, southwestern Kansas: U.S. Geological Survey, Hydrologic Investigations Atlas HA-416, 2 sheets. The symbology indicates that its identity or existence is questionable, location concealed.

Lithologic Explanation

- Unconsolidated silt, sand, and gravel
- Unconsolidated silt
- Sand
- Sandstone, shale, or siltstone
- Sand and gravel, conglomeritic, or "mortar beds"
- Bentonite
- Volcanic ash
- Limestone

TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 2011

Index to 1:24,000 scale USGS quadrangle maps

Index shows the names and locations of the 30 USGS 7.5-min 1:24,000-scale quadrangles used in the digital compilation of the Kearny County map. The geology was mapped in the field using these topographic maps.

Explanation

Boundaries and Locations
- County line
- Township/range line
- Section line
- County seat
- City
- Locality
- Built-up area

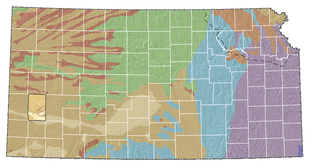
Transportation
- U.S. highway
- State highway
- Medium-duty primary road
- Medium-duty secondary road
- Light-duty road
- Unimproved road
- Railroad
- Unpaved landing strip
- Airport

Geologic Unit Boundaries
- Observed contact
- Concealed contact

Hydrology and Topography
- Perennial stream
- Intermittent stream
- DITCH Canal
- Perennial water body
- Intermittent water body
- 950 Elevation contours (50-meter interval)
- Elevation contours (10-meter interval)
- 950 Depression contour (50-meter interval)
- Depression contour (10-meter interval)

Resource Development
- Open sand or gravel pit
- Shale Pit Open shale pit
- Clay Pit Open clay pit

LOCATION DIAGRAM



SCALE 1:5 000 000
50 0 50 100 150 200 MILES
50 0 50 100 150 200 KILOMETERS

GENERALIZED GEOLOGY OF KANSAS

QUATERNARY SYSTEM
- Holocene - Pleistocene Series
- Loess and river-valley deposits
- Sand dunes
- Glacial-drift deposits
- Limit of glaciation in Kansas

NEOGENE SYSTEM
- Pliocene - Miocene Series
- Ogallala Fm

CRETACEOUS SYSTEM

JURASSIC SYSTEM

PERMIAN SYSTEM

CARBONIFEROUS SYSTEM
- Pennsylvanian Subsystem
- Mississippian Subsystem

Elevation contours are presented for general reference. They are generated from U.S. Geological Survey National Elevation Dataset (NED) digital elevation models (DEM) with 1/3 arc-second resolution, which are in turn generated from high-resolution elevation data and other USGS DEMs. In some places the contours may be more generalized than the base maps 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.

The geology was mapped in the field using USGS 7.5' 1:24,000-scale topographic maps.

Roads and highways shown on the base map as represented by data from the Kansas Department of Transportation (KDOT) 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 also based on a USGS digital elevation model (DEM) with 1/3 arc-second data, in ESRI GRID format, were smoothed using a focal mean algorithm to minimize unwanted artifacts. 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 map was produced using the ArcGIS system developed by ESRI (Environmental Systems Research Institute, Inc.).

Suggested reference to this map:

Johnson, W.C., [2003] 2011, Surficial geology of Kearny County, Kansas; Playa deposits and Arkansas River terrace deposits by W. C. Johnson and T. L. Woodburn: Kansas Geological Survey, Map M-62 (Revised), scale 1:50,000.

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SCALE 1:50 000
1 0.5 0 1 2 3 4 MILES
1 0.5 0 1 2 3 4 5 KILOMETERS

LAMBERT CONFORMAL CONIC PROJECTION
WITH STANDARD PARALLELS AT 33° AND 45°
NORTH AMERICAN DATUM OF 1927

Last updated 5/9/2011