

Bedrock Geology of the Osage (Iowa) 7.5' Quadrangle

BEDROCK GEOLOGY OF THE OSAGE 7.5' QUADRANGLE, MITCHELL COUNTY, IOWA

Iowa Geological Survey
Open File Map OFM-14-7
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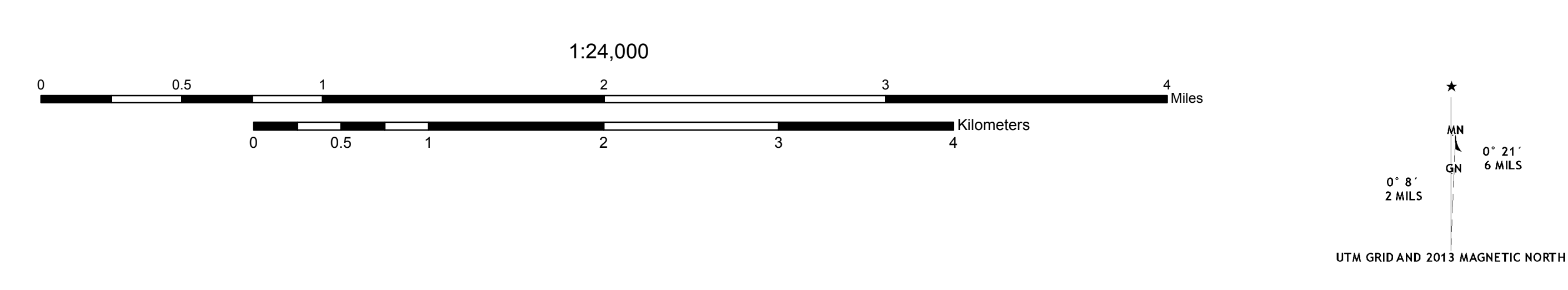
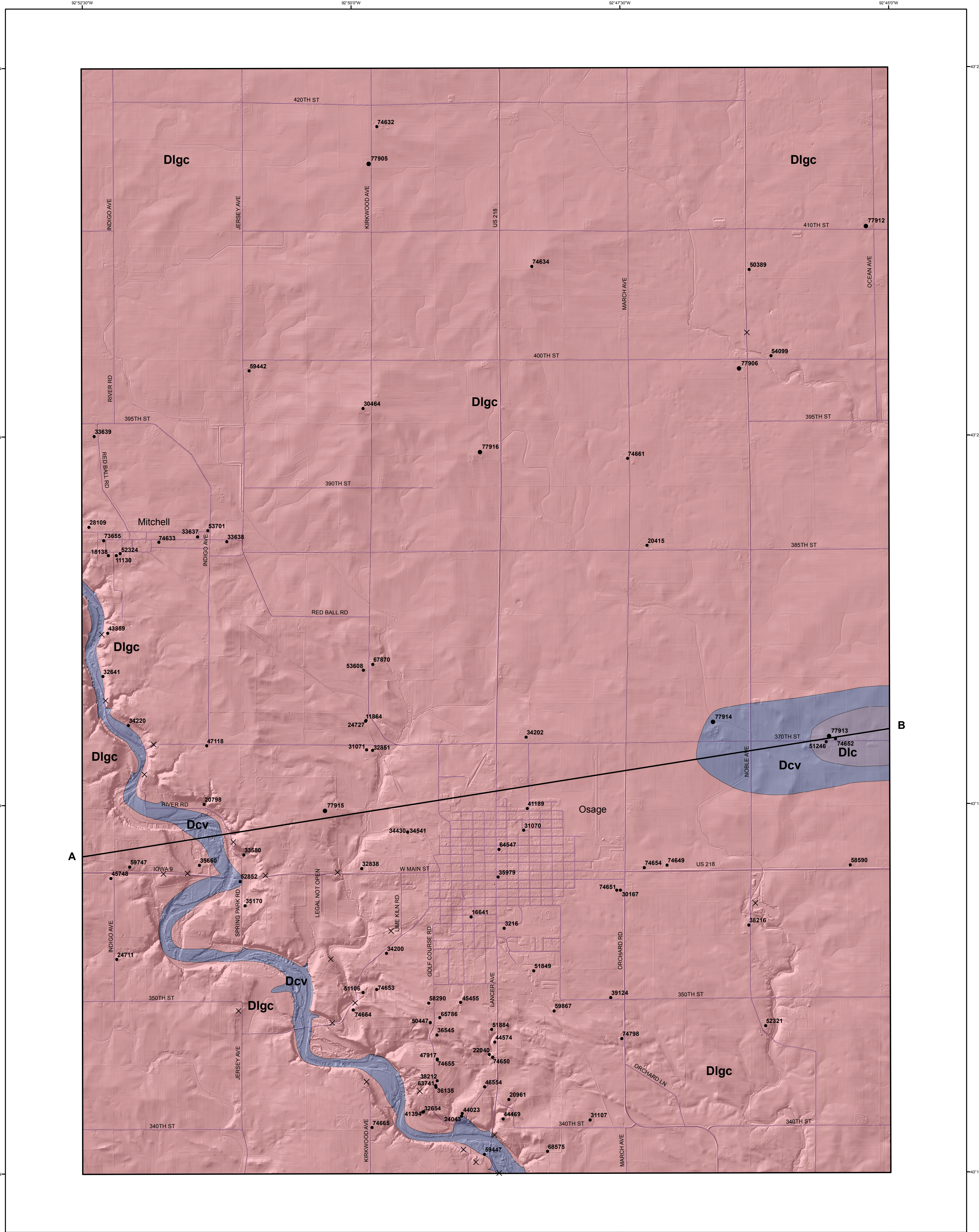
Introduction to the Bedrock Geology of Osage 7.5' Quadrangle, Mitchell County, Iowa

The Osage quad lies within the Iowa Surface Landform region (Prior, 1991 and Prior and Kohn, 2006). This area has been subjected to multiple periods of Quaternary glaciation and subsequent erosion providing a relatively low-relief terrain with moderately incised drainage valleys. Over most of the quad the thickness of Quaternary materials varies from 0 to 10 m (0 to 33 ft) with a bedrock low located at the eastern end of the cross-section line, where Quaternary materials can be up to 52 m (170 ft) thick. Bedrock outcrops exist primarily along the Cedar River in the southwestern portion of the quad, with limited outcrops appearing around the west side of the City of Osage and along the upper reaches of Burr Oak Creek in the northeastern part of the quad. Several bedrock quarries located within the quad were also visited during field mapping activities. Subsurface information was mostly derived from the analysis of water well cutting samples reported at the Iowa Geological Survey (IGS). Lithologic and stratigraphic information from these samples are stored in the online GEOSAM database of the IGS. Geologic information from a total of 21 outcrops and more than 90 private and public wells within the mapping area were used for bedrock geological mapping purposes. Shallow bedrock information from the soil survey in Mitchell County (Voy & Highland, 1975) was used for identifying potential bedrock outcrop locations during field mapping activities. Stratigraphic information from the surrounding area, including bedrock outcrops, quarries, and well samples, were also utilized for this mapping project.

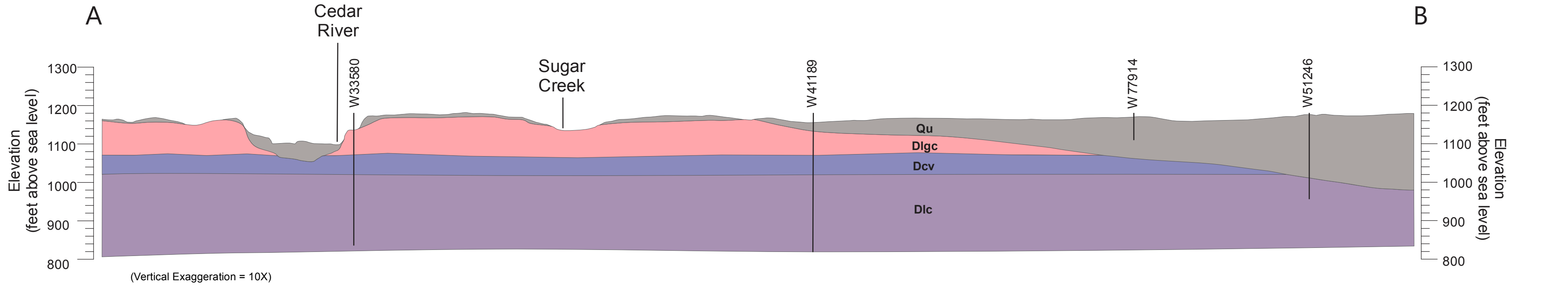
Paleogeographically, the mapping area is within the northern portion of the Devonian Iowa Basin, a region of thickened shelf carbonate and shale deposits. Middle and lower Upper Devonian rocks form the major bedrock surface and upper bedrock aquifer in this area. The hydrogeology of Floyd and Mitchell counties has been well studied by Libra and others (1994). Due to its stratigraphic completeness, the stratigraphy and depositional environments of the Devonian Iowa Basin have been intensively studied (e.g., Belanski, 1927, 1928; Koch, 1970). Recent geologic and stratigraphic studies of this basin include Witzke and Bunker (1984), Anderson (1984), Bunker and others (1986), Witzke and others (1988), Bunker (1995), and Groves and others (2008). Devonian stratigraphy at Mason City, Iowa, has also been discussed by McKay and Liu (2012). The bedrock surface of the surrounding area was recently mapped by Witzke and others (2010) and Liu and others (2010 & b, 2011 & b, 2012). Results from these studies provided an important stratigraphic framework for this bedrock geologic map. The bedrock stratigraphic nomenclature and correlation for this map follows the stratigraphic framework proposed by Witzke and others (1988).

The entire mapping area is underlain by Devonian rocks comprised of carbonates, varying between limestone and dolomite, and shale. Based on lithologic features and fossils, the Devonian strata comprising the bedrock surface in the mapping area can be subdivided into, in descending order, the Lithograph City, Coralville, and Little Cedar formations. The Middle to Upper Devonian Lithograph City Formation dominates the bedrock surface within the mapping area and is characterized by laminated lithographic and sublithographic limestone and dolomite. "Birdseye," vugs, and calcite vug-fills are common in this formation. Some layers of this formation are fossiliferous with abundant brachiopods and stromatopora. The majority of bedrock outcrops within the mapping area are of the Lithograph City Formation. The maximum thickness of the Lithograph City Formation is about 27 m (90 ft) within the Osage quad. The Coralville Formation consists of limestone, dolomitic limestone, and dolomite; in part laminated and argillaceous. Brachiopods, echinoderm debris, and corals may be found within the limestone facies. The Coralville Formation has an average thickness of about 12 to 18 m (40 to 60 ft) in the mapping area and only occurs at the bedrock surface within the core of the Cedar River channel and within a bedrock low at the eastern end of the cross-section line. The Little Cedar Formation is dominated by slightly argillaceous to argillaceous dolomite and dolomitic limestone, usually vuggy or partially laminated and/or cherty. Moderate shale units also occur in this formation with the lower portion being commonly fossiliferous. The thickness of the Little Cedar Formation in the mapping area is approximately 64 m (210 ft) though it thins to approximately 45 m (150 ft) in the bedrock low at the eastern end of the cross-section line. This unit only occurs at the bedrock surface within the bedrock low at the eastern end of the mapping area. Deep wells within the Osage quad (W-3216, W-16641, and W-41189) along with previous research by Witzke and Bunker (1984), indicate that the Devonian bedrock units lie unconformably over older Ordovician units across the entire quad.

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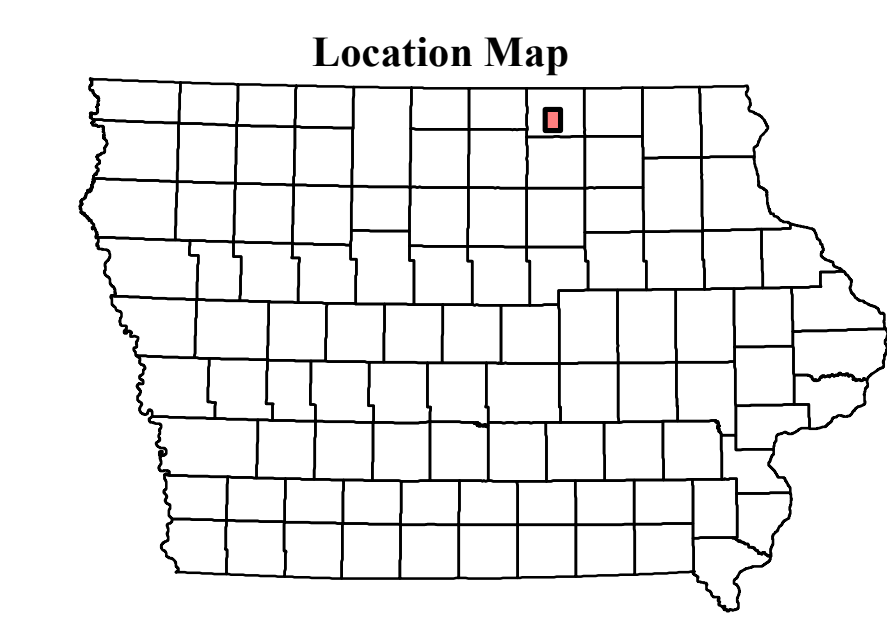
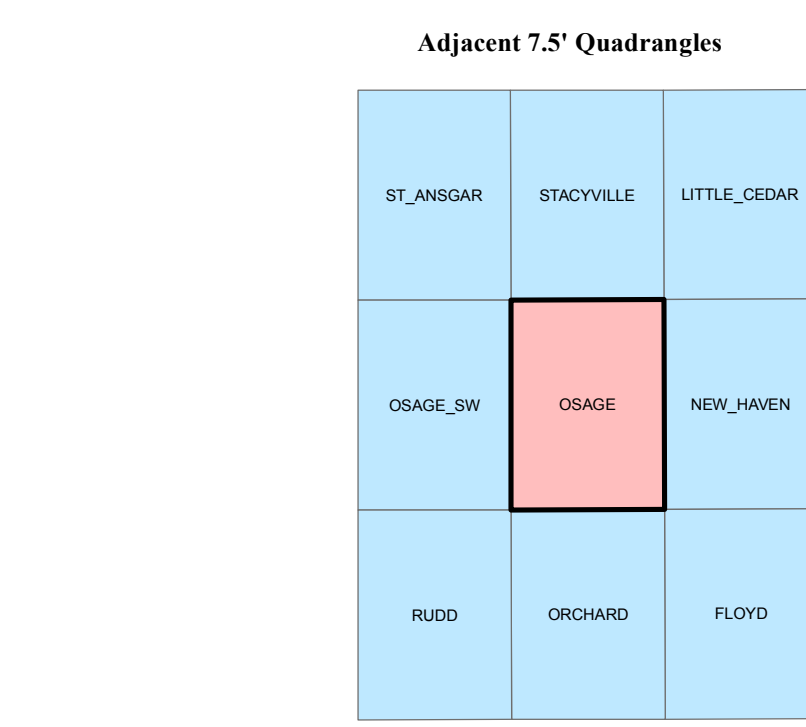


GEOLOGIC CROSS-SECTION A-B



Correlation of Map Units

AGE (Ma)	SYSTEM	SERIES	STAGE	MAP UNIT
2.588	QUATERNARY	Upper	Frasnian	Dl
			Givetian	Dc
382.7	DEVONIAN	Middle	Eifelian	Dcv
387.7				
393.3				



LEGEND

QUATERNARY SYSTEM

PALEOZOIC

DEVONIAN SYSTEM

Qu Unconsolidated to moderately consolidated glacial till, sand, silt, and clay, and alluvial fan deposits, and other Quaternary deposits. This unit is derived from the glacial drift and alluvial fan deposits that are present in the area. The thickness of this unit varies from 0 to 52 m (0 to 170 ft) within the Osage quad.

Dl The Shellock, Shellock, and Shellock City Formations. The Shellock Formation is a massive to blocky limestone and dolomite. The Shellock City Formation is a massive to blocky limestone and dolomite. The Shellock Formation is a massive to blocky limestone and dolomite. The Shellock City Formation is a massive to blocky limestone and dolomite.

Dc The Coralville and Shellock City Formations. The Coralville Formation is a massive to blocky limestone and dolomite. The Shellock City Formation is a massive to blocky limestone and dolomite. The Coralville Formation is a massive to blocky limestone and dolomite. The Shellock City Formation is a massive to blocky limestone and dolomite.

Dcv The Little Cedar Formation. The Little Cedar Formation is a massive to blocky limestone and dolomite. The Little Cedar Formation is a massive to blocky limestone and dolomite. The Little Cedar Formation is a massive to blocky limestone and dolomite. The Little Cedar Formation is a massive to blocky limestone and dolomite.

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79200 Well hole for this map.

x Outcrop.

33550 IGS-GEOSAM Well Files. Source: geosam.igs.uiowa.edu

— Road.

Base map from Iowa DOT Road Map Layers 2006. Shaded relief from Iowa LIDAR Project 2007-2011.
Iowa Geological Survey digital cartographic file Osage_BedrockGeology.mxd, version 9/15/14 (A0228, 10/1).
Map projection and coordinate system based on Universal Transverse Mercator (UTM) Zone 15, Datum: NAD83.
The map and cross section are based on interpretations of the best available information at the time of mapping. They are not intended to be used as a basis for detailed site-specific studies.
Research supported by the U.S. Geological Survey, National Cooperative Geologic Mapping Program, under USGS award number C01AC000177. The map and cross section are based on interpretations of the best available information at the time of mapping. They are not intended to be used as a basis for detailed site-specific studies.
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