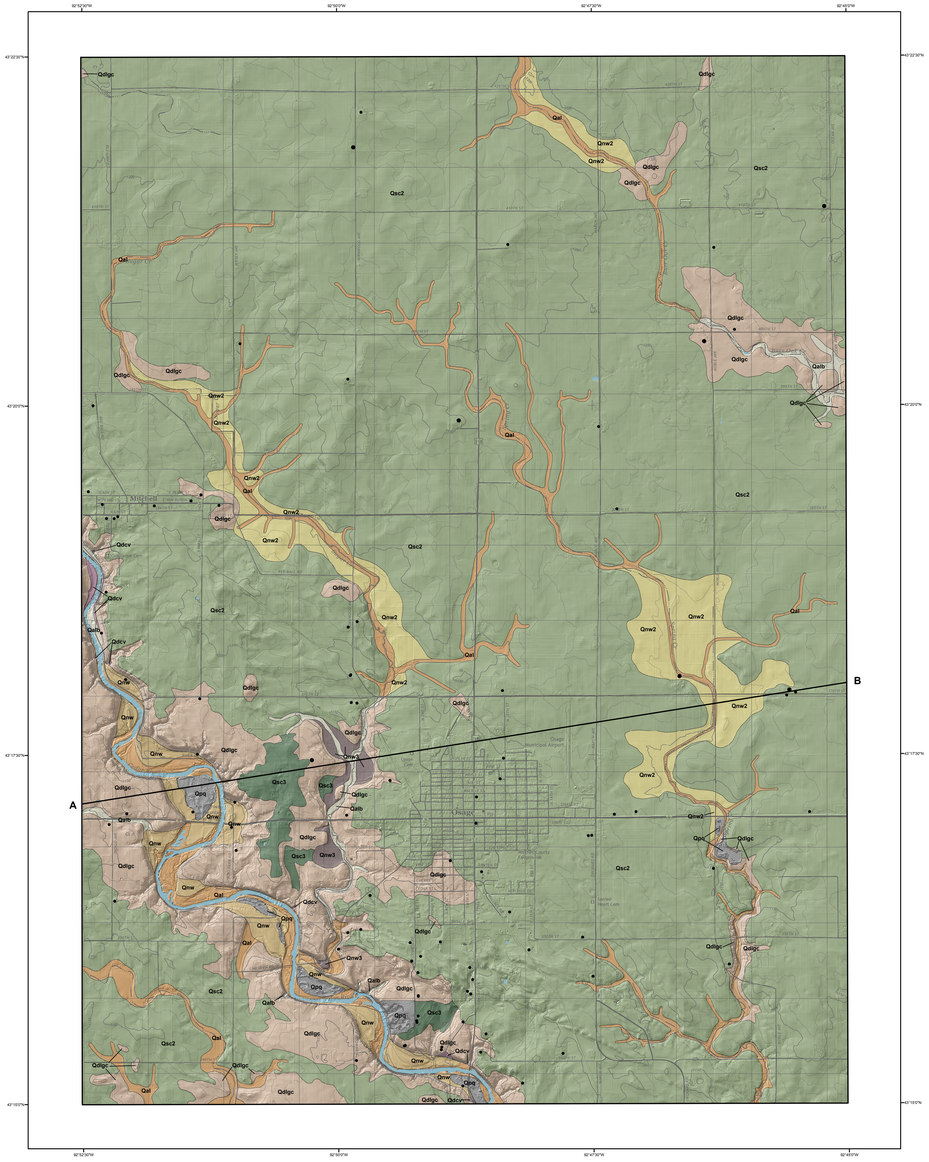
Surficial Geology of the Osage (Iowa) 7.5' Quadrangle



1:24,000

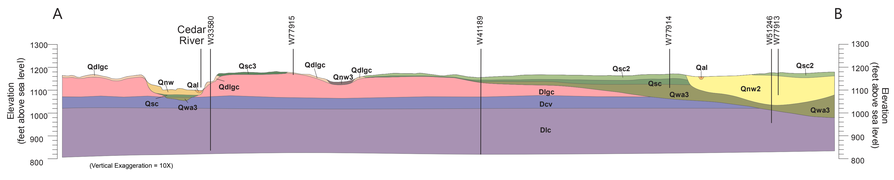
0 0.5 1 2 3 4 Miles

0 0.5 1 2 3 4 Kilometers

0° 8' 2 MILS | 0° 40' 12 MILS

UTM GRID AND 2013 MAGNETIC NORTH

GEOLOGIC CROSS-SECTION A-B



LEGEND

CENOZOIC

QUATERNARY SYSTEM

HUDSON EPISODE

Qal – Alluvium (DeForest Formation-Undifferentiated) - Variable thickness of less than 1 to 5 m (3-16 ft) of very dark gray to brown, noncalcareous to calcareous, massive to stratified silty clay loam, clay loam, loam to sandy loam alluvium and colluvium in stream valleys, on hillslopes and in closed depressions. May overlie Noah Creek, Sheldon Creek, Wolf Creek or Albumett formations or fractured Devonian carbonate bedrock. Associated with low-relief modern floodplain, closed depressions, modern drainageways or toeslope positions on the landscape. Seasonal high water table and potential for frequent flooding.

Qalb - Alluvium Shallow to Bedrock (DeForest Formation-Undifferentiated) - Variable thickness of less than 1 to 5 m (3-16 ft) of very dark gray to brown, noncalcareous to calcareous, stratified silty clay loam, clay loam, loam to sandy loam alluvium and colluvium in stream valleys, on hillslopes and in closed depressions. May overlie the Noah Creek Formation or Devonian carbonate bedrock. Bedrock surface is within 5 m (16 ft) of the land surface. Associated with low-relief modern floodplain, closed depressions, modern drainageways or toeslope positions on the landscape. Seasonal high water table and potential for frequent flooding. *This unit is too thin to be shown in the cross section.*

HUDSON and WISCONSIN EPISODES

Qdlgc – Loamy Sediments Shallow to Limestone, Dolomite, and Shale (DeForest, Noah Creek, and Lithograph City formations) - 1 to 2 m (3–7 ft) of yellowish brown to gray, massive to weakly stratified, well to poorly sorted loamy, sandy and silty alluvial sediment that overlies the Noah Creek Formation. The thickness of the Lithograph City Formation varies between 12 and 18 m (40-60 ft) within the mapping area. It is dominated by limestone, dolomitic limestone, and dolomite, in part, laminated and argillaceous. Brachiopods, echinoderm debris and corals usually occur in the limestone facies.

Qdcv – Loamy Sediments Shallow to Limestone, Dolomite, and Shale (DeForest, Noah Creek, and Coralville formations) - 1 to 2 m (3-7 ft) of yellowish brown to gray, massive to weakly stratified, well to poorly sorted loamy, sandy and silty alluvial sediment that overlies the Middle Devonian bedrock surface. The thickness of the Coralville Formation varies between 12 and 18 m (40-60 ft) within the mapping area. It is dominated by limestone, dolomitic limestone, and dolomite, in part, laminated and argillaceous. Brachiopods, echinoderm debris and corals usually occur in the limestone facies.

Qnw2 - Sand and Gravel (Noah Creek Formation) - 2 to 12 m (7-40 ft) of yellowish brown to gray, poorly to well sorted, massive to well stratified, coarse to fine feldspathic quartz sand, pebbly sand and gravel with few intervening layers of silty clay. Thickness along Spring Creek in the east-central portion of the map may exceed 30 m (98 ft). Along many valleys, a thin mantle of loess, reworked loess, or fine-grained alluvium (Qal) may be present. This unit includes silty colluvial deposits derived from the adjacent map units. In places this unit is mantled with 1 to 3 m (3-10 ft) of well sorted fine to medium sand derived from wind reworking of the alluvium. This unit encompasses deposits of sand accumulated in low-relief stream valleys during the Wisconsin and Holton episodes. Seasonal high water table and some potential for flooding.

WISCONSIN EPISODE

Qnw - Sand and Gravel (Noah Creek Formation) - Generally less than 10 m (33 ft), but there may be significantly thinner coarse-grained deposits in smaller stream valleys. Yellowish brown to gray, poorly to well sorted, massive to well stratified, coarse to fine feldspathic quartz sand, pebbly sand and gravel. In the map area the unit overlies the middle Wisconsin-age Sheldon Creek Formation. This unit encompasses outwash deposits that accumulated in valley trains during the Wisconsin Episode.

Qnw3 - Sand and Gravel Shallow to Bedrock (Noah Creek Formation) - 1 to 5 m (3-10 ft) of yellowish brown to gray, poorly to well sorted, massive to well stratified, coarse to fine feldspathic quartz sand, pebbly sand and gravel. May be overlain by up to 2 m (7 ft) of silty alluvial sediment that overlies the Middle Devonian bedrock surface. Associated with low-relief modern floodplain, closed depressions, fractured carbonate bedrock is less than 5 m (16 ft) below the land surface. This unit encompasses deposits that accumulated in river and stream valleys during the late Wisconsin as well as enhanced Pre-Illinois Episode deposits of the Wolf Creek and Albumett formations.

Qsc2 - Loamy Sediments Shallow to Glacial Till (Unnamed erosion surface sediment 1 - 1 to 6 m (3-20 ft) of yellowish brown to gray, massive to weakly stratified, well to poorly sorted loamy, sandy and silty-erosion surface sediment. Map unit includes some areas mantled with less than 1 m (3 ft) of Peoria Formation (silt or sand facies). Overlies massive, fractured, slightly firm glacial till of the Sheldon Creek Formation.

Qsc - Glacial Till (Sheldon Creek Formation-Undifferentiated) - Generally 5 to 15 m (16-50 ft) of yellowish brown to gray, calcareous fractured to massive clay loam; at depth this unit can be variably textured and contain significant sand and gravel bodies. The upper 3 to 7 m (10-20 ft) may be pervglacially altered. This unit overlies Pre-Illinois diamicton or Devonian carbonate bedrock and is only shown on the cross-section.

Qsc3 – Loamy and Sandy Sediment Shallow to Rock (Unnamed erosion surface sediment) - Generally 1 to 6 m (3-20 ft) of yellowish brown to gray, massive to weakly stratified, well to poorly sorted loamy, sandy and silty erosion surface sediment. Map unit includes some areas mantled with less than 3 m (10 ft) of Peoria Formation sand facies (eolian sand). Overlies fractured Devonian carbonate bedrock.

PRE-ILLINOIS EPISODE

Qwa3 - Till (Wolf Creek or Albumett formations) - Generally 3 to 15 m (10-50 ft) of very dense, massive, fractured, loamy glacial till of the Wolf Creek or Albumett formations. This mapping unit can be buried by glacial sediments (Sheldon Creek Formation), unnamed erosion surface sediments, loess, or alluvium and is shown only on the cross-section.

PALEOZOIC

DEVONIAN SYSTEM

Dlgc - Dolomite, Limestone, and Shale (Lithograph City Formation) Middle to Upper Devonian - This map unit attains a maximum thickness of up to 27 m (90 ft) within the mapping area. It consists of dolomite and dolomitic limestone, partially characterized by interbeds of laminated lithographic and sublithographic limestone and dolomitic limestone, in part argillaceous or with minor shale. "Birdseye," vugs and calcite vug-fills are common. Some intervals are fossiliferous and stromatoporoid-rich. Outcrops of this map unit are primarily found in the southwestern part of the mapping area along the banks of the Cedar River and occasional road cuts, and are otherwise restricted to quarries in the mapping area. This unit is shown only on the cross-section, not on the map.

Dcv - Limestone and Dolomite (Coralville Formation) Middle Devonian - The thickness of this map unit varies between 12 and 18 m (40-60 ft) within the mapping area. It is dominated by limestone, dolomitic limestone, and dolomite, in part, laminated and argillaceous. Brachiopods, echinoderm debris and corals usually occur in the limestone facies. This unit occurs at the bedrock surface within the Cedar River channel, where sparse outcrops can be found, and within a bedrock low in the eastern portion of the mapping area. This unit is shown only on the cross-section, not on the map.

Dlc - Dolomite and Limestone (Little Cedar Formation) Middle Devonian - The thickness of this formation is approximately 44 m (210 ft), but is erosionally thinned to 45 m (150) thick at the eastern end of the cross section line within the study area. The unit is dominated by slightly argillaceous to argillaceous dolomite and dolomitic limestone, usually vuggy and partially laminated and/or cherty. This unit is commonly fossiliferous, especially in the lower portion. This unit only occurs at the bedrock surface within a bedrock low in the eastern portion of the mapping area. This unit is shown only on the cross-section, not on the map.

OTHER FEATURES

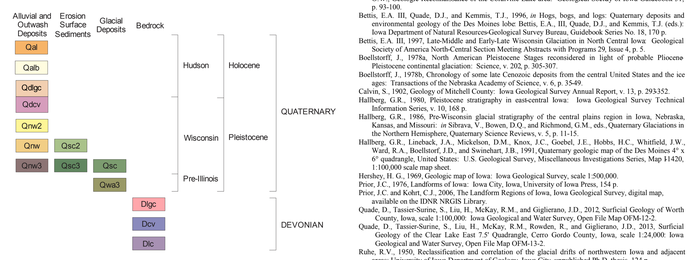
Qpq – Pits and Quarries - Sand and gravel pits and rock quarries. Extent mapped as shown in county soil surveys and as identified on aerial imagery.

Water Features - Rivers, lakes, and small ponds. Extent mapped as shown in county soil surveys and as identified on aerial imagery.

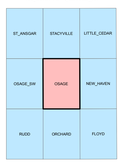
New Drill Holes for this map project

IGS GEOSAM Data Points- records available at www.iowageologicalsurvey.com

CORRELATION CHART



Adjacent 7.5' Quadrangles



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

Iowa Geological Survey
Open File Map OFM-14-8
September 2014

Stephanie Tassier-Surine[1], Deborah Quade[1], Matthew T. Streeter[1], Phil Kerr[1], Robert Rowden[2], Robert McKay[1], Huaibao Lou[1], Ryan Clark[1] and Rochelle Galer[1]

Iowa Geological Survey, IIHR-Hydroscience & Engineering, University of Iowa, Iowa City, Iowa

Iowa Geological Survey, Robert D. Libra, State Geologist

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National Cooperative Geologic Mapping Program (STATEMAP)

ACKNOWLEDGMENTS

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[1]Iowa Geological Survey, IIHR-Hydroscience & Engineering, University of Iowa, Iowa City, Iowa
[2]Iowa Department of Natural Resources, Des Moines, Iowa

Introduction to the Surficial Geology of the Osage 7.5' Quadrangle, Mitchell County, Iowa

The Osage Quadrangle is located in Mitchell County in north-central Iowa. The quadrangle is located on the Wisconsin-age Iowan Surface Landform Region (Prior and Kohrt, 2006). Quaternary deposits in this quadrangle generally vary in thickness from 0 to 16m (0 to 52 ft), but may be up to 55m (180 ft) thick on the east-central portion of the quadrangle near Spring Creek. The map area is dominated by unnamed loamy sediments (unnamed erosion surface sediment) of variable thickness overlying Wisconsin-age Sheldon Creek Formation glacial sediments, Pre-Illinoian glacial sediments, or shallow rock. These deposits are regionally extensive as shown on the Des Moines 4 ° x 6 ° Quadrangle at a scale of 1:1,000,000 (Hallberg et al., 1991). Significant areas of bedrock outcrop or areas with less than 4.5m (15 ft) of loamy material over rock are present, especially along the Cedar River, Sugar Creek west of Osage, and Burr Oak Creek.

Calvin (1902) described and mapped the Quaternary and Paleozoic bedrock geology of Mitchell County. He noted the extreme variability of the till units in Mitchell County and also the presence of significant sand and gravel bodies. Statewide bedrock geologic maps by Hershey (1969), and most recently by Witzke, Anderson, and Pope (2010), depict increased understanding of the complex distribution of geologic units at the bedrock surface across northeast Iowa, including Mitchell County. Previous surficial geologic mapping completed as part of the STATEMAP program adjacent to the project area includes Surficial Geology of Worth County, Iowa (Quade et al., 2012) and Surficial Geology of the Clear Lake East Quadrangle (Quade et al., 2013).

The map region has a rich and complex geologic history punctuated by at least seven periods of glaciation between 2.6 million to 500,000 years before present (Boellstorff, 1978a, b; Hallberg, 1980, 1986). In this area, Pre-Illinois Episode glacial deposits and associated buried soils are overlain by much younger Wisconsin-age glacial deposits. During the earlier and mid Wisconsin-age, ice advances dating from approximately 40,000 to 26,000 years before present deposited glacial materials throughout the map area. In Iowa, this glacial deposit is formally recognized as the Sheldon Creek Formation (Bettis et al., 1996, Bettis, 1997) and in earlier literature is referred to as the "Tazewell till" (Ruhe, 1950). Results from this mapping program and others in Worth and Cerro Gordo County indicate that the Sheldon Creek glacial materials extend much farther east than was previously thought.

A period of intense cold occurred during the Wisconsin full glacial episode from 21,000 to 16,500 years before present (Bettis, 1989). This cold episode and ensuing upland erosion led to the development of the distinctive landform recognized as the Iowan Surface (Prior, 1976). A periglacial environment prevailed during this period with intensive freeze-thaw action, solifluction, strong winds, and a host of other periglacial processes (Walters, 1996). The result was that surface soils were removed from the Iowan Surface, and the Sheldon Creek and Pre-Illinois till surface was significantly eroded, resulting in the development of a region-wide colluvial lag deposit referred to as a "stone line." Thick packages of stratified loamy and sandy sediments located low in the upland landscape and adjacent to streams are remnants of solifluction lobes associated with the formation of the Iowan Surface. These materials can be found along Sugar Creek, Spring Creek, and Burr Oak Creek.

Surficial deposits within the map area are composed of six formations: DeForest, Noah Creek, Peoria, Sheldon Creek, Wolf Creek, and Albumett formations, as well as unnamed erosion surface sediments. Hudson age deposits associated with fine-grained alluvial, organic, and colluvial sediments include the DeForest Formation which is subdivided into the Camp Creek, Roberts Creek, Gunder, Corrington, Flack, and Woden members. The Noah Creek Formation includes coarse sand and gravel associated with outwash from the Des Moines Lobe, as well as coarse to finer grained fluvial deposits associated with local stream and river valleys. Unnamed erosion surface sediments consist of reworked till and slopewash deposits associated with periglacial activity during the Wisconsin ice advance. Areas of Peoria Formation eolian materials are intermittently present mantling most other mapping units, and are more abundant near stream valleys. Sheldon Creek Formation glacial deposits are undifferentiated and occur in northwest and northcentral Iowa. The maximum extent of these deposits is still not fully understood. Pre-Illinoian glacial deposits in Iowa consist of two formations: the younger Wolf Creek Formation and the Albumett Formation. The Wolf Creek is divided into the Winthrop, Aurora, and Hickory Hills members (oldest to youngest). The Albumett Formation consists of several "undifferentiated" members.

Three bedrock mapping units (Devonian Lithograph City, Coralville, and Little Cedar formations) are present at the bedrock surface in the quadrangle, with the Lithograph City Formation occurring at the bedrock surface over most of the mapping area. Twenty-one outcrops and one rock quarry are located in the map area. The Devonian rocks are dominated by carbonates varying between limestone and dolomite, accompanied with minor shale.

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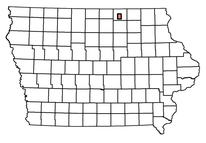
Location Map



Base map from USGS Osage 7.5' Digital Raster Graphic (IGS GIS file DRGC32C.tif) which was scanned from the Osage 7.5' Topographic Quadrangle map, published by US Geological Survey in 2013
Land elevation contours (10' interval).

Iowa Geological Survey digital cartographic file Osage_SurficialGeology.mxd, version 9/15/14 (ArcGIS 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. Map interpretations are not a substitute for detailed site specific studies.

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number G13AC00173. The views and conclusions contained in this
document are those of the authors and should not be interpreted as
necessarily representing the official policies, either expressed or
implied, of the U. S. Government.