

SURFICIAL GEOLOGIC MAP OF THE CENTER POINT NW (IOWA) 7.5' QUADRANGLE

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, micaceous or calcareous, stratified silty clay loam, clay loam, loam to sandy loam alluvium and colluvium in stream valleys, on hill slopes, and in closed depressions. May overlie Wolf Creek or Albion Formation glacial tills, Peoria Formation loess or colluvial sand, or Wisconsin sand and gravel. Associated with low- to mid-level modern floodplains, closed depressions, modern drainage ways, or topographic 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, micaceous, stratified silty clay loam, clay loam, loam to sandy loam alluvium and colluvium in stream valleys, on hill slopes, and in closed depressions. May overlie the Noah Creek, Wolf Creek/Albion Formations, or fractured Devonian bedrock. Bedrock surface is within 5 m (16 ft) of the land surface. Associated with low-level modern floodplains, closed depressions, modern drainage ways, or topographic positions on the landscape. Seasonal high water table and potential for frequent flooding.

Qallt - Low Terrace (Camp Creek and Robert Creek members) Variable thickness of less than 1 to 5 m (3-16 ft) of very dark gray to brown, micaceous, stratified silty clay loam, loam, or clay loam, associated with the modern channel belt of the Cedar River and its tributaries. Overlies Wisconsin sand and gravel of the Noah Creek Formation. Occupies the lowest position on the floodplains, i.e., the modern channel belt. Seasonal high water table and frequent flooding potential.

Qall-ht - Intermediate-High Terrace (DeForest Formation - Roberts Creek and Gaudier members) Variable thickness of less than 1 to 5 m (3-16 ft) of very dark gray to brown, micaceous, silty clay loam to loam alluvium or colluvium. Overlies Wisconsin sand and gravel of the Noah Creek Formation or Devonian aged bedrock. Occupies terrace and valley margin positions 1 to 2 m (3-7 ft) above the modern floodplain of the Cedar River and its tributaries. Seasonal high water table and low to moderate flooding potential.

HUDSON AND WISCONSIN EPISODE

Qnw2 - Sand and Gravel (Noah Creek Formation) Generally 2 to 10 m (6-33 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 low intertonguing layers of silty clay. A thin mantle of loess, reworked loess, or fine-grained alluvium may be present. This unit includes silty colluvial deposits derived from the adjacent map units. Seasonal high water table and some potential for flooding.

Qnw3 - Sand and Gravel Shallow to Bedrock (Noah Creek Formation) 1 to 6 m (3-20 ft) of yellowish brown to gray, poorly to well-sorted, massive to well-sorted, coarse to fine feldspathic quartz sand, pebbly sand and gravel. May be overlain by 0.3 m (1.0 ft) of silty alluvium material. In places, this unit can be mantled with fine to medium, well-sorted feldspathic quartz sand derived from wind reworking of the alluvium. Fractured carbonate bedrock is less than 6 m (20 ft) below the land surface. The unit encompasses deposits that accumulated in river and stream valleys during the late Wisconsin as well as enhanced Pre-Illinoian Episode deposits of the Wolf Creek and Albion Formations.

Qe - Sand Dunes and Sand Sheets (Peoria Formation - sand facies) Generally less than 3 m (10 ft) of yellowish brown, massive, calcareous, loamy sand to fine sand. It occurs as sand strings or dunes overlying Wisconsin aged outwash or bedrock.

WISCONSIN EPISODE

Qps6 - Eolian Dunes and Sand Sheets Shallow to Glacial Till (Peoria Formation - sand facies) Generally 2 to 4 m (7-14 ft) of yellowish brown, massive to well-stratified, micaceous, fine to medium, well-sorted, feldspathic quartz sand. May contain thin beds of yellowish brown silt, in turn, overlies reworked massive, jointed, firm, loamy glacial till of the Wolf Creek or Albion Formations.

Qps2 - Eolian Sand and Interbedded Silt (Peoria Formation - sand facies) Generally 5 to 15 m (16-49 ft) of yellowish brown to gray, moderately to well-sorted, micaceous grading downward to calcareous, silt loam and interbedded fine to medium, well-sorted sand. Sand is most abundant in the lower part of the colluvial package. Overlies massive, fractured, loamy glacial till of the Wolf Creek or Albion Formations with or without the intervening clayey Farquhar/Sauganog sand.

Qps1 - Loess and Interbedded Eolian Sand (Peoria Formation - silt and/or sand facies) Generally 2 to 5 m (7-16 ft) of yellowish brown to gray, massive, micaceous grading downward to calcareous, silt loam and interbedded fine to medium, well-sorted sand. Sand is most abundant in the lower part of the colluvial package. Overlies massive, fractured, loamy glacial till of the Wolf Creek or Albion Formations with or without the intervening clayey Farquhar/Sauganog sand.

Qps1b - Thick Loess and Interbedded Eolian Sand (Peoria Formation - silt and/or sand facies) Generally 5 to 15 m (16-49 ft) of yellowish brown to gray, massive, micaceous grading downward to calcareous, silt loam and interbedded fine to medium, well-sorted sand. Minimum thickness of 5 m (16 ft) on upland. Maximum thickness of 2 to 7 m (7-23 ft) from the surface. The thickness of Quaternary deposits in the Center Point NW Quadrangle is generally between 8 to 24 m (25-80 ft), but bedrock may be more than 45 m (150 ft) from the surface in the southeastern part of the mapping area.

Qnw - Sand and Gravel (Noah Creek Formation) 3 to 10 m (10 ft) more than 30 m (100 ft) of yellowish brown to gray, poorly to well-sorted, massive to well-sorted, coarse to fine feldspathic quartz sand, pebbly sand and gravel. In places, mantled with 1 to 2 m (3-7 ft) of fine to medium, well-sorted sand derived from wind reworking of the alluvium. This unit encompasses deposits that accumulated in the Cedar River Valley during the Wisconsin Episode.

Qwa2 - Loamy and Sandy Sediment Shallow to Glacial Till (Unnamed erosion surface sediment) Generally 2 to 8 m (6-26 ft) of yellowish brown to gray, massive to well-sorted, well-sorted, loamy, sandy and silty loam and silty sand. May contain thin beds of yellowish brown silt, in turn, overlies reworked massive, jointed, firm, loamy glacial till of the Wolf Creek or Albion Formations. Seasonal high water table may occur in this map unit.

PRE-ILLINOIAN EPISODE

Qwa3 - Glacial Till (Wolf Creek or Albion Formations) Generally 2 to 15 m (7-50 ft) but can be more than 45 m (150 ft) within the bedrock valley in the eastern part of the mapping area. This mapping unit can be overlain by unannounced erosion surface sediments, colluvium, outwash, loess, silt loam, or alluvium. This unit is shown only on the cross-section.

Qbr - Loamy Sediment Shallow to Dolomite, Limestone and Shale (DeForest, Peoria, Wolf Creek and Albion Formations) 1 to 2 m (3-7 ft) of yellowish brown to gray, massive to well-sorted, loamy, sandy and silty sediment that overlies the Devonian bedrock surface. All areas of bedrock outcrop or shallow to bedrock soils are shown in red on the map. For detailed description of bedrock units see the accompanying bedrock map, Liu et al., 2019.

OTHER MAPPING UNITS

Qcpq - Pits and Quarries - Sand and gravel pits and rock quarries. Extent mapped as shown on the county soil survey and as identified on aerial imagery.

OTHER MAPPING FEATURES

Water features - Rivers, lakes and small ponds. Extent mapped as shown on the county soil survey and as identified on aerial imagery.

Bedrock outcrops - New drill holes for this map project.

IGS GEOSAM data points - records available at www.iowageologic.com

W26162 - Well used for geologic cross-section labels in bold reprinted new drill holes.

Qps - Pits and Quarries - Sand and gravel pits and rock quarries. Extent mapped as shown on the county soil survey and as identified on aerial imagery.

CORRELATION OF MAP UNITS

General Lithology	Iowan Erosion Surface			Episode	Series	System
	Cedar River Valley	Pre-Illinoian Till Plain	Shallow Rock			
Alluvium	Qal	Qallt	Qal	Qalb	Hudson	Quaternary
Colluvium	Qall-ht	Qnw2	Qnw3	Qe	Hudson and Wisconsin	
Eolian Sand	Qe	Qps6	Qps2	Qps1	Wisconsin	
Loess	Qnw	Qps1	Qps1b	Qps1	Wisconsin	
Outwash	Qnw	Qwa2	Qwa2	Qwa3	Pre-Illinoian	
Erosion Surface and Glacial Till	Qwa3	Qbr	Qbr	Qbr	Pre-Illinoian	
Bedrock	Qbr	Qbr	Qbr	Qbr	Paleozoic	

*Shown only on the cross-section

SURFICIAL GEOLOGIC MAP OF THE CENTER POINT NW 7.5' QUADRANGLE, BENTON COUNTY, IOWA

IOWA GEOLOGICAL SURVEY
OPEN FILE MAP OFM-19-6
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IOWA GEOLOGICAL SURVEY
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INTRODUCTION TO THE SURFICIAL GEOLOGIC MAP OF THE CENTER POINT NW 7.5' QUADRANGLE, BENTON COUNTY, IOWA

The Center Point NW Quadrangle is located in central Iowa on the Iowan Surface landform region, commonly referred to as the Iowan Erosion Surface (IES) (Prior and Korth, 2006). The map area is dominated by dissected till plains with unannounced reworked sediments, sand sheets and dunes, and elongated loess-covered uplands called paha as well as larger 'erosional pillars' (Ruhe et al., 1968; Prior and Korth, 2006). The Cedar River has a significant role in shaping the surficial geology in this area as well. Stratigraphically, this area contains Pre-Illinoian age glacial deposits above Paleozoic carbonates. There are areas of shallow bedrock, where it is less than 2m (7 ft) from the surface. The thickness of Quaternary deposits in the Center Point NW Quadrangle is generally between 8 to 24 m (25-80 ft), but bedrock may be more than 45 m (150 ft) from the surface in the southeastern part of the mapping area.

The map area has a rich and complex Quaternary geologic history punctuated by at least seven periods of glaciation between 2.6 million and 500,000 years ago (Boellstorff, 1978a, b; Hallberg, 1980, 1986). Episodic erosion over the last 500,000 years has led to the destruction of pre-existing glacial landforms associated with Pre-Illinoian glaciation. While this area was not glaciated during the last glacial episode of the Wisconsin, the effects of the paleoclimate can be seen in deposits throughout the area. This period had an intensely cold and windy environment from 21,000 to 16,500 years ago (Walter, 1994; Bettis and Antin, 1997; Mason, 2015). Due to this climate, a periglacial environment prevailed with intensive freeze-thaw action, soilification, strong winds, thin plant cover, and a host of other periglacial processes (Baker et al., 1996; Walter, 1994; Mason, 2015; Kerr et al., 2019).

During the formation of the IES, soils that had developed on the upland landscape were removed and the underlying Pre-Illinoian till weathering zone was significantly eroded in this area; this resulted in the development of a region-wide colluvial lag deposit referred to as a 'stone line'. During this same interval, the Cedar River valley was filled with glacially derived deposits of sand and gravel from the Des Moines Lobe. This outwash provided a local source for wind-derived sediment. The distinctive features of this region are paha and the larger 'erosional pillars'. These are isolated landforms and may represent erosion surfaces of loess-mantled Pre-Illinoian till. They have a north-west to southeast alignment (McGee, 1891; Ruhe et al., 1968). This orientation seems to coincide with the regional paleo-prevailing winds (Mads et al., 2013; Mason, 2015; Kerr et al., 2019). Paha and 'pillars' usually have a thick package of wind-blown material, with some locations in the mapping area having over 12 m (40 ft) of loess and fine sand. Where paha are not present, packages of stratified loamy and sandy sediment cover the upland and hill slope positions on the landscape. This material is thought to be the remnants of soilification lobes associated with the formation of the IES. The toeslopes and smaller valleys have thick packages of coarse sand and gravel interspersed with loamy and silty layers. Some valleys, like Hinkle Creek, have over 7 m (24 ft) of this coarse material beneath a thin mantle of reworked loess. These valley deposits were developed in response to the shifting climate and base levels during the formation of the IES (Bettis and Antin, 1997).

Surficial deposits in the map area are composed of six formations: the DeForest, Noah Creek, Peoria, Pisgah, Wolf Creek, and Albion Formations, as well as unannounced 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, Gaudier, Corrognon, and Woden members (Bettis, 1990a; Bettis et al., 1992). The Noah Creek Formation includes coarse sand and gravel associated with outwash from the Des Moines Lobe, as well as coarse to fine-grained fluvial and colluvial deposits associated with local stream and river valleys (Bettis et al., 1996). Unannounced erosion surface sediments consist of reworked till slopeshed and reworked deposits associated with periglacial activity during the late Wisconsin Episode. The Peoria Formation is found across the mapping area and has a silt and sand facies deposited during the Late Wisconsin Stage (McKay, 1979; Bettis et al., 2003). Generally, the sand facies is found downwind (southeast) of the Cedar River, while the silt facies is found on the upland, especially in paha. This deposits of Peoria Formation, less than 1 m (3 ft), are found across most of the mapping area. The Pisgah Formation is comprised of loess and colluvium deposited during the Middle Wisconsin (Bettis, 1990b). Beneath these materials are Pre-Illinoian glacial deposits, which are subdivided into two formations: the younger Wolf Creek Formation and the Albion Formation (Hallberg, 1980). The Wolf Creek Formation is divided into the Winthrop, Aurora, and Hickory Hills members (oldest to youngest). The Albion Formation consists of several 'undifferentiated' members. This project had 17 new drill holes to assist with the geologic characterization.

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Base maps from USGS Center Point NW 7.5' Digital Raster Graphic (DRG) GIS File IA_Center_Point_NW_USGS_1900.tif which was scanned and modified from the Center Point NW 7.5' Topographic Quadrangle map, published by The US Geological Survey in 2018. Land elevation contours (10' interval).

Iowa Geological Survey digital cartographic file Center_Point_NW_SurficialGeology.mxd, version 6/30/19 (ArcGIS 10.5.1). Map projection and coordinate system based on Universal Transverse Mercator (UTM) Zone 15N, 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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