

Surficial Geology of Adams County, Iowa

SURFICIAL GEOLOGY OF ADAMS COUNTY, IOWA

Iowa Geological and Water Survey
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prepared by
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Introduction to the Surficial Geology of the Adams County, Iowa

Adams County lies within the Southern Iowa Drift Plain (Prior and Kohn, 2006) landform region of Iowa. Surficial materials consist of a mix of eolian deposits (loess, glacial till, outwash) and alluvium. Multiple periods of Quaternary glaciation and substantial erosion have led to the landscape we see today. Generally speaking, the map area consists of loess of variable thickness overlying Pre-Illinoian glacial sediments, and these deposits are regionally extensive.

Previous surficial geologic mapping of the area is limited to the Des Moines 4° x 6° Quadrangle at a scale of 1:100,000 (Hallberg et al., 1991). Wood (1941) first described and mapped the Quaternary and Pleistocene bedrock geology of Adams County, and developed the stratigraphy of the Peoria, Devonian, and Silurian strata that comprise the county's bedrock units. Statewide bedrock geologic maps by Hersey (1969), and most recently, by Witke, Anderson, and Pope (2010), depict the increased understanding of the distribution of geologic units at the bedrock surface across this region, including Adams County.

Early researchers believed there were only two episodes of Pre-Illinoian glaciation in Iowa: Kansan and Nebraskan (Chamberlain, 1894, 1895; Blair, 1896; Shook, 1909; Rube, 1969). Later regional studies determined that original concepts of Kansan-Adrian-Nebraskan was grossly oversimplified and flawed. It is now recognized that there were at least seven episodes of Pre-Illinoian glaciation that occurred in this region from approximately 2.2 to 0.5 million years ago (Boelhaert, 1978a; Boelhaert, 1978b; Hallberg, 1980a; Hallberg, 1980b). Episodic erosion during the last 500,000 years has led to the destruction of pre-existing glacial landforms associated with these episodes. Boelhaert (1978a and Hallberg, 1980a, 1980b) undertook regional-scale mapping that involved detailed outcrop and subsurface investigations including extensive laboratory work and synthesis of previous studies. These studies led to the abandonment of the classic glacial and interglacial terminology (Kansan, Adrian, and Nebraskan). This study marked a shift from the use of time-stratigraphic terms to lithostratigraphic classification. The result of Boelhaert's and Hallberg's studies was the development of a lithostratigraphic framework for Pre-Illinoian till. They developed a general stratigraphic framework for Iowa and eastern Nebraska based on physical stratigraphy, mineralogical criteria as well as magnetostratigraphy and rockmagnetism. In western Iowa and eastern Nebraska three lithologically distinctive till assemblages, the 'A', 'B', and 'C' tills with paleosols sometimes defining multiple till units within the A and B till assemblages. Recent work by Halse and Rowley (2010) suggests that a single ice advance around 2.4 Ma deposited the C till and the A and B tills accumulated between about 1.3 and 0.5 Ma.

The Loveland Loess (Daniels and Hardy, 1959; Rube, 1969; Bettis, 1980) is the only Illinoian or late middle Pleistocene deposit that is currently recognized in western Iowa. Where observed in outcrop, the Sangamon Geosol is developed in the upper part of the Loveland. The Loveland Loess thins away from the Missouri River and the Sangamon Geosol merges with the thick and more weathered Yarmouth-Sangamon Geosol in southern Iowa (Rube, 1967).

In Adams County, the highly eroded and dissected Pre-Illinoian upland and older terraces are mantled by Wisconsin loesses of variable thickness (Blair, 1896; Prior, 1978). The Wisconsin loesses are the youngest and regionally extensive Quaternary materials and were deposited between 30,000 and 12,000 years ago. Two loess units were deposited across Iowa during Wisconsin time, the older Pisgah Formation and the younger Peoria Loess. The Pisgah is thin and includes loess and related slope deposits that have been altered by soilforming processes, pedogenic and periglacial processes. The upper part of the unit is modified by development of the Farmdale Geosol. It is not uncommon to see the Farmdale developed throughout the Pisgah and incorporated into the underlying older Sangamon Geosol. The Pisgah fm. loess was deposited on the western Iowa landscape from about 55,000 to 26,000 years ago (Bettis et al., 2003). The Peoria Formation is typically buried by Peoria Formation loess. The Peoria Formation loess accumulated on stable landscapes in western Iowa from 23,000 to 12,000 years ago.

Surficial deposits of the map area are composed of four formations: Deforest, Nash Creek, Peoria, and undifferentiated Pre-Illinoian tills. Hudson age deposits associated with fine-grained alluvial and colluvial sediments include the Deforest Formation which is subdivided into the Camp Creek, Roberts Creek, Gauder and Corning members. The Nash Creek Formation includes coarser grained deposits associated with large valleys which are overlain by fine-grained alluvial material or eolian silt and sand. Peoria Formation colluvial materials consist of wind-blown silt that may be up to 25 feet in thickness. Limited areas of eolian sand may be found adjacent to major river valleys (Middle Nodaway, East Nodaway and Platte rivers). Additional eolian materials may be intermittently present mantling Wisconsin Epoch terraces. Pre-Illinoian glacial till and outwash are mapped along drainage and where loess covers thin. Based on existing well data, Pre-Illinoian deposits may be as thick as 300' in bedrock valleys.

Soils series units from the Soil Survey of Adams County, Iowa (Lamsch, 2008) were categorized by soils series into a surficial geologic units based on soil data and available subsurface geologic data from Iowa Geological and Water Survey's GEGRAM database (water well log database) as well as other existing subsurface data for this correlation map project. Modeling and mapping of the glacial till outcrop was completed using ArcGIS 10.0, gvSIG open source GIS program and the Sextante landscape classification subprogram.

* We disagree with the younger 0.2Ma age estimate for Pre-Illinoian glaciations presented by Halse and Rowley (2010) and suggest 0.5Ma is more consistent with regional data and stratigraphic relationships.

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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, 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 Pre-Illinoian glacial till of the Wolf Creek or Albarett formations or Pre-Holocene fine-grained alluvium. Associated with low-relief modern floodplain, closed depressions, modern drainageways or topographic positions on the landscape. Unit also includes colluvial deposits derived from adjacent map units. Seasonal high water table and potential for frequent flooding.
- Qallt** - Nodaway River - Low Terrace (Deforest Formation-Camp Creek Mbr. and Roberts Creek Mbr.) Variable thickness of less than 1 to 5 m (3-16 ft) of very dark gray to brown, noncalcareous, stratified silty clay loam, loam, or clay loam, associated with the modern channel belt of the Middle Nodaway, East Nodaway and Platte river valleys. Overlies Pre-Holocene fine-grained alluvium. Occupies lowest positions on the floodplain; modern channel belts. On-bow lakes and meander scars are common features associated with this terrace level. Seasonal high water table and frequent flooding potential.

HUDSON AND WISCONSIN EPISODE

WISCONSIN EPISODE

- Qpt** - Loess Mantled Terrace (Peoria Formation-silt and/or sand facies) 2 to 7 m (7-23 ft) of yellowish brown to gray, massive, jointed, calcareous or noncalcareous, silt loam and intercalated fine to medium, well sorted, sand. May grade downward to poorly to moderately well sorted, moderately to well stratified, coarse to fine eolian quartz sand, loam, or silt loam alluvium (Late Phase High Terrace) or may overlie a Farmdale Geosol developed in Roxanna Silt which in turn overlies a well-exposed Sangamon Geosol developed in poorly to moderately well sorted, moderately to well stratified, coarse to fine sand, loam, or silt loam alluvium (Early Phase High Terrace).
- Qps** - Loess (Peoria Formation-silt facies) Generally 2 to 8 m (6 to 25 ft) of yellowish to grayish brown, massive, jointed calcareous or noncalcareous silt loam to silty clay loam. Limited areas of fine eolian sand may be present near major valleys. Overlies a grayish brown to olive gray silty clay loam to silty clay (Pisgah Formation-eroded Farmdale Geosol) which is less than 1.5 m (5 ft) thick. The Farmdale may be welded to an older Sangamon Geosol developed in loamy glacial till of the Wolf Creek or Albarett formations. This mapping unit encompasses upland divides, ridgtops and convex sideslopes. Well to somewhat poorly drained landscape.

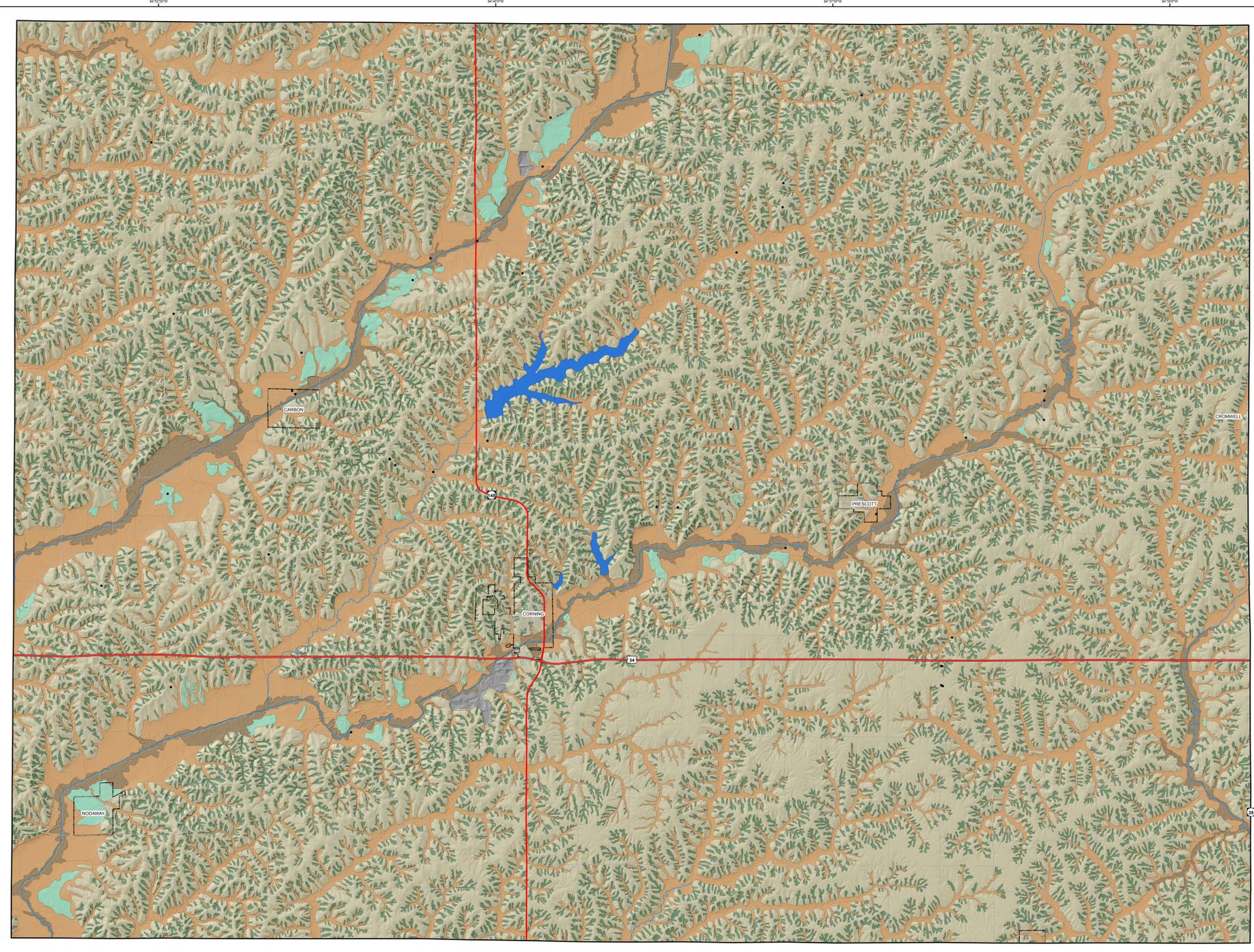
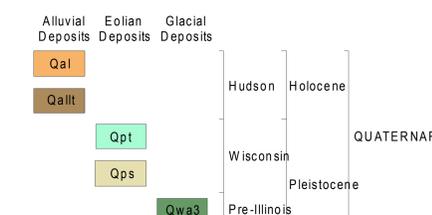
PRE-ILLINOIAN EPISODE

- Qwa3** - Till (Wolf Creek or Albarett Formations) Generally 15 to 90 m (49-295 ft) of very dense, massive, fractured, loamy glacial till of the Wolf Creek or Albarett formations with or without a thin loess mantle (Peoria Formation-less than 2 m) and intersecting clayey Farmdale-Sangamon Geosol. This mapping unit encompasses narrowly dissected interfluvial and side slopes, and side valley slopes. Drainage is variable from well drained to poorly drained.

Other Mapping Units

- Qpq** - Pits and Quarries Sand and gravel pits and rock quarries. Extent mapped as shown on county soil surveys and as identified on aerial imagery.
- Water Features** Rivers, lakes and small ponds formed by blockage of drainageways and river channels. Extent mapped as shown in county soil surveys and as identified on aerial imagery.
- Drill Holes**

Correlation of Map Units



1:50,000



Map Location

