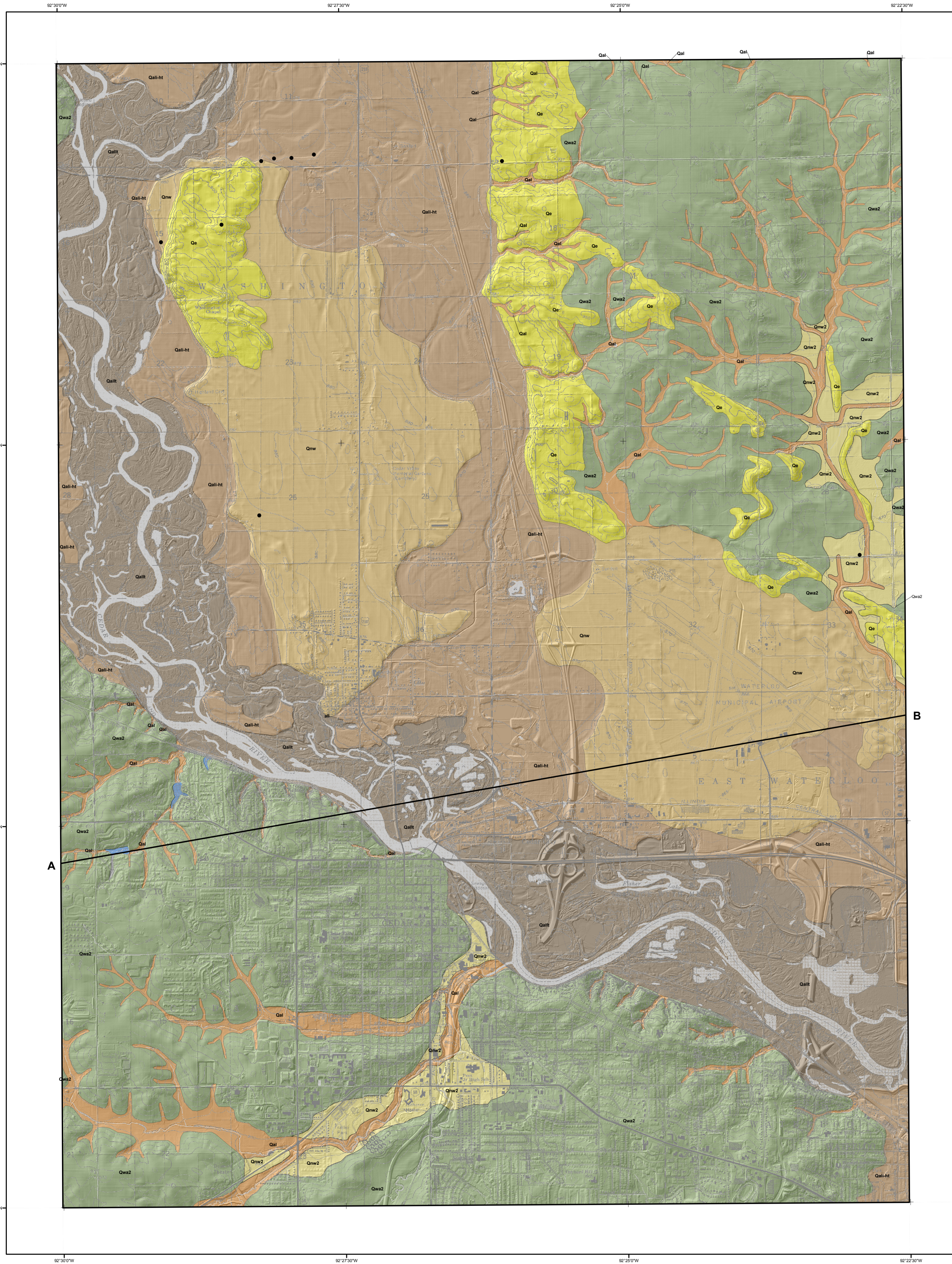


Surficial Geology of the Cedar Falls (Iowa) 7.5' Quadrangle



SURFICIAL GEOLOGY OF THE CEDAR FALLS 7.5' QUADRANGLE, BLACK HAWK COUNTY, IOWA

Iowa Geological and Water Survey
Open File Map OFM-12-04
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prepared by
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- LEGEND**
- CEZOIC**
- QUATERNARY SYSTEM**
- HUDSON EPISODE**
- Qal** - Alluvium (DeForest Formation) Indifferently variable thicknesses of less than 1 to 5 m (3-16 ft) of very dark gray to brown, noncalcareous to calcareous, massive to stratified silt clay loam, clay loam, loam to sandy loam alluvium and colluvium in stream valleys, on hillsides, and in chert depressions. May overlie Noah Creek Formation, Wolf Creek or Allamont formations, or fractured Devonian or Silurian carbonate bedrock. Associated with low-level modern floodplain, closed depressions, modern drainageways, or topographic positions on the landscape. Seasonal high water table and potential for frequent flooding.
 - Qallt** - Low Terrace (DeForest Formation-Camp Creek Mbr. and Roberts Creek Mbr.) Variable thicknesses of less than 1 to 5 m (3-16 ft) of very dark gray to brown, noncalcareous, stratified silt clay loam, loam, or clay loam. Associated with the modern channel belt of the Cedar River Valley. Overlies the Noah Creek Formation. Occupies lowest position on the floodplain or modern channel belts. Seasonal high water table and frequent flooding potential.
 - Qallt-ht** - Intermediate-High Terrace (DeForest Formation-Camp Creek Mbr.) Variable thicknesses of less than 1 to 5 m (3-16 ft) of very dark gray to brown, noncalcareous, silt clay loam to loam alluvium or alluvium that overlies the Noah Creek Formation. Occupies terrace and valley margin positions 1 to 2 m (3-7 ft) above the modern floodplain. May be marked with 2 to 3 m (7-10 ft) of well-sorted medium to fine sand derived from wind reworking of the alluvium. Seasonal high water table and low to moderate flooding potential.
- WISCONSIN EPISODE**
- 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 may overlie yellowish-brown sand and gravel (Noah Creek Formation) or reworked unsorted loam to silt loam deposits associated with the Iowa Erosion Surface and/or a may overlie yellowish to grayish brown, often calcareous and fractured clay loam to loam facies of the Wolf Creek and Allamont formations.
 - Qnw2** - Sand and Gravel (Noah Creek Formation) Generally 2 to 8 m (6-26 ft) of yellowish brown to gray, poorly to well-sorted, massive to well-sorted, coarse to fine kolklike quartz sand, pebbly sand and gravel with few intervening layers of silt clay. A thin mantle of less, reworked loess, or fine-grained alluvium may be present. This unit includes silt colluvial deposits derived from the adjacent map units. In places, unit is marked with 1 to 3 m (3-10 ft) of well-sorted, medium to fine sand derived from wind reworking of the alluvium. This unit encompasses deposits that accumulated in low-relief stream valleys during the Wisconsin and Hudson episodes. Seasonal high water table and some potential for flooding.
- WISCONSIN EPISODE**
- Qnw** - Sand and Gravel (Noah Creek Formation) 3 m (10 ft) to more than 30 m (98 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 marked with 1 to 3 m (3-10 ft) of fine to medium, well-sorted sand derived from wind reworking of the alluvium. This unit encompasses deposits that accumulated in stream valleys during the Wisconsin episode.
 - Qwa2** - Loamy and Sandy Sediment Shallow to Glacial Till (unsorted on-surface sediment) Generally 2 to 8 m (6-26 ft) of yellowish brown to gray, massive to weakly stratified, well to poorly sorted loamy, sandy and silt loam Erosion Surface sediment. Map unit includes some areas marked with less than 2 m (7 ft) of Peoria Formation materials (loam to silt loam sand). Overlies massive, fractured, fine grained till of the Wolf Creek or Allamont formations. Seasonal high water table may occur on this map unit.
- PRE-ILLINOIS EPISODE**
- Qwa3** - Till (Wolf Creek or Allamont formations) Generally 1 to 4.5 m (3-15 ft) of very dense, massive, fractured, loamy glacial till of the Wolf Creek or Allamont formations with or without thin loess mantle (Peoria Formation)-less than 2 m or thin loamy sediment mantle. An intervening clayey Flandrau-Stapleton Gneiss may separate these units. This mapping unit is shown only on the cross-section and may be buried by unsorted erosion surface sediments, loess or alluvium.
- PALEOZOIC**
- DEVONIAN SYSTEM**
- Dcv** - Limestone and Dolomite (Corville Formation) Middle Devonian. The thickness of this map unit varies between 0 and 10 m (32-33 ft) within the quad. The low Grand Creek Member is fossiliferous carbonate with an abundant marine fauna and is dominated by dolomite and dolomitic limestone, becoming slightly argillaceous in part, with common calcite fill vugs; the low diversity fauna are characterized by crinoid stems, brachiopods, and rare gastropods and bryozoans. The upper low City Member is carbonate dominated, with laminated, brecciated, or evaporitic features and some restricted marine fauna; the restricted marine fauna is dominated by fossiliferous corals and/or branching and domal stromatolites. Scattered irregularly horizontal intervals occur within and around the quad area. This unit is shown only on the cross-section, not on the map.
 - Dic** - Dolomite and Limestone (Iadic Cedar Formation) Middle Devonian. The thickness of this map unit ranges from 0 to 30 m (100 ft) within the quad. The map 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 and brachiopods are especially abundant in the lower portion. The upper portion (Halle Mountain) is dense, argillaceous, fibrographic or subfibrographic limestone or dolomitic limestone, with laminated, pelted, intraclastic, and bi-bedded fabrics. This unit is shown only on the cross-section, not on the map.
 - Dw** - Dolomite, Limestone, Shale, and minor Sandstone (Wapiniton Group) Middle Devonian. This map unit consists only the Princeton Ridge Formation of the group, with a total thickness that varies from 0 to 2.3 m (7.5 ft) in the mapping area. It is dominated by laminated or brecciated, interbedded limestone and dolomite that is sometimes sandy and cherty at its base. This unit is shown only on the cross-section, not on the map.
- SILURIAN SYSTEM**
- Shb** - Dolomite with Chert (Hopkinton and Blanning formations) Lower Silurian. The total thickness of this map unit is up to 40 m (130 ft). The unit is fossiliferous to vuggy dolomite and cherty to very cherty with nodular to bedded chert in the upper part of the Blanning formation. Fossils include corals, brachiopods, and stromatolites. The Hopkinton rocks are generally more fossiliferous and less cherty than the underlying Blanning rocks. This unit is shown only on the cross-section, not on the map.
- ORDOVICIAN SYSTEM**
- Om** - Shale and Dolomite (Maquoketa Formation) Upper Ordovician. The total thickness of this map unit is up to 91 m (300 ft). The unit is composed of interbedded green to gray dolomitic shale and shaly dolomite with minor limestone; variably cherty and variably fossiliferous with brachiopods and graptolites. Thin to very thin gray dolomitic shale layers occur in the lower 10 m (33 ft). This unit is shown only on the cross-section, not on the map.
- Other Mapping Units**
- Water Features** - Rivers, lakes, and small ponds formed by block-up of drainageways and river channels. Extent mapped as shown in county soil surveys and as identified on aerial imagery.
 - Drill Holes** -

Introduction to the Surficial Geology of the Cedar Falls 7.5' Quadrangle

The Cedar Falls Quadrangle, located in Black Hawk County, lies within the Iowa Erosion Surface (IES) Landform Region (Prior and Kohrt, 2006). This area has been subjected to multiple periods of Quaternary glaciations and substantial erosion. Generally speaking, the map area consists of unsorted loamy sediments (IES materials) of variable thickness overlying Pre-Illinoian glacial sediments. The Cedar River Valley is filled with Wisconsin Episode Noah Creek Formation sand and gravel and mantled with younger Holocene terrace materials. These deposits are regionally extensive.

Previous surficial geologic mapping completed as part of the STATEMAP program includes the Gilbertville Quadrangle in Black Hawk County (Tassier-Surine et al., 2011) and mapping to the north in adjacent Bremer County (Tassier-Surine et al., 2007, 2009, 2010). The only other regional surficial map of the area consists of the Des Moines 4° x 6° Quadrangle at a scale of 1:1,000,000 (Halberg et al., 1991). The Devonian stratigraphy of the regional area has been intensively studied by Iowa Geological and Water Survey (IGWS) staff (e.g., Belanski, 1923; Koch, 1979), and restudied and correlated by Witzke and Banker (1984), Witzke and others (1988), Anderson and Banker (1988), and Groves and others (2008). An updated bedrock geologic map was completed in 2010 (Witzke et al.). Other studies in the area include Anderson and Carvin (1984) and Day and others (2006). The stratigraphic nomenclature and correlation in this map follow the stratigraphic framework proposed by Witzke and others (1988).

At least seven episodes of Pre-Illinoian glaciations occurred in this region between approximately 2.2 and 0.5 million years ago (Boehrer, 1978a,b; Halberg, 1980, 1986). Episode erosion during the last 50,000 years has led to the destruction of pre-existing glacial landforms associated with Pre-Illinoian glaciations. A period of intense cold occurred during the full glacial Wisconsin Episode from 21,000 to 16,500 years ago (Betts, 1989). This cold episode and ensuing uplift erosion led to the development of the distinctive landform recognized as the IES (Prior, 1976). A periglacial environment prevailed during this period with intensive freeze-thaw action, soilfrosting, strong winds and a host of other periglacial processes (Walkers, 1996). Surface soils were removed from the IES and the Pre-Illinoian till surface was significantly eroded, resulting in the development of a region-wide colluvial lag deposit referred to as a "stone line." Another common feature of the region are paleo-isolated and unsorted topographic highs of loess-derived Pre-Illinoian till with a directional orientation from northwest to southeast that exist as erosional outliers of the once higher and older landscape. Thick packages of stratified loamy and sandy sediments located low in the upland landscape and adjacent to streams are remnants of well-fluctuating lobes associated with the formation of the IES. These materials can commonly be found along small tributaries of the Cedar River.

Surficial deposits of the map area are composed of five formations: DeForest, Noah Creek, Peoria, Wolf Creek, and Allamont formations as well as unsorted erosion surface sediments. Hudson glacial deposits associated with fine-grained alluvial and colluvial sediments include the DeForest Formation which is subdivided into the Camp Creek, Roberts Creek, Gander, and Corvinton 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. Unsorted erosion surface sediments consist of reworked till and alluvium deposited associated with glacial retreat during the Wisconsin ice advance and may be up to 25 feet thick. Peoria Formation colluvial materials consist of fine sand with thick deposits only present adjacent to the Cedar River Valley. Additional colluvial materials may be intertongued present mantling most other mapping units and are more abundant near stream valleys. Pre-Illinoian glacial deposits in northeast Iowa consist of two formations: the younger Wolf Creek Formation and the Allamont Formation. The Wolf Creek Formation is divided into the Windrop, Aurora, and Hickory Hills members (subdivided into the Camp Creek, Roberts Creek, Gander, and Corvinton members). The Noah Creek Formation is not exposed in the map area but is mantled throughout the Cedar Falls Quadrangle by IES materials, colluvial sand or alluvial sediments. Pre-Illinoian deposits may be as thick as 200 feet in bedrock valleys. The Quaternary materials are underlain by Silurian and Devonian carbonate bedrock. There are no natural bedrock outcrops in the quadrangle.

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Base map from USGS Cedar Falls 7.5' Digital Raster Graphic (IGS GIS file DRG35 TIF) which was scanned from the Cedar Falls 7.5' Topographic Quadrangle map, published by US Geological Survey in 1963, photorevised 1963. Geographic contours and land features based on 1954 and 1955 aerial photography, field checked in 1963. Land elevation contours (10' interval).

Iowa Geological and Water Survey digital cartographic file Cedar Falls_BedrockGeology.mxd, version 9/28/12 (ArcGIS 10.0). 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.

