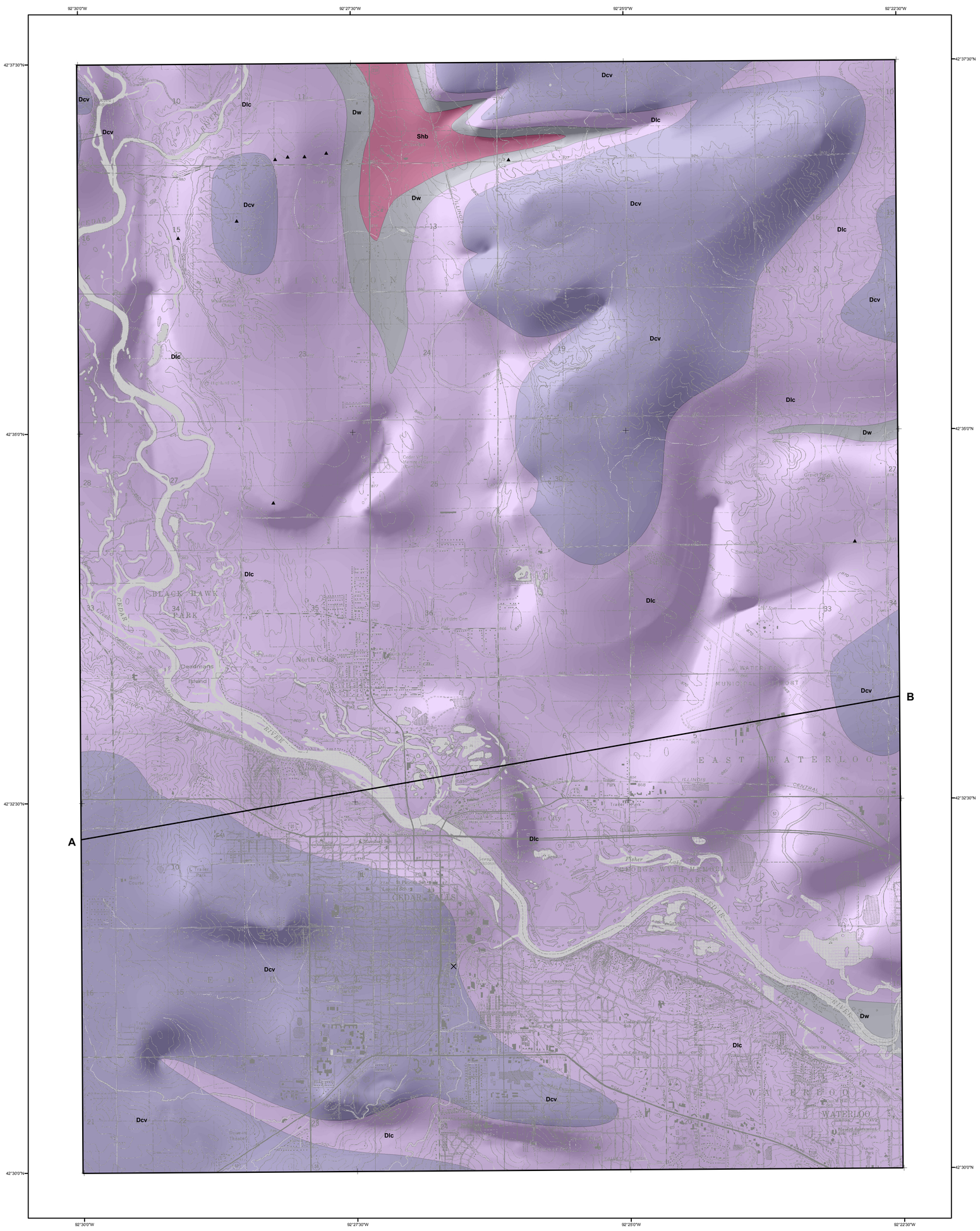
Bedrock Geology of the Cedar Falls (Iowa) 7.5' Quadrangle



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

Iowa Geological and Water Survey
Open File Map OFM-12-03
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prepared by

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

The Cedar Falls 7.5' Quadrangle within Black Hawk County, Iowa, is located in the south-central portion of the Iowan Surface landform region, which is characterized by various episodes of erosion before the Wisconsinan glacial events (Prior, 1991).

The quadrangle area of Cedar Falls is covered by various Quaternary glacial deposits with a maximum thickness of up to 58.8 m (193 ft). One indubitable bedrock outcrop (actually an excavation for a lift station) was found in the south-central portion of the quad within the city of Cedar Falls during the field investigation. Subsurface information for the bedrock mapping was mostly derived from the analysis of water well materials and drill-hole information collected by the Iowa Geological and Water Survey (IGWS) and stored in the GEOSAM database of IGWS. A total of 172 private and public wells and 9 drill holes were reviewed within the quad. Bedrock information from surrounding quarries was also helpful in mapping the bedrock geology of the quad.

In the mapping area, Middle Devonian rocks form the major bedrock surface, and water wells are developed in both Devonian and Silurian rocks. Being part of a special depositional region within the Iowa Basin, the Devonian stratigraphy of the regional area has been intensively studied by IGWS staff (e.g., Belanski, 1927; Koch, 1970) and re-studied and correlated by Witzke and Bunker (1984), Witzke and others (1988), Anderson and Bunker (1998), Groves and others (2008), etc. Other studies in the area include Anderson and Garvin (1984) and Day and others (2006). The stratigraphic nomenclature and correlation in this map follow the stratigraphic framework proposed by Witzke and others (1988).

The youngest bedrock unit within the quad is the Devonian Coralville Formation, while the oldest rocks forming part of the bedrock surface are the Silurian Hopkinton and Blanding formations. The Devonian is dominated by carbonates varying between limestone and dolomite with accompanying minor shale. The Silurian is comprised of dolomite with varying amounts of chert and minor shale. Based on lithologic features and fossils, the Devonian rocks in the mapping area can be subdivided, in descending order, into the Coralville and Little Cedar formations and the Wapsipinicon Group.

The Coralville Formation occurs mostly in the southwest and northeast quarters of the quad on bedrock highs and is characterized by a lower fossiliferous carbonate member with abundant marine fauna (Gizzard Creek Member) and an upper carbonate dominated unit with laminated, brecciated, or evaporitic textures and some restricted marine faunas (Iowa City Member).

The Little Cedar Formation is the dominant bedrock surface unit in the quad and is characterized by fossiliferous dolomite and dolomitic limestone in the lower part and by sparsely fossiliferous to unfossiliferous dolomite, shale, and limestone (laminated to brecciated) in the upper part.

The Wapsipinicon Group is dominated by laminated or brecciated, unfossiliferous limestone and dolomite that is sometimes sandy and cherty at its base. Within the quad, only the Pinicon Ridge Formation of the group is present, and it forms the bedrock surface in the deeper bedrock valleys in the north-central and eastern portions of the quad.

The Silurian Hopkinton and Blanding formations are comprised of fossil-moldic to vuggy dolomite that are cherty to very cherty with nodular to bedded chert in the upper part of the Blanding Formation. The Hopkinton rocks are generally more fossiliferous and less cherty than the underlying Blanding rocks. The Silurian rocks form the bedrock surface in the deepest parts of the bedrock valleys in the north-central portion of the quad.

Ordovician Maquoketa Formation rocks do not occur at the bedrock surface within the quad, but directly underlie the Silurian rocks. The Maquoketa rocks include interbedded green to gray dolomitic shale and shaly dolomite with minor limestone, and are variably cherty and fossiliferous.

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LEGEND

CENOZOIC

QUATERNARY SYSTEM

Qu – Undifferentiated unconsolidated sediment Consists of loamy soils developed in loess and glacial till of variable thickness, and alluvial clay, silt, sand, and gravel. Total thickness can be up to 58.8 m (193 ft) in the bedrock valleys within the quad. This unit is shown only on the cross-section, not on the map.

PALEOZOIC

DEVONIAN SYSTEM

Dcv - Limestone and Dolomite (Coralville Formation) Middle Devonian. The thickness of this map unit varies between 0 and 16 m (0-52 ft) within the quad. The lower Gizzard 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 filled vugs; the low diversity fauna are characterized by crinoid debris and brachiopods and rare gastropods and bryozoans. The upper Iowa City Member is carbonate dominated, with laminated, brecciated, or evaporitic textures and some restricted marine faunas; the restricted marine fauna is dominated by favositid corals and/or branching and domal stromatoporoids. Stromatoporoid rich biostromal intervals occur within and around the quad area.

Dlc - Dolomite and Limestone (Little Cedar Formation) Middle Devonian. The thickness of this map unit ranges from 0 to 37 m (0-121 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 (Hinkle Member) is dense unfossiliferous lithographic or sublithographic limestone or dolomitic limestone, with laminated, pelleted, intraclastic, and bird seye fabrics.

Dw - Dolomite, Limestone, Shale, and minor Sandstone (Wapsipinicon Group) Middle Devonian. This map unit contains only the Pinicon Ridge Formation of the group, with a total thickness that varies from 0 to 23 m (0-75 ft) in the mapping area. It is dominated by laminated or brecciated, unfossiliferous limestone and dolomite that is sometimes sandy and cherty at its base.

SILURIAN SYSTEM

Shb – Dolomite with Chert (Hopkinton and Blanding formations) Lower Silurian. The total thickness of this map unit is up to 49 m (160 ft). The unit is fossil-moldic to vuggy dolomite and cherty to very cherty with nodular to bedded chert in the upper part of the Blanding Formation. Fossils include corals, brachiopods, and stromatoporoids. The Hopkinton rocks are generally more fossiliferous and less cherty than the underlying Blanding rocks.

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 comprised of interbedded green to gray dolomitic shale and shaly dolomite with minor limestone; variably cherty and variably fossiliferous with brachiopod sand graptolites; thin brown to brown-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.

- **Wells**
- **Drill Holes**
- **Outcrops**

Adjacent 7.5' Quadrangles

1:24,000

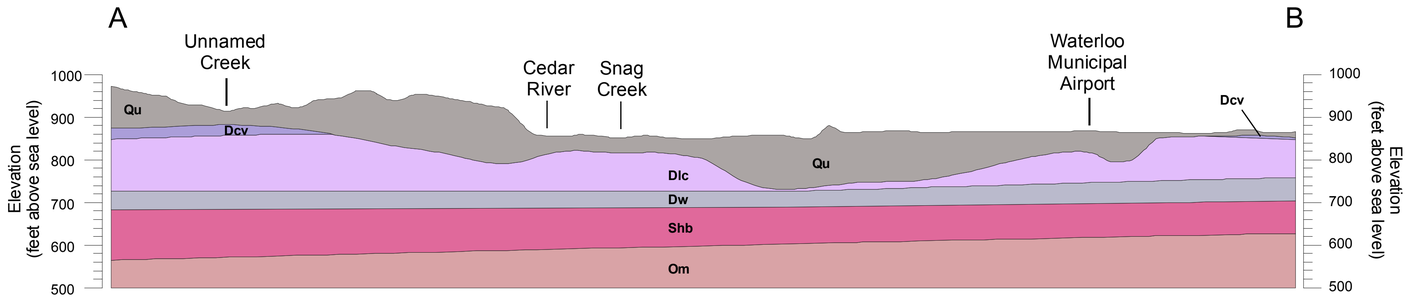
0 0.5 1 2 3 4 Miles

0 0.5 1 2 3 4 Kilometers

Location Map

N

GEOLOGIC CROSS-SECTION A-B



Base map from USGS Cedar Falls 7.5' Digital Raster Graphic (IGS GIS file DRGI35.TIF) which was scanned from the Cedar Falls 7.5' Topographic Quadrangle map, published by US Geological Survey in 1963, photorevised 1963
Topographic contours and land features based on 1958 and 1963 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.

Correlation of Map Units