

Surficial Geology of the Freeport (Iowa) 7.5' Quadrangle

GEOLOGIC MAPPING OF THE UPPER IOWA RIVER WATERSHED PHASE 2: Freeport 7.5' Quadrangle

Iowa Geological Survey
Open File Map OFM-06-2
July 2006

prepared by
Robert McKay¹, Paul Liu¹, Jean Young²,
and Stephanie Tassier-Sartin²

¹Iowa Geological Survey, Iowa City, Iowa
²Luther College, Decorah, Iowa



Iowa Department of Natural Resources, Jeffrey R. Voth, Director
Iowa Geological Survey, Robert D. Libra, State Geologist

Supported in part by the U.S. Geological
Cooperative Agreement Number 05HQAO0086
National Cooperative Geologic Mapping Program (STATEMAP)

ACKNOWLEDGEMENTS

We thank Lena Friest and Adam Kiel of the Northeast Iowa RC & D for their efforts in helping to initiate this mapping project and for supporting our work in the Upper Iowa River watershed. New subsurface geologic data was generated by University of Iowa students Ryan Clark and Ben Belgode who produced descriptive logs of water well drill samples. Luther College in Decorah actively participated in the project through subcontract 05-7380-01 for field mapping support. Luther College student Jared Bredel was a participant in the field work to support the mapping effort. Drilling in selected sites was provided under contract by Aquadri, Inc. of Coraville, Iowa. Thanks to Joe Anz of the Office of the State Archeologist, Iowa City for time spent in the field examining Quaternary exposures and for providing drill records from that office. Deborah Quake, Iowa Geological Survey (IGS) lent support with Quaternary field and office expertise, and Brian Witzke (IGS) provided valuable information concerning the Ordovician stratigraphy of the area. Digital cartography by Jim Cigliarano (IGS). We thank Mike Root of Ironing Rock Products, Decorah who arranged entry to company quarries and pits, and Dave Orlert of the Winnebago County Engineers Office for securing bridge crossing logs. Special thanks to the following landowners who graciously allowed access to their land for outcrop examination and drilling: Cloyd Dohley, Jim Stevens, Lorado Adelman, Ted and Pats Wilson, the late Gordon MacMasters, and Steven and Jane Hildebrand.

LEGEND

Description of Map Units

Cenozoic

Quaternary System

Hudson Episode

- Qal - Alluvium (De Forest Formation Unstratified)** One to four meters (3 to 13 ft) of massive to weakly stratified, grayish brown to brown loam, silt loam, clay loam, or loamy sand overlying less than three meters of poorly to moderately well sorted, massive to moderately well stratified, coarse to fine feldspathic quartz sand, pebbly sand, and gravel and more than three meters of pre-Wisconsinan or late Wisconsinan Noah Creek Formation sand and gravel. Also includes colluvium derived from adjacent map units in stream valleys, on hillslopes, and in closed depressions. Seasonal high water table occurs in this map unit.
- QalH - Upper Iowa River Valley - Low Terrace/Modern Channel Belt (DeForest Formation-Camp Creek Member and Roberts Creek Member)** Variable thickness of less than 1 m to 5 m (3 to 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 Upper Iowa River valley. Oxbow lakes and meander scars are common features associated with this terrace level. Post-settlement alluvium thickness varies from 0.5 m (1.5 ft) higher areas to 2 m (6.5 ft) along the river course and in lower lying areas. Seasonal high water table and frequent flooding potential.
- QalI - Upper Iowa River Valley - Intermediate Terrace (DeForest Formation-Camp Creek Member, Roberts Member and Gunder Member)** Variable thickness of less than 1 m to 5 m (3 to 16 ft) of very dark gray to brown, noncalcareous, stratified silt clay loam to loam that overlies calcareous, medium- to coarse-grained sand and gravel of Wisconsinan (Noah Creek Formation) and/or pre-Wisconsinan age. Occupies low terrace position. Seasonal high water table and frequent flooding potential.
- QalH - Upper Iowa River Valley - High Terrace (DeForest Formation-Guider and Corrington members)** Thickness of less than 0.5 m to 1.5 m (1.5 - 5 ft) of very dark gray to brown, noncalcareous, silt clay loam, loam alluvium or colluvium. Overlies 3 m to 18 m (10 to 60 ft) of calcareous, medium- to coarse-grained sand and gravel of Wisconsinan (Noah Creek Formation) and/or pre-Wisconsinan age. Occupies terrace and valley margin position 3 to 4 m (10 to 13 ft) above the modern floodplain. Eolian material composed of silt and sand facies may be present on the terrace surface. Seasonal high water table and rare flooding potential.

Wisconsin Episode

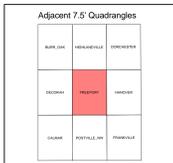
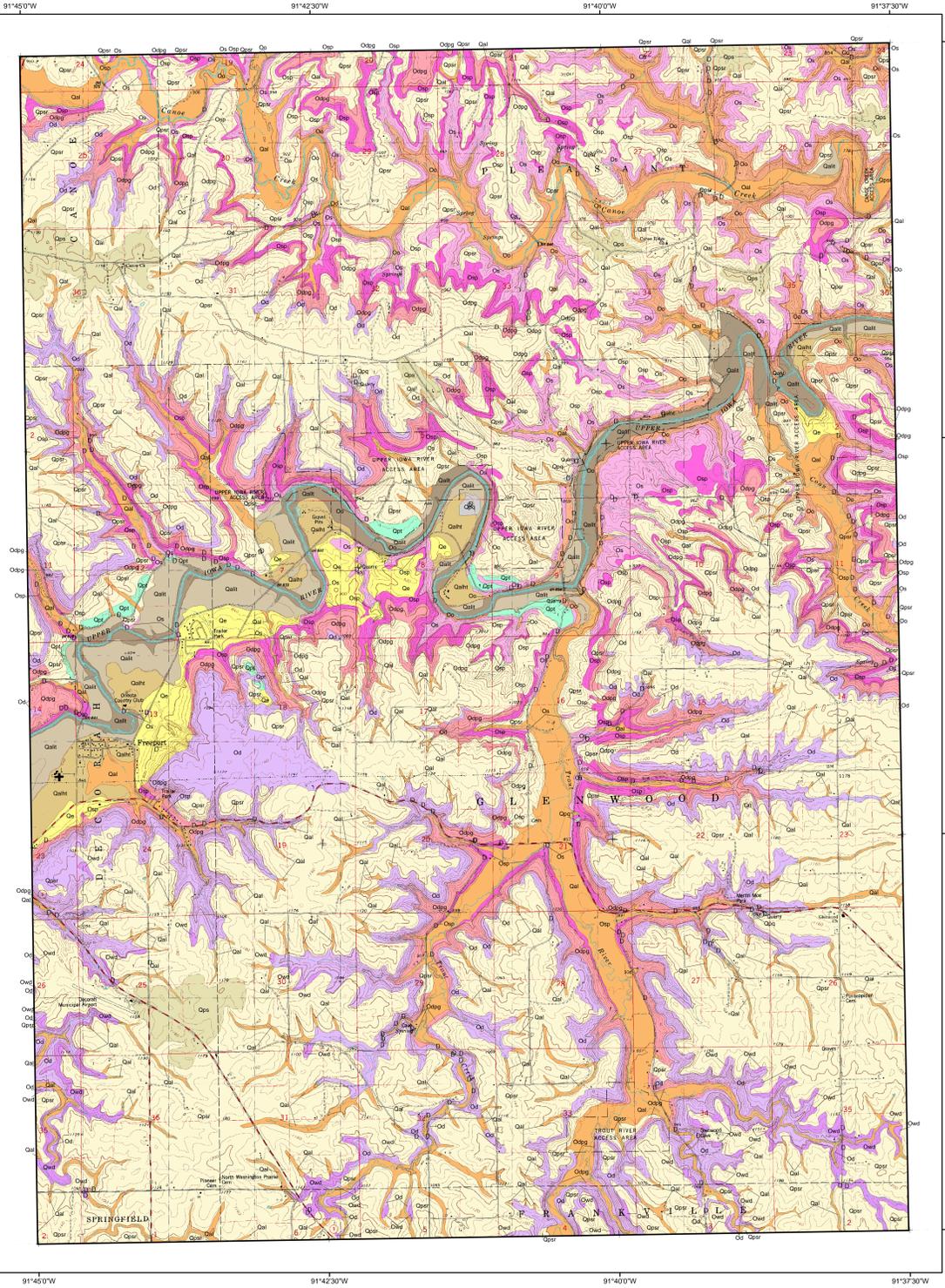
- Qpt - High Terrace - either Late Phase or Early Phase (Pocahontas Formation - silt and/or sand facies)** Two to seven meters (6 to 23 ft) of yellowish brown to gray, massive, jointed, calcareous or noncalcareous, silt loam and interbedded fine to medium, well sorted sand. May grade downward to poorly to moderately well sorted, moderately to well stratified, coarse to fine feldspathic quartz sand, pebbly sand, loam, or silt loam alluvium (Late Phase) or may overlie a Farmdale Geosol developed in Farmdale Sand 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).
- Qe - Sand Sheet and Sand Dunes (Pocahontas Formation - sand facies)** Variable thickness of 2 m to 8 m (6 to 27 ft) of yellowish brown, massive, jointed, calcareous silt loam and silt clay loam. Fine sand deposited by eolian processes. It may overlie Upper Iowa River High Terrace or bedrock along lower elevation portions of Upper Iowa River valley walls. Seasonal high water table and rare flooding potential.
- Qps - Loess (Pocahontas Formation - silt facies)** Generally 2 m to 8 m (6 to 27 ft) of yellowish to grayish brown, massive, jointed noncalcareous grading downward to calcareous silt loam to silt clay loam. Overlies massive, fractured, loamy glacial till of the Pre-Illinoian Wolf Creek or Alluvium formations with or without intervening clayey Farmdale-Sangamon Geosol. In most areas the Pre-Illinoian till is 1 m to 1.5 m (3 to 5 ft) thick, but may be up to 8 m (27 ft) thick locally. This mapping unit encompasses upland divides, ridge-tops and convex-side slopes. Well to somewhat poorly drained landscape.
- Qpr - Loess over Bedrock (Pocahontas Formation - silt facies)** Generally 2 m to 8 m (6 to 27 ft) of yellowish to grayish brown, massive, jointed noncalcareous grading downward to calcareous silt loam to silt clay loam. Overlies Ordovician bedrock units or colluvium. This mapping unit encompasses upland divides, ridge-tops and convex-side slopes. Well to somewhat poorly drained landscape.

Paleozoic

Ordovician System

- Owl - Limestone and minor Shale (Wise Lake and overlying Dubuque formations)** A prominent ledge and cliff-forming unit of up to 31 m (102 ft) of limestone with notable thin interbedded shale in the upper 6 m. This map unit is the upper of two successive major cavern and karst-forming bedrock units in the area. The Wise Lake Formation consists of 21 m (69 ft) of massive limestone portions of which exhibit a distinctive botryoidal fabric. The Dubuque Formation consists of 10 m (34 ft) of crinoidal limestones and thin interbedded shale. Sinkholes are common to abundant within this map unit. Often mantled by 0 m to 2 m (0 to 6 ft) of loess-derived and weathered bedrock-derived colluvium.
- Od - Limestone (Danforth Formation)** A prominent ledge and cliff-forming unit of up to 42 m (137 ft) of limestone with minor thin interbedded shale. This is the lower of two successive major cavern and karst-forming bedrock units in the area. The formation consists of fossiliferous limestone and argillaceous limestone with common chert nodules. Major springs occur near the base and sinkholes and karst features are common. Frequently mantled by 0 m to 2 m (0 to 6 ft) of loess-derived and weathered bedrock-derived colluvium.
- Odpg - Shale, Limestone, and Dolomite (Decorah, and underlying Platville, and Glenwood formations)** A nonresistant slope-forming unit of green-gray shales, dense limestones, argillaceous limestones, and dolomite with average thickness of 26 m to 27 m (85 to 90 ft). Large detached slump blocks of overlying Danforth Formation limestone often rest on the upper surface of this unit. Forms a regional confining unit that serves as the basal boundary of the karst system in the overlying Danforth, Wise Lake and Dubuque formations. The upper division, the Decorah Formation, consists of 12 m to 14 m (39 to 46 ft) of green-gray fossiliferous shales with minor interbedded limestones. The middle division, the Platville Formation, consists of 7.5 m (25 ft) of limestone, argillaceous limestone, and dolomite. The lower division, the Glenwood Formation, consists of 2 m to 3 m (7 to 10 ft) of green-gray shale with minor siltstone to fine sandstone. This map unit, especially the Decorah and Glenwood subdivisions, is rarely exposed and almost everywhere is mantled by 0 m to 2 m (0 to 6 ft) of loess-derived and weathered bedrock-derived colluvium.
- Oop - Sandstone (St. Peter Formation)** A moderately resistant unit forming distinctive elongate ridges in upland landscape positions, especially where capped by Platville Formation limestone. It generally ranges from 15 m to 45 m (50 to 150 ft) in thickness, but may attain a thickness of several hundred feet where it overlies paleotopographic low areas on the high-relief surface of unconformity with underlying units. A white to tan, and occasionally red to orange-stained, quartz sandstone ranges from hard cemented at top to friable. Grey shale and conglomerate occurs locally in the lower part, particularly in thicker sections. Forms a local bedrock aquifer where confined by overlying bedrock. Commonly mantled by 0 m to 2 m (0 to 6 ft) of loess-derived and weathered bedrock-derived colluvium.
- Os - Dolomite and Sandstone (Shalopee Formation)** A variably resistant slope to ledge-forming unit ranging in thickness from 0 m to 30 m (0 to 100 ft). Composed of interbedded dolomite, sandy dolomite and sandstone with a prominent 8 m to 10 m (26 to 33 ft) sandstone (New Richmond Sandstone Member) occupying its lower part. Contains some chert nodules, and has distinctive oncolite and stromatolite facies. May locally be thin or absent where truncated beneath the unconformity at the base of the overlying St. Peter Formation. Small springs locally occur near its base and it may host karst caverns. Mostly mantled by 0 m to 2 m (0 to 6 ft) of loess-derived and weathered bedrock-derived colluvium.
- Os - Dolomite (Onota Formation)** A highly resistant ledge and cliff-forming unit of up to 60 m (200 ft) of dolomite that has chert nodules, small calcite crystal filled cavities, and stromatolite facies. May host limited karstic cavities, caverns, and springs. Forms a bedrock aquifer throughout much of the map area. May be mantled by 0 m to 2 m (0 to 6 ft) of loess-derived and weathered bedrock-derived colluvium.
- Qps - Pits and Quarries** Sand and gravel pits and rock quarries.

- Drill Holes
- D Outcrops



Base map from USGS Freeport 7.5' Digital Raster Graphic (IGS GIS file DRGC41.TIF) which was scanned from the Freeport 7.5' Topographic Quadrangle map, published by US Geological Survey in 1981. Topographic contours and land features based on 1975 aerial photography, field checked in 1977. Land elevation contours (20' interval) based on NGVD 1929.

Iowa Geological Survey digital cartographic file Freeportquad06.mxd, version 6/28/06 (ArcGIS 9.0). Map projection and coordinate system based on Universal Transverse Mercator (UTM) Zone 15, datum NAD83.