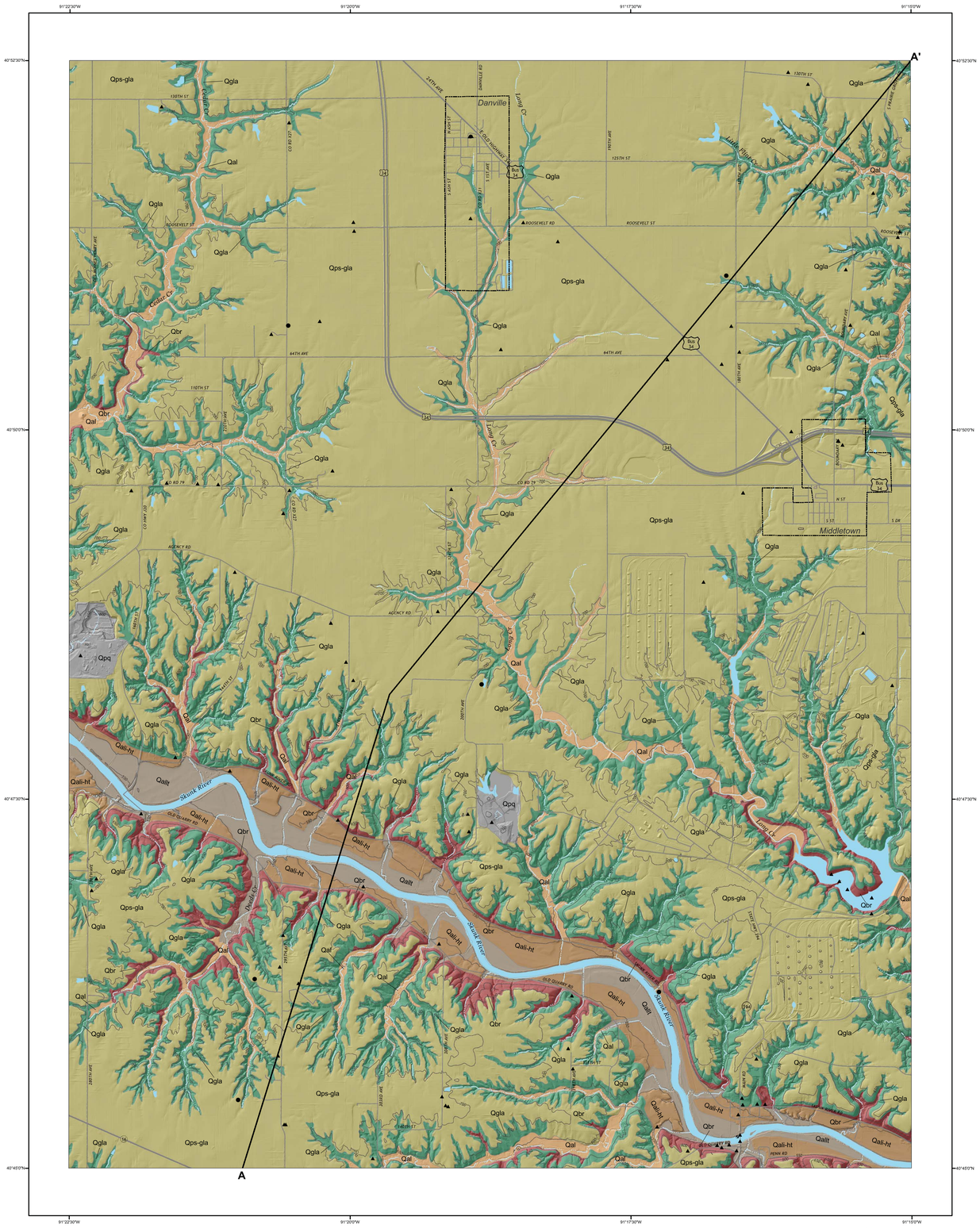
Surficial Geologic Map of the Danville (Iowa) 7.5' Quadrangle



1:24,000

0 0.5 1 2 3 4 Miles

0 0.5 1 2 3 4 Kilometers

CONTOUR INTERVAL 50 FEET

MN
GN
0°51´ 9 MILS
1°1´ 20 MILS

UTM GRID AND 2017 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

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 alluviam and colluviam in stream valleys, on hill slopes and in closed depressions. May overlie Glasford Formation glacial till, Peoria Formation loess or eolian sand, or Noah Creek Formation sand and gravel. Associated with low-relief modern floodplain, closed depressions, modern drainageways or toeslope positions on the landscape. Seasonal high water table and potential for frequent flooding.

Qalt - Low Terrace (DeForest Formation-Camp Creek and Roberts Creek members) 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 Skunk River valley. Overlies Noah Creek Formation sand and gravel. Occupies the lowest position on the floodplain ie. modern channel belts. Seasonal high water table and frequent flooding potential.

Qali-ht - Intermediate-High Terrace (DeForest Formation-Gunder Member) Variable thickness of less than 1 to 5 m (3-16 ft) of very dark gray to brown, noncalcareous, silty clay loam to loam alluviam or colluviam. Overlies Noah Creek Formation sand and gravel along the Skunk River. Occupies terrace and valley margin positions 1 to 2 m (3-7 ft) above the modern floodplain. Two terrace levels are present in some areas. Seasonal high water table and low to moderate flooding potential.

WISCONSIN EPISODE

Qnw - Sand and Gravel (Noah Creek Formation) Generally 3 to 9 m (10-30 ft), but may be up to 15 m (50 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 few intervening layers of silty clay. This unit is buried by younger Hudson-age alluvial deposits associated with the Skunk River valley and encompasses deposits that accumulated in river valleys during the Wisconsin Episode. This unit is shown only on the cross-section.

Qps-gla - Loess (Peoria Formation-silt facies) Generally 2 to 5 m (7-15 ft) of yellowish to grayish brown, massive, jointed, calcareous or noncalcareous silt loam to silty clay loam. May overlie 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 Pisgah Formation is in the same stratigraphic position as the Roxanna Silt which is mapped in Illinois. The Farmdale Geosol may be welded to an older Sangamon Geosol developed in loamy glacial till of the Glasford Formation. This mapping unit encompasses upland divides, ridgetops and convex sideslopes. Well to somewhat poorly drained landscape.

ILLINOIS EPISODE

Qgla - Till (Glasford Formation) Generally 3 to 10 m (10-33 ft) of very dense, massive, fractured, loamy glacial till of the Illinoian Glasford Formation with or without a thin loess mantle (Peoria Formation- less than 2 m) and intervening clayey Farmdale/Sangamon Geosol. Overlies the Yarmouth Paleosol formed in Pre-Illinoian till. This mapping unit encompasses narrowly dissected interfluves and side slopes, and side valley slopes. Drainage is variable from well drained to poorly drained.

PRE-ILLINOIS EPISODE

Qwa3 - Till (Wolf Creek or Alburnett formations) Generally 10 to 35 m (33-115 ft) of very dense, massive, fractured, loamy glacial till of the Wolf Creek or Alburnett formations. The Yarmouth Paleosol is formed in this unit, and it is overlain by Illinoian till. Drainage is variable from well drained to poorly drained. This unit is shown only on the cross-section.

Qbr - Loamy Sediments Shallow to Dolomite, Limestone, Shale and Sandstone (DeForest, Noah Creek, Peoria, and Glasford formations) - 1 to 2 m (3-7 ft) of yellowish brown to gray, massive to weakly stratified, well to poorly sorted loamy, sandy and silty sediments that overlie the Pennsylvanian or Mississippian bedrock surface. All areas of bedrock outcrop or shallow to bedrock soils are shown in red on the map, regardless of the bedrock mapping unit. Bedrock units are shown on the cross-section and may be identified on the bedrock map of the Danville Quadrangle with the following descriptions:

PALEOZOIC

CARBONIFEROUS SYSTEM

PENNSYLVANIAN SUBSYSTEM

Pcl - Sandstone and Shale (lower Cherokee Group) Lower-Middle Pennsylvanian. Pennsylvanian units occur as erosional outliers reaching a thickness of up to 14 m (45 ft) within the mapping area. This unit consists of shale/mudstone, light to medium gray, part silty to sandy and fine to medium sandstone, rarely conglomeratic. Some shales are carbonaceous to phosphatic, minor coal, and rare limestone lithologies.

MISSISSIPPIAN SUBSYSTEM

Mpsl – Limestone, Sandstone, and Dolomite (Pella or "St. Louis" formations) Middle-Upper Mississippian, Meramecian-lower Chesterian. This map unit ranges between 12 and 24 m (40 – 80 ft) thick in the mapping area. It is dominated by limestone, sandstone, dolomitic limestone, and dolomite with minor shale. Limestones of the Pella Formation are typically sub-lithographic with scattered to abundant fossils, primarily brachiopods, echinoderms, and ostracods. The "St. Louis" Formation is dominated by limestone, sandy limestone and dolomite, variably cherty, and partly fossiliferous with brachiopods, echinoderms, and several varieties of coral. Some fossils are silicified. Sandstones of the "St. Louis" Formation are typically very fine to medium, quartz sandstones that are poorly to moderately cemented with calcite or quartz. Lower "St. Louis" units are more dolomitic, gray to dark brown, and commonly brecciated.

Mws – Shale, Dolomite, and Limestone (Warsaw Formation) Upper Osagean. The Warsaw Formation varies in thickness reaching a maximum thickness of approximately 17 m (55 ft). This unit can generally be divided into two major lithologic groupings, a lower argillaceous dolomite sequence and an upper shale-dominated sequence. The upper shale is typically light to medium gray, silty, and variably dolomitic with minor chert, sand, and sparse quartz geodes. The lower dolomite, sometimes referred to as the "geode beds", is argillaceous to shaly, with scattered to abundant quartz geodes

Mkeo – Limestone, Dolomite, Chert, and Shale (Keokuk Formation) Upper Osagean. The Keokuk Formation typically ranges from 12 to 23 m (40 – 75 ft) in thickness in the mapping area. This unit is dominated by tan to gray interbedded skeletal limestones displaying packstone/grainstone fabrics. Nodular to bedded chert, in part fossiliferous, is common in the lower half of the sequence. Dolomite, variably argillaceous, and thin shales also occur throughout the unit. The unit displays multiple hardground surfaces and bone beds with scattered to abundant fish debris, the most prominent of these serves as a marker bed at the base of the formation (sometimes referred to as the Burlington-Keokuk or B-K bone bed).

Mb – Limestone, Dolomite, and Chert (Burlington Formation) Lower Osagean. The Burlington Formation ranges in thickness from 18 to 26 m (60 – 85 ft) in the mapping area. This unit is subdivided into three members (in ascending order: the Dolbee Creek, Haight Creek, and Cedar Fork), characterized by distinct lithologic groupings. The Dolbee Creek Member is dominated by white to tan skeletal limestone displaying packstone/grainstone fabrics and nodular to bedded chert. The Haight Creek Member is characterized by dolomite with an intermittent unit of skeletal limestone (sometimes referred to as the "middle grainstone") and thick beds of chert. A glauconite-rich zone marks the lower contact between the Dolbee Creek and can be used as a regional marker bed. The Cedar Fork Member is a pure white crinoidal packstone limestone unit which is usually differentiated from the packstones of the overlying Keokuk Formation by its white appearance.

Mk – Dolomite, Limestone, and Siltstone (Kinderhookian formations) Lower Mississippian. The Kinderhookian sequence ranges in thickness from 12 to 23 m (40 – 75 ft) in the mapping area. This unit comprises three formations (in ascending order: the McCraney, Prospect Hill, and Wassonville), characterized by distinct lithologic groupings. The McCraney Formation is composed of alternating beds of sparsely fossiliferous, sub-lithographic limestone and dark brown, unfossiliferous dolomite, generating a unique "zebra striped" appearance in outcrop. The Prospect Hill Formation is a light to medium gray, dolomitic siltstone that grades to shale in some locations. The Wassonville Formation consists of massive dolomite that is variably cherty grading into dolomitic limestone lower in the section. The basal Starr's Cave Member is a fossiliferous limestone with packstone/grainstone fabrics and is commonly oolitic.

DEVONIAN SYSTEM

Der – Siltstone and Shale (English River Formation) Upper Devonian, lower to upper Famennian. The English River Formation is up to 6 m (20 ft) within the mapping area. This unit is dominated by gray to olive green siltstone with apparent bioturbated fabrics. Bivalves and brachiopods are common, especially in the upper beds, with scattered to abundant fossil molds as well.

Dss – Shale (Saverton Shale Formation) Upper Devonian, lower to upper Famennian. The Saverton Shale Formation can be up to 46 m (150 ft) within the mapping area. This unit is dominated by green-gray shale, commonly burrowed with sparse to absent macro-fossils.

OTHER FEATURES

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

Incorporated city boundary

New drill holes for this map project

IGS GEOSAM data points - records available at www.iowageologicalsurvey.org

W8761 **Wells used for geologic cross-section**

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

CORRELATION OF MAP UNITS

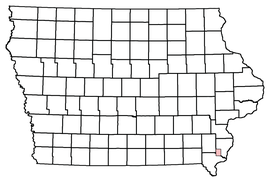
	Valley	Illinoian Till Plain	Episode	Series	Stage
Alluvium	Qalit	Qal	Hudson	Holocene	Quaternary
	Qali-ht				
Loess		Qps-gla	Wisconsin	Pleistocene	
Outwash	Qnw*				
Glacial Till	Qgla		Illinoian		
	Qwa3*		Pre-Illinoian		
Bedrock	Qbr	Pcl*	Pennsylvanian		
		Mpsl*	Mississippian		
		Mws*			
		Mkeo*			
		Mb*			
		Mk*			
		Der*	Devonian		
		Dss*			

*Units only shown on the Cross-Section

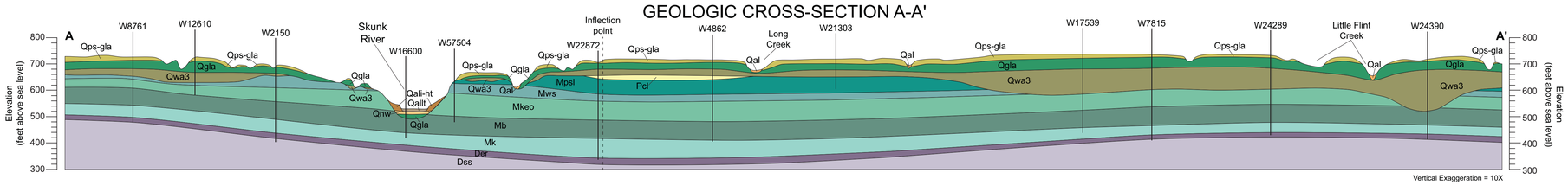
Adjacent 7.5' Quadrangles

NEW LONDON IOWA	PLEASANT GROVE IOWA	SPERRY IOWA
LOWELL IOWA	DANVILLE IOWA	WEST BURLINGTON IOWA
WEST POINT IOWA	FORT MADISON IOWA-ILL	DALLAS CITY IOWA-ILL

Location Map



GEOLOGIC CROSS-SECTION A-A'



Vertical Exaggeration = 10X

SURFICIAL GEOLOGIC MAP OF THE DANVILLE 7.5' QUADRANGLE, DES MOINES, HENRY, AND LEE COUNTIES, IOWA

Iowa Geological Survey
Open File Map OFM-17-8
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Stephanie Tassier-Surine, Phil Kerr, Ryan Clark, and Huaibao Liu

Iowa Geological Survey, IIHR-Hydroscience & Engineering, University of Iowa, Iowa City, Iowa

Iowa Geological Survey, Robert D. Libra, State Geologist

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Introduction to the Surficial Geologic Map of the Danville 7.5' Quadrangle, Des Moines, Henry, and Lee Counties, Iowa

The Danville Quadrangle is located in southeastern Iowa on the Southern Iowa Drift Plain landform region (Prior and Kohrt, 2006). The map area is dominated by loess mantled till plains in the uplands, and glacial outwash and finer-grained alluvial deposits within the Skunk River and its tributaries. Stratigraphically, this area contains Illinoian age glacial deposits, which are only present in a small area of southeastern Iowa. The terminal moraine for the Illinoian glacial advance is three to four miles west of the mapping area. The thickness of Quaternary materials varies widely across the quadrangle generally ranging from 0 to 18 m (0-60 ft), reaching a maximum thickness of 64 m (210 ft) in the northern part of the mapping area. Bedrock outcrops are located primarily in the southern half of the quadrangle, along the Skunk River and its tributaries including Cedar, Long, and Deeds creeks.

Mapping the Lowell and Danville quadrangles provides the first study of the regional Quaternary stratigraphy of southeast Iowa in almost 40 years since Hallberg (1980a,b) established the stratigraphy for the Illinoian and Pre-Illinoian glacial advances in eastern and southeastern Iowa. The majority of the drill cores and outcrops for those studies were north and east of the Danville Quadrangle. Additional data available since that time (LIDAR, DEMs, and digital soil surveys), have allowed for the refinement of the Illinoian boundary and greater detail in mapping the valleys. The only other surficial map of the area consists of the Des Moines 4° x 6° Quadrangle at a scale of 1:1,000,000 (Hallberg et al., 1991). Several Iowa Geological Survey (IGS) field trip guidebooks outline the Pleistocene, Devonian, and Mississippian stratigraphy (Witzke et al., 2002; Witzke and Tassier-Surine, 2001), but their focus was on the area near Burlington (to the east).

The soil surveys of Des Moines, Henry, and Lee counties (Brown, 1983; Seaholm, 1985; and Lockridge, 1979) provided information regarding shallow rock areas, helped to guide valley mapping units, and defined slope areas where glacial till is exposed. Subsurface information was mostly derived from the analysis of water well cutting samples reposited by the IGS. Lithologic and stratigraphic information from these samples are stored in the online GeoSam database of the IGS. Additionally, IGS drilled five new cores in the quadrangle to characterize the Quaternary sediments and establish unit thickness.

The glacial history of Iowa began more than two million years ago, as at least seven episodes of Pre-Illinoian glaciation occurred between approximately 2.6 and 0.5 million years ago (Boellstorff, 1978a,b; Hallberg, 1980a). In east-central Iowa, Hallberg formally classified the units into two formations on the basis of differences in clay mineralogy: the Alburnett Formation (several undifferentiated members) and the younger Wolf Creek Formation (including the Winthrop, Aurora and Hickory Hills members). Both formations are composed predominantly of till deposits, but other materials are present. Paleosols are formed in the upper part of these till units.

A limited area of southeastern Iowa was glaciated during the Illinois Episode, around 300,000-130,000 years ago (Hallberg, 1980b). The Danville Quadrangle was glaciated during this time. The Illinoian till was deposited by the advancing Lake Michigan Lobe which moved across western Illinois into Iowa from the northeast (Leverett, 1899; Wickham, 1980). The Lake Michigan Lobe incorporated Paleozoic bedrock materials from the Lake Michigan Basin which are distinguished by both the clay mineralogy of the matrix as well as the pebbles and clasts (Lineback, 1980; Wickham, 1980). Hallberg (1980b) defined the formal stratigraphic nomenclature in Iowa. The only Illinoian Episode till present in Iowa is the Glasford Formation Kellerville Till Member (Willman and Frye, 1970). Following the Illinoian glaciation, this area underwent landscape development and erosion until the Wisconsin Episode loess began to be deposited. The Illinoian till is only exposed in drainages and relatively steep sideslopes.

In eastern Iowa, the highly eroded and dissected Illinoian and Pre-Illinoian upland and older terraces are mantled by two Wisconsin loesses. The older Pisgah Formation is thin and includes loess and related slope sediments that have been altered by colluvial hillslope processes. The unit is characterized by the presence of a weakly developed soil recognized as the Farmdale Geosol. It is not uncommon to see the Farmdale developed throughout the Pisgah Formation and into the underlying older Sangamon Paleosol. The Pisgah loess was most likely deposited on the eastern Iowa landscape from 30,000 to 24,000 years ago (Bettis, 1989) and is typically buried by Peoria Formation loess. The Peoria Formation loess accumulated on stable land surfaces in eastern Iowa from 25,000 to 21,000 years ago. Peoria Formation eolian materials mantle the upland till units and are present on the Wisconsin outwash terraces. On the uplands, the Peoria Formation is a uniform silt loam; in the valleys the silt commonly grades downward to fine sand.

The Skunk River deposited coarse sand and gravel associated with glacial outwash (Noah Creek Formation) of the Des Moines Lobe during the Wisconsin Episode. Hudson age deposits are associated with fine-grained alluvial, organic, and colluvial sediments and include the DeForest Formation which is subdivided into the Camp Creek, Roberts Creek, and Gunder members. These deposits are present in valleys and upland drainages throughout the map area.

Surficial deposits in the map area are composed of seven formations (youngest to oldest): Hudson DeForest; Wisconsin Peoria, Pisgah, and Noah Creek; Illioian Glasford; and Pre-Illinoian Wolf Creek and Alburnett. Six bedrock mapping units (Pennsylvanian lower Cherokee Group; and the Mississippian Pella and "St. Louis", Warsaw, Keokuk, Burlington, and Kinderhookian formations) are exposed at the bedrock surface in the Danville Quadrangle. The Mississippian Pella and "St Louis" formations and the Pennsylvanian lower Cherokee Group comprise the bedrock in most of the map area, especially in the upland areas. The other Mississippian units occur within the bedrock valleys and tributaries. Twenty-six rock outcrops and five quarries are located in the map area and were investigated in the field.

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Base map from USGS Danville 7.5' Digital Raster Graphic (IGS GIS file IA_Danville_USGS_topo.tif) which was scanned and modified from the Danville 7.5' Topographic Quadrangle map, published by The US Geological Survey in 2015
Land elevation contours (10' interval).

Iowa Geological Survey digital cartographic file Danville_SurficialGeology.mxd, version 6/30/17 (ArcGIS 10.3)
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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