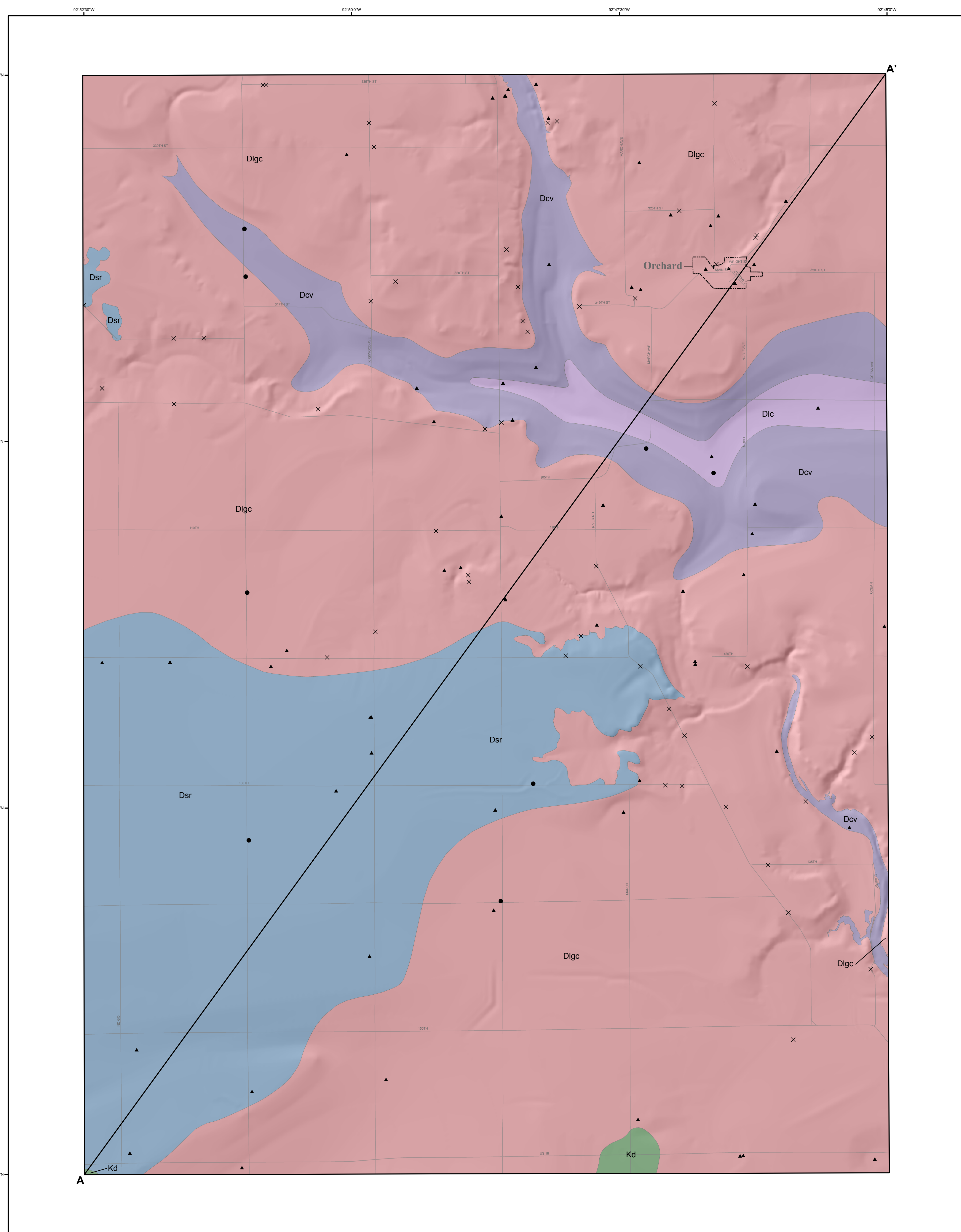


Bedrock Geologic Map of the Orchard (Iowa) 7.5' Quadrangle



LEGEND

QUATERNARY SYSTEM

Qu - **Undifferentiated Unconsolidated Sediments** (Quaternary System) The Quaternary deposits consist of loamy soils developed in loess, glacial till, and colluvium of variable thickness, and alluvial clay, silt, sand, and gravel. The Quaternary deposits are usually less than 12 m (40 ft) thick in the mapping area, but can be up to 30 m (100 ft) in bedrock valleys. This unit is shown only on the cross-section, not on the map.

MESOZOIC

CRETACEOUS SYSTEM

Kd - **Sandstone, Malmstone, and Shale** (Dakota/Window Formations) (Malm-Cretaceous) This map unit forms the bedrock surface mainly in the southwest part of the quadrangle. It usually has a thickness of 6 to 14 m (20-45 ft) in the mapping area, and is characterized by limestone, dolomitic limestone, and dolomite, with some gray to light green shale and/or argillaceous carbonates. Fossiliferous layers, especially characterized by abundant brachiopods and other fossils, commonly occur in the lower part of the unit. Stromatoporoids, bryozoans, corals, and crinoids are abundant in some intervals of this formation.

DEVONIAN SYSTEM

Dsr - **Limestone, Dolomite, and Shale** (Shell Rock Formation) (Upper Devonian) This map unit forms the bedrock surface mainly in the southwest part of the quadrangle. It usually has a thickness of 6 to 14 m (20-45 ft) in the mapping area, and is characterized by limestone, dolomitic limestone, and dolomite, with some gray to light green shale and/or argillaceous carbonates. Fossiliferous layers, especially characterized by abundant brachiopods and other fossils, commonly occur in the lower part of the unit. Stromatoporoids, bryozoans, corals, and crinoids are abundant in some intervals of this formation.

Dgic - **Limestone, Dolomite, and Shale** (Lithograph City Formation) (Middle Devonian) This map unit dominates the bedrock surface except in the southwest part and the deep valley in the northeast part of the quadrangle. Its thickness of this unit is usually 70 to 210 m (230 to 700 ft) in the mapping area. It is characterized by limestone, dolomitic limestone, and dolomite, with some gray to light green shale and/or argillaceous carbonates. Fossiliferous layers, especially characterized by abundant brachiopods and other fossils, commonly occur in the lower part of the unit. Stromatoporoids, bryozoans, corals, and crinoids are abundant in some intervals of this formation.

Dcv - **Limestone and Dolomite** of the Cedar Valley Group (Middle Devonian) This map unit occurs on the bedrock surface along the Cedar River and in bedrock valleys in the northeast part of the quadrangle. The thickness of this unit varies between 12 and 21 m (40 to 70 ft) in the mapping area. It is characterized by limestone, dolomitic limestone, and dolomite, with some gray to light green shale and/or argillaceous carbonates. Fossiliferous layers, especially characterized by abundant brachiopods and other fossils, commonly occur in the lower part of the unit. Stromatoporoids, bryozoans, corals, and crinoids are abundant in some intervals of this formation.

Dic - **Dolomite, Limestone, and Shale** (Little Cedar Formation) (Middle Devonian) This map unit only occurs in the bedrock valley in the northeast part of the quadrangle. The thickness of this unit varies between 12 and 21 m (40 to 70 ft) in the mapping area. It is characterized by limestone, dolomitic limestone, and dolomite, with some gray to light green shale and/or argillaceous carbonates. Fossiliferous layers, especially characterized by abundant brachiopods and other fossils, commonly occur in the lower part of the unit. Stromatoporoids, bryozoans, corals, and crinoids are abundant in some intervals of this formation.

Dpr - **Dolomite and Dolomitic Limestone** (Pinicon Ridge Formation) (Middle Devonian) This formation consists of dolomite and dolomitic limestone with varying textures (cherty, laminated, blocky, sandy, and/or shaly). The thickness of this unit usually ranges from 0 to 14 m (0 to 45 ft) in the mapping area. It is characterized by limestone, dolomitic limestone, and dolomite, with some gray to light green shale and/or argillaceous carbonates. Fossiliferous layers, especially characterized by abundant brachiopods and other fossils, commonly occur in the lower part of the unit. Stromatoporoids, bryozoans, corals, and crinoids are abundant in some intervals of this formation.

Dsp - **Dolomite** (Spillville Formation) (Middle Devonian) This unit is dominated by medium to thick bedded dolomite with scattered abundant fossiliferous layers, especially characterized by abundant brachiopods and other fossils, commonly occur in the lower part of the unit. Stromatoporoids, bryozoans, corals, and crinoids are abundant in some intervals of this formation.

OTHER FEATURES

- New drill holes for this map project
- Bedrock outcrop
- IGS GEOSAM data points - records available at www.igs.iastate.edu/geosam
- Incorporated city boundary
- Basin
- W24024 Wells used for geologic cross-section

BEDROCK GEOLOGIC MAP OF THE ORCHARD 7.5' QUADRANGLE, FLOYD AND MITCHELL COUNTIES, IOWA

Iowa Geological Survey
Open File Map OFM-16-3
June 2016

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IOWA GEOLOGICAL SURVEY

Iowa Geological Survey, Robert D. L. Ibra, State Geologist

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STRATIGRAPHIC COLUMN

System	Series	Stage	Lithostratigraphic Unit	Map Symbol	Lithology	Thickness (m feet)
Cretaceous	"Middle"		Dakota/Window Formation	Kd	Shale, sandstone, limestone, dolomite	5-20
			Shell Rock Formation	Dsr	Limestone, dolomite, shale	30-65
Devonian	Upper	Frasnian	Lithograph City Formation	Dgic	Limestone, dolomite, shale	70-115
			Cedar Valley Group			
			Coralville Formation	Dcv	Limestone, dolomite	40-70
			Little Cedar Formation	Dic	Dolomite, limestone, shale	90-130
			Pinicon Ridge Formation	Dpr	Dolomite, dolomitic limestone	20-45
Devonian	Middle		Spillville Formation	Dsp	Dolomite	50-70
			Wespospicon Group			

Introduction to the Bedrock Geologic Map of the Orchard 7.5' Quadrangle, Floyd and Mitchell Counties, Iowa

The Orchard 7.5' Quadrangle is located in Floyd and Mitchell counties, north-central Iowa. In terms of landforms, this quadrangle lies in the lower Surface landform region where the land surface has been modified by various episodes of erosion before and during Wisconsin-age glacial events (Prior, 1911). Due to extensive glacial and erosional activities, the landscape of this area is characterized by relatively low topographic relief and commonly features large fields of glacial till known as glacial terraces. The land surface of this mapping area is mostly covered by Quaternary deposits with a thickness commonly less than 12 m (40 ft), and it can reach a maximum thickness of 36 m (117 ft) in a bedrock valley located in the northeast part of the mapping area. These unconsolidated Quaternary sediments are undifferentiated in this map. For the detailed Quaternary stratigraphy, see the surficial geologic map of this quadrangle (Kerr et al., 2016).

Bedrock exposures commonly occur in the north and southeast parts of the Orchard Quadrangle, especially along the Cedar River and its tributaries. During the field investigations, shallow bedrock information from the digital soil surveys in Floyd and Mitchell counties (Voy, 1995; Voy and Highland, 1975) was used for delineating potential bedrock outcrops. In the map area, 55 bedrock outcrops including several rock quarries were accessed and studied, which provided important regional stratigraphic information for the bedrock geologic map. Subsurface geologic information was mainly derived from the analysis of water well data stored in the Iowa Geological Survey (IGS) GEOSAM database. Within the mapping area, 73 private and public wells were studied, including 9 shallow drill holes which were completed for this mapping project. Among these studied wells, 30 have descriptive striplogs with cutting samples reported at the IGS Oakdale Rock Library, 21 of which were newly logged for this bedrock geologic mapping task. Bedrock stratigraphic information from the surrounding area, including bedrock outcrops, quarries, and well information, was also studied and utilized for this mapping project.

The bedrock surface of the Orchard 7.5' Quadrangle is dominated by Devonian strata, with scattered Cretaceous deposits. Paleogeographically, the mapping area is within the northern portion of the Devonian Iowa Basin, a region of thickened shelf carbonates, shale and minor others deposited from the Eiffel through part of the Famennian age (Witzke et al., 1988; Witzke and Bunker, 2006; Day, 2006; Day et al., 2008). The middle and lower Upper Devonian carbonate rocks form the important upper bedrock aquifer in the mapping area (L. Ibra et al., 1984, 1994). This Devonian aquifer becomes vulnerable when it is shallow, and carbonate rocks, especially relatively pure limestones, are easily karstified (Moore, 1995). Due to its complex sedimentary lithology, many richly fossiliferous units, and groundwater and environmental issues, the geology, paleoenvironments, paleontology and stratigraphy of the Devonian Iowa Basin have been intensively studied (e.g., Belanski, 1927, 1928; Koch, 1970). Recent important studies of the Iowa Basin include Witzke and Bunker (1984), Anderson (1984), Bunker and others (1986), Bunker (1995), Anderson and Bunker (1999), Groves and others (2008), McKay and Liu (2012), and Day and others (2016, 2008, 2013). Geologic mapping projects at 1:24,000 and 1:100,000 scales in north-central Iowa have been undertaken by the IGS since 2009. In addition to 7.5' quadrangle maps, 1:100,000 scale bedrock geologic maps have been recently completed for Bremer County (McKay et al., 2010), Worth County (Liu et al., 2012), Black Hawk County (Rowden et al., 2013), Cerro Gordo County (Liu et al., 2015), and Mitchell County (Clark et al., 2016) in the Devonian Iowa Basin. The Bedrock Geologic Map of Iowa (1:500,000) was completed by Witzke and others (2010). Results from these geologic studies and bedrock mapping projects provide significant regional geologic information and new data for the present bedrock map.

Five bedrock formations, in descending order, the Cretaceous Dakota/Window Formation, the Devonian Shell Rock, Lithograph City, Coralville, and Little Cedar formations comprise the bedrock surface of the map area. Two other formations, the Devonian Pinicon Ridge and Spillville formations, are found in wells only and do not occur at the bedrock surface. The bedrock stratigraphic nomenclature and correlation of the Devonian strata for this map follow the stratigraphic framework proposed by Witzke and others (1988). The general lithologic features and thickness of each map unit are shown in the Stratigraphic Column and described in the Legend section of this map.

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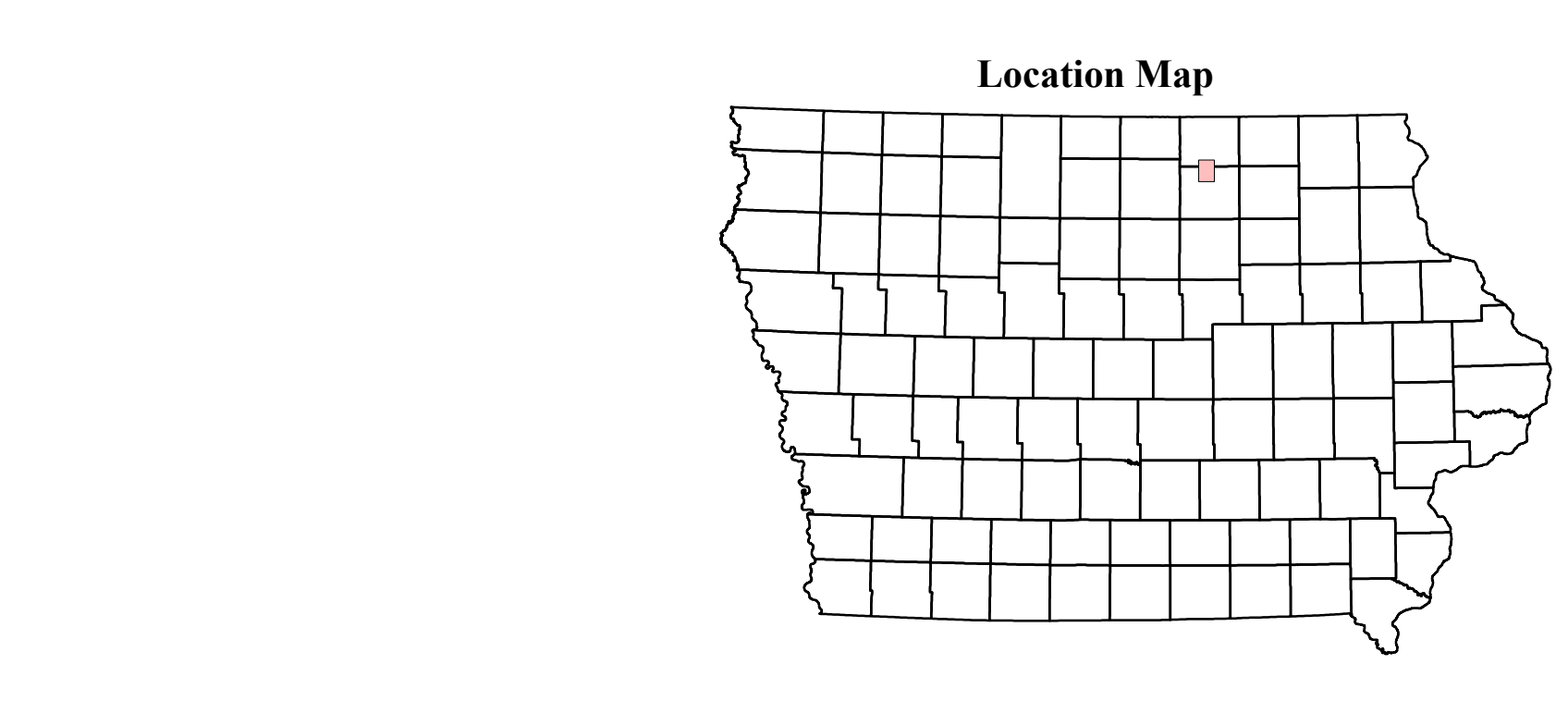
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Adjacent 7.5' Quadrangles

OSAGE SW	OSAGE	NEW HAVEN
RUDD	ORCHARD	FLOYD
ROCKFORD	ROSEVILLE	CHARLES CITY



GEOLOGICAL CROSS-SECTION A-A'

