

Bedrock Geology of the New Haven (Iowa) 7.5' Quadrangle

BEDROCK GEOLOGY OF THE NEW HAVEN 7.5' QUADRANGLE, MITCHELL COUNTY, IOWA

Iowa Geological Survey
Open File Map OFM-15-3
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Introduction to the Bedrock Geology of the New Haven 7.5' Quadrangle, Mitchell County, Iowa

The New Haven Quadrangle lies within the Iowan Surface landform region (Prior, 1991; Prior and Kohrt, 2006). This area has been subjected to multiple periods of Quaternary glaciations and subaerial erosion providing a relatively low-relief terrain with moderately incised drainage valleys.

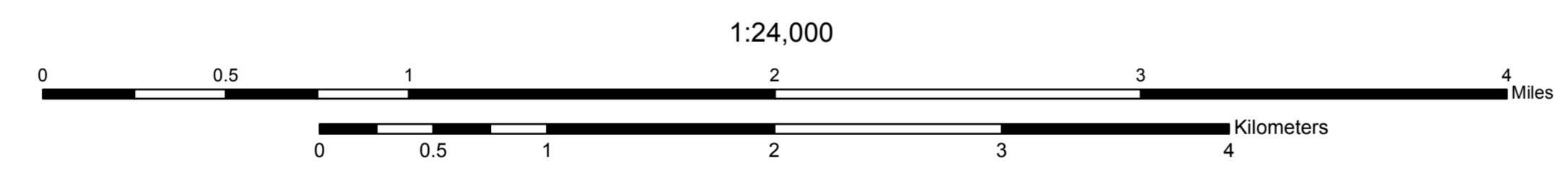
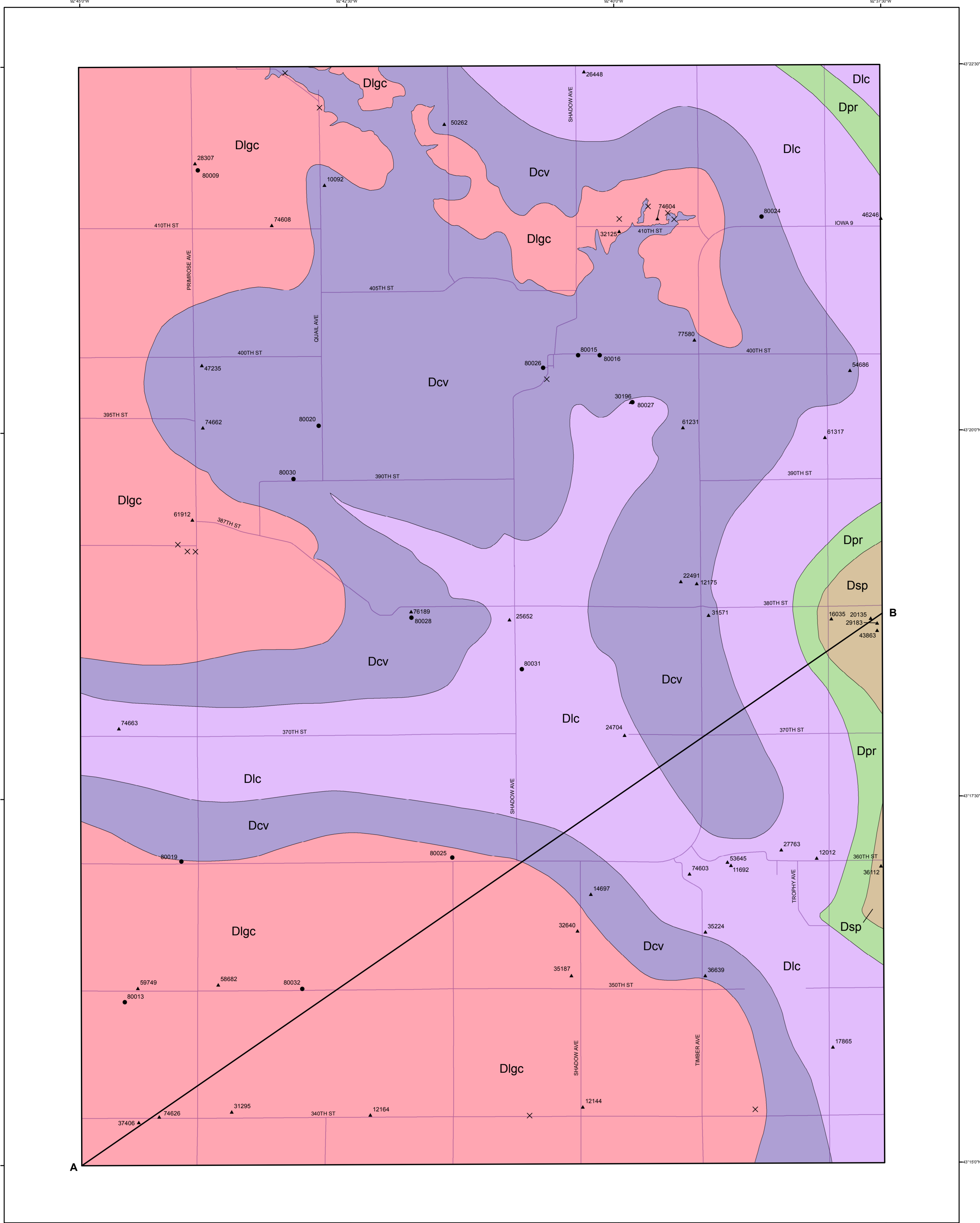
The thickness of Quaternary materials, which overlies the Devonian bedrock surface, varies widely across the quadrangle. Where the Lithograph City Formation is at the bedrock surface, Quaternary cover ranges from 0 to 14 m (0 to 45 ft). However, several bedrock valleys exist within the quadrangle with the most prominent located along the eastern border where the thickness of Quaternary materials reaches a maximum of 84 m (275 ft). Shallow bedrock information from the soil survey in Mitchell County (Voy and Highland, 1975) was used for identifying potential bedrock outcrop locations during field mapping activities. Bedrock outcrops exist primarily along the Little Cedar River exposing Lithograph City and Coralville formations in the northern half of the quadrangle. A few sporadic outcrops appear along Beaver Creek and Burr Oak Creek, also in the northern half of the quadrangle. Rare outcrops of the Lithograph City Formation can be found in the southern part of the quadrangle as well. Subsurface information was mostly derived from the analysis of water well cutting samples repositied at the Iowa Geological Survey (IGS). Lithologic and stratigraphic information from these samples are stored in the online GEOSAM database of the IGS. Geologic information from three quarries, 12 outcrops, and more than 110 private and public wells within the New Haven Quadrangle and surrounding area were used for bedrock geological mapping purposes.

Paleogeographically, the mapping area is within the northern portion of the Devonian Iowa Basin, a region of thickened shelf carbonate and shale deposits. Middle and lower Upper Devonian rocks form the major bedrock surface and upper bedrock aquifer in this area. The hydrogeology of Floyd and Mitchell counties has been well studied (e.g., Libra and Hallberg, 1985; Libra et al., 1994). Due to its stratigraphic completeness and rich fossil fauna, the stratigraphy and depositional environments of the Devonian Iowa Basin have been intensively studied (e.g., Day et al., 1992). Other important geologic and stratigraphic studies of this basin include Witzke and Bunker (1984 and 1985), Anderson (1984), Bunker et al. (1986), Witzke et al. (1988), Bunker (1995), and Groves et al. (2008). The bedrock surface of the surrounding area was recently mapped by Witzke et al. (2010), Liu et al. (2012 and 2014), and Rowden et al. (2014a and b). Results from these studies provided an important stratigraphic framework for this bedrock geologic map. The bedrock stratigraphic nomenclature and correlation for this map follows the stratigraphic framework proposed by Witzke et al. (1988).

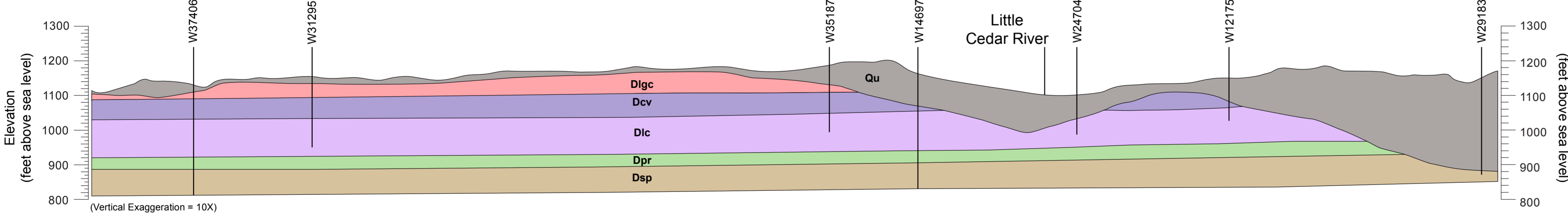
The entire mapping area is underlain by Devonian rocks comprised of carbonates, varying between limestone and dolomite, and shale. Based on lithologic features and fossils, the Devonian strata comprising the bedrock surface in the mapping area can be subdivided into, in descending order, the Lithograph City, Coralville, and Little Cedar formations of the Cedar Valley Group and the Pinicon Ridge and Spillville formations of the Wapsipicon Group. The Middle to Upper Devonian Lithograph City Formation is characterized by laminated lithologic and sublitologic limestone and dolomite "Birdseye", vugs, and calcite vug-fills are common in this formation. Some layers of this formation are fossiliferous with abundant brachiopods, most as molds, as well as some stromatopora and corals. The majority of bedrock outcrops within the mapping area are of the Lithograph City Formation. The maximum thickness of the Lithograph City Formation is about 14 m (45 ft) within the quadrangle. The Coralville Formation consists of limestone, dolomitic limestone, and dolomite; in part laminated and argillaceous Brachiopods, echinoderm debris, and corals may be found within the limestone facies and occur as fossil molds within the dolomite facies. The Coralville Formation has an average thickness of about 12 to 20 m (40 to 65 ft). Together, the Lithograph City and Coralville formations dominate the bedrock surface in the New Haven Quadrangle. The Little Cedar Formation is characterized by slightly argillaceous to argillaceous dolomite and dolomitic limestone, usually vuggy or partially laminated and/or cherty. A moderate shale unit (Chickasaw Shale Member) occurs in the upper half of the formation and is relatively continuous across the quadrangle. The thickness of the Little Cedar Formation in the mapping area is approximately 37 m (120 ft). This unit occurs at the bedrock surface within the east-west trending bedrock valley near the middle of the quadrangle and along the slopes of the prominent bedrock valley along the eastern boundary of the mapping area. The Middle Devonian Wapsipicon Group consists of two formations in north-central Iowa, in ascending order the Spillville and Pinicon Ridge, which were undifferentiated in previous mapping efforts. The Pinicon Ridge Formation consists of unfossiliferous dolomite and limestone exhibiting a wide variety of textures (shaly, laminated, brecciated, sandy, and cherty). The formation ranges from 9 to 15 m (30 to 50 ft) in thickness within the mapping area. The Pinicon Ridge Formation appears at the bedrock surface within the slope of the prominent bedrock valley along the eastern border of the quadrangle. The Spillville Formation is characterized by thick bedded dolomite with scattered to abundant fossil molds. The basal unit of the formation, where present, is variably shaly, sandy, and/or conglomeratic with reworked chert clasts from the underlying Ordovician Maquoketa Formation. The Spillville Formation is restricted to the bedrock surface within the deepest parts of the prominent bedrock valley along the eastern margin of the mapping area and reaches a maximum thickness of 24 m (80 ft). Deep wells within the New Haven Quadrangle (W-14697, W-14699, and W-14692), along with previous research by Witzke and Bunker (1984) indicate that the Devonian bedrock units lie unconformably over older Ordovician units across the entire quad.

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GEOLOGIC CROSS-SECTION A-B



LEGEND

CENOZOIC

QUATERNARY SYSTEM

Qu - Unconsolidated Quaternary Sediments

PALEOZOIC

DEVONIAN SYSTEM

Dlgc - Dolomite, Limestone, and Shale (Lithograph City Formation) Middle Devonian. Maximum thickness of up to 14 m (45 ft) within the mapping area. This unit consists of dolomite and dolomitic limestone, partially characterized by thickness of laminated lithologic and sublitologic limestone and dolomite facies, vugs, and calcite vug-fills are common. Some layers are fossiliferous with abundant brachiopods, most as molds, as well as some stromatopora and corals. The majority of bedrock outcrops within the mapping area are of the Lithograph City Formation. The maximum thickness of the Lithograph City Formation is about 14 m (45 ft) within the quadrangle. The Coralville Formation consists of limestone, dolomitic limestone, and dolomite; in part laminated and argillaceous Brachiopods, echinoderm debris, and corals may be found within the limestone facies and occur as fossil molds within the dolomite facies. The Coralville Formation has an average thickness of about 12 to 20 m (40 to 65 ft). Together, the Lithograph City and Coralville formations dominate the bedrock surface in the New Haven Quadrangle. The Little Cedar Formation is characterized by slightly argillaceous to argillaceous dolomite and dolomitic limestone, usually vuggy or partially laminated and/or cherty. A moderate shale unit (Chickasaw Shale Member) occurs in the upper half of the formation and is relatively continuous across the quadrangle. The thickness of the Little Cedar Formation in the mapping area is approximately 37 m (120 ft). This unit occurs at the bedrock surface within the east-west trending bedrock valley near the middle of the quadrangle and along the slopes of the prominent bedrock valley along the eastern boundary of the mapping area.

Dcv - Limestone and Dolomite (Coralville Formation) Middle Devonian. Ranges from 9 to 15 m (30 to 50 ft) in thickness. This formation consists of unfossiliferous dolomite and limestone exhibiting a wide variety of textures (shaly, laminated, brecciated, sandy, and cherty). The formation ranges from 9 to 15 m (30 to 50 ft) in thickness within the mapping area. The Pinicon Ridge Formation appears at the bedrock surface within the slope of the prominent bedrock valley along the eastern border of the quadrangle. The Spillville Formation is characterized by thick bedded dolomite with scattered to abundant fossil molds. The basal unit of the formation, where present, is variably shaly, sandy, and/or conglomeratic with reworked chert clasts from the underlying Ordovician Maquoketa Formation. The Spillville Formation is restricted to the bedrock surface within the deepest parts of the prominent bedrock valley along the eastern margin of the mapping area and reaches a maximum thickness of 24 m (80 ft). Deep wells within the New Haven Quadrangle (W-14697, W-14699, and W-14692), along with previous research by Witzke and Bunker (1984) indicate that the Devonian bedrock units lie unconformably over older Ordovician units across the entire quad.

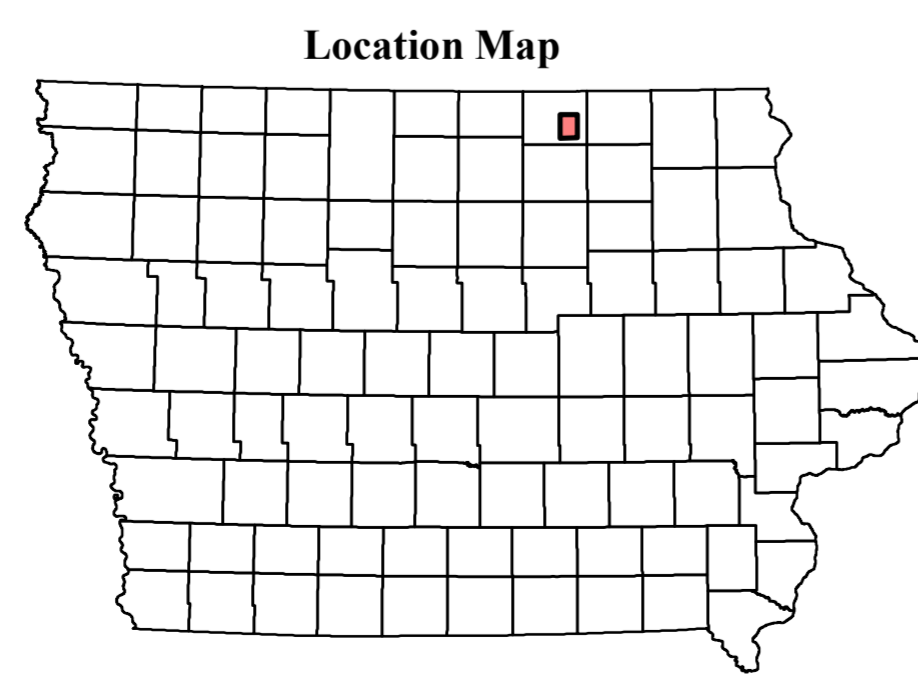
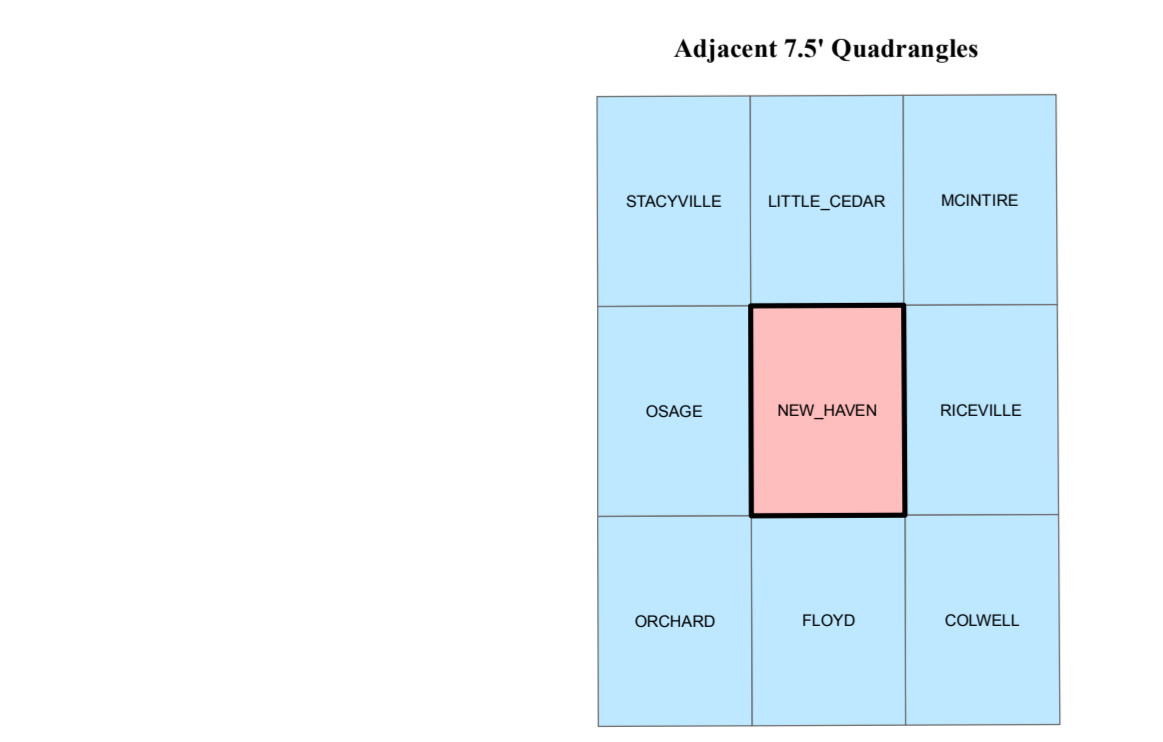
Dic - Dolomite, Limestone, and Shale (Little Cedar Formation) Middle Devonian. Approximately 37 m (120 ft) thick. This unit is dominated by slightly argillaceous to argillaceous dolomite and dolomitic limestone, usually vuggy and partially laminated and/or cherty. A moderate shale unit (Chickasaw Shale Member) occurs in the upper half of the formation. It is commonly fossiliferous, especially in the lower portion. This unit occurs at the bedrock surface within the east-west trending bedrock valley near the middle of the quadrangle and along the slopes of the prominent bedrock valley along the eastern margin of the mapping area.

Dpr - Dolomite and Limestone (Pinicon Ridge Formation) Middle Devonian. Ranges from 9 to 15 m (30 to 50 ft) in thickness. This formation consists of unfossiliferous dolomite and limestone exhibiting a wide variety of textures (shaly, laminated, brecciated, sandy, and cherty). The formation ranges from 9 to 15 m (30 to 50 ft) in thickness within the mapping area. The Pinicon Ridge Formation appears at the bedrock surface within the slope of the prominent bedrock valley along the eastern border of the quadrangle. The Spillville Formation is characterized by thick bedded dolomite with scattered to abundant fossil molds. The basal unit of the formation, where present, is variably shaly, sandy, and/or conglomeratic with reworked chert clasts from the underlying Ordovician Maquoketa Formation. The Spillville Formation is restricted to the bedrock surface within the deepest parts of the prominent bedrock valley along the eastern margin of the mapping area.

Dsp - Dolomite (Spillville Formation) Middle Devonian. Maximum thickness of approximately 24 m (80 ft). This unit is dominated by thick bedded dolomite with scattered to abundant fossil molds. The basal unit, where present, is variably shaly, sandy, and/or conglomeratic with reworked chert clasts from the underlying Ordovician Maquoketa Formation. The Spillville Formation is restricted to the bedrock surface within the deepest parts of the prominent bedrock valley along the eastern margin of the mapping area.

Correlation of Map Units

AGE (Ma)	SYSTEM	SERIES	STAGE	MAP UNIT
2.588	QUATERNARY			Qu
382.7	DEVONIAN	Upper	Frasnian	Dlgc
387.7			Givetian	Dlc
387.7			Eifelian	Dpr
393.3				Dsp



Base map from Iowa DOT Road map Layers 2006.
Iowa Geological Survey digital cartographic file NewHaven_BedrockGeology.mxd, version 6/30/15 (ArcDoc 10.3)
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.
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