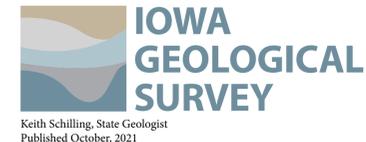


BEDROCK GEOLOGIC MAP OF THE ARGYLE 7.5' QUADRANGLE, LEE COUNTY, IOWA AND CLARK COUNTY, MISSOURI

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Open File Map: OFM-21-3



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INTRODUCTION

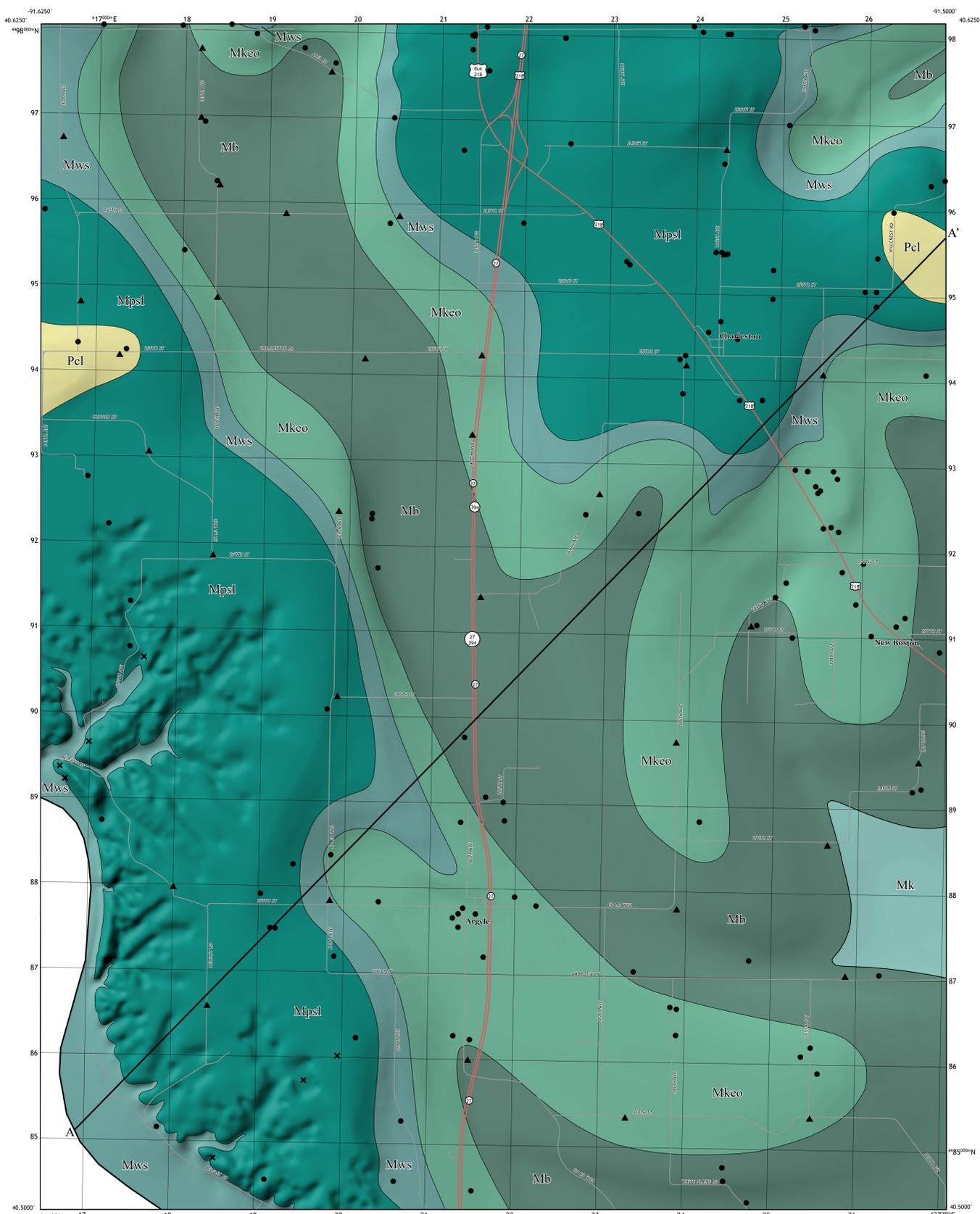
The Argyle Quadrangle lies within the Southern Iowa Drift Plain landform region, which is dominated by loess-mantled till plains in the uplands and fine-to coarse-grained alluvial deposits in stream valleys. The thickness of Quaternary materials overlying the bedrock surface varies widely across the quadrangle ranging from 0 to 18 m (0 – 60 ft), reaching a maximum thickness of 88 m (290 ft) in the southeastern part of the mapping area. An accompanying map of the surficial geology of the Argyle Quadrangle has been published concurrently with this map (Open File Map OFM-21-4; Tassier-Surine et al., 2021).

The bedrock surface of the Argyle Quadrangle is dominated by Mississippian strata overlain by Pennsylvanian strata that occur as minor erosional outliers. The majority of the bedrock exposures were found along Monks Creek in the western part of the mapping area. Although it is expected that there are bedrock exposures along the bluffs of the Des Moines River valley, that portion of the mapping area was inaccessible. Geologic reconnaissance of one abandoned quarry and three exposures within the mapping area were conducted during field activities. There are five abandoned quarries and no active quarries within the mapping area. Additional subsurface information was derived from the analysis of more than 200 water well records, 18 of which have cutting samples that were described as part of this mapping project, and 22 passive seismic data points. For a more detailed account of data resources, mapping methods, and stratigraphy of the Argyle Quadrangle, please refer to the Summary Map Report.

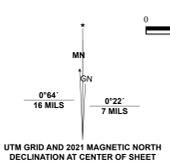
STRATIGRAPHIC COLUMN AND LEGEND

System ¹	Subsystem ¹	Series ¹	Stage ²	Lithostratigraphic Unit	Map Symbol	Lithology	Thickness (in feet)	Lithostratigraphic Unit Description														
Quaternary				Quaternary undifferentiated	Qu		0-60	Qu - Undifferentiated Unconsolidated Sediments Consists of loamy soils developed in loess, glacial till, and colluvium of variable thickness, and alluvial clay, silt, sand, and gravel. The total thickness of the Quaternary deposits typically varies between 0 and 18 m (0-60 ft), but can be as much as 88 m (290 ft) thick in the southeastern part of the mapping area. This unit is shown only on the cross-section, not on the map.														
								Carboniferous	Pennsylvanian	Middle	Desmoinesian-Atokan	lower Cherokee Group	Pel		<20	Pel - Shale and Sandstone - Pennsylvanian units occur as erosional outliers reaching a thickness of up to 6 m (20 ft) within the mapping area. This unit consists of light to medium gray shale/mudstone that is part silty to sandy, fine to medium quartz sandstone that is rarely conglomeratic, and coal. Some shales are carbonaceous to phosphatic. No outcrops of this unit were identified in the mapping area.						
																Upper	Chesterian	Pella or "St. Louis" formations	Mpsl		<40	Mpsl - Limestone, Sandstone, and Dolomite - This map unit reaches a maximum thickness of 12 m (40 ft) in the mapping area. It is dominated by limestone, sandstone, dolomite limestone, and dolomite with minor shale and chert. The Pella Formation are typically sub-lithologic with scattered to abundant fossils, primarily brachiopods, echinoderms, and ostracods. The "St. Louis" Formation is dominated by limestone, sandy limestone, sandstone, and dolomite that is variably cherty. The limestone facies of this unit can be fossiliferous with brachiopods, echinoderms, and several varieties of corals while the dolomitic facies typically exhibit fossil molds. 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. The lower portion of the "St. Louis" Formation is commonly gray to dark brown dolomite that is locally brecciated and sandy, with minor shale seams, and rare fossils. This mapping unit dominates the bedrock surface in the mapping area and is overlain by Quaternary sediments or Pennsylvanian outliers. Three outcrops and five abandoned quarries exposing this mapping unit were identified in the mapping area.
																						Middle
								Lower	Osagean	Keokuk Formation	Mkeo		<85	Mkeo - Limestone, Dolomite, Chert, and Shale - The Keokuk Formation can be up to 26 m (85 ft) thick in the mapping area. This unit is dominated by tan to gray interbedded skeletal limestones displaying packstone-grainstone facies. Nodular to bedded chert, in part fossiliferous, is common in the lower half of the sequence. Variably argillaceous dolomite and thin shales also occur throughout the unit. The unit displays multiple handground 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). Brachiopods, crinoids, bryozoans, solitary corals, and fish bones and teeth occur throughout this unit as both abraded debris and partially articulated specimens. Molds of sponge spicules can occur in the dolomite facies. Minor glauconite and locally abundant goodes are also associated with this unit. Calcitic vug fills and rare splinterite are noteworthy. Outcrops of this unit were not found in the mapping area.								
														Burlington Formation	Mb		<80	Mb - Limestone, Dolomite, and Chert - The Burlington Formation can be up to 24 m (80 ft) thick in the mapping area. This unit is subdivided into three members (in ascending order): the Dolbe Creek, Haight Creek, and Cedar Fork, characterized by distinct lithologic groupings. The Dolbe Creek Member is a pure white crinoidal packstone limestone with minor 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 glauconitic-rich zone marks the contact between the Haight Creek and Dolbe Creek and can be used as a regional marker bed. Fossil molds are also present in the dolomite facies. The Cedar Fork Member is dominated by white to tan skeletal limestone displaying packstone-grainstone facies, nodular to bedded chert, occasional fish debris, and traces of glauconite. Its light color helps differentiate this unit from the dominantly gray packstones of the overlying Keokuk Formation. Outcrops of the Burlington Formation were not observed in the mapping area.				
																		Kinderhookian formations	Mk		100-170	Mk - Dolomite, Limestone, and Siltstone - The Kinderhookian sequence ranges in thickness from 30 to 43 m (100 - 140 ft) in the mapping area. This unit comprises three formations (in ascending order): the McCrany, Prospect Hill, and Wassonville, characterized by distinct lithologic groupings. The McCrany Formation is composed of alternating beds of sparsely fossiliferous, sub-lithologic limestone and dark brown, unconsolidated dolomite, generating a unique "extra striped" appearance in outcrop. Calcitic vug fills are common and a basal coelite is locally present. The Prospect Hill Formation is a light to medium gray, dolomitic siltstone that grades to shale in some locations. This unit is often laminated with vertical and horizontal burrow fabrics and fine cross-stratified bedforms. Fossils are rare to absent although fossil molds are locally abundant. The Wassonville Formation, which now includes the former Star's Cave Formation as the basal member, consists of massive dolomite with variable chert that grades into dolomitic limestone lower in the section. The basal Star's Cave Member is a fossiliferous limestone with packstone-grainstone facies and is commonly oolitic. Crinoids (partially articulated) are the dominant fossil type of the Star's Cave Member. A diverse assemblage of brachiopods are also present with lesser amounts of blastoids, starfish, corals, bryozoans, and trilobites reported. Outcrops of this map unit were not observed as it only occurs at the bedrock surface in a deep bedrock channel in the southeastern part of the mapping area.
								Devonian	Upper	Famennian	English River Formation	Der		<20	Der - Siltstone and Shale - The English River Formation ranges in thickness from 3 to 6 m (10 - 20 ft) within the mapping area. This unit is dominated by gray to olive green siltstone, locally shaly, with distinct bioturbate fabrics. Bivalves and brachiopods are common, especially in the upper beds, with scattered to abundant fossil molds as well. This unit only appears in the cross-section, not on the map.							
															Saverton Shale Formation	Dss		<65	Dss - Shale - The Saverton Shale Formation can be up to 20 m (65 ft) thick within the mapping area. This unit is dominated by green-gray shale, commonly burrowed, with sparse to absent macrofossils. This unit only appears in the cross-section, not on the map.			
																			Grassy Creek Formation	Dgc		<150

¹Global chronostratigraphic units
²Regional chronostratigraphic units



Base map from U.S. Geological Survey (USGS) Argyle 7.5' Quadrangle map, published by the USGS in 2018. Bedrock topography was created manually for this map project. Argyle 7.5' Quadrangle, version 10/31/21 (AUG21 Pro 281). Map projection and coordinate system based on Universal Transverse Mercator (UTM) Zone 18N, datum NAD83. The map and cross-section are based on interpretations of the best available information in the time of mapping. Map interpretations are not a substitute for detailed site-specific studies. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government. Supported in part by the USGS Cooperative Agreement Number G21AC00043 National Cooperative Geologic Mapping Program (STATEMAP). This work was partially supported by a National Science Foundation award: Improving Undergraduate STEM Education Grant GP-IMPACT-1600629.



ADJOINING QUADRANGLES

1	2	3
4	5	
6	7	8

1 Farmington, IA
2 Donnellson, IA
3 West Point, IA-MO
4 Croton, IA-MO
5 Nauvoo, IA-IL
6 Kahoka, MO
7 Wayland, IA-MO
8 Keokuk, IA-IL-MO



MAP SYMBOLS

- bedrock outcrop
- GeoSam point
- geophysics collection point
- unit contact
- cross-section
- hillshade
- U.S. Route
- State Route
- Local Road

LITHOLOGIES

- coal
- dolomite
- dolomitic shale
- fossiliferous limestone
- lithologic limestone
- sandstone
- sandy limestone
- shale
- siltstone
- unlithified sediments

LITHOLOGY SYMBOLS

- goodes
- chert
- oolitic
- argillaceous zone
- breccia
- unconformity

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GEOLOGIC CROSS-SECTION A-A'

