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North American Datum of 1983 (NAD 83) Projection: Transverse Mercator 10,000-foot ticks: Illinois State Plane Coordinate system, west zone (Transverse Mercator) 1,000-meter ticks: Universal Transverse Mercator grid system, zone 15

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BASE MAP CONTOUR INTERVAL 5 and 10 FEET NATIONAL GEODETIC VERTICAL DATUM OF 1929

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State Route

STATEMAP Foley-BG Sheet 1 of 2

### Introduction

The Foley Quadrangle is located about twenty miles north of St. Louis, Missouri in Calhoun County Illinois. This quadrangle is driftless but mantled in loess. Most of the drainages flow west of the Dividing Ridge to the Mississippi River. These drainages provide some of the natural bedrock exposures. The Mississippi River yields the bluff exposures. The oldest rock exposed is the Plattin Limestone (Middle Ordovician). It occurs on the Mississippi River bluff in the southern portion of the quadrangle. The youngest bedrock unit mapped in the study area is the Burlington-Keokuk Limestone which occurs all along the east border of the map along the Dividing Ridge. The Grover Gravel is a younger Tertiary (Neogene) unit was also mapped but could hardly be called a bedrock unit because it is composed of unlithified gravel that intermittently caps the upland areas above the Burlington-Keokuk Limestone.

# **Geologic Setting**

The Foley Quadrangle is over one mile north of the Cap au Gres faulted flexure. No major structures, i.e. faults and folds occur in this quadrangle. Only a broad and subtle feature that would be equivalent to the north limb of the Cap au Gres faulted flexure strikes northwest and dips northeast in the southern quarter of the study area. Dips in the southern part of the quadrangle range from six to four degrees east or north east. Regional dips into the Illinois Basin range from two to three degrees east or northeast. Rocks in this part of the basin are influenced by two major structures that occur off the map: the east west trending Cap au Gres to the south and the north-northwest trending Lincoln Fold in Missouri to the west.

Another subtle feature called the Meppen Syncline (Rubey 1952) can be seen on a jetty made by the Army Corp of Engineers on the north side of Madison Creek. Here in Sec. 18, T12S, R2W, looking east off the jetty one can see the subtle synclinal feature by looking at the contact between the lime-mudstones of the Plattin/Decorah and the grainstones of the overlying Kimmswick Limestone. This small fold is probably a slight compressional response to the Cap au Gres feature directly to the south of the Foley Quadrangle.

## Stratigraphy

The Plattin Limestone (Middle Ordovician) is the oldest unit in the quadrangle. It is dominantly composed of gray lime mudstones and dolostones that are exposed along the Mississippi River bluff and up West Point Creek, Madison Creek and extends to Dixon Hollow in the southern portion of the quadrangle on the Illinois side. An old abandoned quarry, west of Batchtown, Illinois on the Mississippi River was put into the Plattin Limestone. Another good exposure is just north of a second abandoned quarry on the north side of West Point Creek. The basal contact of the Plattin was not observed whereas the upper contact is sharp and conformable with the thin Decorah.

The Decorah Limestone (Middle Ordovician) ranges from five to ten feet thick. It has similar bedding characteristics as the Plattin, i.e. wavey with thin shale interbeds. The difference being the Decorah is a dense, chocolate brown, lime mudstone that weathers to a creamy yellow-white. The shale is also brown and calcareous. The Decorah was too thin to map on a 1:24,000 scale so it was combined with the Plattin on the map as Odrovician, Decorah/Plattin (Odp). This unit is unconformable with the overlying Kimmswick Limestone.

The Kimmswick Limestone (Middle Ordovician) is an exceptionally pure crystalline limestone that outcrops along the river bluffs above the Odp and in the creeks in the southern portion of the quadrangle. The Kimmswick is well exposed in Dixon Hollow in Sec.5, T12S, R2W. It is a dense limestone due to large blocky calcite cement that forms around large fragmental crinoid grains which yields greatly reduced porosity. This calcite cement is called epitaxial cement which quickly "grows" during early burial of the carbonate sediment. The dense nature of this unit makes it susceptible to jointing and karstification. The only pervasive karst in the Foley Quadrangle occurs in Secs. 8, 17 and 20 of T12S, R2W where the Kimmswick Limestone occurs below loess. The Kimmswick is unconformable with the overlying Maquoketa Shale.

A shale break above the Devonian denotes the Hannibal Shale (Lower Mississippian) and can be seen on the map as a shelf in the southern and northern part of the study area. The shale is greenish-gray, non-resistant and soft. In the central part of the outcrop area the Hannibal is protected by the resistant, siliceous, Chouteau Limestone and forms steep slopes. Both the Hannibal and Chouteau are conformable and they are both Kinderhookian.

The Burlington-Keokuk Limestones (Middle Mississippian) unconformably overlies the Chouteau Limestone. This is a calcium-rich limestone that forms steep outcrops in the upper parts of the bluffs along the Dividing Ridge. It is a white to light gray crinoidal grainstone that contains chert nodules in the lower part of the unit. It is overlain locally by either Tertiary gravel (Grover Gravel) or loess. The siliceous nature in the lower part of the rock makes this unit resistant to erosion. The upper part is higher in calcium and where loess is thin karst features form. This is seen in the northern portion of the Burlington-Keokuk outcrop belt. The Burlington-Keokuk belongs to the Valmeyran Series.

## **Economic Geology**

No oil and gas has been produced from this quadrangle. Three oil and gas wells were drilled in the quadrangle all were dry and abandoned. The main objective was the Kimmswick Limestone which is known to produce basinward.

#### **Industrial Minerals**

The primary industrial mineral in the area is limestone used for aggregate and calcium-rich limestone. There are two abandoned limestone quarries in the Foley Quadrangle: one west of Batchtown, Illinois and the other at the mouth of West Point Creek. The operation west of Batchtown quarried the Plattin, Decorah and Kimmswick Limestones. The other abandoned quarry at West Point Creek only mined the Plattin Limestone.

The Plattin Limestone is a good limestone for hydrating lime in making cement because it is consistently made-up of 75% calcium carbonate and 25% magnesium carbonate (Rubey 1952). The Kimmswick and Burlington-Keokuk Limestones are used in calcium-rich products i.e. agricultural lime, limestone for power plant scrubbers and making cement. Currently there are no active quarries in the Foley Quadrangle.

## References

Rubey, W.W., 1952, Geology and mineral resources of Brussels Quadran-

Oil and Gas The Maquoketa Shale (Upper Ordovician) is a nonresistant, one hundred foot thick unit. It makes a north-south valley east of the river bluff and

### parallels both the river bluff and the Dividing Ridge. This shale is an aquatard, impervious to groundwater movement. Water percolates down from overlying rocks and creates numerous springs along the upper contact of

the shale. When this unit gets wet it becomes a gummy bluish-gray clay. The Maquoketa Shale is unconformably overlain by the Silurian Dolostones.

Silurian Dolostones of the Bowling Green, Kankakee, and Joliet Formations were mapped together as a single unit. The Silurian rocks are distinc tive and highly resistant. This dolostone forms a forty to sixty-five foot ridge that strikes approximately north-south. They are composed of yellow, magnesium carbonate, with moldic porosity. Unconformities occur above and below each of the three Silurian formations and the Kankakee and Joliet Formations are nearly indistinguishable.

The overlying Cedar Valley Limestone (Middle Devonian) unconformably overlies Silurian rocks. In some areas, the sandy carbonate rock in-fill fractures in the underlying Silurian dolostones marking the sub-Kaskaskia unconformity of the Sloss mega-sequences. The Cedar Valley is composed of sandy, fossil packstones. These rocks are poorly exposed in the quadrangle. In the southern part of the Devonian outcrop belt, in the Foley

Quadrangle, the Devonian is eroded out. The Cap au Gres was probably active during the Devonian and effected deposition during Devonian Period (Rubey 1952). The Devonian rocks are thicker where Silurian dolostones are thinner. No upper Devonian black shale is present in the study area.

gle (in Illinois), U.S. Geological Survey Professional Paper 218, 197 pp.

SYSTEM	SERIES	FORMATION	MEMBER or BED	GRAPHIC COLUMN	THICKNESS (feet)	UNIT	<ul> <li>A Alluvium Alluvial deposits Clay, silt, sand to cobble-sized clasts, some rounded to subangular to angular clasts from local bedrock sources. All sediment is confined to tributaries and creeks that flow into the Mississippi River or Illinois River Systems. Unconformable at base.</li> <li>B Fan Deposits These geomorphic features are broad sub-conical landforms that have origins at the mouth of the larger streams. They are composed of angular bedrock clasts, sand, silt and clay sized particles. A change in gradient from the stream onto the flood plain creates these types of deposits. Unconformable at base.</li> <li>C Grover Gravel Poorly sorted gravel containing sand and clay. Clasts</li> </ul>	<ul> <li>brachiopods: <i>Mucrospirifer, Paraspirifer, Orthospirifer iowaensis</i> and <i>Ilita johnsonensis</i>. Other brachiopods include atrypids and strophominids. Large rugose corals and pelmatozoa are also present. Laterally this unit can grade from wackestone to packstone facies. This unit is also typically thin bedded, dolomitic, and sandy in places. Some chert also occurs in the limestone. The contact is unconformable and sandstone infilling cracks and joints in the Silurian Dolostone has been reported by Ruby (1952).</li> <li>H Joliet, Kankakee, and Bowling Green Formations Dolostones yellow, that has moldic porosity and sugary appearance. Thin to thick bedded hard and massive formations. Shale is rare and thin, but is light green</li> </ul>
QUATERNARY	HOLOCENE	Cahokia	Alluvial deposits		0–200	A		
			Fan deposits		0–35	В		
TERTIARY	PLIO- PLEISTO- CENE	Grover Gravel			0–5	С	composed of polished and rounded quartzite, chert and quartz. The pri- mary constituent of this gravel is the sub-rounded chert clasts. Most of the particle range from sand, granule and pebble size. The gravel clasts are	and occurs between dolostone beds. Glauconite occurs in the lower beds they can also have pinkish stains from iron. Multiple unconformities occur within this unit between the formations. Fossils found include: brachio-
ISSIPPIAN	VALMEYERAN	Burlington - Keokuk Limestones			190–250	D	<ul> <li>red, white, brown, yellow and black. This deposit is poorly exposed below the loess (silt) but above the bedrock surface in the uplands but was mapped based on the presence of alluvial gravel in the drainages. Where no gravel was found in drainages the unit was not mapped above the bedrock and below the loess in the uplands. Unconformable at base.</li> <li>D Burlington-Keokuk Limestones A white to light gray, crinoidal grainstone that occurs in thin to thick beds as cross-bedded bioclastic facies. The lower Burlington Limestone is light gray to brown cherty crinoidal</li> </ul>	<ul> <li>pods, bryozoans, rugose corals and trilobites. One of the most common trilobites is <i>Gravicalymene celebra</i>. The base of this map unit is unconformable.</li> <li>I Maquoketa Shale This unit is poorly exposed and yields a shale, strike valley that runs three miles from Batchtown, IL to the edge of the Foley quadrangle. The shale is bluish gray to light gray, with alternating shale and lime-mudstones at the base. This lower shale weathers to gummy, bluish-green, clay. The lower part also contains the blind trilobite</li> </ul>
MISS	JOKIAN	Chouteau Limestone			30–45	E	<i>Ampyrina behatula.</i> The middle portion is dominated by medium shale, the appearance or texture of a coarsely crystalline limestone. The Phylum Echinodermata has a unifying characteristic of all members in that their skeletal structure are grown as single crystals of calcite. Therefore all members yield unite extinction with cross nicols. The chert is another character of this unit. It occurs as nodules and discontinuous stringers that may be laterally absent. The overlying Keokuk Limestone has more crinoids and less chert and is softer that the underlying unit. There	shale. The upper part can be locally a silty shale that weathers tan. A dark brown to black shale layer near the top of the unit contains phosphatic nodules, pyrite and a dwarf fauna. The base of this unit is unconformable.
	KINDERHC	Hannibal Shale			60–100	F		J Kimmswick Limestone The limestone is a white to light gray crinoi- dal grainstone. The lower part is massive, coarsely crystalline due to large disarticulated crinoid stems that make-up the bulk of the rock. Diagnostic
DEVONIAN	MIDDLE DEVONIAN	Cedar Valley Limestone			0–60	G	are bryozoans in both units but the Keokuk has a greater abundance of <i>Archimedes</i> sp. a fenestrate bryozoan. Calcareous geodes containing calcite crystals and some containing quartz crystals are common in this	fossils are the trilobite, Isotelus gigas, the brachiopod, <i>Strophomena</i> sp, and the green, calcareous, dasyclad algae, <i>Reseptaculites</i> . All these fossils are preserved as white shells. The upper portion of this formation is
SILURIAN	ALEXAN- DRIAN	Joliet Kankakee Bowling Green			40–65	н	unit and continue into the overlying unit. The Burlington and Keokuk Lime- stones are disconformable at the base and top.	finer grained i.e. contains smaller fossil fragment grainstones mixed with a few coarse grained layers. The base of the Kimmswick is sharp but con- formable with the underlying strata.
ORDOVICIAN	CINCINNATIAN	Maquoketa			100–120	1	<ul> <li>E Chouteau Limestone A thin bedded, dense, tan, brownish gray</li> <li>lime-mudstone that contains small calcite nodules. Bedding is irregular to</li> <li>wavey and when weathered it has a nodular appearance. Chert is common and the formation is argillaceous to sandy in many places. The lower</li> <li>contact is conformable but sharp.</li> <li>K Decorah Limestone Thin, wavey bedded dense chocolate brown</li> <li>lime-mudstone comprises this formation. The unit weathers to a cream</li> <li>yellow with smooth, wavey bedding surface. The nodular limestone beds</li> </ul>	
	MOHAWKIAN	Kimmswick Limestone			70–100	J	<b>F</b> Hannibal Shale This shale is gray to greenish-gray, silty shale, weathers to gummy clay that resembles the Maquoketa. Poorly resistant and therefore poorly exposed. The shale is dominantly non-calcareous and	are common: strophominid brachiopods, rare large, <i>Isotelus gigas</i> and <i>Grabycerarus</i> sp. trilobites, bivalves and gastropods. This unit is thin and mapped with the Plattin below. The lower contact is conformable.
		Decorah			5–10	K	<ul> <li>massive but is fissile in places and can also weather to tan clay. Where this shale thins the overlying Chouteau Limestone thickens and via versa. There is a facies relationship between the Hannibal and Chouteau formations. Fossils are rare in this unit in the study area only a few inarticulate, linguloid brachiopods have been found. The base of the shale is unconformable with the underlying unit.</li> <li>G Cedar Valley Limestone The limestone is a brownish-yellow to brown, brachiopod, wackestone. The dominant character is spiriferid</li> </ul>	L Plattin Limestone Thin bedded, mottled gray to light gray, weathers to white lime-mudstone that is dense and displays conchoidal fracture. Like the Decorah this limestone alternates with thin gray shale. Dolostone is common in the lower part of the formation. A diagnostic feature of this unit is the "wormy" or burrowed appearance. The burrows are filled with crystalline dolomite which gives them a unique appearance. Fossils can be locally abundant as to yield wackestone and packstone facies. Some beds near the top contain a brachiopod coquina. The lower part of this unit was not exposed in this quadrangle.
		Plattin Limestone			140–150	L		





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