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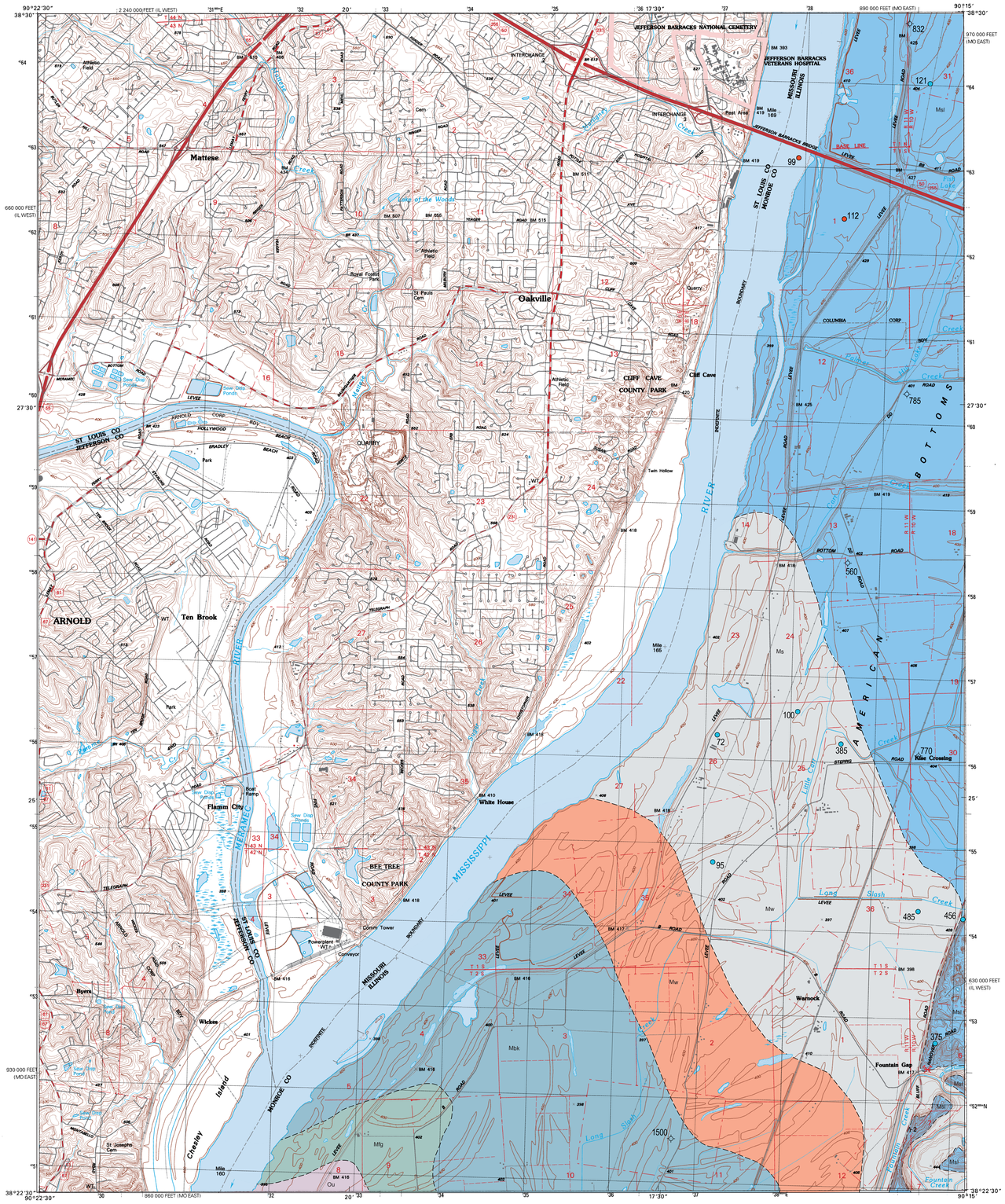
BEDROCK GEOLOGY OF OAKVILLE QUADRANGLE
MONROE COUNTY, ILLINOIS

F. Brett Denny
2003



Valmeyeran	Msl	St. Louis Limestone
	Ms	Salem Limestone
	Mw	Warsaw Shale
	Mkb	Burlington and Keokuk Limestones
	Mfg	Fern Glen Formation
Mississippian		
Unconformity		
Cincinnatian	Om	Maquoketa Formation
Unconformity		
Mohawkian	Ok	Kimmswick Limestone
	Od	Decorah Formation
	Op	Plattin Limestone
	Ou	Ordovician undifferentiated
Ordovician		

456 Water well (depth in feet)

770 Oil test, dry and abandoned (depth in feet)

99 Engineering or ISGS boring (depth in feet)

Abandoned quarry

Introduction

This map has been constructed using several data sources. Field outcrops were the primary source of data for the upland areas above the floodplain of the Mississippi River, and boring records from the files of the Illinois State Geological Survey were the primary source of data for the Mississippi River area. Most wells and borings in the Mississippi River Bottom area do not reach bedrock. Therefore, the bedrock in the bottomland area has been projected and is subject to change as new data is acquired. All Quaternary units have been removed from the map to portray the bedrock geology.

Stratigraphy

The oldest bedrock unit exposed at the surface in this quadrangle is the Salem Limestone. The Salem is dominantly a tan-brown to gray bioclastic limestone to dolomitic limestone (grainstone) with an occasional shale parting. The beds range from several inches to a few feet thick. Texturally, the unit is dominated by small fossil fragments composed of disarticulated echinoderms and fenestrate bryozoans that are abraded into a fossil hash. Other common macro fossils include corals, spirifers, and *Pentremites*. Cross beds are common and usually dip to the southwest. Chert is white to light gray, banded, and nodular. Peloidal to oolitic limestones are also present, and shales are blue gray to green gray. The Salem is composed of several fining- upward cycles composed of thick, wave-generated, coarse grained bioclastics that alternate with fine grained, tidal laminated bioclastics. The coarse phase represents carbonate sand waves deposited on a deeper middle shelf environment. The finer laminated and stromatolitic carbonate beds represent shallow, subtidal shelf conditions. Either sea level was fluctuating during the deposition of the Salem, or the northern shelf of the Ozarks was tectonically "bobbing" at this time. Endothyrid foraminifers are common,; an index fossil of the Salem is *Globoendothyra baileyi*. The contact with the overlying St. Louis Limestone in adjacent quadrangles is unconformable and in places forms a karstic limestone conglomerate to breccia. While the contact is sharp in this area it is probably also unconformable with the overlying St. Louis Limestone

The St. Louis Limestone is typically micritic to lithographic with a few gray shale layers separating 5 to10 feet thick limestone beds. Gray to blue gray chert is present as thin lenticular layers to nodules. The St. Louis Formation is fossiliferous with brachiopods and corals being most abundant. In places the St. Louis has identical lithographic properties as the underlying Salem (fine-grained and bioclastic) and differentiation is difficult. A good marker composed of a colonial coral (*Acrocyathus floriformes*) occurs within the Lower St. Louis, about 20 feet above the contact with the Salem Limestone. This coral zone is widespread in the region and has been traced to several adjacent quadrangles. In places the colonial form of this coral seems to dissipate and a solitary digitate coral may be present along this horizon. Care should be taken in using this zone to identify the lower contact due to the presence of solitary corals throughout the St. Louis Limestone.

The older units mapped in the floodplain of the Mississippi River do not occur at the surface and are concealed by Quaternary and Holocene sediments. These older bedrock units are described on the geologic map of the Valmeyer 7.5 Minute Quadrangle (Denny F. B., in prep.)

Economic Geology

Oil

Five oil tests have been drilled in the quadrangle, and each of the wells were dry holes. The deepest well 11-2S-11W was drilled to a total depth of 1500 feet. Oil is produced from adjacent quadrangles to the east. This petroleum production is associated with structural closure on the Waterloo-Dupo Anticline and production is from the Kimmswick Limestone.

Sand and Gravel

Sand and gravel are available in the alluvial deposits of the Mississippi River, and talus from the toe of the bluff along the Mississippi River has been mined for construction fill material.

Limestone

Limestone from the St. Louis and the Salem are quarried in region. The limestones are relatively pure and are an excellent source of aggregate for construction purposes. These units outcrop along the uplands along the southeast corner of the map.

Structural Geology

This quadrangle lies between the Waterloo-Dupo Anticline and the Valmeyer Anticline (Weller, 1939). The gentle northwest limb of the Valmeyer Anticline is located just to the south of this quadrangle and effects the southwestern portion of the map sheet. In the Valmeyer Quadrangle to the south this structure is an asymmetric anticline trending north 15 to 40 degrees west and plunges gently to the southeast. The western limb is steeper with dips up to 25 degrees and the east limb is gentle with less than 5 degree dips. There is no indication of near surface faulting associated with this structure. The Waterloo-Dupo Anticline is located in the adjoining Columbia quadrangle to the east. It has been speculated the Waterloo-Dupo Anticline is a result of drape folding of the sedimentary units over a deep-seated basement fault (Nelson, 1995), and this structure also has a steep western limb and gentle northeastern limbs. The Columbia Syncline trends parallel to the southwestern limb of the Waterloo-Dupo Anticline and trends north-south to north 30 degrees west (Devera, J.A., in prep.). The northeastern portion of this map sheet is effected by this structure.

References

Denny, F.B., in prep., Geologic Map of the Waterloo 7.5 Minute Quadrangle: Illinois State Geological Survey, IGQ Series, 1:24,000 scale.

Denny, F.B., in prep., Geologic Map of the Valmeyer 7.5 Minute Quadrangle: Illinois State Geological Survey, IGQ Series,1:24,000 scale.

Devera, J.A., in prep., Geologic Map of the Columbia 7.5 Minute Quadrangle: Illinois State Geological Survey, IGQ Series, 1:24,000 scale.

Nelson, W.J., 1995, Structural features in Illinois: Illinois State Geological Survey, Bulletin 100, 144 p.

Weller, J. M., 1939, Preliminary Geological Maps of the Pre-Pennsylvanian Formations in Part of Southwestern Illinois: Illinois State Geological Survey, Report of Investigations - NO.59, 15 p.

SYSTEM	SERIES	FORMATION		GRAPHIC COLUMN	AVERAGE THICKNESS (feet)	DESCRIPTION LETTER	Description
Mississippian	Valmeyeran	St. Louis Limestone	*Acrocyathus floriformis Zone*		75-100	A	**A. St. Louis Limestone:** *limestone, siltstone, limestone breccia, and shale*. Light gray to medium gray dense lime-mudstone with fossil wackestones. Part of the unit contains quartz sand and subangular limestone breccia clasts. Oolitic grainstones, greenish oncolitic packstones, peloidal grainstones, stromatolitic boundstones, and carbonate intraclastic conglomerates make up a highly variable mix of microfacies. Yellowish dolostone beds are also present in this formation. Gray to dark gray chert occurs as nodules and stringers. Siltstones are calcareous and greenish. The shales are greenish gray and reddish brown, calcareous, soft, and non-fissile. *Acrocyathus floriformis*, a colonial coral, occurs in the upper part of the basal portion of this formation. *A. floriformis* is widespread near the base of the unit. The contact with the underlying unit is unconformable but difficult to identify due to lithologic similarities of the two units. The contact was placed about 20 feet below the lower *Acrocyathus floriformis zone*. Locally a erosional karstic surface can be observed between these units.
		Salem Limestone			120-150	B	**B. Salem Limestone:** *limestone, dolomite, chert, and siltstone*. Limestones are tan-brown to light gray and contain laminated tidallites, wackestones to grainstones composed of rounded and broken fossils and coated grains to gray lime-mudstones similar to the overlying St. Louis Limestone. Bedding styles range from tabular to undulatory. Cross-beds are present in grainstone facies. The unit has a dirty gray-brown grainy appearance. The diagnostic character of this formation is alternating beds of laminated, fine-grained (calcisiltite) facies with coarse bioclastic, peloidal to oolitic grains in shoaling-upward cycles. Dolomites are brown and have moldic porosity. Cherts are light gray and may be bioclastic and weather with a porous rind. Cherts occur between grainstones and laminated beds as elliptical nodules containing concentric rings that spall off like egg shells when weathered. Siltstones are brown to light gray and thinly bedded, typically less than 1 inch thick. Oolitic beds are rare. The foraminifera, Fossil invertebrates include spiriferid and productid brachiopods, rugose corals, conularids, and crinoids. Ramose, fenestrate, encrusting, and bifoliate bryozoans are also present. The contact with the underlying unit is gradational.
		Warsaw Shale			90 -110	C	**C. Warsaw Shale:** *dolomitic limestone, siltstone, and mudstone*. Medium-gray, crinoidal, bryozoan wackestones and packstones that contain a few brachiopods. Dolostone beds are gray-brown, thinly bedded, and contain chlorite-rich shale clasts. The upper half of the unit is dominated by shaly limestone and dolostone beds. The lower half contains bluish gray mudstones up to 20 feet thick interbedded with thin lime-mudstones. Conularids and gastropods occur in the shaly portion of this unit and brachiopods, spirifers, bryozoans, and . echinoderms are very common in the limestones and dolostones. Siltstones are calcareous and fossiliferous and thinly bedded in the lower part. The basal contact is poorly exposed but thought to be sharp and conformable with the underlying carbonate beds.
		Burlington-Keokuk Limestones			190-200	D	**D. Burlington and Keokuk Limestone:** *limestone, chert, siltstone, and shale*. Light gray to white crinoidal grainstones dominate and are interbedded with nodular and bedded light gray to black cherts. The cherts, which comprise at least 25 percent of the lowermost beds are white when weathered, and some have bioclasts of crinoids and brachiopods. Sandy limestones weather light brown, are cross-bedded, and contain brachiopod and crinoid molds. The unit is characterized by alternating layers of light gray to white crinoidal grainstones with beds of argillaceous and sandy limestones. Large spirifers are common along with crinoids, bryozoans, and corals. Siltstones are dark gray with a greenish tint and are calcareous. The unit is conformable with the underlying unit.
		Fern Glen Formation			40-60	E	**E. Fern Glen Formation:** *limestone, siltstone, and shale*. Limestone is red to greenish gray, thin-bedded, and argillaceous; it contains small calcite geodes and crinoid stems. Green and red shaly calcareous siltstones are diagnostic. The cherts are greenish gray, nodular, and fossiliferous. The basal part is unconformable with the underlying formation.
Ordovician	Cincinnatian	Maquoketa Formation			50-80	F	**F. Maquoketa Formation:** *dolostone, siltstone, mudstone*. This unit is poorly exposed and forms gentle hill slopes that are well vegetated. The lower part of the formation is calcareous and grades upward into bluish green, thin calcareous siltstones interbedded with bluish gray mudstones. The upper part is shaly buff-gray to greenish gray and has interlaminated silts and shales. This unit is unconformable with the underlying units.
	Mohawkian	Kimmswick Limestone			80-110	G	**G. Kimmswick Limestone–Trenton Limestone in the subsurface:** *limestone, dolostone, and minor shale*. White to gray, coarsely crinoidal grainstone is the dominant facies in this formation. Fossils include *Receptaculites* sp., *Illaenus* sp., *Isotelus gigas* (trilobites), brachiopods, and gastropods that are commonly broken in the cross-bedded coarse bioclastics of the formation. Shales are calcareous and may contain pyrite. Cherts are not very common and are white with slight yellow tones. When cracked, the limestones have a faint petroliferous odor. The basal contact is a distinct hardground omission surface.
		Decorah Formation			20-40	H	**H. Decorah Formation:** *limestone and shale*. Light brownish to greenish limestone or lime mudstone interbedded with organic-rich reddish brown shales. The cherts are dark gray, and the dominant fossils are strophomimid brachiopods.
		Plattin Limestone			+ 145	I	*Subsurface only (described from drill logs and reports).* **I. Plattin Limestone:** *limestone, dolostone, and shale*. Light brown to chocolate brown sublithographic limestone with alternating fossiliferous shales and sandy limestones near the base.

Base map compiled by Illinois State Geological Survey from digital data provided by the United States Geological Survey. Topography compiled from imagery dated 1986. Planimetry derived from imagery taken 1993 and other sources. Photoinspected using imagery taken 1998.

North American Datum of 1983 (NAD 83)
Projection: transverse Mercator
10,000-foot ticks: Missouri (east zone), and Illinois (west zone) State Plane coordinate systems, (transverse Mercator)
1,000-meter grid: Universal Transverse Mercator grid, zone 15

SCALE 1:24 000

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

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

Released by the authority of the State of Illinois: 2003

Geology based on fieldwork by F. Brett Denny, 2003.

Digital cartography by F. Brett Denny, Jane E. Domier, and John D. McLeod, Illinois State Geological Survey.

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4		5
6	7	8

ADJOINING QUADRANGLES
1 Kirkwood
2 Webster Groves
3 Cahokia
4 Maxville
5 Columbia
6 Herculaneum
7 Valmeyer
8 Waterloo

APPROXIMATE MEAN DECLINATION, 1999

ROAD CLASSIFICATION

Primary highway, hard surface
Secondary highway, hard surface
Light duty road, hard or improved surface
Unimproved road

64 Interstate Route 30 U.S. Route 136 State Route