BEDROCK GEOLOGY OF HARDIN QUADRANGLE
GREENE, CALHOUN, AND JERSEY COUNTIES, ILLINOIS

Prairie Research Institute
ILLINOIS STATE GEOLOGICAL SURVEY

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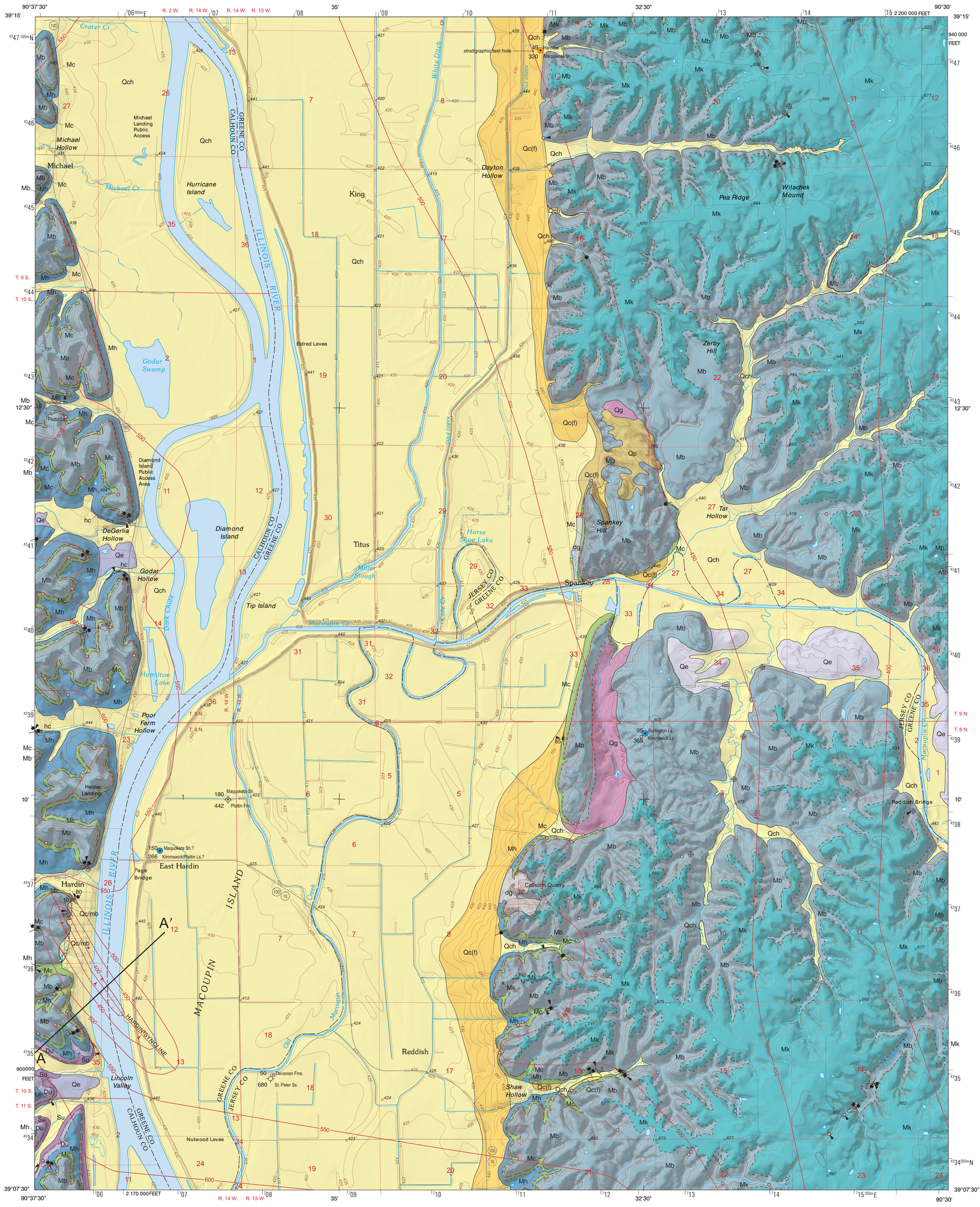
2015

STATEMAP Hardin-BG



EXPLANATION

Quaternary	dg	disturbed ground	Holocene
	Qc(f)	Cahokia Formation, fan facies	
	Qch	Cahokia Formation and Henry Formation	
	Qc/mb	Cahokia Formation over Mississippian Burlington Limestone	
	Qp	Parkland facies of the Henry Formation	Holocene and Pleistocene
	Qe	Equality Formation (Wisconsin Episode)	Pleistocene
	Qg	Glasford Formation (Illinois Episode)	
Unconformity			
Mississippian	Mk	Keokuk Limestone	Valmeyeran
	Mb	Burlington Limestone	
	Mc	Chouteau Limestone	Kinderhookian
	Mh	Hannibal Shale Horton Creek Limestone Member	
Unconformity			
Devonian	Du	Devonian undifferentiated Louisiana Limestone Saverton Shale Grassy Creek Shale Sylamore Sandstone Cedar Valley Limestone	Upper and upper Middle
Unconformity			
Silurian	Su	Silurian undifferentiated Joliet Limestone Kankakee Limestone Bowling Green Limestone	Niagaran and Alexandrian

Symbols

- 40 — Strike and dip of bedding; number indicates degree of dip
- Horizontal bedding
- Vertical joints
- 85 — Inclined joints or fractures; number indicates degree of dip
- Abandoned quarry
- Active pit or quarry
- Outcrop of special note, shown where contact or map unit was well exposed at time of mapping
- Field note location

Drill Holes
from which subsurface data were obtained

- Stratigraphic boring (ISGS)
- Water-well boring
- Dry oil well
- Labels: upper left indicates depth to bedrock; lower left indicates total depth of boring in feet; upper right denotes uppermost formation; lower right denotes formation at bottom. Dot indicates location accurate within 100 feet. (95 Burlington Ls. / 365 Kimmswick Ls.)

Line Symbols
dashed where inferred, dotted where concealed

- Contact
- 400 — Structure contour of the top of the Chouteau Ls
- Syncline
- A—A′ Line of cross section

Note: Well and boring records are on file at the ISGS Geological Records Unit and are available online from the ISGS Web site.

Base map compiled by Illinois State Geological Survey from digital data (2012 U.S. Topo) provided by the United States Geological Survey. Shaded relief derived from 1978 data from the National Elevation Dataset.

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

Recommended citation:
Seid, M.J., and J.A. Devera, 2015, Bedrock Geology of Hardin Quadrangle, Greene, Calhoun, and Jersey Counties, Illinois, Illinois: Illinois State Geological Survey, USGS-STATEMAP contract report, 2 sheets, 1:24,000, report, 7 p.

SCALE 1:24,000

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

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

Geology based on field work by Mary J. Seid, Joseph A. Devera, F. Brett Denny, and W. John Nelson, 2014–2015.

Digital cartography by Jennifer E. Carrell and Trisha S. Rentschler, Illinois State Geological Survey.

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program under StateMap award number G14AC00328, 2014. 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.

This map has not undergone the formal Illinois Geologic Quadrangle map review process. Whether or when this map will be formally reviewed and published depends on the resources and priorities of the ISGS.

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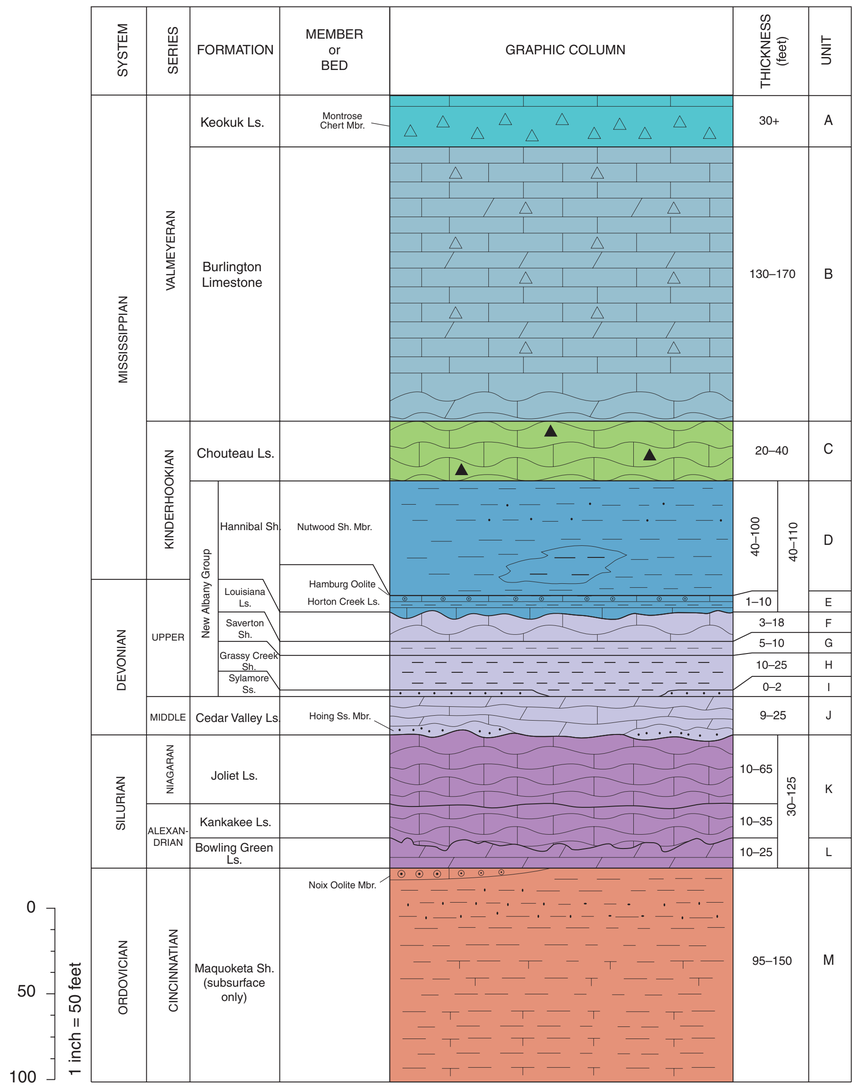
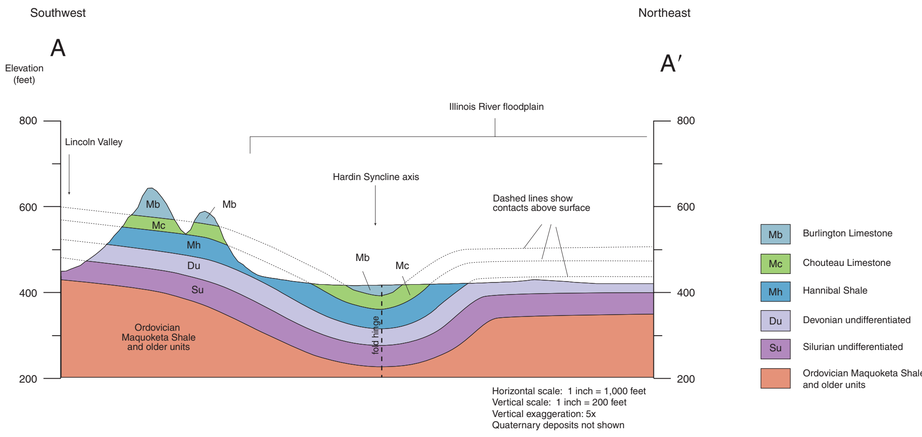
1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES
1 Pleasant Dale Valley
2 Kampsville
3 Carrollton
4 Hamburg
5 Boyer Creek
6 Foley
7 Nutwood
8 Otterville

APPROXIMATE MEAN DECLINATION, 2015
1° EAST
TRUE NORTH
MAGNETIC NORTH

ROAD CLASSIFICATION
State Route
Local road





A Keokuk Limestone Chert and limestone. The Montrose Chert Member occurs at the base of the Keokuk Limestone. It consists of white, light gray and orange chert, which is intensely brecciated, angular, and crumbly. Outcrops are sparse, but they typically expose about 6 feet of the Montrose Chert Member in the upper reaches of ravines and capping the bluffs in the eastern part of the quadrangle. The limestone above the Montrose Chert Member is poorly exposed. It generally consists of a packstone containing abundant crinoids, bryozoans and brachiopods with an occasional rugose coral. The corkscrew fenestrate bryozoan, *Archimedes*, is abundant. The large brachiopod Spirifer logani is distinctive and common. The basal contact is conformable but sharp in places where the chert is present.

B Burlington Limestone Limestone and chert. Bluff-former and caps the steep bluffs in the western part of the quadrangle. It contains two lithologies which are interbedded with one another. The dominant lithology is light gray to white, medium- to coarse-grained crinoidal packstone to grainstone that is cross-bedded in places. Fossil blastoids that occur in this unit are *Crytoblastus melo, Globoblastus norwoodi, Schizoblastus sayi* and *Schizoblastus aplatus*. Brachiopods include *Dictyoclostus burlingtonensis, Spirifer grimesi* and *Rhipidomella burlingtonensis*. The secondary lithology is yellowish brown dolomitic wackestone to packstone, with coarsely crystalline white crinoidal fragments floating in a yellowish brown very fine- to fine-grained dolomite matrix. Bedding is thin to medium and wavy to very undulatory. Throughout the eastern and northern parts of the quadrangle, the lowermost 5 feet of the unit forms a marker horizon, which is yellowish brown dolomitic limestone that contains solution cavities, vugs, quartz geodes in some places, and forms a re-entrant weathering profile. In bluff faces in the southwestern quarter of the Hardin Quadrangle, the contact between the Chouteau and Burlington is often found in the vertical face, 5 or 10 feet above the base of the bluff or within a covered interval between the less well-exposed Chouteau and the more well-exposed Burlington. The chert content generally increases upward in the formation; the chert consists of white to light gray one- to five-inch-thick bedding-parallel chert in beds or lenses. Disarticulated crinoid stems are dominant, although scattered brachiopods, bryozoans, and corals have been reported. The basal contact ranges from gradational to sharp.

C Chouteau Limestone Limestone and chert. Occurs at the base of steep bluffs in Calhoun County where it is conformably overlain by the Burlington Limestone. In the southern part of the quadrangle, the Chouteau is medium gray shaly lime wackestone, with thin wavy bedding, and contains minor amounts of bedding parallel chert. In the northern part of the quadrangle, the Chouteau is olive brownish gray to yellowish greenish gray silty argillaceous mudstone, in thin wavy beds, and it gradually becomes more crinoidal upward, forming a gradational contact with the overlying Burlington Limestone. It contains abundant calcite geodes, an occasional brachiopod, and sparse colonial corals with small tubular corallites. Near Shaw Hollow, the uppermost Chouteau contains calcareous siltstone, shale, and light gray chert lenses with dark gray rinds. In Hardin, the Chouteau weathers with a rosy reddish tint and contains small quartz geodes. The most complete exposure of the Chouteau Limestone is in the bluff face on the north side of the town of Hardin, near the outlet of the Hardin bridge. At that locality, the upper 20 feet contains 3 dark gray bedding-parallel chert beds, and the contact with the Burlington can be traced in the bluff face. The gastropod *Straparollus* is relatively common and reaches 5-7 cm in diameter. The contact between the Chouteau Limestone and Hannibal Shale was observed to be gradational in some places and sharp in other places.

D Hannibal Shale Shale, claystone, and siltstone. Greenish gray silty claystone to silty shale, fissile in part, calcareous in part, pyritic in the middle part, slope-former. The best exposures occur at the base of ravines west of Hardin, in Godar Hollow, and in Lincoln Valley. The unit is often poorly exposed and covered by float of the Chouteau and Burlington Limestones. The Nutwood Shale Member is not well-developed in the quadrangle, but it does contain elevated carbon content (2.05%C) relative to the other parts of the formation. *Zoophycus* isp. was identified in the middle of the unit in the Juhl #1 corehole. Small carbonaceous fragments and burrowing are associated with the siltstone facies. Fossils in the Hannibal are sparse and seem to only occur within the uppermost beds. The basal contact is sharp with the Horton Creek below.

E Horton Creek Limestone Member Limestone and shale. Exposed in Poor Farm Hollow, Lincoln Valley, and A. Schleeper Rd. in the southwestern part of the quadrangle. The basal part of the Horton Creek is medium gray limestone that contains inconspicuous silt, low-angle micro cross-bedding, and rounded imbricated clasts; these features are well-exposed in Poor Farm Hollow on the western edge of the quadrangle. The middle greenish gray silty shale is distinguished from the overlying Hannibal Shale by the fact that its bedding is more conspicuous, but where the Hamburg Oolite bed is not exposed, it may be easily confused with the Hannibal. The uppermost Hamburg Oolite bed is 2.5 to 3 feet thick dark gray to brown packstone, with disarticulated brachiopods and crinoids, and in the Juhl #1 corehole, it contains vugs with dead oil and calcite. It is exposed as inconspicuous ledges just above road level at the mouths of Godar and DeGerlia Hollows. Thin sections indicate that the "oolites" are actually coated sand grains and lack the features of well-developed oolites (i.e. concentric calcite rims). The oolitic beds also contain rounded rip-up clasts of Louisiana Limestone in the adjacent Hamburg Quadrangle. Fossils in the Horton Creek are restricted to the Hamburg Oolite at the top of the formation include: *Chonetes, Rhynchopora hamburgensis, Dielasmella calhounensis* and *Delthyris missouriensis* (brachiopods), *Schizodus appressus*, and *Parallelodon sulcatus*, (bivalves). The contact between the Louisiana and Horton Creek is wavy, sharp, erosional, and unconformable.

F Louisiana Limestone Limestone. Light grayish brown lithographic lime mudstone, wavy bedded throughout, conchoidal fracture when broken, contains some greenish gray mottling. Weathers white to light gray and very smooth. The unit contains articulated brachiopods, spirifirids, productids, and the genera: *Ripidomella, Pixidixia, Athyris marionensis* and *Cyrtina* sp. Calcite nodules in the form of neomorphic spar were seen along some bedding planes. The basal contact is razor sharp with the Saverton below.

G Saverton Shale Shale. Dark gray, silty, bioturbated, well-laminated shale. The Saverton Shale was not observed in outcrop anywhere in the quadrangle, but it is 10 feet thick in the Juhl #1 stratigraphic corehole. The basal contact is sharp with underlying formation.

H Grassy Creek Shale Shale. Dark greenish gray shale, contains small flattened round black and brown spores, and burrowed in the middle part. The Grassy Creek Shale was present in the Juhl #1 corehole but was not observed in outcrop anywhere in the quadrangle. The lower part of the unit may be paleoslumped in places, as indicated by bedding dipping about 25 degrees in the Juhl #1 hole. No fossils were observed from the Grassy Creek. The lower contact is corrugated and unconformable.

I Sylamore Sandstone Sandstone. The Sylamore was not observed in the study area, but it may be present as a thin layer of fine-grained quartz arenite sandstone. The lower contact is unconformable with the underlying Cedar Valley.

J Cedar Valley Limestone Limestone and dolomitic limestone. Wackestone to packstone, grayish brown fresh, yellowish brown weathered, dolomitic in part, beds uneven, average 6 inches thick. In outcrop, microkarst is developed on the underside of beds and weathers with 0.75-inch holes. In places, brachiopod shells contain purplish calcite. A two-foot-thick chert conglomerate layer is present in some areas at the base of the unit--it was well-exposed on the north side of A. Schleeper Road. The Hoing Sandstone Member is a very thin, fine-grained, well-rounded, light brown quartz arenite that occurs at the base of the Cedar Valley in the ravines on the south side of A. Schleeper Road. The Hoing Sandstone Member may be the sandstone unit that fills joint crevices in the adjacent Hamburg Quadrangle. Where the Hoing Sandstone is not well-developed, the chert conglomerate layer can be sandy in places. The Cedar Valley Limestone is the most highly fossiliferous unit in the study area. The large size of the fossils is diagnostic of the unit. The fauna consists of ramose and lace-like *Fenestella* bryozoans, *Syringopora* colonial and Cystiphyllum rugose corals, crinoid stems, spirifers include *Syringospira* and *Tylothyris* brachiopods, and *Stromatoporid* sponge heads. The basal contact is sharp and unconformable. The Lower and lower Middle Devonian units from southern Illinois are not present in the study area.

K Joliet Limestone and Kankakee Limestone Limestone. The two formations could not be differentiated in outcrop or drill core because they are lithologically very similar in the study area. The Kankakee and Joliet Limestones contain light gray limestone with varying bioclastic content ranging from mudstone to wackestone to packstone. The basal part of the unit is dolomitic in places, and the unit is very dense and hard to break. Beds are undulatory, burrowed, and dominantly thin to medium but can appear massive. Greenish clay stringers and a reddish tint are common features. The limestone contains a minor amount of white chert nodules. Horizontal and vertical stylolites are common. The upper one foot of the Joliet contains fine-grained silica sand on the north side of A. Schleeper Road. About 6 miles to the west in the adjacent Hamburg Quadrangle, dessication cracks were observed in outcrop. At the same location, light brown fine- to medium-grained quartz arenite sandstone with gray and white subangular chert pebbles was lithified in overhangs and joints. In the Juhl #1 corehole, carbonate and chlorite clay infills solution cavities. This relationship suggests that the sandstone, carbonate, and clay were deposited in a Silurian paleokarst topography. Thin sections indicate that echinoderm fragments are dominant, but trilobite, rhomboperoid bryozoans, ostracodes, and chitinozoans are also present. Sparse amounts of glauconite and chalcedony are present. Fossils were not observed within the quadrangle, but 5 miles to the west in Hamburg, abundant *Orthoceras* sp. cephalopods exceeding 1 foot in length were found on weathered bedding planes. The contact between the Bowling Green and Kankakee has up to five feet of relief in the adjacent Hamburg Quadrangle. The contact between the Kankakee and Joliet is disconformable and based on a faunal change.

L Bowling Green Limestone Limestone and dolomite. The only outcrop of the Bowling Green is on the north side of A. Schleeper Road. At this locality, the unit is medium yellowish brown, microgranular dolomitic mudstone with moldic porosity, and weathers chalky. In an outcrop about 4 miles west of the quadrangle, the bedding ranges from 6 inches to 3 feet thick, is planar bedded, contains stylolitic sutures between beds, and exhibits beehive weathering. In the Juhl #1 corehole, the unit is light brownish gray mudstone with horizontal stylolites and contains vugs filled with neomorphic calcite spar. No fossils were observed. The basal contact is not exposed in the quadrangle, but in the Juhl #1 corehole, the contact with the Maquoketa is gradational.

M Maquoketa Shale (subsurface only) Shale and limestone. Greenish gray fissile silty shale and shaly siltstone. The Noix Oolite Member at the top of the Maquoketa was not observed in the quadrangle or in the Juhl #1 corehole, but it is known to be present in the area. Only 4 miles west in the Hamburg Quadrangle, the Noix is brownish gray oolitic grainstone in 3-foot-thick beds and contains conspicuous glauconite and phosphatic nodules 2 to 7 mm in diameter in the basal 3 inches. The Noix weathers white and in places, the oolites have been replaced by secondary calcite cement. The basal contact is not exposed in the study area.