BEDROCK GEOLOGY OF DEKOVEN QUADRANGLE
HARDIN COUNTY, ILLINOIS, AND UNION AND CRITTENDEN COUNTIES, KENTUCKY

Prairie Research Institute
ILLINOIS STATE GEOLOGICAL SURVEY

STATEMAP Dekoven-BG

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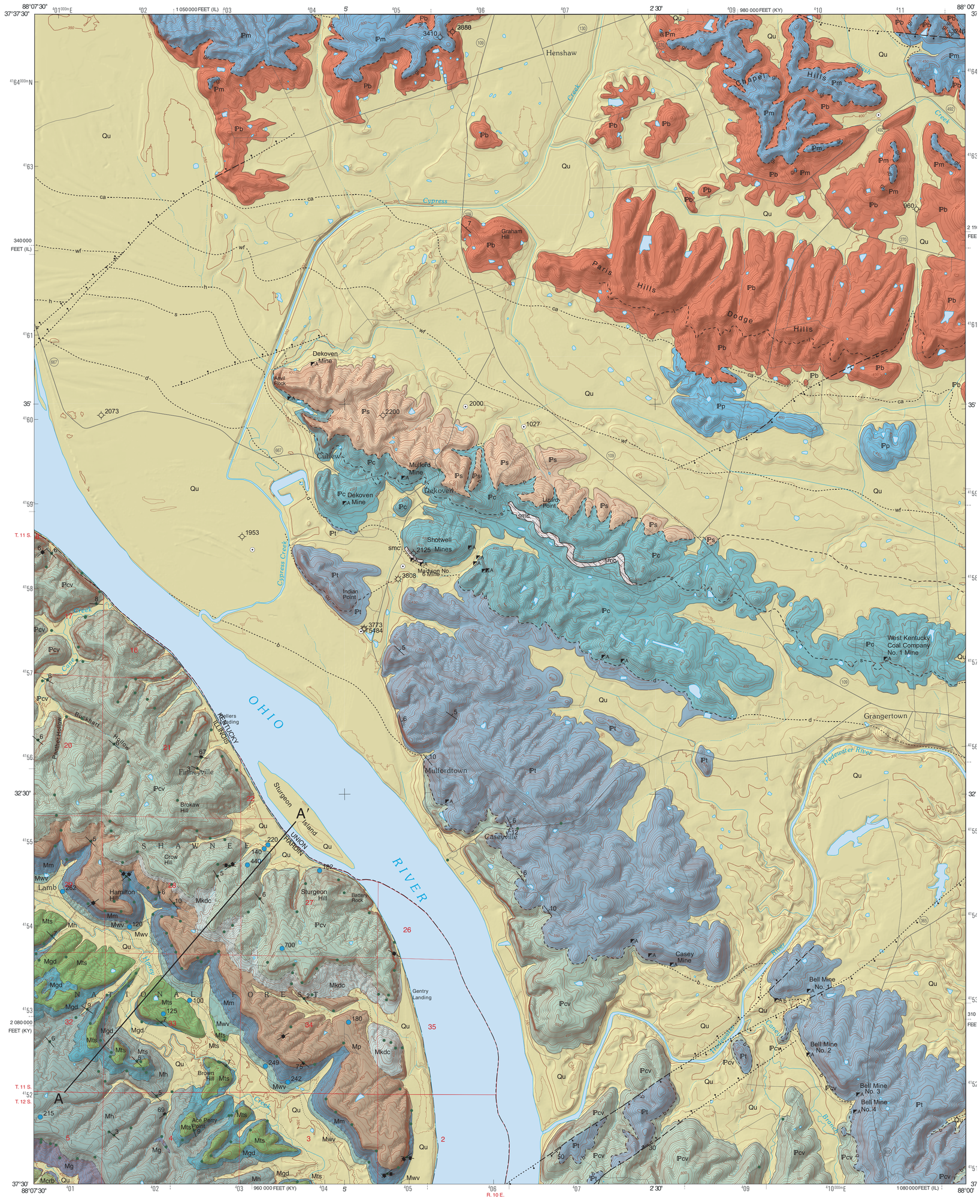
2013



EXPLANATION

- smc — Surface mine (coal mine)
- Quaternary
  - Qu — Quaternary undifferentiated — Holocene and Pleistocene
- Unconformity
- Pennsylvanian
  - Missourian
    - IPm — Mattoon Formation; gl, Geiger Lake Coal
    - IPb — Bond Formation; l, Lisman Coal; ca, Carthage Limestone
    - IPp — Patoka Formation
  - Demoinesian
    - IPs — Shelburn Formation; wf, West Franklin Limestone
    - IPc — Carbondale Formation; h, Herrin Coal; s, Springfield Coal; d, Davis Coal
    - IPt — Tradewater Formation; cu, Curlew Limestone; b, Bell Coal
  - Atokan
  - Morrowan
    - IPcv — Caseyville Formation
- Unconformity
- Mississippian
  - Chesterian
    - Mkdc — Kinkaid Limestone, Degonia Sandstone, and Clore Limestone
    - Mp — Palestine Sandstone
    - Mm — Menard Limestone
    - Mts — Tar Springs Sandstone
    - Mwv — Waltersburg Formation and Vienna Limestone
    - Mgd — Glen Dean Limestone
    - Mh — Hardinsburg Sandstone
    - Mg — Golconda Formation
    - Mcrb — Cypress Sandstone, Ridenhower Formation, and Bethel Sandstone

Symbols

- 40 — Strike and dip of bedding; number indicates degree of dip
- Vertical joint
- Inclined joint; number indicates degree of dip
- A — Abandoned shaft mine
- A — Abandoned slope mine
- Field notes

Drill Holes

- Stratigraphic boring
- Water well
- 125 — Numeric label indicates total depth of boring in feet.

Line Symbols

Long dash where approximately located, short dash where inferred, dotted where concealed

- Contact
- Normal fault; bar and ball on downthrown side
- 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 website. Well and boring records in Kentucky are available on the Kentucky Geological Survey website.

Base map compiled by Illinois State Geological Survey from digital data (2011 US Topo) provided by the United States Geological Survey. Shaded relief and contours derived from USGS NED and Saline Watershed LiDAR elevation data.

North American Datum of 1983 (NAD 83)
Projection: Transverse Mercator
10,000-foot ticks: Illinois Coordinate system, east zone and Kentucky Coordinate System, south zone
1,000-meter ticks: Universal Transverse Mercator grid system, zone 16

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SCALE 1:24,000
1 MILE
7000 FEET
1 KILOMETER

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

Illinois geology based on field work by Mary J. Seid, F. Brett Denny, and W. John Nelson, 2012–2013. Kentucky geology based on Trace (1947) and Martin (2002).

Digital cartography by Jennifer E. Carrell, Coy E. Potts, and Jane E. Johnshoy Domier, Illinois State Geological Survey.

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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.

The Illinois State Geological Survey and the University of Illinois make no guarantee, expressed or implied, regarding the correctness of the interpretations presented in this document and accept no liability for the consequences of decisions made by others on the basis of the information presented here. The geologic interpretations are based on data that may vary with respect to accuracy of geographic location, the type and quantity of data available at each location, and the scientific and technical qualifications of the data sources. Maps or cross sections in this document are not meant to be enlarged.

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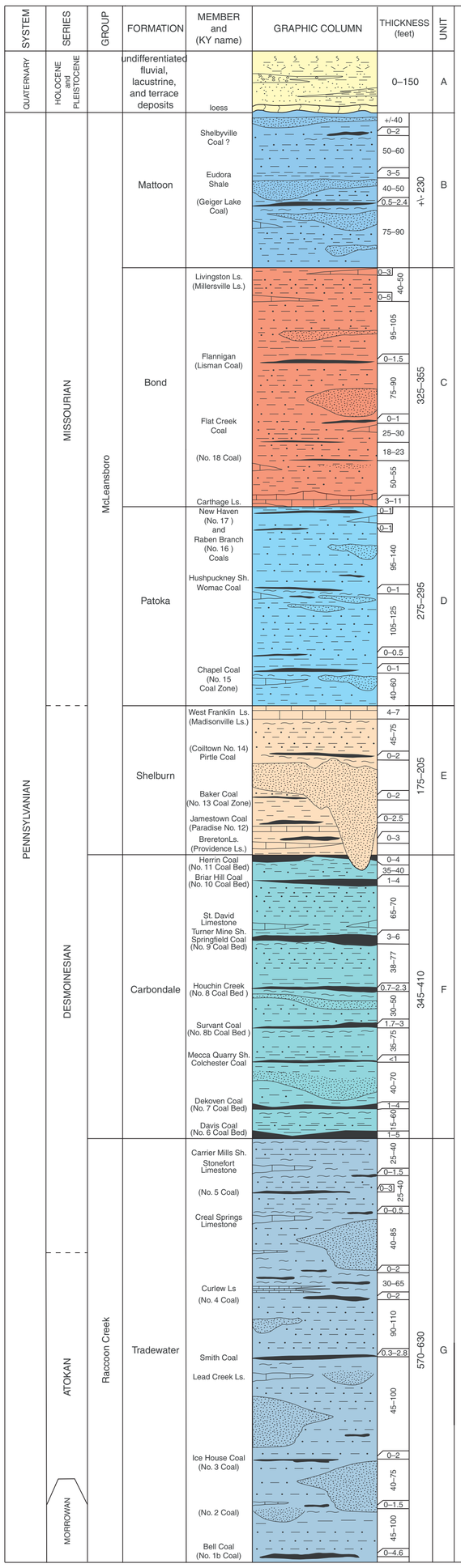
ADJOINING QUADRANGLES
1 Shawneetown
2 Grove Center
3 Morganfield
4 Saline Mines
5 Sturgis
6 Cave-in-Rock
7 Repton
8 Blackford

APPROXIMATE MEAN DECLINATION, 2013
2 1/2°
TRUE NORTH
MAGNETIC NORTH

ROAD CLASSIFICATION
Interstate Route
U.S. Route
State Route
Local road



A Quaternary undifferentiated Sand, clay, silt, and gravel. Clay is medium gray to light gray and may be silty. The sand is light brown medium- to coarse-grained quartz. The gravel in the upland areas is predominantly chert and sandstone pebbles and cobbles derived from nearby outcrops. The sand and gravel along the Ohio River may have been transported considerable distances. There is a lower terrace usually occurring between 340 and 350 feet and an upper terrace above 350 feet. Several other terraces may be present, which results from flooding of the Ohio River. The terraces in higher elevations may be the remnants of dissected Pleistocene age units, whereas the lower younger terraces are Holocene age. These terraces are recognizable as flat geomorphic surfaces but are not distinguished from other surficial deposits on the map. Loess is present in the upland hills and is commonly 5-10 feet thick.

B Mattoon Formation Sandstone, siltstone, shale, limestone, and coal. Sandstone is light-gray fresh, weathers to yellow-brown. It is micaceous, fine- to medium-grained, and well cemented to friable. Cross beds are common and the unit forms bluffs 20 to 25 feet thick. Siltstone is gray to yellow-brown and also micaceous. It is commonly interbedded with the sandstones. The shale is dark gray and may grade into the siltstone and sandstone. All lithologies can be carbonaceous locally where associated with coal seams. Limestone is gray and commonly discontinuous. Several coal seams have been encountered in this unit, and most are thin and discontinuous. The Geiger Lake Coal attains a thickness of just over two feet, but it is reported to be nearly four feet thick to the north of the quadrangle.

C Bond Formation Sandstone, siltstone, shale, limestone, coal and underclay. Sandstone is light-gray when fresh, and weathers to yellow-brown. It is micaceous, fine to medium grained, and well cemented to friable. Siltstone is gray to yellow-brown and commonly micaceous, especially along bedding surfaces. It is commonly interbedded with the sandstones. The shale is dark gray to black, is gradational into the siltstone and sandstone, and can be carbonaceous locally where associated with coal seams. Limestone usually lacks fossils, is yellowish-brown, sandy, and commonly forms discontinuous beds. Several thin and discontinuous coal seams have been encountered in this unit. The top of the Bond is marked by the top of the Livingston Limestone; the base of the formation is marked by the base of the Carthage Limestone.

D Patoka Formation Sandstone, siltstone, shale, limestone, coal and underclay. Sandstone is brown to gray when fresh, weathers to yellow-brown to light gray, is thin to thick-bedded and is commonly interbedded with siltstone. Siltstone and shale are dark gray to yellow-brown, commonly micaceous, especially along bedding surfaces, locally carbonaceous, and locally calcareous above coal beds. Limestone is light to medium gray, coarsely crystalline, and commonly fossiliferous. Several thin and discontinuous coal seams occur in this unit. Underclay is light gray clay and may be slightly silty.

E Shelburn Formation Sandstone, siltstone, shale, limestone, coal and underclay. The sandstone is light to medium gray when fresh, weathers yellow-brown, and locally contains calcareous cement. The sandstones are thin to thick-bedded, attain thicknesses of nearly 30 feet, and contain abundant iron oxides. Siltstone is light gray, micaceous, and weathers yellowish brown to gray. Shale is light gray to black, commonly silty to sandy, and locally carbonaceous. Limestone is very poorly exposed but is probably similar to other limestones in formations above and below. Coal seams are generally thin and discontinuous, attaining a maximum thickness of three feet.

F Carbondale Formation Shale, sandstone, siltstone, coal, and limestone. Shale is a major component of this unit, ranging from gray to dark gray to black. Shales of this formation are typically fissile above the coals and massive, nonfissile underclays below the coals. Sandstones are sub-lithic arenites composed of tan to brown, well sorted to moderately sorted, fine to medium grained, micaceous, and clay-rich from weathered feldspar. Siltstones are light green-gray to brown and range from laminated to thick-bedded. Coal is bright banded and vitreous. Limestones are thin, dark gray to black, argillaceous, ferruginous, brachiopod wackestones and lime mudstones. This formation contains most of the minable coals in the Illinois Basin. The base of the unit is defined by the Davis Coal, which is sharp but conformable with the underlying Tradewater Formation. The top the formation is defined by the Herrin Coal.

G Tradewater Formation Sandstone, siltstone, shale, conglomerate, limestone, and coal. The sandstones are composed of white to tan-brown, fine- to coarse-grained quartz arenite and sub-lithic arenite. Mica is usually present, and a small percentage of clay is present in the impure sandstone. Sandstones are cross-bedded and rippled. Ichnofossils are common and include both burrowing and feeding or grazing patterns. The siltstones are gray, and mica may be present on the bedding surfaces. The shale is gray to black and thinly bedded. The few conglomerate layers were probably reworked quartz pebbles from the underlying Caseyville Formation into which the lower portion of this unit is incised. Thin and discontinuous coal seams are reported in this unit. Where present, the Bell Coal (No. 1b) marks the base of the Tradewater. In places, the Tradewater is unconformable with the underlying Caseyville. Where the lower quartz arenite of the Tradewater is deposited over an upper Caseyville quartz arenite, it is difficult to define the contact.

H Caseyville Formation Sandstone, shale, siltstone, and conglomerate. The sandstone is usually white to gray on fresh surfaces and weathers to a brown or orange-brown. It is composed of sub-rounded to subangular fine- to coarse-grained quartz arenite that has a sugary appearance. The Caseyville is commonly cross-bedded but also forms thin beds and massive ledges. Outcrops are usually well-exposed bluffs showing diverse fluvial and tidal patterns, including stacking channels and unidirectional and bidirectional cross-beds. Iron-rich "liesegang bands" may be very common in some sandstone outcrops. Occasional plant remains, such as stigmaria, are rarely found in the sandstone but are more common within the shale. The shale is dark gray, thinly bedded, and laminated. Plant debris is common, and iron nodules or concretions may be present. Siltstone occurs as thin beds, usually interbedded with shale. Conglomerates occur as shale pebbles within sandstone and more commonly as quartz pebbles within coarse-grained quartz sandstone. The quartz pebbles are well-rounded and are usually white. The quartz pebbles may be several inches in diameter. The lower contact is unconformable with the Mississippian units. Locally, the Caseyville Formation rests atop the Menard Limestone.

I Kinkaid Limestone Limestone, shale, and mudstone. Where this unit is well developed, it consists of three members, which in descending order are the Goreville Limestone, Cave Hill Shale, and Negli Creek Limestone. The Goreville has probably been eroded in this area and the uppermost member of the Kinkaid present in this area is the Cave Hill Member. The bryozoan Archimedes can be abundant in the upper beds, and *Pterotocrinus* wing plates have been described and studied in the formation. The Cave Hill is composed of shale and mudstone with thin beds of limestone. The shale is dark gray, soft, fissile, calcareous and may be laminated. The shale may grade to limestone, which is dominantly lime mudstone. The Negli Creek is primarily a dark gray lime mudstone to wackestone. Fossils include brachiopods, fenestrate bryozoans, blastoids, bellerophontid gastropods, and *Girvanella* spheroids. The lower contact is generally sharp but is rarely exposed.

J Degonia Formation Shale, sandstone, and siltstone. The Degonia is mostly shale that is dark gray, greenish gray, and reddish gray, partly silty and moderately to strongly fissile. Greenish gray siltstone to silty mudstone in the middle of the Degonia may be massive. Sandstone is light brown, very fine-grained, clean quartz arenite with thin, wavy bedding and ripple marks. More distinctive is very fine sandstone to siltstone that is dark olive to greenish gray, weathering rusty orange. This rock has planar lamination and erodes out as long rectangular and wedge-shaped blocks bounded by joints. The unit is thin and poorly exposed and is mapped together with the underlying Clore Formation. The contact with the Clore is sharp to gradational.

K Clore Formation Limestone, shale, sandstone, siltstone, and chert. Limestones are mainly lime mudstones that are several feet thick, medium-dark gray to olive-gray, and weather to a light gray or orange-brown. Spiriferids, productid, and compositid brachiopods are common. The Ford Station Limestone Member is dark gray, calcareous, and fossiliferous limestone; its shaly portion ranges from platy clay shale to silty shale with laminae and thin interbeds of light gray siltstone and limestone. The Tygett Sandstone Member is light gray to light brown, very fine- to medium-grained quartz arenite. The sandstone is thin-bedded with wavy ripple-marked bedding surfaces. The sandstone grades downward to siltstone and shale. The Cora Member contains thin beds and lenses of highly fossiliferous limestone and greenish gray, silty, and weakly fissile shale or mudstone. A limestone bed at the top is a dark gray, very argillaceous brachiopod-bryozoan lime mudstone to wackestone that weathers yellowish gray. The lower contact is sharp but conformable.

L Palestine Sandstone Sandstone, siltstone, shale, mudstone, and minor coal. Sandstone is light gray to white, very fine- to fine-grained quartz arenite, and forms thin, tabular beds. The base of the formation is marked by a prominent sandstone bluff that is 10 to 25 feet thick. The sandstone bluff is massively bedded, cross-bedded and pock-marked on weathered faces. The shale and siltstone is white to brown, slightly micaceous, and contains minor amounts of interstitial clay and carbonaceous debris. The basal contact was not observed but is probably conformable.

M Menard Limestone Limestone and shale. The upper limestone is called the Allard Limestone Member. It is usually a gray lime mudstone and fine to coarse skeletal wackestone and packstone with thin shale interbeds and scattered chert nodules. The Scottsburg Limestone Member is dominantly gray to greenish gray shale with few beds of light to medium gray, massively bedded lime wackestone. The lowest member is the Walche Limestone Member, which is composed of argillaceous lime mudstone, wackestone, and packstone, and thin shale interbeds. Fossils within the Menard include brachiopods, bryozoans, gastropods, and disarticulated crinoidal debris. Where found in the shale layers above the Walche, the crinoid *Pterotocrinus menardensis* is diagnostic of this limestone. The lower contact is conformable.

N Waltersburg Formation Sandstone, shale, and siltstone. The unit is mainly dark gray, thinly laminated clay shale that becomes silty upward and grades into siltstone. Sandstone is olive-gray to brownish gray, very fine-grained, thinly bedded, and contains up to 5% very fine black grains. Thin coal and greenish shale may be present near the top of this unit. The unit is poorly exposed.

O Vienna Limestone Limestone, shale, and chert. Limestone is largely dark gray to brownish gray, siliceous lime mudstone and wackestone. A few thin interbeds of sandy dark gray shale are present. Dark brown chert nodules are numerous and commonly weather with a porous rind. The white to brown weathered, porous blocks of fossiliferous chert are diagnostic. The unit is poorly exposed.

P Tar Springs Sandstone Sandstone, siltstone, shale, and thin coal. Sandstone is white when fresh, brown when weathered, very fine- to fine-grained quartz arenite. Bedding ranges from one inch to one foot thick and has ripple marks, cross-bedding, small load casts, indistinct burrows, and shale rip-up clasts. Shale and siltstone are medium to dark gray, micaceous, and thinly laminated. Thin coal commonly less than one foot thick occurs near the top; the coal rests on dark gray mudstone. Dark gray claystone also occurs in the lower Tar Springs. The lower contact is sharp in some localities, but may grade into the underlying unit.

Q Glen Dean Limestone Limestone and shale. The unit is generally composed of an upper limestone, a middle shale, and a lower limestone. The upper limestone is light to medium brownish gray coarsely crinoidal packstone to grainstone, contains cross beds, and in places has a reddish tint. Fossils include crinoidal debris, fenestrate bryozoans, brachiopods, blastoids, and corals. The middle shale is thin, medium to dark gray and greenish gray, fossiliferous, and calcareous. The middle shale beds grade into the lower limestone. The lower limestone is medium gray wackestone, with dominant crinoids and bryozoans, and a dwarfed crinoid fauna in the lower 5 feet. The lower contact appears to be gradational.

R Hardinsburg Sandstone Sandstone, siltstone, and shale. The lower Hardinsburg contains two sandstone bodies. The sandstone is white to light gray, very fine- to medium-grained quartz arenite that is thinly bedded to massive. Ripple marks and low-angle cross bedding are common. Siltstone and shales are medium to dark gray or greenish gray and are interbedded, rippled, and laminated. The lower contact is generally conformable with the underlying unit.

S Golconda Formation Limestone, shale, and mudstone. The formation is divided into three members. The Haney Limestone Member at the top is light brownish gray, fine to coarse crinoidal wackestone to cross-bedded grainstone, and is in places peloidal. *Pterotocrinus capitalis* is highly characteristic of the Haney Limestone Member, and the wing plates of this crinoid are commonly found in the shaly part of this member. The lower part of the Haney comprises limestone and shale interbedded in roughly equal proportions, which grade into the underlying Fraileys Shale Member. The Fraileys Shale Member is largely olive gray, silty, calcareous, and thinly fissile clay shale with limestone beds of varied texture as thick as several feet. Red shale or mudstone may occur near the top. The Beech Creek Limestone Member at the base is gray to brown, partly dolomitic, argillaceous limestone. The lower contact is sharp.

T Cypress Formation Sandstone, shale, and siltstone. The sandstone is white to light brown, fine- to medium-grained subangular quartz arenite, in massive rounded beds. Low-angle cross beds, healed soft-sediment normal faults, and scour-and-fill channel sets occur. The upper portion contains thin beds of siltstone and interbedded sandstone and shale. The lower portion is primarily thickly bedded bluff-forming sandstone. A red-and-green shale may be present near the top of the formation. Locally, the contact with the underlying unit may be unconformable.

U Ridenhower Formation Shale, limestone, and sandstone. The shale is dark gray with a green tint and may be fossiliferous. It is thinly bedded and silty to finely sandy. Limestone up to several feet thick is locally present at the top of this formation. This unit is highly variable but is dominantly dark gray shale with interbeds of gray-green siltstone and fine-grained sandstone containing molds of brachiopods. It is poorly exposed. The basal contact is conformable.

V Bethel Sandstone Sandstone with minor shale. Sandstone is white to light gray, fine- to coarse-grained quartz arenite. The shale occurs as greenish thin interbeds between thicker beds of sandstone. Near the base, shale and quartz pebbles may be present.