

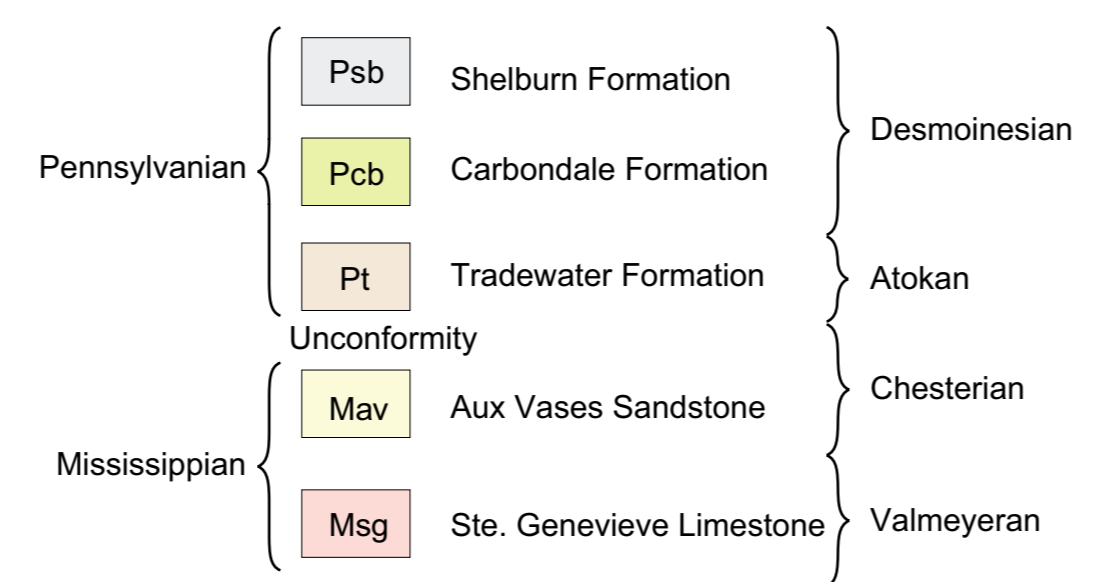
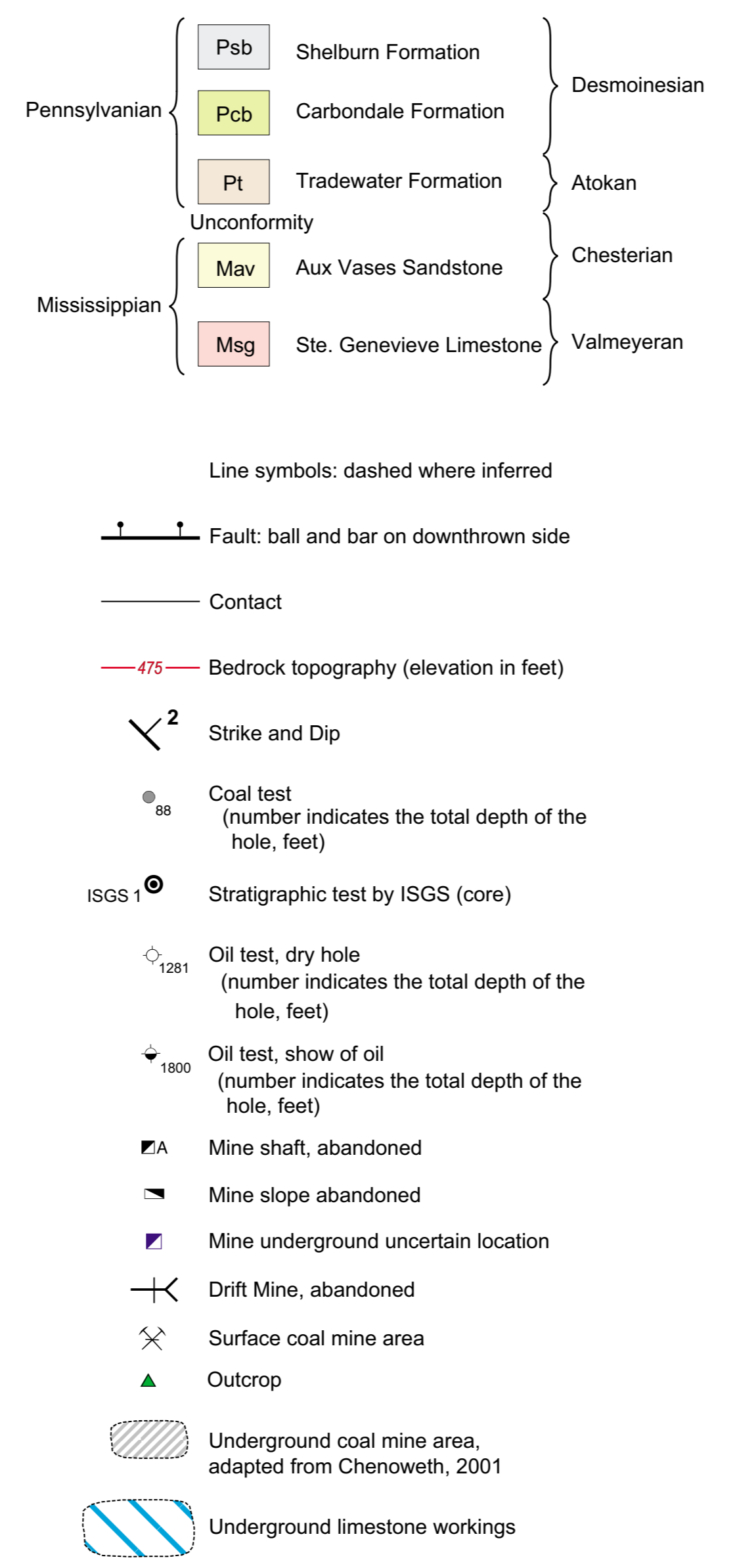
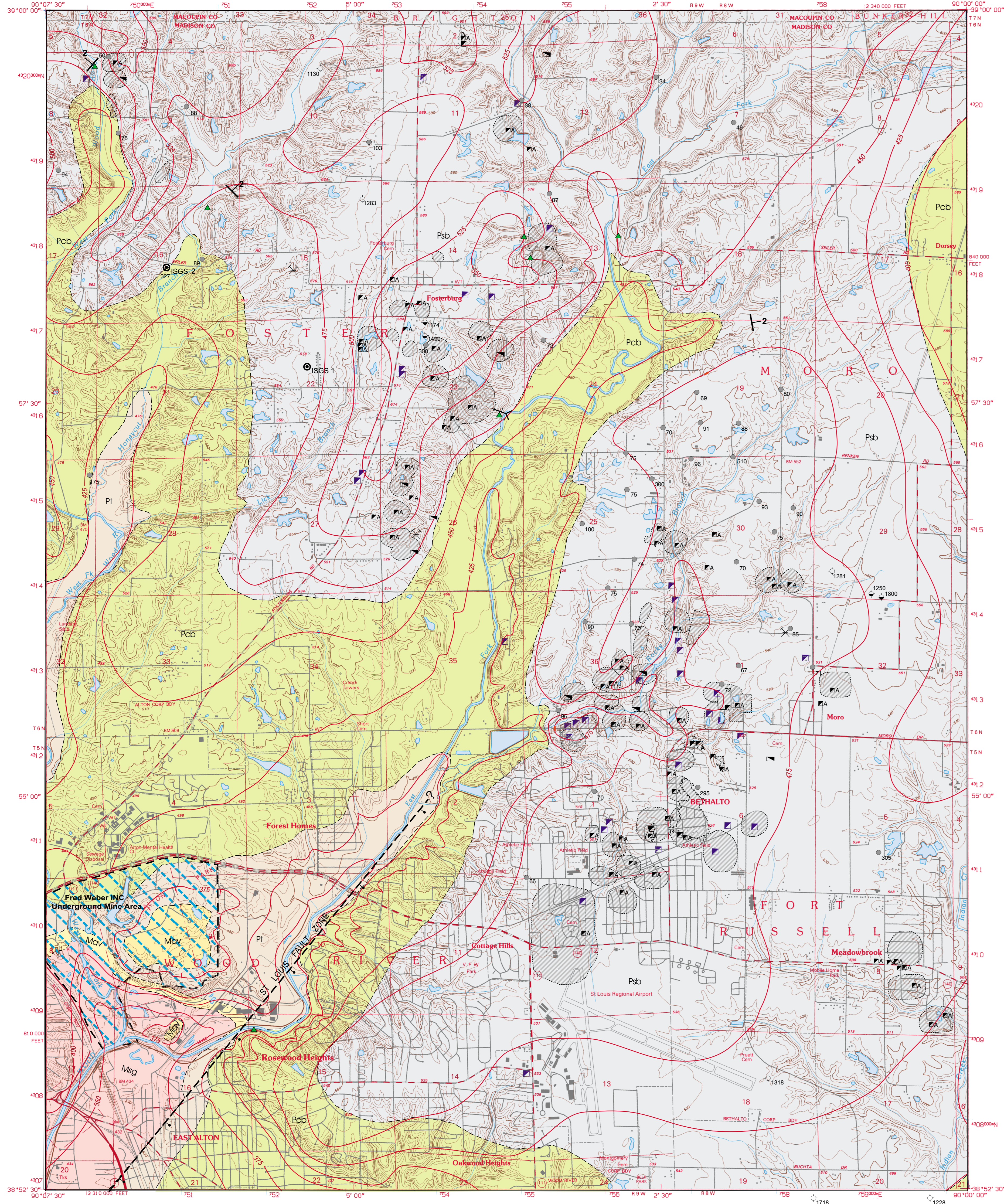
# BEDROCK GEOLOGY OF BETHALTO QUADRANGLE

## MADISON AND MACOUPIN COUNTIES, ILLINOIS

Department of Natural Resources  
ILLINOIS STATE GEOLOGICAL SURVEY  
William W. Shotts, Chief

Illinois Preliminary Geologic Map  
IPGM Bethalto-BG

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2004



- Line symbols: dashed where inferred
- Fault: ball and bar on downthrown side
- Contact
- Bedrock topography (elevation in feet)
- Strike and Dip
- Coal test (number indicates the total depth of the hole, feet)
- Stratigraphic test by ISGS (core)
- Oil test, dry hole (number indicates the total depth of the hole, feet)
- Oil test, show of oil (number indicates the total depth of the hole, feet)
- Mine shaft, abandoned
- Mine slope abandoned
- Mine underground uncertain location
- Drift Mine, abandoned
- Surface coal mine area
- Outcrop
- Underground coal mine area, adapted from Chenoweth, 2001
- Underground limestone workings

### Introduction

Bedrock Geology of Bethalto Quadrangle was prepared as part of a statewide 1:24,000 scale geologic mapping program by the Illinois State Geological Survey (ISGS). This map was funded in part through a contract with the United States Geological Survey. Bedrock geologic maps may aid in exploration for economic minerals including coal, petroleum and natural gas, and may facilitate regional planning by locating groundwater resources and aggregate materials for infrastructure support.

The Bethalto 7.5' Quadrangle is located about 20 miles northeast of St. Louis, Missouri and is dominantly composed of Middle Pennsylvanian (Desmoinesian) strata. Regional dip is to 3 degrees east to the northeast and the strike is north-south.

Natural bedrock exposures are rare due to cover by Quaternary glacial deposits of the Glasford Formation and windblown deposits of the Peoria and Roxana Silt. The area is dissected by the southwest-flowing East Fork of the Wood River. Near the confluence of the West and East forks of the Wood River in the southwest corner of the map, Pennsylvanian bedrock exposures occur on the east bank of the East Fork (NW Sec. 15, T5N, R9W). Another outcrop is near the center of the map on the west bank of the East Fork (SE Sec. 23, T6N, R9W). Here the Herrin Coal can be observed along with early drift mine tunnels that date from the late 1800s and early 1900s. A tributary to the East Fork (Rocky Branch) also exposes Pennsylvanian strata. In addition, a few outcrops occur in small tributaries in the northern reaches of the East Fork and at the headwaters of the West Fork, in the northwest corner of the quadrangle (NE Sec. 8, T6N, R9W). All natural outcrops contain rocks of mid-Pennsylvanian age.

Man-made exposures occur in the southwest corner of the map. North of East Alton, limestone and sandstone of Chesterian (Upper Mississippian) age can be seen in the entrance of an underground limestone mine that extends down dip to the east below Alton Park, south of State Route 140.

There is 180 feet of relief in the quadrangle. The elevations at the northern end are up to 600 feet above mean sea level. The southwestern corner of the quadrangle has the lowest elevation at 420 feet on the banks of the Wood River. The topography is gently rolling to flat in the southeastern part of the quadrangle.

### Geologic History

The oldest exposed bedrock is the Mississippian Ste. Genevieve Limestone. Wackestones and lime-mudstones locally are developed and probably were deposited in quiet-water inter-shoal areas on a marine shelf. The Aux Vases Sandstone locally is disconformable on the Ste. Genevieve Limestone. Local reworked echinoderm fragments and tidal laminations in the Aux Vases indicate a marine origin. The Absaroka unconformity, representing persistent subaerial exposure and erosion, separates the Aux Vases Sandstone (Mississippian) from the overlying Tradewater Formation (Pennsylvanian) on the west side of the quadrangle. By contrast, the Paint Creek Formation underlies the Tradewater Coal on the east side, indicating a gain of 95 feet of Chesterian strata. A borehole just off the map area in the adjacent Wood River Quadrangle (NW SE NW Sec. 20, T5N, R9W) penetrated the Paint Creek, Yanketown, and Renault Formations before entering the Aux Vases.

Above the Absaroka unconformity, Middle Pennsylvanian units include

the Tradewater, Carbondale, and Shelburn Formations. Much of the post-Mississippian erosional surface was filled by the Tradewater Formation and ranges from 35 to 120 feet thick across the area. The depositional environment initially was fluvial, but it contains indications of marine reworking at the top as evidenced by tidal rhythmites. During the deposition of much of the Carbondale Formation, the area was fairly low, flat, and swampy. The depositional environment of the Shelburn was similar to that of the Carbondale.

### Structural Geology

Near-vertical faults are present in the Ste. Genevieve Limestone in the Fred Weber INC limestone mine in the southwestern corner of the quadrangle. The faults indicate only two to three feet of displacement within the formation (down to the east southeast). One fault in this mine strikes N30E and shows offsets of 2 to 3 feet down to the west. These small-scale structures are thought to be part of the St. Louis Fault Zone (SLFZ), a north-northeast-trending structure first described by Frank (1948). He discussed possible structural control on the Mississippi River, and well data indicates 150 feet of downward displacement on the west side of the SLFZ. Well data from the southern part of the Bethalto Quadrangle suggest that strata are downropped 200 feet on the east side of the fault in Illinois. The change of relative offset from 150 feet down in Missouri to 200 feet down to the east (farther north along the structure in Illinois) suggests scissoring along the SLFZ.

More drilling and seismic work will be needed to verify the continuation of this fault zone in Illinois. Mid-Pennsylvanian strata are unconformable, and some apparent offset may be due to erosion on the east side of the fault. Pennsylvanian strata do not appear to be displaced by the SLFZ. Movements are thought to be post- or late Chesterian based on well data. Mississippian strata strike predominantly north-south with dips of 2E to 3E east, whereas Pennsylvanian rocks strike northwest and dip basinward 2E northeast, indicating a low-angle unconformity between the Mississippian and Pennsylvanian rocks.

### Economic Geology

Coal Many coal mines were active from the 1860s through the early 1900s in the Bethalto Quadrangle. Most were small drift mines, although some were underground shaft mines in the Herrin (# 6) Coal. Over 18 mines were documented east and south of Fosterburg, Illinois (Smith, 1961). Three small mines were located in Sec. 9, T 6 N, R9 W, but the largest cluster of mines was east of the East Fork of Wood River, and north of Bethalto, Illinois where more than 25 mines were active. No coal mines currently are active.

Outcrops in the northwest corner of the quadrangle on the West Fork of the Wood River expose three feet of Herrin Coal, six feet of gray shale and three feet of limestone. This is the mapped contact between the Carbondale and the overlying Shelburn Formation. The Herrin is a black, vitreous, and bituminous coal with only the upper part exposed in the creek. The gray shale and overlying Breerton Limestone is the basal part of the Shelburn Formation.

The only mine in the lower Colchester (# 2) Coal is in Sec. 14, T5N, R9W. Outcrops of this coal can be seen in the northern part of Section 14, along the bank of the East Fork of the Wood River.

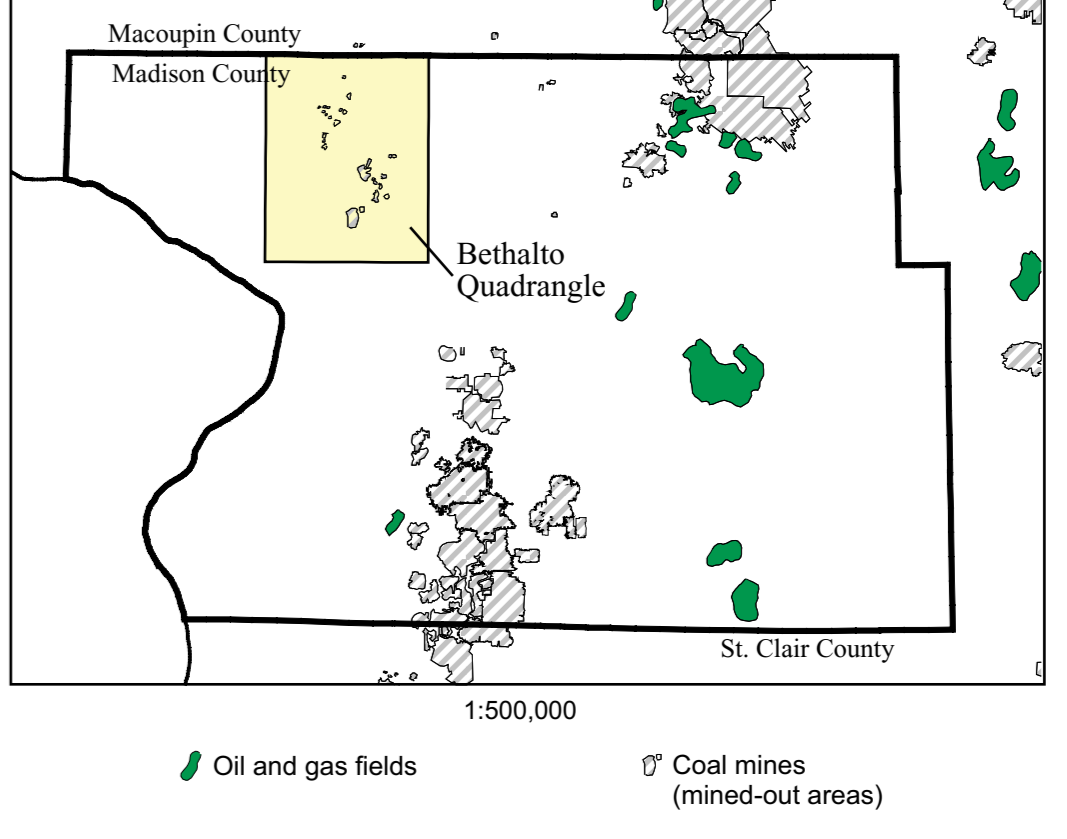
**Oil and Gas**  
Numerous oil wells drilled in the Bethalto Quadrangle were all dry and abandoned. A well drilled in 1943 in NE NW Sec. 23, T6N, R9W had shows of oil in the saline zone of the Ste. Genevieve Limestone; oil stains in the lower dolostone of the St. Louis Limestone, and a show of oil in a Devonian limestone at 1,169 feet total depth was 1,174 feet. Other tests in 1945 in Section 23 and had similar multiple shows, but all were dry and abandoned. No oil or gas has been produced commercially from the Bethalto Quadrangle.

**Limestone**  
Limestone currently is mined underground in the southwestern corner of the Bethalto Quadrangle by Fred Weber, INC. It is used as limestone aggregate for road metal, construction, and agricultural lime. The Ste. Genevieve Limestone and the St. Louis Limestone are the mined units. No other quarries are operating in the mapped area.

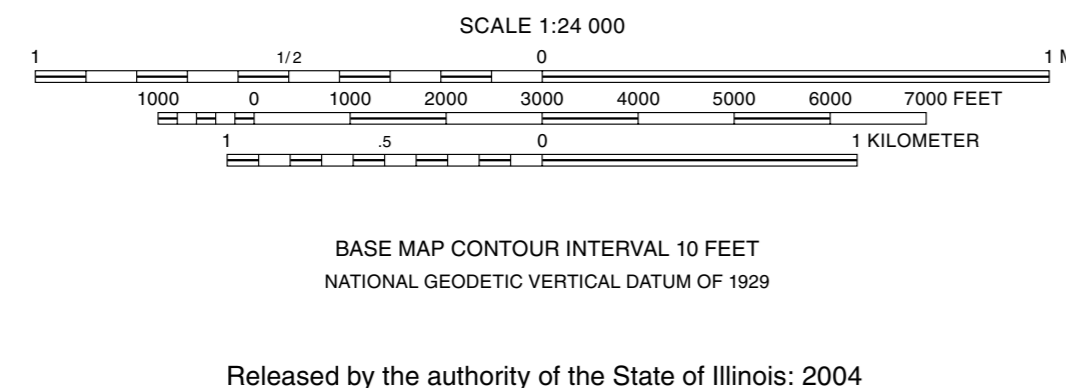
### References

- Chenoweth, C., 2001, Mined Areas of Illinois, 7.5 minute Quadrangle Series, Bethalto quadrangle, Illinois State Geological Survey, map with report.
- Frank, A. J., 1948, Faulting on the northeast flank of the Ozarks (Missouri) [in:] Geological Society of America Bulletin, v. 59, no. 12, p. 1322.
- Harrison, R. W., 1997, Bedrock Geologic Map of the St. Louis 30' x 60' Quadrangle, Missouri and Illinois, U.S.G.S. I-2533, Miscellaneous Investigation Series, 2 plates and text.
- Smith, W. H., 1961, Stripplable Coal Reserves of Illinois Part 3: Illinois State Geological Survey Circular 311, 4 plates, p. 40.

### Petroleum and Coal Resources of Madison County



Base map compiled by Illinois State Geological Survey from digital data provided by the United States Geological Survey. Topography compiled from imagery dated 1948. Revised and updated from imagery dated 1952 and 1993. Map edited 1996.  
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



Geology based on fieldwork by J. Devera, 2003.  
Digital cartography by F.B. Denny, J. Dornier and J. McLeod, Illinois State Geological Survey.  
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