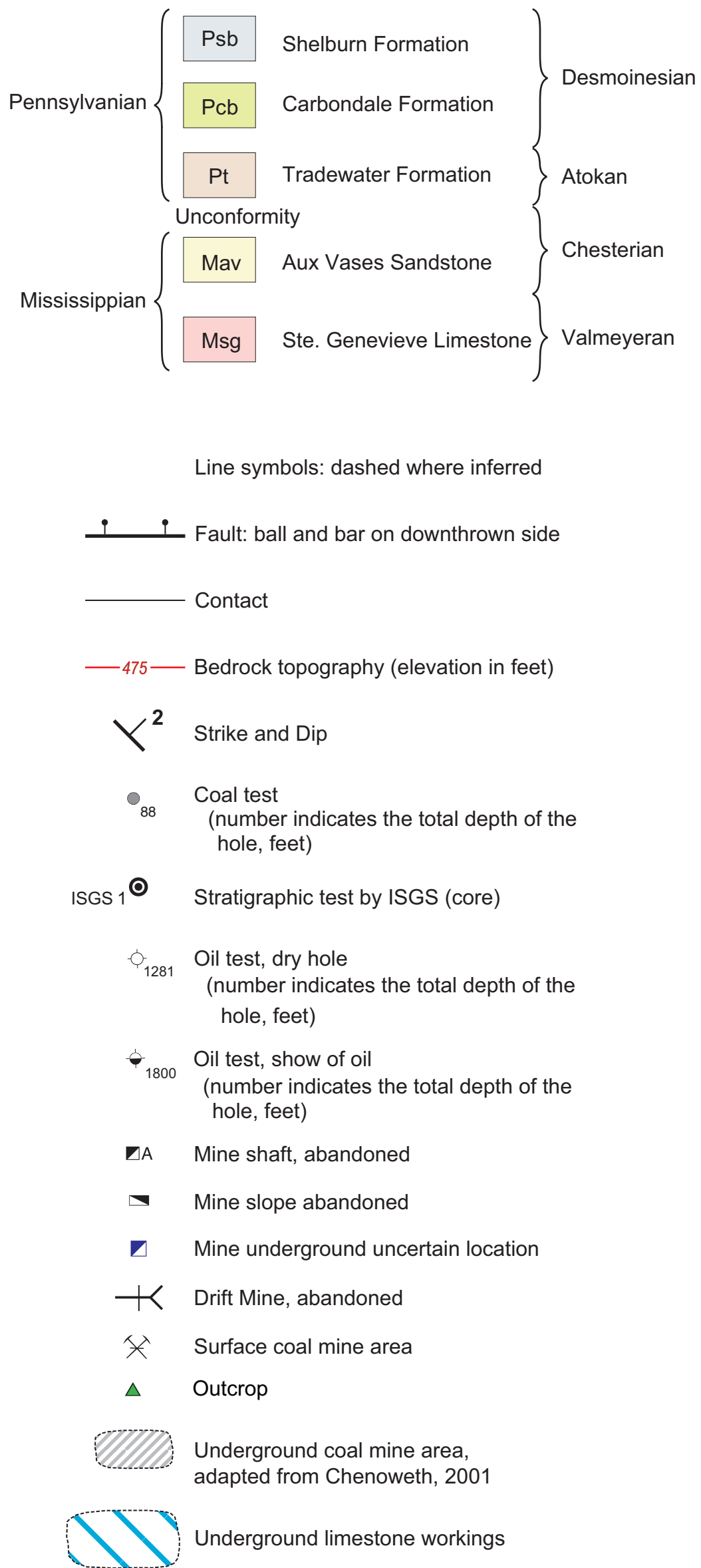
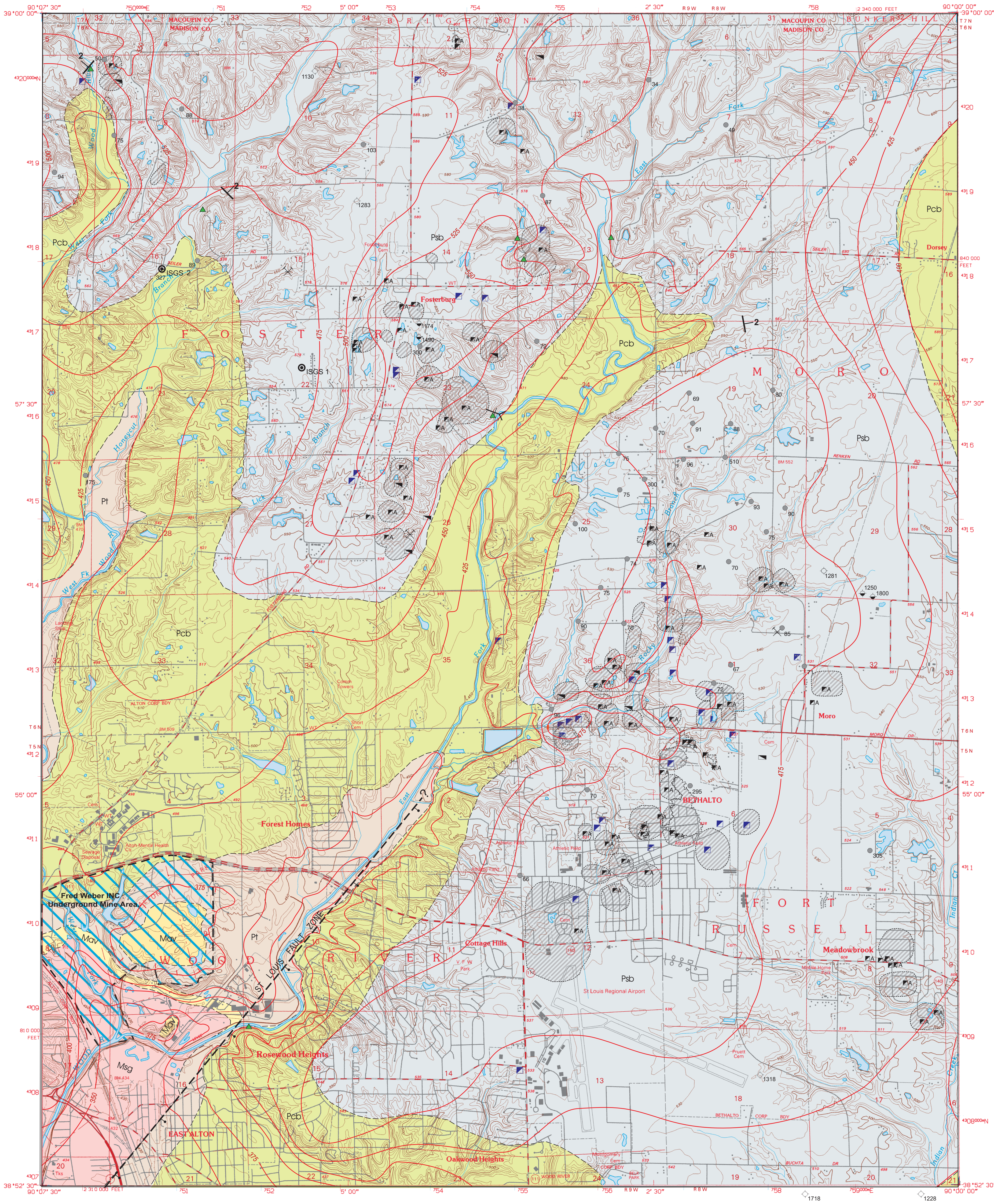


BEDROCK GEOLOGY OF BETHALTO QUADRANGLE
MADISON AND MACOUPIN COUNTIES, ILLINOIS

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

Joseph A. Devera
2004

Illinois Preliminary Geologic Map
IPGM Bethalto-BG



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 1953. 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
Recommended citation:
Devera, J.A., 2004. Bedrock Geology of Bethalto Quadrangle, Madison and Macoupin Counties, Illinois. Illinois State Geological Survey, Illinois Preliminary Geologic Map, IPGM Bethalto-BG, 1:24,000.

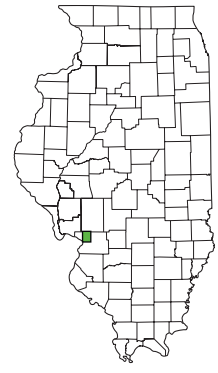
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Geology based on fieldwork by J. Devera, 2003.

Digital cartography by F.B. Denny, J. Dornier and J. McLeod, Illinois State Geological Survey

This Illinois Preliminary Geologic Map (IPGM) is a lightly edited product, subject to less scientific and cartographic review than our Illinois Geological Quadrangle (IGQ) series. It will not necessarily correspond to the format of IGQ series maps, or to those of other IPGM series maps. Whether or when this map will be upgraded depends on the resources and priorities of the ISGS.

The Illinois State Geological Survey, the Illinois Department of Natural Resources, and the State 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/technical qualifications of the data sources. Maps or cross sections in this document are not meant to be enlarged.



1	2	3
4	5	6
7	8	

ADJOINING QUADRANGLES
1 Brighton
2 Brighton
3 Bunker Hill
4 Alton
5 Prairieboro
6 Columbia Bottom
7 Wood River
8 Ellettsville

APPROXIMATE MEAN DECLINATION, 2004

ROAD CLASSIFICATION
Primary highway, hard surface
Secondary highway, hard surface
Light-duty road, hard or improved surface
Unimproved road
Interstate Route
U.S. Route
State Route

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 2 to 3 degrees east to the northeast and the strike is northwest.

Natural bedrock exposures are rare due to cover by Quaternary glacial deposits of the Glasford Formation and windblown deposits of the Peoria and Roxana Silts. 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 Formation on the east side, indicating a gain of 95 feet of Chesterian strata. A benchhole just off the map area in the adjacent Wood River Quadrangle (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 Shelbyburn Formations. Much of the post-Mississippian erosional surface was infilled 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 Shelbyburn 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 along this fault zone in the eastern part of the St. Louis 30' x 60' Quadrangle, Missouri. Harrison (1997) showed the fault zone extending into adjacent parts of Illinois. Most of the SLFZ lies beneath the alluvium of 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 strikes predominantly north-south with dips of 2E to 3E east, whereas Pennsylvanian rocks strike northwest and dip basinward 2E northwest, 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 Bethalto, 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 northwestern 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 Shelbyburn Formation. The Herrin is a black, vitreous, and bituminous coal, with only the upper part exposed in the creek. The gray shale and overlying Bererton Limestone is the basal part of the Shelbyburn 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 tests 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 oolitic 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.

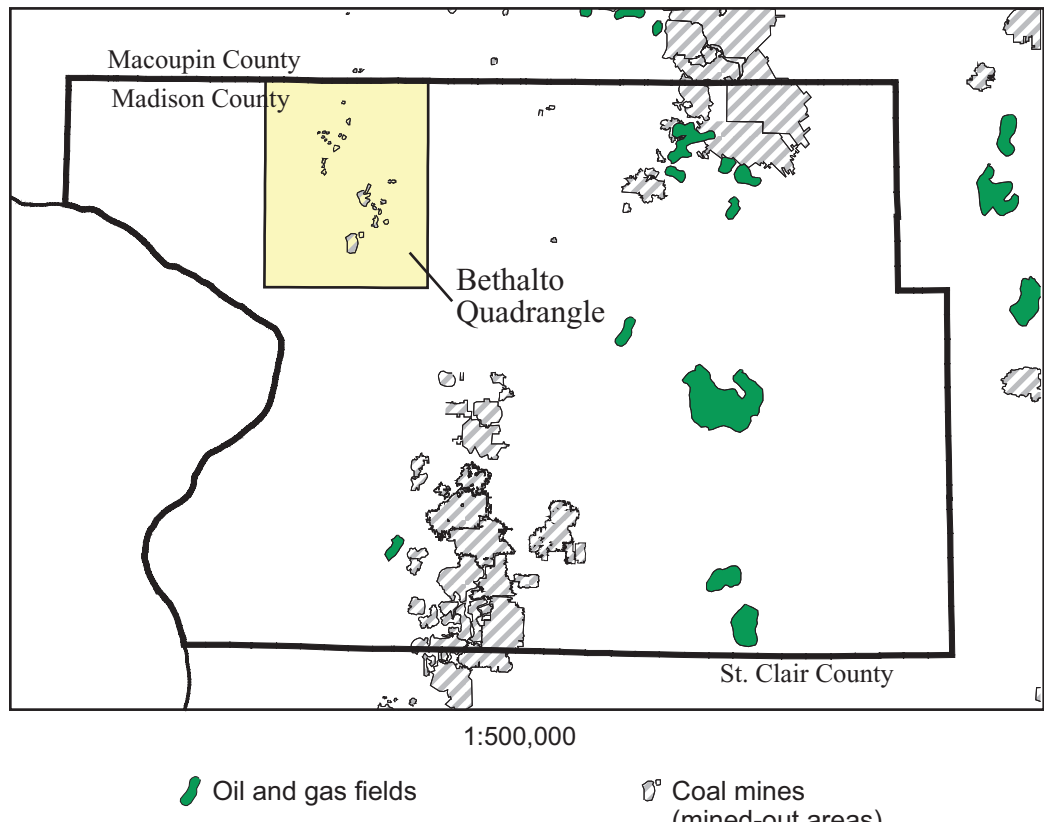
Limestone
Limestone currently is mined underground in the southwestern corner of the Bethalto Quadrangle by Fred Weber, INC. It is used as limestone aggregate for road metal, construction, and agricultural lime. The Ste. Genevieve Limestone and the St. Louis Limestone are the mined units. No other quarries 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) [abs.]. Geological Society of America Bulletin, v. 59, no. 12, p.1322.
Harrison, R. W., 1997. Bedrock Geology 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. Strippable Coal Reserves of Illinois Part 3: Illinois State Geological Survey Circular 311, 4 plates, p. 40.

Petroleum and Coal Resources
of Madison County

(areas where resources have been produced)



SYSTEM	SERIES	FORMATION	MEMBER/SUBUNIT	STRATIGRAPHIC COLUMN	THICKNESS (feet)	DESCRIPTION
Pennsylvanian	Desmoinesian	Shelbyburn	Passa Ls. Danville Coal Bregenton Ls. Herrin Coal		100-150	A. Shelbyburn Formation (claystone, shale, siltstone, limestone, sandstone, and coal); <i>claystone</i> light or medium to dark gray, variegated, red and green in places where associated with Passa Limestone, a black <i>shale</i> above Danville Coal; <i>siltstones</i> gray to gray green, laminated to thick bedded, commonly micaceous; <i>limestone</i> light gray to dark gray, argillaceous lime mudstone and wackestone, with echinoderms and brachiopods; fusulines common in lower Passa; <i>sandstone</i> rare, but where present, light gray to tan, medium-grained, micaceous quartz arenite; <i>coal</i> thin and discontinuous, bituminous and commonly overlain by a thin black shale and red and green claystones and a limestone; <i>limestone</i> (Bererton Limestone) dark gray, micritic, ferruginous;
		Carbondale	Hanover Ls.		130-150	B. Carbondale Formation (shale, claystone, sandstone, limestone, and coals); <i>shale</i> (Anna Shale) marine, black; <i>coal</i> (Herrin Coal) near top of formation, with a bluish gray argillaceous layer near its base ("blue band"); <i>claystones</i> light gray to white, with carbonized root remains below coals; <i>sandstone</i> sporadic, sometimes gray, medium-grained, thick bedded quartz arenites; <i>limestone</i> (Hanover Limestone) dark to medium gray, nodular, up to three-feet thick, a persistent bed, argillaceous, brecciated, containing primarily brachiopods; <i>limestone</i> (Oak Grove Limestone) lithologically distinct, a sequence of thin lime mudstones interbedded with thin dark gray and black shales; <i>coals</i> (Herrin and Colchester Coals) both vitreous (glassy); <i>coal</i> (Colchester Coal) near base of formation, thinner than Herrin
		Tradewater	Oak Grove Ls. Coalchester Shelburn Ls.		35-120	C. Tradewater Formation (limestone, sandstone, siltstone, shale and conglomerate); <i>limestone</i> (Sachem Limestone) light gray, commonly nodular or brecciated, contains dark gray fragments, marine fossilisandstone predominantly micaceous quartz arenites, some clay or altered feldspar sublitharenites, fine to coarse-grained, cross bedded in places; <i>siltstones</i> gray to tan with abundant mica, laminated to thick-bedded; <i>shale</i> light gray to dark gray with carbonaceous debris, typically interbedded with siltstone; <i>conglomerate</i> rare, with chert gravel and pebbles and coarse grained to medium grained sand; fossil plant debris within conglomerate mainly at or near base of unit
						D. Paint Creek Formation (claystone, limestone, and sandstone); <i>claystone</i> variegated, red and green to light gray, typically soft and non fissile, scattered marine fossils (crinoid and blastoid calyxes and other echinoderm fragments, brachiopods, rugose corals, and fenestrate bryozoans); <i>limestone</i> medium to dark gray, primarily fossil packstones and wackestones with shale interbeds, locally with fine grained quartz and stringers; upper limestone locally with pink chert-replaced echinoderms; basal limestone mainly dark greenish gray, but occasionally red, green, and brownish shales
Mississippian	Chesterian		Paint Creek Yanketown Renault Aux Vases		0-45 0-25 0-20 45-60	E. Yanketown Sandstone (sandstone, shale, and chert); <i>sandstone</i> very fine grained, quartz-rich, white, red, and gray-green, in places preserved as chert; stacked ripple-bedded chert structures containing very fine angular quartz grains common; <i>shale</i> typically red claystone at top of formation but locally variegated green and gray; can grade into underlying limestone
			St. Genevieve Limestone		60-80	F. Renault Limestone (limestone, sandy limestone, and limestone conglomerate); <i>limestone</i> light to medium gray packstones and grainstones, with oolites, fossils and diagnostic red echinoderm fragments, quartz and within limestone, and in places carbonate conglomerates at the base
						G. Aux Vases Sandstone (sandstone and shale; sandstone); <i>sandstone</i> clean, white, well sorted, quartz arenite with crossbedding and current ripples; green <i>shales</i> and green clay <i>drapes</i> near upper part of <i>sandstone</i> ; lower part of <i>sandstone</i> calcareous, locally unconformable with underlying unit
			St. Louis Limestone		200-250	H. St. Genevieve Limestone (limestone and sandstone); <i>limestone</i> , oolitic and echinodermal, chalky white, with crossbedded grainstones or oolites in uppermost part; about seven feet of very fine grained <i>sandstone</i> also within upper part of formation, light greenish gray, bioturbated, with calcareous cement; lower formation predominantly echinodermal packstones with tightly packed coated grains and thin greenish shale laminae; stylolites common, with local chert and greenish oololites also in lower beds
						I. St. Louis Limestone (limestone, chert and dolostone); <i>limestone</i> , predominantly thin-bedded lime mudstones, dark gray to light gray, fossil wackestone to packstone, conchoidal fracture, stylolites common; abundant white to dark gray <i>chert</i> nodules and stringers; yellowish <i>dolostone</i> and breccia in middle of formation; colonial coral <i>Acrocyathus</i> common in lower limestone