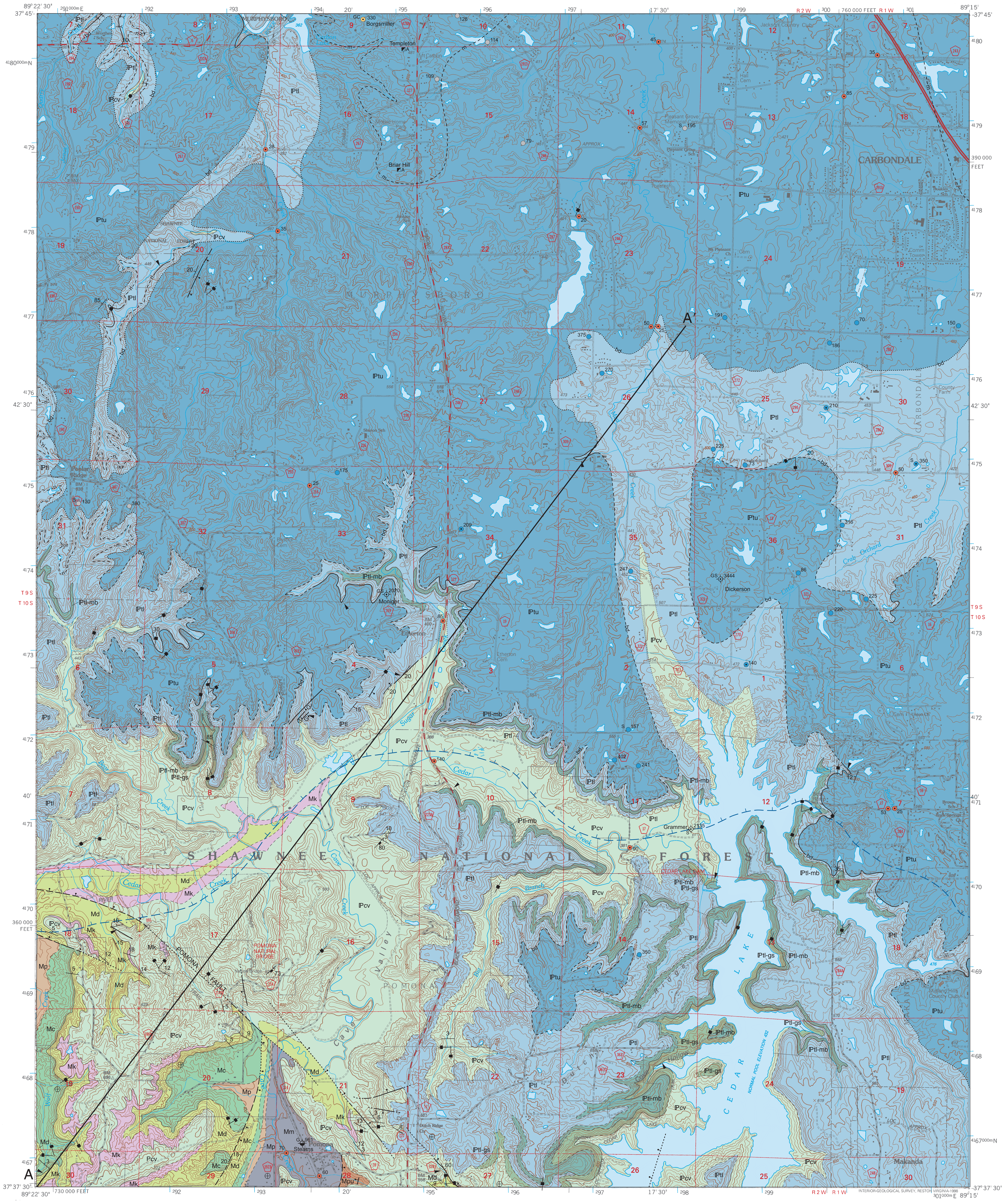
Illinois Department of Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY
William W. Shilts, Chief

BEDROCK GEOLOGY OF POMONA QUADRANGLE
JACKSON COUNTY, ILLINOIS

Mary J. Seid, W. John Nelson, and Joseph A. Devera
2007

Illinois Preliminary Geologic Map
IPGM Pomona-BG



EXPLANATION

Period	Unit	Description	Series
Pennsylvanian	Ptu (—m—, —bd—)	Upper Tradewater Formation; m, Muphysboro Coal Member; bd, Boskydell Member (base)	Desmoinesian
	Ptl (—ri—), Ptl-mb, Ptl-gs	Lower Tradewater Formation; ri, Rock Island Coal Member; mb, Murray Bluff Sandstone Member; gs, Grindstaff Sandstone Member	Morrowan and Atokan
	Pcv	Caseyville Formation	
Unconformity			
Mississippian	Mpu	Upper Pope Group undifferentiated (in rotated slump blocks)	Chesterian
	Mk	Kinkaid Formation	
	Md	Degonia Formation	
	Mc	Clore Formation	
	Mp	Palestine Formation	
	Mm	Menard Limestone	

Symbols

- Shaft mine (abandoned)
- Slope mine (abandoned)
- Outcrop of special note, shown where contact or map unit was well exposed at time of mapping
- Drift mine (abandoned)
- 40 — Strike and dip of bedding; number indicates degree of dip
- Horizontal bedding
- Vertical joints or fractures
- 85 — Inclined joints or fractures; number indicates degree of dip

Drill Holes

from which subsurface data were obtained

- Stratigraphic boring
- Water well
- Engineering boring
- Coal boring
- Dry hole
- Dry hole - show of oil
- CSG 100 — Numeric label indicates total depth of boring in feet. Boring with samples (S), geophysical log (G), or core (C). Dot indicates location accurate within 100 feet.

Line Symbols

dashed where inferred, dotted where concealed

- Contact
- Normal fault: bar and ball on downthrown side
- G — Normal fault (growth fault): bar and ball on thickened block
- Strike-slip movement
- Glacial boundary
- A — A′ Line of cross section

Note: This is a subcrop map, showing bedrock surface with all Quaternary deposits removed. Geology shown as it was prior to surface mining. 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 (Raster Feature Separates) provided by the United States Geological Survey. Topography compiled 1947. Planimetry derived from imagery taken 1993. PLSS and survey control current as of 1996. Partial field check by U.S. Forest Service 1996.

North American Datum of 1927 (NAD 27)
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 16

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SCALE 1:24,000

1 MILE — 7000 FEET — 1 KILOMETER

BASE MAP CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Released by the authority of the State of Illinois: 2007

Geology based on field work by M. Seid, J. Nelson, and J. Devera, 2007.

Digital cartography by J. Domier, M. Widener, S. Geegan, and A. Schultz, 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.

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ADJOINING QUADRANGLES

1	2	3
4		5
6	7	8

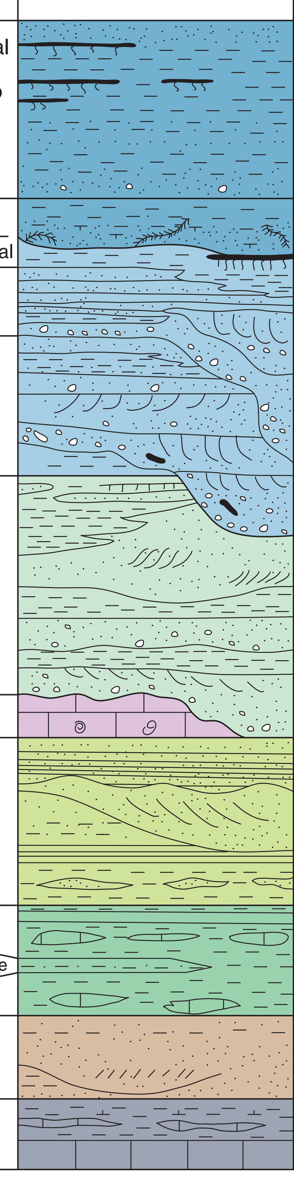
1 Oraville
2 Murphysboro
3 De Soto
4 Gorham
5 Carbondale
6 Wolf Lake
7 Cobden
8 Makanda

1°
TRUE NORTH
MAGNETIC NORTH

APPROXIMATE MEAN DECLINATION, 2007

ROAD CLASSIFICATION

- Primary highway, hard surface
- Secondary highway, hard surface
- Light-duty road, hard or improved surface
- Unimproved road
- State Route
- County Route

SYSTEM	SERIES	FORMATION	MEMBER	GRAPHIC COLUMN	THICKNESS (FEET)	UNIT
PENNSYLVANIAN	DESMOINESIAN	Tradewater: Upper Tradewater	Mt Rorah Coal		~20	A
			Murphysboro Coal		40–50	B
					50–60	C
			Boskydell		10–40	D
	ATOKAN	Tradewater: Lower Tradewater	Rock Island Coal		4	E
			Murray Bluff		50–150	F
			Grindstaff		60–100; 110–254 (E–G)	G
	MORROWAN	Caseyville			120–370	H
MISSISSIPPIAN	CHESTERIAN	Kinkaid Limestone	Negli Creek		0–50	I
		Degonia			0–120	J
		Clore	Ford Station Tygett Sandstone Cora		0–80	K
		Palestine			0–60	L
		Menard Limestone			150	M

A Sandstone, coal, and claystone The sandstone is light gray and weathers to a rusty orange. It is fine to medium grained, and becomes finer upward. It contains abundant mica, little to no clay matrix, and coal rip-up clasts at the base. It has small-scale cross-bedding. A 3.7-foot thick coal occurs within this unit at 39.5 to 43.2 feet in the Borgsmiller core. Other drill holes and outcrops just outside the Pomona Quadrangle indicate that this coal is 3 to 4 feet thick; this bed was mined in the Murphysboro and Carbondale Quadrangles. Locally, the coal thins to as little as 3 inches, is bright-banded, and has well developed cleat. The coal contains occasional pyrite laminae and rare pyrite lenses. It is underlain by an olive-gray claystone that contains abundant root traces near the top; lower contact is gradational.

B Shale and coal The shale is light to dark gray and silty at the top, becoming dark gray to black, slightly silty, and very fissile downward. The lower 18 feet of shale contains scattered plant fragments and vertical slip fractures and becomes very carbonaceous at the base, grading to a dull coal. This coal is bright-banded and has well developed cleat. The coal contains few to no traces of sulfides and is interbedded with shale; the shale is medium gray, well laminated and fissile, silty in places, and contains common plant fossils including lycopod leaves and *Neuropteris*. This coal underlies a small area along the northern edge of the map area, where it was largely removed by underground mining during the late 19th and early 20th centuries. Borehole information indicates the coal is as thick as 7 feet, and in places it is split into two or more benches separated by layers of gray shale. In the Borgsmiller core, the coal in unit B, likely the Murphysboro Coal, includes an upper coal bench 3.8 feet thick and a lower bench 2.9 feet thick, separated by 17 feet of gray shale that contains siderite nodules and common well-preserved fossil plants. The coal appears to have been replaced by shale and sandstone in the eastern parts of Secs. 10 and 15, T9S, R2W. This coal is projected to pass through the northeastern corner of the quadrangle, but no reliable drilling records exist in this area.

C Shale, siltstone, and sandstone Shale units are dominantly medium gray, silty, and carbonaceous in places. The siltstone is olive gray with light-gray siltstone laminae. The majority of the sandstone is light gray, fine grained, and interlaminated with dark-gray silty shale; basal sandstone is poorly sorted and also contains rounded quartz granules, angular shale clasts, siderite pebbles, and interstitial clay. Lower contact is erosional.

D Sandstone and shale This unit is light-gray, fine-grained, calcareous sandstone and a dark-gray calcareous sandy shale. The sandstone often contains red hematitic shale pebbles and larger, irregularly shaped cobbles that are especially good indicators of the unit in the field. In addition, the sandstone is commonly stained or permeated with hematitic cement (dark purplish red to reddish brown). In most outcrops the sandstone is laminated to thinly bedded, with numerous shale laminae, planar and wavy lamination, cross lamination, and small-scale trough cross-bedding. This marine zone occurs as channel-form bodies scoured into underlying strata, and varies in thickness from less than 10 feet to at least 40 feet. It is well exposed in the S½ of Sec. 33, T9S, R2W. Marine invertebrate fossils are present, including crinoid columnals, brachiopods, and rugose corals. Trace fossils are common throughout and include *Psammichnites (Olivellites) plummeri, Conostichus* isp., and *Tiechichnus* isp. The trace fossils listed also are indicative of marine organisms (Devera 1989). The lower contact of the unit is scoured.

E Shale and coal In the northwestern part of the map area the coal is 3 to 4 feet thick and commonly split and sandwiched by thin layers of dark-gray to black, highly carbonaceous shale. It was worked in small drift mines near the northwestern corner of the map area and in the Poplar Ridge Mine, just outside the map area in Sec. 30, T9S, R2W. Outcrops of the coal were observed along the stream in the NE¼ NW¼ SW¼, Sec. 20, T9S, R2W. This coal also was mined east of the Pomona Quadrangle, where it directly underlies the type Boskydell member. The coal was correlated with the Rock Island Member (uppermost Atokan) on the basis of palynology (Peppers 1993). Lower contact is disconformable.

F Sandstone, shale and conglomerate The unit is medium-brown to brownish gray, fine-to coarse-grained quartz sandstone. In most places, the unit is a sublitharenite to litharenite and contains abundant mica, interstitial clay, and Liesegang banding. Quartz granules are common in some places but absent in others. Bedding is massive to thick with large-scale cross-bedding and displays faint planar laminations. The shale is dark gray and silty with fine planar laminae of light-gray sandstone; however, it is not exposed in the study area. The conglomerate contains siderite and rounded quartz pebbles in a medium-gray sandstone matrix. Lower contact is erosional.

G Sandstone and shale The sandstone is light gray to brownish gray and dominantly fine grained, but it contains coarse grains, rounded quartz granules, and shale rip-up clasts in places. Small mica flakes and light colored interstitial clay are diagnostic, but the unit approaches a quartz arenite near the base. Bedding is massive, cross-bedding is prominent, and the clay matrix is a light yellowish orange color. The shale is dark gray, silty, and is interbedded with light-gray siltstone laminae. Lower contact is erosional.

H Sandstone, siltstone, and shale This sandstone unit is light gray to light yellowish and dominantly very fine- to medium-grained quartz arenite with scattered quartz granules. The siltstone is light to medium gray, well indurated, and layered, but it is poorly exposed in the study area. The shale is medium to dark gray, silty, and fissile. Sandstone in the upper part of the formation is a widely traceable ledge and cliff-former as thick as 60 feet. It is very fine to fine grained, fining upward from an erosional lower contact, and generally has indistinct thick bedding. This sandstone unit is well exposed at Saltpeter Cave and Pomona Natural Bridge. The lower part of this formation is mostly poorly exposed shaly strata, with one or two ledge-forming, cross-bedded sandstone units 10 to 25 feet thick. The sandstone forming bluff east of the road headed north from Pomona is believed to be near the base of this formation, but the base is concealed. Thickness is estimated to be 300 to 370 feet based on electric logs and sample studies from two oil-test holes. There is evidence of downcutting and reworking of the unit below. At the lower contact of this unit there is a major disconformity and in places an angular unconformity.

I Limestone This unit is a medium gray argillaceous, lime-mudstone to skeletal wackestone. Invertebrate marine fossils such as crinoids, brachiopods, rugose corals, bellerophontid gastropods and fenestrate bryozoans are common. The weathered limestone displays an hourglass profile and karst topography. The overlying member is likely present, but no outcrops were found. Lower contact is conformable.

J Sandstone, siltstone, and shale The sandstone is white to light gray, very fine to fine grained pure quartz arenite that displays a sugary appearance in the sun. Bedding is very thin to thin, but massively bedded sand-waves up to 40 feet thick form the bluffs along Wolf Creek. Cross-bedding occurs at the base, and bedding surfaces are ripple laminated. The siltstone is medium to dark gray and interlaminated with sandstone but is poorly exposed in the study area. The shale is greenish gray, interbedded with sandstone, and occurs near the top of the unit. Lower contact is conformable to slightly disconformable.

K Shale and limestone The upper member of this formation contains dark gray fissile shale with 2 feet thick interbeds of lime mudstone to skeletal wackestone. A shale zone near the top is extremely fossiliferous and is well exposed in the SW¼ NE¼ NW¼ of Sec. 30, T10S, R2W. This zone contains brachiopods and *Sulcatapinna missouriensis*. The middle member is a thin, dark grayish green calcareous silty shale. The basal member is dominated by dark gray shale; it weathers to a medium olive-gray, platy, non-calcareous, fissile shale. Interbedded with the shale are lenses of thin, dark gray, argillaceous, fossil lime-mudstones and wackestones. The fossils are dominated by brachiopods i.e. *Spirifer increbescense*, *Composita subquadrata* and fenestrate bryozoans. Locally near the carbonate lenses, the shale is calcareous. Lower contact is conformable.

Subsurface Only

L Shale, siltstone, and sandstone The sandstone is tan to white, fine-grained, well sorted quartz arenite. The upper part can be rooted, yielding Stigmaria root-casts and locally thin coal at the top. The upper contact is gradational and fines upward. Thin-bedded siltstones are commonly seen as ripple laminated sheets. In places the sandstones and siltstone beds contain carbonaceous debris that is commonly burrowed with *Psammichnites* trace fossils. Basal contact is shaly and gradational with the unit below.

M Shale and limestone The shale is dark olive-gray, fissile, calcareous, and argillaceous in places. It is interbedded with thin fossil lime-mudstones and wackestones in the upper part of the formation. The limestone beds can be locally fossiliferous, containing rugose corals, brachiopods, crinoids, and bryozoans. The base of the unit was not observed in the study area.

Introduction

The Pomona Quadrangle is located in Jackson County, Illinois, along the southwestern edge of the Illinois basin. Bedrock generally dips about 100 feet per mile, which is equivalent to 1 degree, into the basin to the northeast. The Paleozoic bedrock in the south half of the quadrangle is well exposed, whereas the majority of bedrock in the north half is covered by Quaternary age glacial drift. The southernmost boundary of the Illinoian glaciations follows an undulating line along Cedar Creek.

Pennsylvanian Stratigraphy

The Pennsylvanian System in the Pomona Quadrangle and most of southern Illinois is composed dominantly of sandstone, siltstone, and shale, with lenticular coal beds and local marine limestone or sandstone. The thickness and character of sandstone units may change dramatically in short distances. The most prominent cliff-forming sandstones are generally fluvial and estuarine incised-valley deposits; other sandstones are formed in a variety of deltaic environments.

Sandstones of the Caseyville Formation are dominantly quartz arenite with common rounded quartz pebbles and granules. Sandstones of the Tradewater Formation are sublitharenites containing mica, clay matrix, occasional rock fragments, and some quartz granules. These quartz granules are probably reworked from the Caseyville Formation. The contact between the two formations is gradational and in places is arbitrary.

A persistent interval of marine sandstone, named the Boskydell Marine Zone by Wanless (1939), occurs within the middle part of the Tradewater formation. As Desborough (1958 and 1961) reported but contrary to Peppers (1993), the Boskydell is a widespread, mappable unit in Jackson County. Its age is early (probably close to basal) Desmoinesian based on conodonts (Rexroad et al. 1998) and palynology of the underlying coal (Peppers 1993). The Boskydell probably is correlative with the Curlew Limestone Member of western Kentucky. It fills shallow channels and is interpreted as an estuarine deposit.

In the northwestern part of the Pomona Quadrangle the Boskydell member occurs within 20 feet of the base of the Tradewater Formation. Toward the southeast, the lower Tradewater (below the Boskydell) thickens dramatically to more than 200 feet. This relationship is believed to reflect eastward or southeastward tectonic tilting during deposition of the lower Tradewater. In the northwest, lower Tradewater (Atokan) sediments were eroded or not deposited, so that basal Desmoinesian rocks unconformably overlie the Morrowan Caseyville Formation.

Structural Geology

Pomona Fault Zone

The Pomona Fault was mapped by Desborough (1958), Pickard (1963), and Satterfield (1965) as a northwest-trending high-angle fault crossing the southwestern part of the Pomona Quadrangle. These authors depicted a single high-angle fault having the northeast side downthrown as much as 200 feet. Johnson (1970) reported fracture patterns consistent with reverse faulting under northeast-southwest compression. Nelson and Lumm (1985) interpreted the structure as a fractured monocline overlying a fault at depth. In the Cobden Quadrangle just south of Pomona Quadrangle, Devera and Nelson (1995) mapped Mississippian rocks faulted, but Pennsylvanian rocks were merely folded. They also reported evidence from deep wells that the fault was active during Late Devonian time with the opposite sense of displacement (northeast side upthrown).

In this study, we mapped the Pomona Fault Zone as a series of short, northwest-trending fault segments that displace uppermost Mississippian and Lower Pennsylvanian (Caseyville) strata. These faults lie along the flank of a monocline that dips 10° to 15° northeast. Only one kinematic indicator was observed: in situ horizontal slickensides in the Caseyville in the SW¼ SE¼ NE¼, Sec. 18, T10S, R2W. This observation suggests post-depositional strike-slip movement of the Caseyville. However, the inferred fault segments lie en echelon, suggesting a component of right-lateral strike-slip. Because the Caseyville Formation is deformed, the time of faulting is Middle Pennsylvanian or younger. The Pomona Fault Zone is parallel to the much larger Ste. Genevieve Fault Zone, 4 to 5 miles southwest; and both probably developed under the same stress regime.

A pair of north-striking faults displace Chesterian rocks on the west side of Cave Creek, southwest of the Pomona Fault Zone. Strata on the downthrown side of the western fault dip west (toward the fault), suggesting that this is a rotational normal fault. The fault surface is not exposed, so its subsurface geometry is unknown. Many faults having similar characteristics occur in the adjacent Cobden (Devera and Nelson 1995) and Wolf Lake (Devera 1993) Quadrangles, where deformation is restricted to the Palestine Formation and younger units. These rotational faults merge with horizontal bedding planes in basal Palestine or uppermost Menard strata.

Along Cave Creek, the Pennsylvanian Caseyville Formation fills a channel eroded into the Menard Limestone. This is shown by the log of the Burr Lambert #1 Stearns test hole just north of Pomona, in which Menard Limestone directly underlies Quaternary alluvium at shallow depth. The paleochannel provides a ready explanation for the rotational normal faults as slump blocks that slid into the ancient channel. Many such slump blocks associated with ancient channels were documented elsewhere in Illinois by Bristol and Howard (1974).

A northeast-trending structure displaces Caseyville and lower Tradewater (Pennsylvanian) rocks in Sec. 4, T10S, R2W. Desborough (1961) described this feature as involving small thrust faults and local angular unconformities within Pennsylvanian strata. We did not observe thrust faults, but along the ravine in the SW¼ SW¼ SW¼ of Sec. 4, a series of small normal faults displace a lower Tradewater sandstone down to the southeast in stair-step fashion. Because the sandstone thickens on the downthrown side of each little fault, it is apparent that faulting took place during sand deposition, i.e. growth faulting.

Small faults and sharp folds are present in the northwestern part of the Pomona Quadrangle. We observed several examples, and more are recorded in field notes of previous geologists (ISGS, open files). There is not enough information to deduce the overall pattern of deformation in this area, but Jacobson (2007) mapped numerous small northeast-striking faults in the southwestern part of the adjacent Murphysboro Quadrangle.

Desborough (1961) mapped several faults, most of which strike north to north-northeast, in the southeastern quarter of the map area. Supporting evidence provided by Desborough was weak, and our mapping indicates that these faults probably do not exist. In several cases, it appears that Desborough misinterpreted abrupt changes of Pennsylvanian sandstone thickness as faults.

Economic Geology

Coal

The Murphysboro Coal was mined underground during the late 19th and early 20th centuries in parts of Secs. 9, 10, 15, and 16, T9S, R2W. These mines were contiguous with a larger area of mining immediately north of the map area. The coal that was mined varied from about 4 to 7 feet thick, and in places was split by layers of shale. Drill-hole data suggest that the Murphysboro Coal is replaced by shale and sandstone on the eastern edge of the mined area. The coal is believed to underlie the northeastern corner of the quadrangle, but its extent there is highly inferential. Little, if any mineable Murphysboro Coal remains within the Pomona Quadrangle.

A coal seam approximately correlative with the Rock Island Coal Member crops out and was formerly mined on a small scale in the northwestern part of the quadrangle. The coal was extracted in several small drift mines in Secs. 7 and 18, T9S, R2W and in the Poplar Ridge Mine, just outside the map area in Sec. 30 of the same township. At these mines and in natural exposures, the coal is 3 to 4 feet thick and commonly contains interbeds of thinly fissile, carbonaceous shale several inches thick. Coal having similar characteristics also was mined near Boskydell, immediately east of the Pomona Quadrangle. The coal is identified as Rock Island on the basis of palynology (Peppers 1993) and conodonts from the Boskydell sandstone a short distance overlying the coal (Rexroad et al. 1998). Reserves of the Rock Island in this area have not been estimated.

Oil and Gas

Five test holes for oil and gas are on record for the map area, and a sixth was drilled just outside the quadrangle. All were dry and abandoned, although two reported shows of oil and gas. Slight stain and odor of oil were noted in the Aux Vases Formation (Mississippian) in core samples from the Burr Lambert #1 Stearns hole near Pomona in Sec. 21, T10S, R2W. A short distance south of the Stearns hole, in the Cobden Quadrangle (Sec. 28, T10S, R2W), shows of oil and gas were encountered in the Burr Lambert #1 Hagler hole. Specifically, oil stains were observed in samples from the Aux Vases, and oil and gas bubbling out of fractures were found from core samples of the Middle Devonian Grand Tower Limestone. The Hagler hole reached a total depth of 2,565 feet in Lower Devonian cherty limestone. The deepest hole in the area was the Ray Grammer #1 Dickerson in Sec. 36, T9S, R2W, which ended in the Lower Devonian at a depth of 3,444 feet.

The nearest producing wells are in Williamson and Franklin Counties, 15 to 20 miles east and northeast of the Pomona Quadrangle.

Acknowledgments

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