BEDROCK GEOLOGY OF MARION QUADRANGLE
WILLIAMSON COUNTY, ILLINOIS

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

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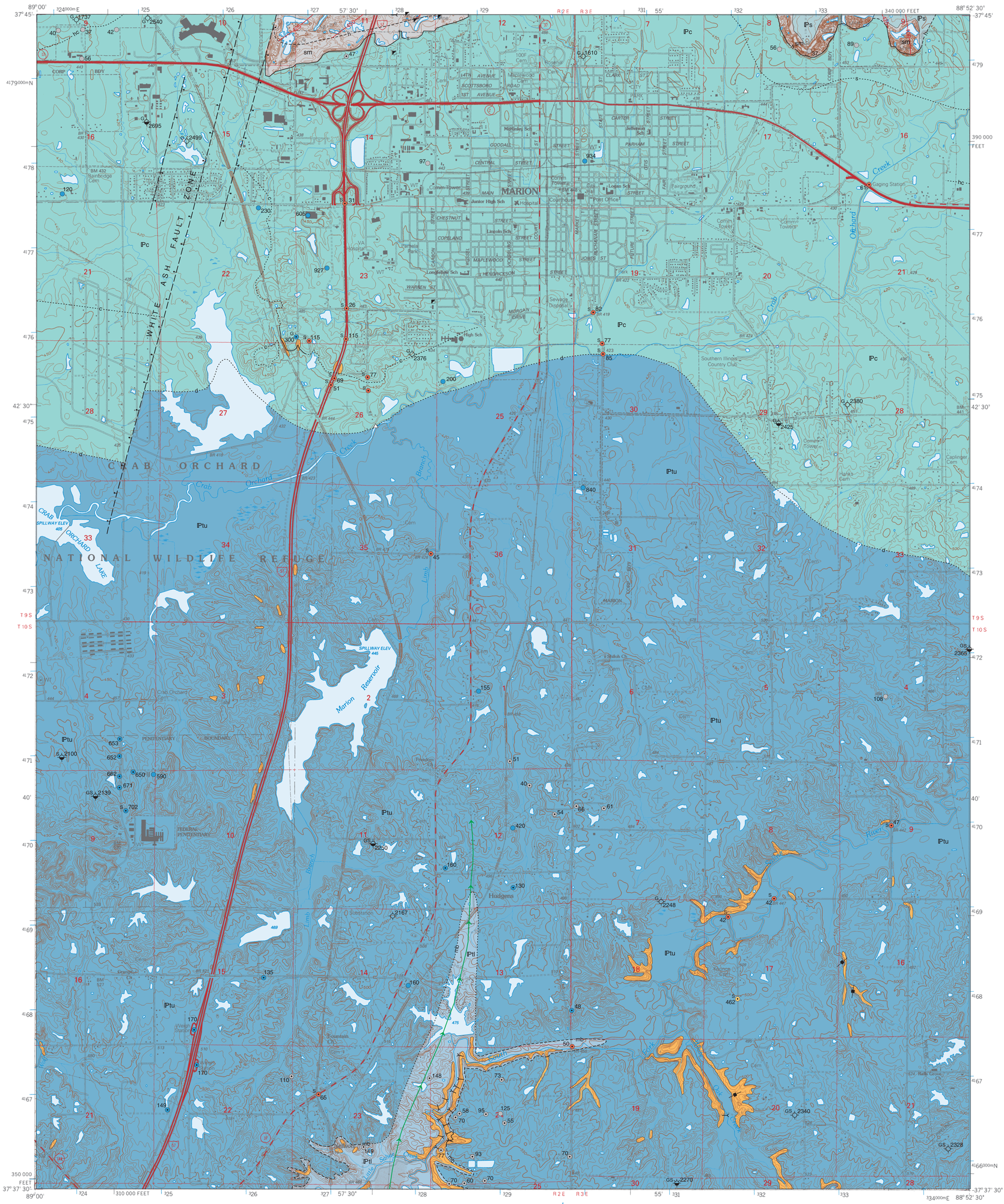
2007

Illinois Geologic Quadrangle Map
IGQ Marion-BG



EXPLANATION

- sm — Surface mine
- IPs — Shelburn Formation (Missourian)
- IPc — Carbondale Formation (Desmoinesian)
  - h, Herrin Coal Member
  - s, Springfield Coal Member
  - hc, Houchin Creek Coal Member
  - c, Colchester Coal Member
  - d, Davis Coal Member
- IPtu — Tradewater Formation, upper part (Atokan)
  - mb, top of Murray Bluff Sandstone Member
- IPtl — Tradewater Formation, lower part (Atokan)

Symbols

- Drift mine
- Shaft mine
- Slope mine
- Vertical joint
- Bedrock outcrop
- Bedrock outcrop now under water, from historic field notes

Drill Holes
from which subsurface data were obtained

- Stratigraphic boring
- Water well
- Engineering boring
- Coal boring
- Dry hole
- Dry hole - show of oil
- Dry hole - show of oil and gas
- SG ⊙ 2500 — Numbers indicate total depth of boring in feet. Boring with samples (s) or geophysical log (g). Dot indicates location accurate within 100 feet.

Line Symbols
dashed where inferred, dotted where concealed

- Contact or coal subcrop
- Normal fault: bar and ball on downthrown side
- 425 — Elevation of top of Herrin Coal, contour interval 25 feet
- Preglacial valley, drawn along axis of valley with arrows in direction of stream flow

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 provided by the United States Geological Survey. Topography compiled 1963. Planimetry derived from imagery taken 1993. PLSS and survey control current as of 1996. Partial field check 1996.

North American Datum of 1927 (NAD 27)
Projection: Transverse Mercator
10,000-foot ticks: Illinois State Plane Coordinate system, east zone (Transverse Mercator)
1,000-meter ticks: Universal Transverse Mercator grid system, zone 16

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SCALE 1:24,000

1 — 1/2 — 0 — 1 MILE
1000 — 0 — 1000 — 2000 — 3000 — 4000 — 5000 — 6000 — 7000 FEET
1 — .5 — 0 — 1 KILOMETER

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

Released by the authority of the State of Illinois: 2007

Geology based on field work and data analysis by W.J. Nelson, 2001–2003.

Digital cartography and graphics by J. Domier, T. Goeppinger, M. Jones, L. Verhelst, S. Geegan, and M. Widener, Illinois State Geological Survey.

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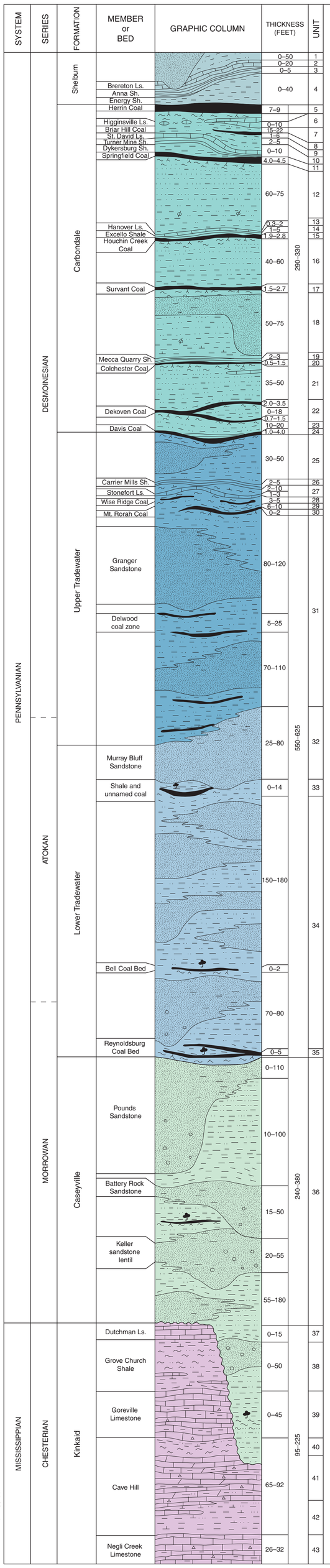
ADJOINING QUADRANGLES
1 Herrin
2 Johnston City
3 Pittsburg
4 Crab Orchard Lake
5 Crab Orchard
6 Lick Creek
7 Goreville
8 Creal Springs

APPROXIMATE MEAN DECLINATION, 2007

ROAD CLASSIFICATION

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



Shelburn Formation

1 Unnamed sandstone Medium- to coarse-grained, porous, very soft and friable, and cross-bedded to massive. Drilling and outcrops north of the Marion Quadrangle show that this sandstone fills channels eroded from above the De Graff Coal (coal unit not shown).
2 Brereton Limestone Member Generally dark gray, micritic limestone (fossiliferous lime mudstone to wackestone) that is argillaceous and may either be massive or have nodular bedding. Fossils mentioned in core logs include echinoderm fragments, brachiopods, pelecypods, fusulinids, and phylloid algae.
3 Anna Shale Member Black, highly carbonaceous, thinly fissile or "slaty," with phosphatic lenses and pyrite. Lower contact is erosional in many places.
4 Energy Shale Member Largely light to medium gray, silty, indistinctly bedded shale (or mudstone) that contains siderite nodules.

Carbondale Formation

5 Herrin Coal Member Banded bituminous coal containing several shale and pyrite partings, of which the "blue band" is thickest and most continuous. The "blue band" is generally less than 0.2 feet thick and lies 1.6 to 3.3 feet above the base of the seam. The coal is generally underlain by several feet of gray, massive, slickensided, and rooted mudstone (underclay).
6 Higginsville Limestone Member Light gray to brownish gray, micritic, nodular bedding with streaks of greenish gray shale; lower part contains marine fossils. In places, the limestone grades to mudstone containing scattered carbonate nodules.
7 Siltstone and shale Interval generally coarsens upward from sideritic gray clay shale at the base through silty shale to siltstone at the top. The thin Briar Hill Coal is near the middle of the interval.
8 St. David Limestone Member Dark gray to nearly black, fossiliferous lime mudstone and wackestone that is argillaceous and grades laterally to calcareous shale.
9 Turner Mine Shale Member Black, highly carbonaceous, thinly fissile or "slaty," pyritic.
10 Dykersburg Shale Member Medium gray, silty, indistinctly bedded, contains siderite nodules and pyrite crystals. Unit is lenticular.
11 Springfield Coal Member Banded bituminous coal, containing pyrite laminae, lenses, and cleat facings, but lacking continuous mudstone partings.
12 Clastic interval Generally a gray, rooted massive mudstone (underclay) directly underlies the Springfield Coal. This is locally underlain by nodules and lenses of silty or sandy limestone. The remainder of the interval coarsens upward from gray shale at the base to gray siltstone or fine-grained, shaly sandstone in the upper part.
13 Hanover Limestone Member Dark gray, argillaceous, fossiliferous lime mudstone to wackestone.
14 Excello Shale Member Black, highly carbonaceous, thinly fissile shale.
15 Houchin Creek Coal Member Banded bituminous coal.
16 Clastic interval Similar in lithology to Interval 12, but thinner. Siderite nodules and fossil plants occur in the lower part.
17 Survant Coal Member Banded bituminous coal.
18 Clastic interval Either coarsening or fining upward. Where the interval coarsens upward, sandstone in the upper part gradually changes downward to siltstone, silty shale, and dark gray clay shale. Where the interval fines upward, it is largely sandstone that has an erosional lower contact, cutting downward nearly to the Colchester Coal.
19 Mecca Quarry Shale Member Black, highly carbonaceous, thinly fissile shale.
20 Colchester Coal Member Banded bituminous coal. A weathered, largely overgrown exposure of the coal and enclosing strata is in the railroad cut near the northeast corner of Sec. 27, T9S, R2E.
21 Clastic interval Either a massive, rooted gray mudstone (underclay) or a thin limestone directly underlies the Colchester Coal. The remainder of the interval generally consists of shaly sandstone in the upper part and gray siltstone or silty shale in the lower part. Locally, channel-filling sandstone cuts out the Dekoven Coal.
22 Dekoven Coal Member Banded bituminous coal. The Dekoven is split into two coal "benches" separated by as much as 18 feet of clastic strata. The upper coal bench ranges up to 3.5 feet thick, whereas the lower is commonly less than 1 foot thick. The clastic interval between the coal benches comprises rooted claystone (underclay), a thin sandstone, and gray siltstone or shale.
23 Clastic interval A gray, massive, rooted mudstone (underclay) directly underlies the Dekoven Coal. The remainder of the interval contains varying proportions of gray shale, siltstone, and sandstone. Black, fissile shale directly overlies the Davis Coal in places.
24 Davis Coal Member Banded bituminous coal.

Tradewater Formation

25 Clastic interval A gray, massive, rooted mudstone (underclay) directly underlies the Davis Coal. The remainder of the interval includes gray sandstone, siltstone, and shale and tends to coarsen upward.
26 Carrier Mills Shale Member Black, highly carbonaceous, thinly fissile shale. Below the black shale is green claystone or shale.
27 Stonefort Limestone Member Gray limestone.
28 Wise Ridge Coal Bed Discontinuous, shaly coal less than 1 foot thick, overlain by shale or mudstone.
29 Clastic interval Massive gray mudstone underlies Wise Ridge Coal. The remainder of the interval is mostly shale and siltstone; black shale directly overlies the Mt. Rorah Coal.
30 Mt. Rorah Coal Member Banded bituminous coal that commonly contains a layer of shale or mudstone up to about 1 foot thick in the lower part.
31 Mt. Rorah to Murray Bluff Interval Sandstone, siltstone, shale, and several thin coal beds. Sandstone is light gray to buff, very fine- to medium-grained (rarely coarse-grained) lithic arenite that contains abundant mica and has a clay matrix. Three categories of sandstone can be identified from wireline logs. (1) Sandstones that fine upward from erosional lower contacts and crosscut underlying units. These sandstones represent fluvial, distributary, and estuarine channel fills. (2) Sandstones that occur in the upper part of upward-coarsening intervals, probably reflecting deltaic deposition. (3) Thin, lenticular bodies of relatively clean sandstone that may represent shallow marine, offshore bars. Siltstone and shale of the upper Tradewater are dominantly medium to dark gray and not distinguishable from older and younger Pennsylvanian lithologies. Scattered outcrops of these strata occur in the southern part of the map area, mostly along South Fork Saline River and its tributaries. Coal beds are lenticular and less than 2 feet thick. Coal near the base of the interval was mined locally along Oak Creek.
32 Murray Bluff Sandstone Member Light gray to buff (weathering dark brown), fine- to medium-grained sublitharenite to quartz arenite. The lower part is generally coarser and thick-bedded to massive, with planar and trough cross-bedding. The upper part is finer-grained, shaly, and thinly bedded. The lower contact is erosional and marked by rip-up clasts. This sandstone forms bluffs along the South Fork of the Saline River near the southern edge of the map area.
33 Shale and unnamed coal bed Mined in numerous small drifts and slopes along the South Fork Saline River near Neilson. The bed (0 to 4 feet thick) is highly lenticular. The coal is overlain, in turn, by dark gray to black shale containing plant fossils, up to 10 feet of gray shale, and the Murray Bluff Sandstone.
34 Clastic interval Largely sandstone that is white to light gray, very fine- to medium-grained (occasionally coarse-grained), sublitharenite to quartz arenite. Mica, lithic fragments, and interstitial clay are present but not abundant. Iron oxide is conspicuous. Some sandstones fine upward; others coarsen upward. Three or more lenticular sandstones are present in the interval, but in some wells they merge into a single, thick sandstone interval. Gray to black shale and siltstone are interbedded and interlaminated. The Bell coal bed, a thin lenticular unit, is near the base of the interval.
35 Reynoldsburg Coal Bed Either a single bed or two beds, each 1 to 3 feet thick, and separated by shale. The Reynoldsburg is widespread, if not continuous in the map area.

Caseyville Formation

36 Caseyville Formation The Caseyville (like the Tradewater) is roughly half sandstone and half shale and siltstone. The sandstone is white to light gray, very fine- to coarse-grained units, and most of it is clean quartz arenite. Small quartz pebbles are commonly logged in well samples. Thick sandstone units generally fine upward and represent channel or valley-fill deposits. Shale and siltstone range from medium gray to nearly black and commonly contain laminae of light gray sandstone along with siderite nodules and fossil plants. Thin, local coal beds are present. Well-to-well correlation of specific sand bodies or sequences is challenging. The lower contact is a striking erosional unconformity that has approximately 120 feet of relief within the map area, removing all of the Kinkaid Formation Grove Church and Goreville Members and the upper part of the Cave Hill Member.

Kinkaid Formation

37 Dutchman Limestone Member Medium to dark gray, slightly argillaceous, crinoidal lime mudstone, wackestone, and packstone.
38 Grove Church Shale Member Shale, mudstone, and thin limestone. At the top is 5 to 10 feet of dark olive-gray to greenish gray calcareous shale that contains brachiopods and bryozoans. Next is 15 to 20 feet of maroon or brick-red mudstone that has blocky structure, a waxy appearance, and contains numerous slickensides. The lower 25 feet is shale that is medium to dark gray with a little maroon mottling near the base. This shale is silty and calcareous, weakly laminated, and contains thin interbeds of limestone.
39 Goreville Limestone Member Light to dark brownish gray, fine- to coarse-grained limestone. The upper part is skeletal grainstone to packstone in which echinoderm fragments are common. Darker, finer-grained wackestone and packstone make up the lower Goreville. The lower part also is argillaceous and cherty. Both contacts are sharp.
40 Cave Hill Member, upper part At the top is greenish gray, silty, laminated shale. The remainder is mottled and variegated mudstone that is calcareous and has blocky structure. Colors include olive-gray and greenish gray, red, and purple. Both contacts are sharp.
41 Cave Hill Member, middle part Limestone with thin interbeds of shale. Much of the limestone is dense lime mudstone commonly described on sample logs as "sublithographic." Also present are wackestone and packstone, mostly in the middle part of the unit. Echinoderm fragments are the only fossils noted in samples. Chert nodules are numerous. The shale interbeds are greenish gray to dark gray. The lower contact is gradational and may intertongue with shale below.
42 Cave Hill Member, lower part Dominantly shale that is dark olive-gray to greenish gray, silty, and calcareous, containing echinoderm fragments. Thin interbeds of limestone occur in the upper part.
43 Negli Creek Limestone Member The upper part includes light gray, coarse-grained, crinoidal packstone and grainstone. The remainder is mostly light gray to brown and micritic (sublithographic to very fine grained), dolomitic, and cherty. Both contacts are sharp.

Introduction

This map depicts the bedrock geology of the Marion Quadrangle as it would appear if all Quaternary surficial materials were removed. Quaternary sediments, consisting mainly of Pleistocene glacial drift and wind-blown silt (loess) together with Holocene stream sediments, blanket the map area at depths ranging from a few inches to at least 121 feet. Bedrock outcrops are concentrated in the southern part of the quadrangle, mainly in sandstone bluffs along the South Fork Saline River and its tributaries. A few road cuts and railroad cuts also expose bedrock.

To supplement the outcrop data, all available drill-hole records on file at the Illinois State Geological Survey (ISGS) were examined. For most of the water wells and coal test boreholes, the only record are drillers' logs that leave much to be desired as to accuracy and detail. Bridge borings drilled by the Illinois Department of Transportation provide good information on surficial sediments and depth to bedrock, but most penetrated only a few feet into rock. Samples are available from some of the deeper water wells and from oil and gas test holes. Where no geologist's sample log was already on file, I logged the samples myself. Electric logs also are available for some of the petroleum test holes.

Geologic interpretations in this quadrangle are limited by the paucity of data and the absence of readily identified marker beds in the near-surface Pennsylvanian bedrock.

Preglacial Valley

A deep preglacial valley, buried by glacial sediments, runs northward from the south-central edge of the map area along the South Fork Saline River (see green line on map). The headwaters of this stream lie south of the glacial limit in the Goreville Quadrangle in Johnson County. Where the South Fork enters the Marion Quadrangle, it passes through a narrow rock-walled valley that exhibits incised meanders and then makes a right-angle turn to the east. Immediately west of the rock-walled gorge, the bedrock disappears beneath thick glacial drift. A coal test borehole just west of the South Fork in the NE¼ of Sec. 23 passed through 121 feet of glacial sediment before reaching bedrock near the axis of the preglacial valley.

The buried valley clearly represents the former course of the South Fork Saline River. After the glacier receded, the South Fork resumed flowing north from its intact headwaters. The new channel, however, lay slightly east of the buried original. Downcutting rapidly through glacial sediment, South Fork became superimposed on Pennsylvanian sandstone and entrenched a gorge therein.

The course of the preglacial valley north of Hudgens is uncertain, although there are plenty of drill holes in the area. The deep, buried valley may be no wider than 0.25 mile. The preglacial South Fork probably flowed north to the ancestral Crab Orchard Creek, which in turn (then as now) flowed west to the Big Muddy River. Thus, the Illinoian glacier diverted the headwaters of the South Fork from the Mississippi River drainageway to the Ohio River drainageway.

Geologic Structure

The Marion Quadrangle is situated near the southern margin of the Illinois Basin. Bedrock strata dip north, dropping approximately 600 feet in elevation from the southern border of the map area to the northern border. This amounts to an average decline of 1 foot in 75, or a dip of less than 1°.

The White Ash Fault Zone trends slightly east of north in the northwestern part of the map area. The zone comprises high-angle normal faults having displacements up to approximately 50 feet. They are mapped in the Marion Quadrangle on the basis of sparse drill-hole information and fault encounters in surface coal mines near the northern edge of the map.

Economic Geology

Coal
The major coal deposits of Williamson County lie immediately north of Marion. The Herrin Coal, originally 7 to 9 feet thick, was removed in surface mines along the northern edge of the quadrangle and mined far more extensively in the adjacent Johnston City Quadrangle. The underlying, thinner (4.0 to 4.5 feet) Springfield Coal also was surface-mined northwest of Marion. Unmined Springfield Coal remains at the northeast corner of the quadrangle.

During the first decade of the twentieth century, the Davis Coal was exploited in the Ingram Mine, a shaft mine located a short distance northwest of the present Marion High School. ISGS geologist G.H. Cady reported that the coal was 3.8 to 4.0 feet thick at the bottom of the shaft and had claystone floor and gray shale roof (Cady 1908, unpublished field notes, ISGS library). Reliable records do not exist on the thickness of the Davis Coal away from the Ingram shaft.

Coal formerly was mined at the base of the bluffs along the South Fork Saline River in Sec. 24, T10S, R2E. These small drift and slope mines provided coal for local trade during and before 1926. Drilling and field notes by various geologists (unpublished field notes, ISGS library) indicate that the coal seam was highly lenticular, with a maximum thickness of about 4 feet. On the basis of fossil spores, Russel A. Peppers (ISGS emeritus, verbal communication 2002) correlated the coal with the Tarter Coal of western Illinois and approximately the Lower Block Coal of Indiana and the No. 4a coal of western Kentucky. This coal is Unit 33 on the stratigraphic column.

Oil and Gas
The ISGS has records for 12 test holes for oil and gas in the Marion Quadrangle. None of these achieved production, although seven encountered shows of oil and gas. These wells tested Mississippian formations that yield oil and gas elsewhere in Williamson County. The deepest hole was 2,695 feet, reaching the St. Louis Limestone (not shown).

Acknowledgments

Gratitude is extended to the numerous landowners who granted property access and verified the locations of wells. Special thanks to Ed Binkley for allowing the ISGS to drill a cored test hole on his property.