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BEDROCK TOPOGRAPHY OF POMONA QUADRANGLE

JACKSON COUNTY, ILLINOIS

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2009

Illinois Preliminary Geologic Map
IPGM Pomona-BT

Introduction

This map shows the elevation (topography) of the upper surface of bedrock in the Pomona 7.5-minute Quadrangle in Jackson County, southern Illinois. It was compiled in conjunction with the map of the bedrock geology of the Pomona Quadrangle (Seid et al. 2007).

Bedrock of the map area comprises sedimentary rocks of Upper Mississippian and Pennsylvanian age. Sandstone is the most prevalent rock type, along with siltstone, shale, and thin layers of limestone, coal, and claystone. Sandstone generally is resistant to erosion, and commonly crops out as cliffs and ledges along steep hillsides. The other rock types seldom are exposed outside of deep ravines and active streams.

The unlithified surficial deposits include Pleistocene glacial drift (till and outwash) and loess (wind-blown silt), and Holocene alluvial sediments in valleys. The Pomona Quadrangle straddles the southern limit of Pleistocene continental glaciation, that of the Illinoian or next-to-last major glacial episode (Willman and Frye 1980) .

Methods

Field observations were combined with subsurface information from drill holes to assemble this map. Field notes made by previous ISGS geologists and archived in the ISGS Library were used along with our own observations. Published works, chiefly Desborough (1960 and 1961), also were consulted. The best drill-hole records are from bridge borings taken by the Illinois Department of Transportation (IDOT) and archived at the IDOT district office in Carbondale. Logs of water wells, coal-test holes, and oil and gas test holes on file at the Geologic Records Unit of the ISGS, also were examined. A few of these include sample studies made by geologists. Experience has shown that the stated locations of water wells are highly inaccurate. Therefore, only wells for which the location could be verified were used in this study.

Topographic expression helps to differentiate areas of thin and thick drift. Thick glacial sediment commonly erodes to a stabilized badland topography characterized by many intricate, steep ridges and gullies. Bedrock, in contrast, erodes to more uniformly sloping contours with many fewer gullies. In the northern part of the map area where less erosion has taken place a gently rolling till plain is developed.

Interpreting the Bedrock Topography

The Upland Surface
Disregarding the deeply incised modern and pre-glacial stream valleys, the upland bedrock surface in the Pomona Quadrangle slopes toward the northeast. The highest elevation, above 650 feet, occurs near the southwest corner of the map; whereas the lowest elevation, below 300 feet, is on the northeast. This slope represents a dip-slope produced by the regional northeast tilt of resistant sandstone layers. This dip-slope is part of the northern flank of the Shawnee Hills, which extend east-west across southern Illinois and formed the final barrier that the Illinoian ice sheet could not surmount.

Pre-glacial Big Muddy River
A deep buried valley enters the northeastern Pomona Quadrangle in Sec. 30, T9S, R1W. The valley initially trends west, making a right-angle bend to the south and joining the present valley of Cedar Creek just above the dam of Cedar Lake. This buried valley is that of the pre-glacial Big Muddy River.

Presently the Big Muddy flows westward, north of Carbondale and through Murphysboro just north of the map area (fig 1).

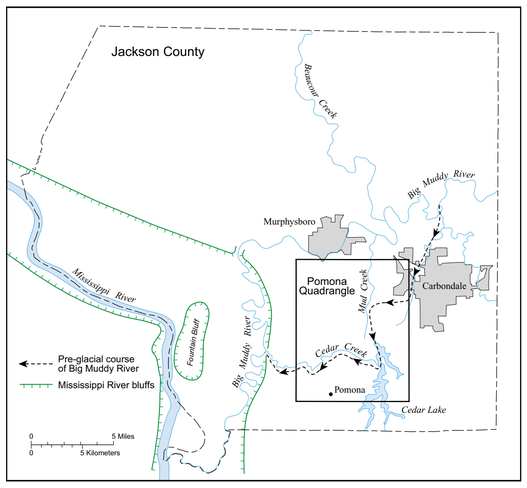

Figure 1 A deep buried valley exists in the east-central part of the Pomona Quadrangle. This feature represents the course of the Big Muddy River as it existed prior to Pleistocene glacciation.

Drill holes in five places show the bedrock floor of the pre-glacial Big Muddy is at or below an elevation of 260 feet. One of these drill holes is in the Carbondale Quadrangle, upstream from the Pomona Quadrangle. The deepest reading is in bridge borings where State Rt. 127 crosses Cedar Creek in Sec. 10, T10S, R2W. Here the deepest hole was drilled to elevation 252 feet without reaching bedrock.

The pre-glacial Big Muddy valley is deeper than that of the modern river below Carbondale. The deepest bedrock elevation in the modern valley is 272 feet, and in most places the valley floor is at or above 290 feet.

Bedrock in the modern Mississippi River flood plain west of Pomona is at a depth of 215 to 260 feet, as shown by drilling. The deepest record of 215 feet is in an oil-test hole bout one mile west of the mouth of Cedar Creek (Sec. 10, T10S, R3W, Gorham Quadrangle). Hence the pre-glacial Big Muddy River, at least as far upstream as Carbondale, was nearly at grade with the valley floor of the Mississippi River.

The old Big Muddy valley was V-shaped in profile and had steep walls. This is evident in the lower, largely unglaciated course of Cedar Creek below the Cedar Lake dam. Steep valley profile in the buried portion is proven by bridge borings where Pleasant Hill Road crosses Mud Creek, the deepest hole went to elevation 260 feet without encountering bedrock. 1,800 feet west of this bridge sandstone crops out in a stream bed at elevation 460 feet.

Willman and Frye (1980) proposed that the upper part of Cedar Creek was blocked by the Illinoian glacier and formed an ice-front lake, which they called Lake Clay Lick. Willman and Frye apparently believed that pre-glacial Cedar Creek originally flowed north from the present reservoir dam toward the Big Muddy near Murphysboro. They further suggest that the ice dam forced Cedar Creek to take a sharp bend to the west and flow to the Mississippi River. They did not have information on the elevation of the buried valley floor and did not consider the possibility that the Big Muddy River flowed southwest through the Pomona Quadrangle.

A remarkable feature of the pre-glacial Big Muddy River is that it flowed southwest, against the regional rise in topography on the Shawnee Hills dip-slope. The Big Muddy (and modern Cedar Creek) exhibit broad meanders that are deeply entrenched into bedrock. Such a situation suggests that either the Big Muddy was superimposed from a higher level on flat-lying sediments that are now totally eroded; or the stream was antecedent to tectonic uplift that produced the dip-slope.

Other Buried Valleys
A pre-glacial valley curves from north to northwest or west in the northwestern corner of the map area. This valley approximately coincides with modern Lewis Creek. The pre-glacial Lewis valley merges with that of the present-day Big Muddy River just west of Murphysboro.

It appears that prior to Illinoian glaciation, Poplar Camp Creek flowed west across the northern part of Sec. 13, T10S, R2W, intercepting the upper segment of Cedar Creek, and entering the Big Muddy valley just west of the present Cedar Lake dam. The buried valley, filled with glacial drift, interrupts the otherwise continuous cliffs of lower Tradewater sandstone that enclose Cedar Lake.

Small buried valley segments were observed in many places during mapping, but not enough information is at hand to interpret an integrated drainage system.

References

Desborough, G.A., 1960, Bedrock geology of the Pomona quadrangle: M.A. thesis, Southern Illinois University, Carbondale, 147 p., map, 1:24,000.

Desborough, G.A., 1961, Geology of the Pomona quadrangle, Illinois: Illinois State Geological Survey, Circular 320, 16 p., map, 1:24,000.

Seid, M.J., W.J. Nelson, and J.A. Devera, 2007, Bedrock geology of Pomona Quadrangle, Jackson County, Illinois: Illinois State Geological Survey, Illinois Preliminary Geologic Map, IPGM Pomona-BG, 2 sheets, 1:24,000.

Willman, H.B. and J.C. Frye, 1980, The glacial boundary in southern Illinois: Illinois State Geological Survey, Circular 511, 23 p.

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

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

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

Digital cartography by J. Domier, M. Widener, and A. Schultz, Illinois State Geological Survey.

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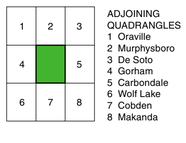

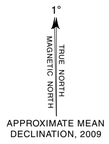

ROAD CLASSIFICATION

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

Bedrock Elevation
(feet above mean sea level)

700
650
600
550
500
450
400
350
300
250
200

Data Type

- Stratigraphic boring (ISGS)
- Water-well boring
- Engineering boring
- Coal
- Dry hole

SGC 674 Labels indicate samples (s), geophysical log (g), or core (c).
Numeric labels indicate bedrock elevation in feet above mean sea level.
Dot indicates location accurate within 100 feet.

Note: Well and boring records are on file at the ISGS Geological Records Unit and are available online from the ISGS Web site.