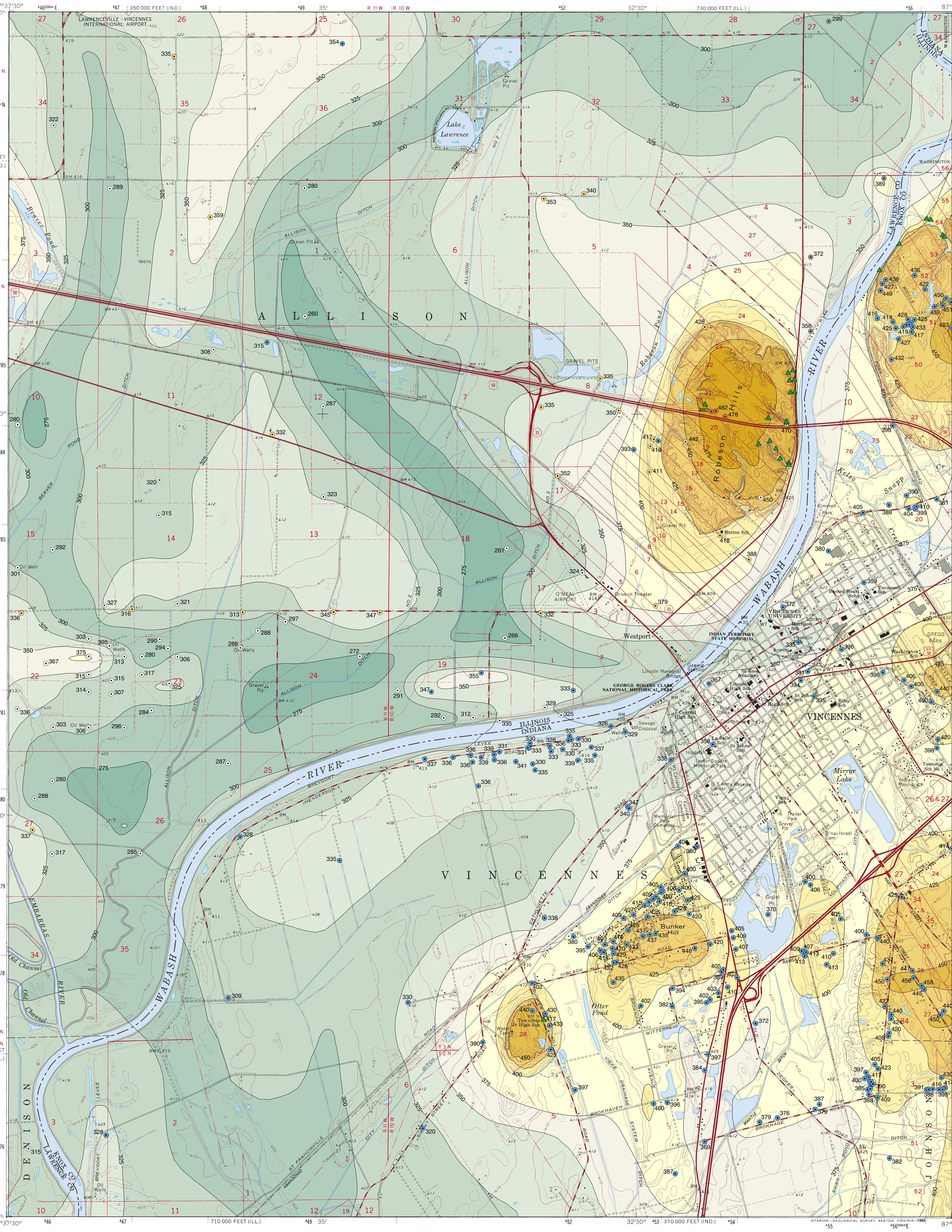
Department of Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY
William W. Shilts, Chief

BEDROCK TOPOGRAPY OF VINCENNES QUADRANGLE
KNOX COUNTY, INDIANA AND LAWRENCE COUNTY, ILLINOIS

Illinois Preliminary Geologic Map
IPGM Vincennes-BT

C. Pius Weibel
2005



Geologic History of the Bedrock Surface

The bedrock surface is the top of the lithified Paleozoic rock that underlies the generally unlithified Quaternary (glacial and postglacial) sediments and soil. The prominent features of this mostly buried surface are large bedrock valleys flanked by uplands. The topography of this surface was formed mostly by the processes of glacial and fluvial erosion during the Quaternary Period. Similar present-day processes occur in regions where the bedrock is at or near the surface, and where continental glaciers are present (e.g., Greenland). Exactly when this period of erosion occurred is not precisely known, but it could have begun as early as the end of the Cretaceous Period. The timing of the incision of the Wabash River drainage and development of its associated topography also is uncertain, but it is likely that a smaller version of the present-day Wabash River existed in southern Indiana prior to the onset of glaciation (Wayne 1952, Thornbury 1958). The effect of early glaciations in the Vincennes area is unknown, due to the paucity of glacial deposits older than those of the Illinois Episode–the next to last glaciation (Thornbury 1958). Glacial deposits of the Illinois Episode, however, almost entirely covered the Wabash River drainage (Gray and others 1970). During the subsequent Sangamon interglacial episode, the Illinoian till plain was eroded as the Wabash River drainage re-established itself, often above pre-existing buried valleys. In the Vincennes area today, a thin veneer of till (composed of diamicton, an unsorted and nonstratified mixture of clay, silt, sand, and rock clasts) is present only on the upland areas. The Wabash River valley during the Sangamon

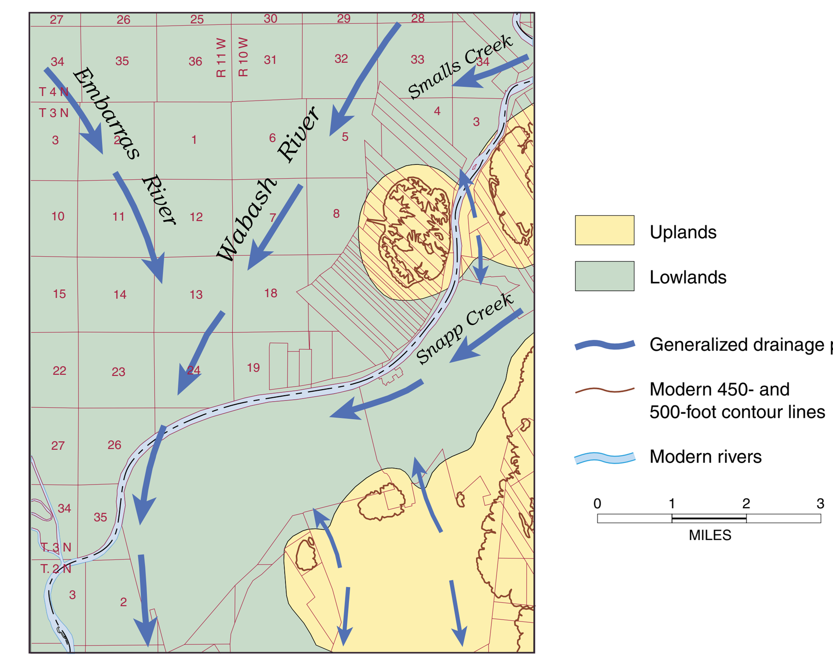


Figure 1 Map of the quadrangle showing a hypothetical landscape of uplands and lowlands prior to Wisconsin Episode glaciation. Present-day, isolated bedrock uplands (indicated by closed contour lines) were likely once contiguous with the adjacent uplands on the east side of the Wabash River Valley. Wisconsin Episode glacial outwash filled the valley to the level where floodwaters were able to flow across divides, eroding drainage channels on the upland spurs, and creating the isolated hills (Fidlar 1936).

Episode was probably narrower and the adjacent uplands were more extensive compared to the modern landscape (fig. 1). During the most recent glaciation (Wisconsin Episode), glacial ice did not reach as far south as the Vincennes area, but large amounts of outwash (sediments composed mostly of sand and gravel and transported by glacial meltwaters) were carried downstream from the glacier. Most of the outwash was deposited within the Wabash River valley, filling the valley to an elevation several tens of feet above the present-day flood plain (Shaver 1979). The Wabash River responded to this large influx of sediments by shifting to a broader, shallower braided stream system composed of many interlacing channels. Due to the elevated level of the valley floor, floodstage meltwaters were able to flow over drainage divides on upland spurs that jutted out into the valley (fig. 1). Continuous flooding and erosion of the bedrock in these narrow channels created isolated upland remnants (Fidlar 1936), such as Bunker Hill and Robeson Hills. The shifting of the Embarras River from its deeply incised paleo-valley southwest to its modern course (fig. 1) probably occurred during this time. As the glacial ice continued to recede to the north and the influx of outwash sediments decreased, the river evolved into a meandering system and began to erode the valley-fill sediments. About 14,000 radiocarbon years ago (Bleuer and Fraser 1981), Glacial Lake Maumee (ancestral Lake Erie) catastrophically drained and flood waters scoured the Wabash River Valley, eroding further into the valley-fill sediments and, in some places, down to the bedrock. Since that time the bedrock surface in the Vincennes Quadrangle has remained virtually unchanged, except for the few small areas where the glacial drift is absent and bedrock is being eroded.

Map Use

This map is useful for delineating buried bedrock valleys where sand and gravel deposits commonly comprise very productive aquifers and for defining flow patterns and recharge/discharge pathways of these aquifers. It is a useful predictive guide for drilling operations, construction and engineering projects, geophysical surveys, and as a base map from which geological units and bedrock structures can be delineated. The bedrock surface is the lower limiting surface that can be integrated into 3-dimensional models of the overlying Quaternary sediment.

Mapping Methods

This map is based on data derived from field mapping and well records at the geologic records libraries of the Illinois State Geologic Survey (Champaign, IL) and of the Indiana Geological Survey (Bloomington, IN). The types of wells used included water, petroleum, coal, engineering, and stratigraphic borings. Locations and bedrock elevations were entered into a spreadsheet, and from this a grid of the bedrock surface was created, with a cell size of about 328 × 328 feet, and contoured using Dynamic Graphics' EarthVision (EV) software. The contours were manually edited using EV's graphic editor to produce a more geologically realistic topographic map of the bedrock surface. Environmental Systems Research Institute's Arc/Info software was used for final map revisions.

Data Distribution

The distribution of the data (well locations and outcrop examination sites) is shown in figure 2. The 1000-foot-wide buffer contours surrounding the data points indicate a qualitative measure of the reliability of the elevation of the bedrock surface extrapolated beyond the well and outcrop sites. The bedrock topography in areas having a higher density of data is less speculative than the topography in areas with little data. For example, elevations within the 1000-foot buffers should be more reliable than those within the 4000- to 5000-foot buffers. Users of this map also should be aware that the accuracy of the lithological data in the well records used for this project is variable.

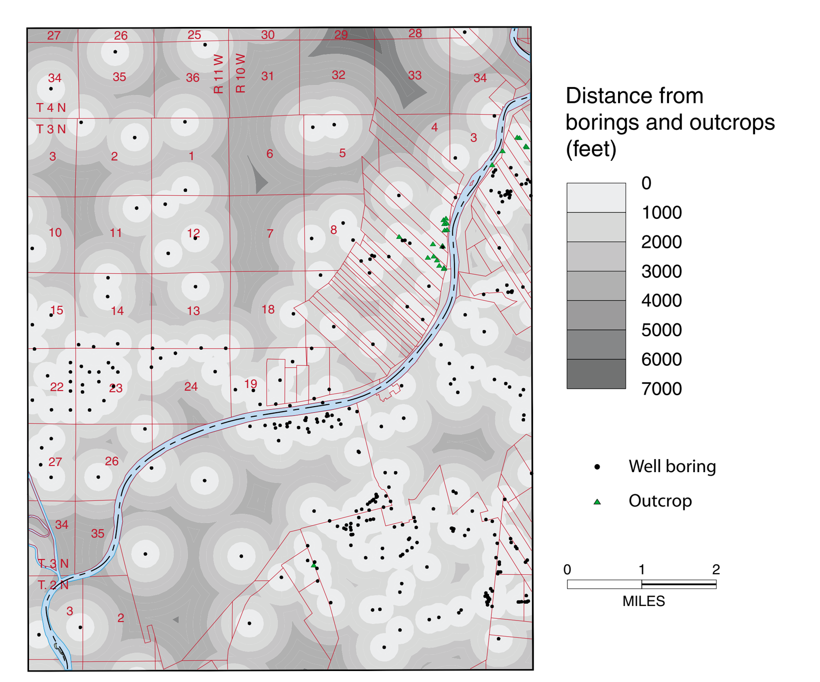


Figure 2 Data distribution map showing subsurface and outcrop data used to construct the bedrock topography map. Data points are buffered by 1000-foot wide contours.

References

Bleuer, N.K., and G.S. Fraser, 1981, Late Wisconsin history of the Middle Wabash River Valley: Geological Society of America, Abstracts with Programs, v. 13, no. 7, p. 411.

Fidlar, M.M., 1936, Features of the valley floor of the Wabash River near Vincennes, Indiana: Proceedings of the Indiana Academy of Science, p. 175–182.

Gray, H.H., W.J. Wayne, and C.E. Wier, 1970, Geologic map of the 1° × 2° Vincennes Quadrangle and parts of adjoining quadrangles, Indiana and Illinois, showing bedrock and unconsolidated deposits: Indiana Geological Survey, Regional Geologic Map No. 3.

Shaver, R.H., 1979, Geologic story of the Lower Wabash Valley with emphasis on the New Harmony area: Indiana Department of Natural Resources, Geological Survey Occasional Paper 27, 14 p.

Thornbury, W.D., 1958, The geomorphic history of the Upper Wabash Valley: American Journal of Science, v. 256, p. 449–469.

Wayne, W.J., 1952, Pleistocene evolution of the Ohio and Wabash Valleys: Journal of Geology, v. 60, p. 575–585.

Base map compiled by Illinois State Geological Survey from the United States Geological Survey topographic map dated 1998. Topography compiled from imagery dated 1958 and 1962 and planetable surveys 1961 and 1965. Planimetry derived from imagery taken 1987 and other sources. Photoinspected using imagery dated 1998.

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

Recommended citation:
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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: 2005

Geology based on data collected by C.P. Weibel, 1997-2001.

Digital cartography by C.P. Weibel and T. Goeppinger, 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.

Bedrock Elevation
(feet above mean sea level)

500
475
450
425
400
375
350
325
300
275
250

Data Type

- Outcrop
- Stratigraphic boring (ISGS)
- Water well
- Engineering boring
- Coal boring
- Oil and Gas boring

Note: Numeric labels indicate elevation in feet above mean sea level. Dot indicates boring to bedrock.

ILLINOIS
DEPARTMENT OF NATURAL RESOURCES

1905-2005 ISGS
Illinois State Geological Survey

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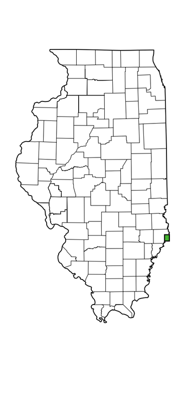

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES
1 Birds
2 Russellville
3 Oaktown
4 Lawrenceville
5 Fritchton
6 Saint Francisville
7 Decker
8 Iona, IN

2½°
MAGNETIC NORTH
TRUE NORTH
APPROXIMATE MEAN DECLINATION, 2005

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