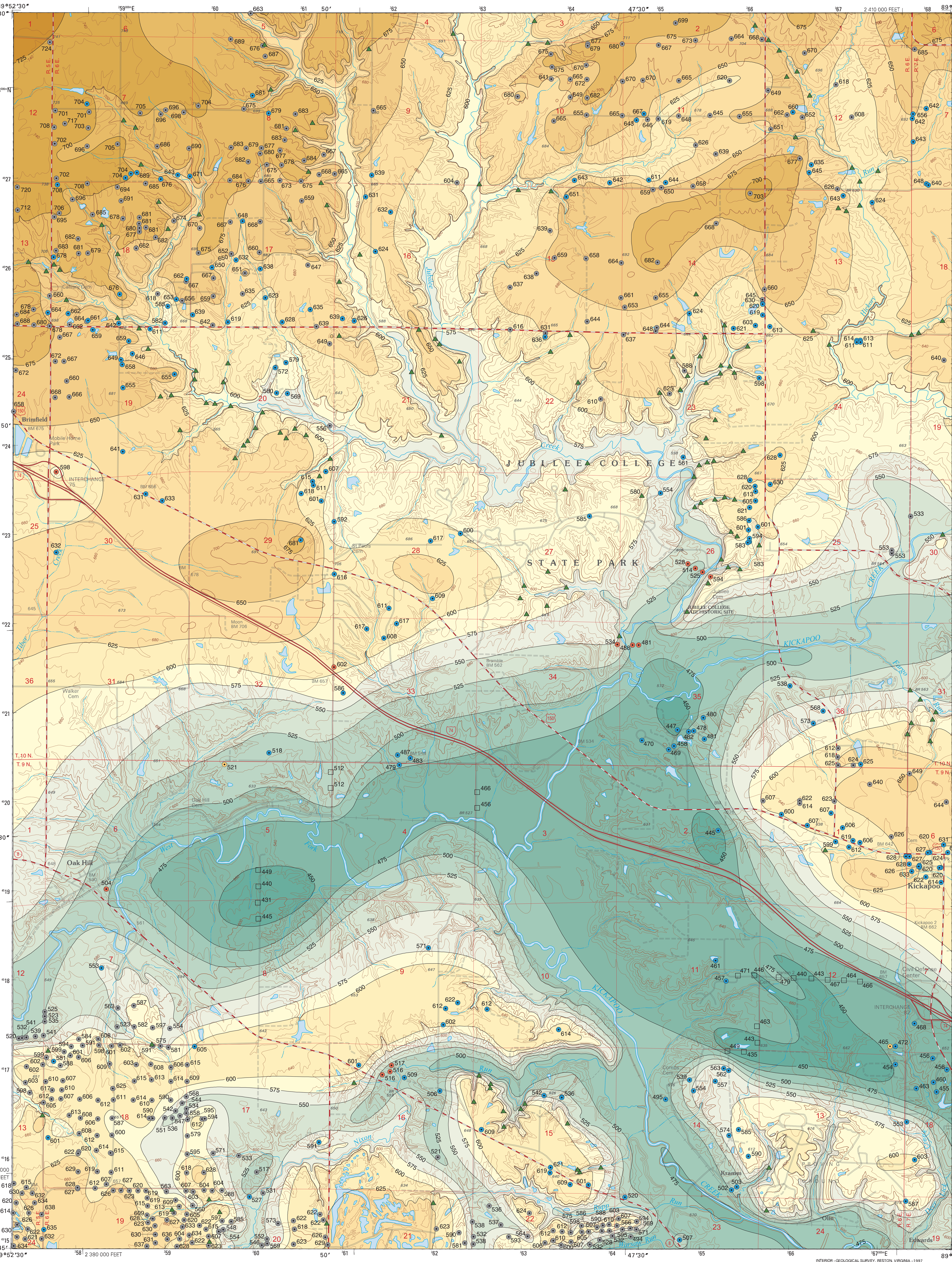
Bedrock Topography of Oak Hill Quadrangle

Peoria County, Illinois

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

Illinois Geologic Quadrangle Map
IGQ Oak Hill-BT

C. Pius Weibel and François Hardy
2007



Bedrock Topography

The bedrock surface is the top of lithified rock that underlies the generally unlithified Quaternary-age drift (glacial and postglacial sediments). The elevations on this mostly buried surface in the Oak Hill Quadrangle range from less than 450 feet (msl) in the deepest parts of the bedrock valleys in the middle area of the quadrangle to more than 725 feet in the northwest corner. A regional bedrock topography map (fig. 1) displays two major landscape elements: (1) a buried bedrock valley system in the central and southeast parts, and (2) upland areas in the northern and the southern parts of the quadrangle. Bedrock outcrops (green triangles, fig. 2) expose the shale-dominated Pennsylvanian Carbondale Formation (Willman et al. 1967). The Quaternary-age sediment overlying the bedrock consists of diamicton (a mixture of gravel, sand, silt, and clay), sand, gravel, and silt that were deposited as till, outwash, colluvium, alluvium, loess, and lacustrine sediments. The Quaternary Period was preceded by a very long period of erosion, and a pre-Quaternary drainage system in the area probably drained toward the east into the ancient Mississippi River valley (now partially occupied by the modern Illinois River valley). During the Quaternary, the area was overridden by multiple advances and retreats of continental glaciers, which resulted in the erosion of pre-existing strata and sediments and the deposition of glacial sediments. Illinois Episode glaciers completely covered the quadrangle, disrupting the pre-existing fluvial drainage system and depositing till, sand, and gravel. During the subsequent interglacial Sangamon Episode, the direct precursor to the modern fluvial drainage system was established and probably eroded down into the bedrock surface in places. The deep bedrock channels underlying Kickapoo Creek, the West Fork of Kickapoo Creek, and some of its tributaries probably were formed at this time. Wisconsin Episode glaciers of the Laurentide Ice Sheet advanced from the east toward the map area and stopped near the eastern edge of the quadrangle. Farther to the south, the terminus of this ice sheet and its moraine crossed the Illinois River valley and dammed the mouth of Kickapoo Creek, forming Lake Kickapoo (Willman and Payne 1942). Fine-grained lake sediments and sandy to gravelly deltaic sediments infilled the deep channels. The deltaic sediments were primarily derived from outwash from the stagnating Wisconsin Episode glacier, located at the headwaters of Kickapoo Creek. As the glaciers receded, the dam was breached, draining Lake Kickapoo via the modern Kickapoo Creek southeast to the Illinois River and downcutting through the deltaic and lacustrine sediments. Since that time, streams have continued to erode the drift deposited during the Illinois and Wisconsin glacial episodes, exposing the bedrock in many areas.

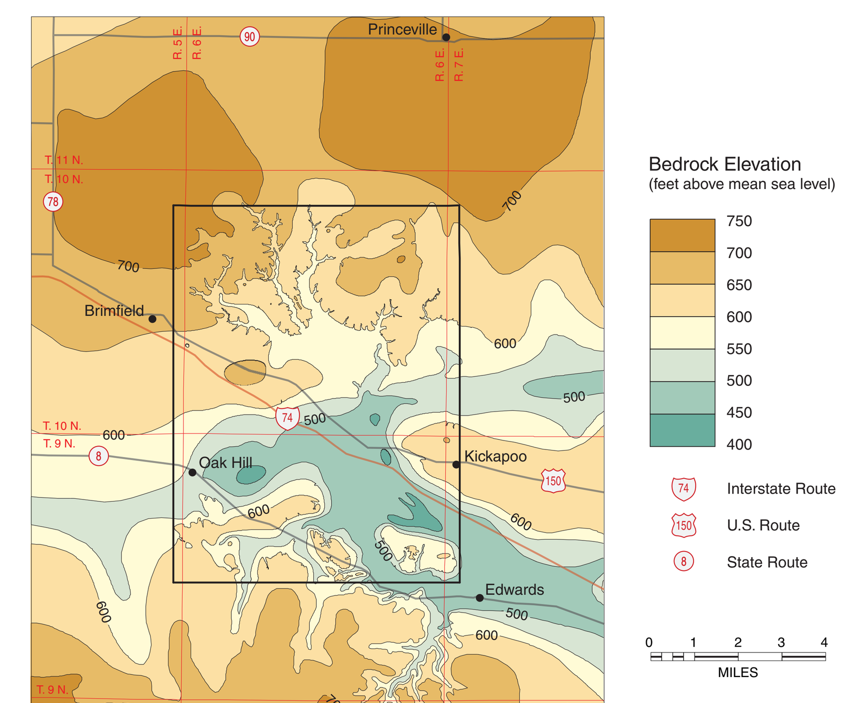


Figure 1 Regional bedrock topgraphy map of the area around Oak Hill Quadrangle (outlined in black). Modified from Wanless (1957) and Herzog et al. (1994).

Map Use

The bedrock topography map is useful for delineating buried bedrock valleys. Sand and gravel deposits are often located in these valleys and can be sources of abundant groundwater. This map also is useful for predicting groundwater flow patterns and areas of recharge and discharge. The map is essential for accurate prediction of the volume, depth, and distribution of shallow, economically significant deposits of coal and construction stone in the bedrock. It is a useful predictive guide for drilling operations, construction and engineering projects, and geophysical surveys. Users of this map should be aware that the accuracy of the boring locations and the lithological data is of variable quality.

Mapping Methods

This map is based on data from field study of outcrops, geophysical (refraction) surveys, and examination of well records in the Geological Records Unit of the Illinois State Geologic Survey (ISGS). The well data consist of 617 borings and include logs of water wells, coal and engineering borings, and ISGS stratigraphic test borings. In addition, well data within a 2-mile buffer of the quadrangle were utilized. All of the well data used to construct this map were selected from a larger data set. Wells with locations that could not be verified or did not contain relevant data were not used. Locations and bedrock elevations were entered into a spreadsheet, and from this, using Environmental Systems Research Institute's ArcGIS 3D Analyst tool, a grid of the data was created using the spline technique and using a cell size of about 191 feet. Bedrock topography contours were manually digitized on an overlay of the grid map (with cells color-coded by elevation), the data points, and the surface topography map. Using the cut/fill option tool in the surface analyst tool, a grid was created to show the intersections of the bedrock and land surfaces. Where data indicated the intersections were mislocated, the bedrock surface contours were appropriately adjusted to better fit the data. The contour lines were subsequently converted back to a grid, using ArcToolbox's topo to raster tool. This grid was overlaid with a digital elevation model of the land surface, and the ArcGIS Spatial Analyst raster calculator tool was used to calculate the minimum elevations of the two grids. This procedure integrated the land surface geomorphology in the areas where bedrock is exposed. The minimum elevation grid was contoured using the ArcGIS surface analysis contour tool, and, after minor manual editing, the result is this bedrock topography map.

Data Distribution

The distribution of the data, along with 1,000-foot-wide buffers around well locations, outcrop examination sites, and geophysical data points, is shown in figure 2. The buffer contours provide a qualitative measure of the reliability of the elevation data extrapolated beyond well or boring locations. Interpretations of the bedrock topography in areas having a higher density of data generally are less speculative than in areas with fewer data. For example, bedrock contours within the 1,000-foot buffer are more reliable than those between the 4,000- and 5,000-foot buffers. In addition, interpretations of the depth and shape of the bedrock topography underneath the modern stream and valley floodplains are speculative at best because there are few data from these areas.

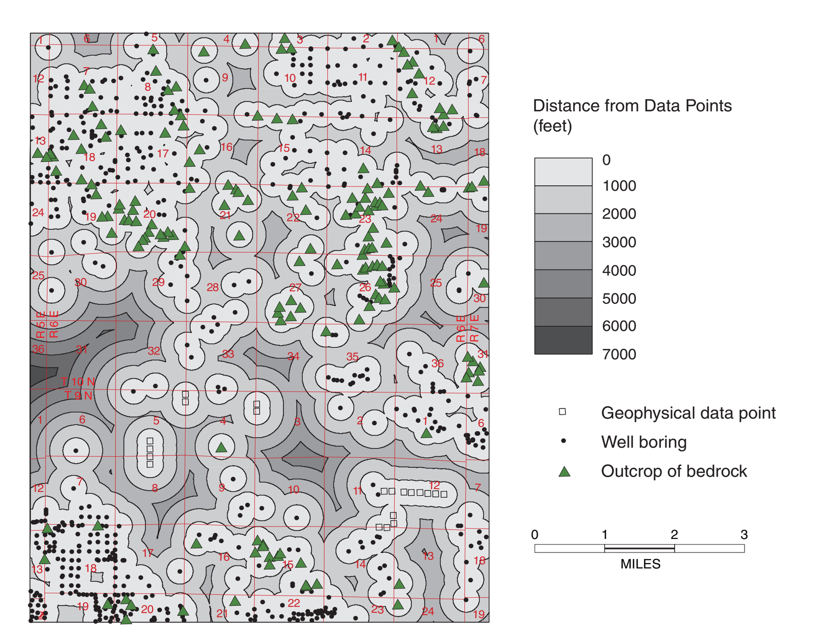


Figure 2 Data distribution map. Data points are surrounded by 1,000-foot distance contours, indicating the relative reliability of the bedrock surface elevations interpreted between the data points.

References

Herzog, B.L., B.J. Stiff, C.A. Chenoweth, K.L. Warner, J.B. Sieverling, and C. Avery, 1994, Buried bedrock surface of Illinois: Illinois State Geological Survey, Illinois Map 5, 1:500,000.

Wanless, H. R., 1957, Geology and mineral resources of the Beardstown, Glasford, Havana, and Vermont Quadrangles: Illinois State Geological Survey, Bulletin 82, 233 p.

Willman, H.B., and J.N. Payne, 1942, Geology and mineral resources of the Marseilles, Ottawa, and Streator Quadrangles: Illinois State Geological Survey, Bulletin 66, 388 p.

Willman, H.B., et al., 1967, Geologic map of Illinois: Illinois State Geological Survey, 1:500,000.

Base map compiled by Illinois State Geological Survey from digital data provided by the United States Geological Survey. Surface topography and planimetry compiled from imagery dated 1994. Digital base created 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 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

Released by the authority of the State of Illinois: 2007

Geology based on field work by C.P. Weibel and F. Hardy, 1998–2000.

Digital cartography by C.P. Weibel, T. Goeppinger, J. Carrell, Z. Golshani, and J. Domier, Illinois State Geological Survey.

Bedrock Elevation
(feet above mean sea level)

750
725
700
675
650
625
600
575
550
525
500
475
450
425

Data Type

- Bedrock outcrop
- Stratigraphic test boring (ISGS)
- Water-well boring
- Engineering boring
- Coal boring
- Geophysically derived data (ISGS)
- 587 Boring labels indicate bedrock elevation in feet above mean sea level. Dot indicates boring is to bedrock.

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

For more information contact:
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http://www.isgs.uiuc.edu

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4		5
6	7	8

ADJOINING QUADRANGLES
1 Laura
2 Princeville
3 Edelstein
4 Elmwood
5 Dunlap
6 Farmington East
7 Hanna City
8 Peoria West

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
Interstate Route
U.S. Route
State Route