Illinois Map 5

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ILLINOIS STATE GEOLOGICAL SURVEY

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Buried Bedrock Surface of Illinois

Third Edition

Illinois State Geological Survey and U.S. Geological Survey

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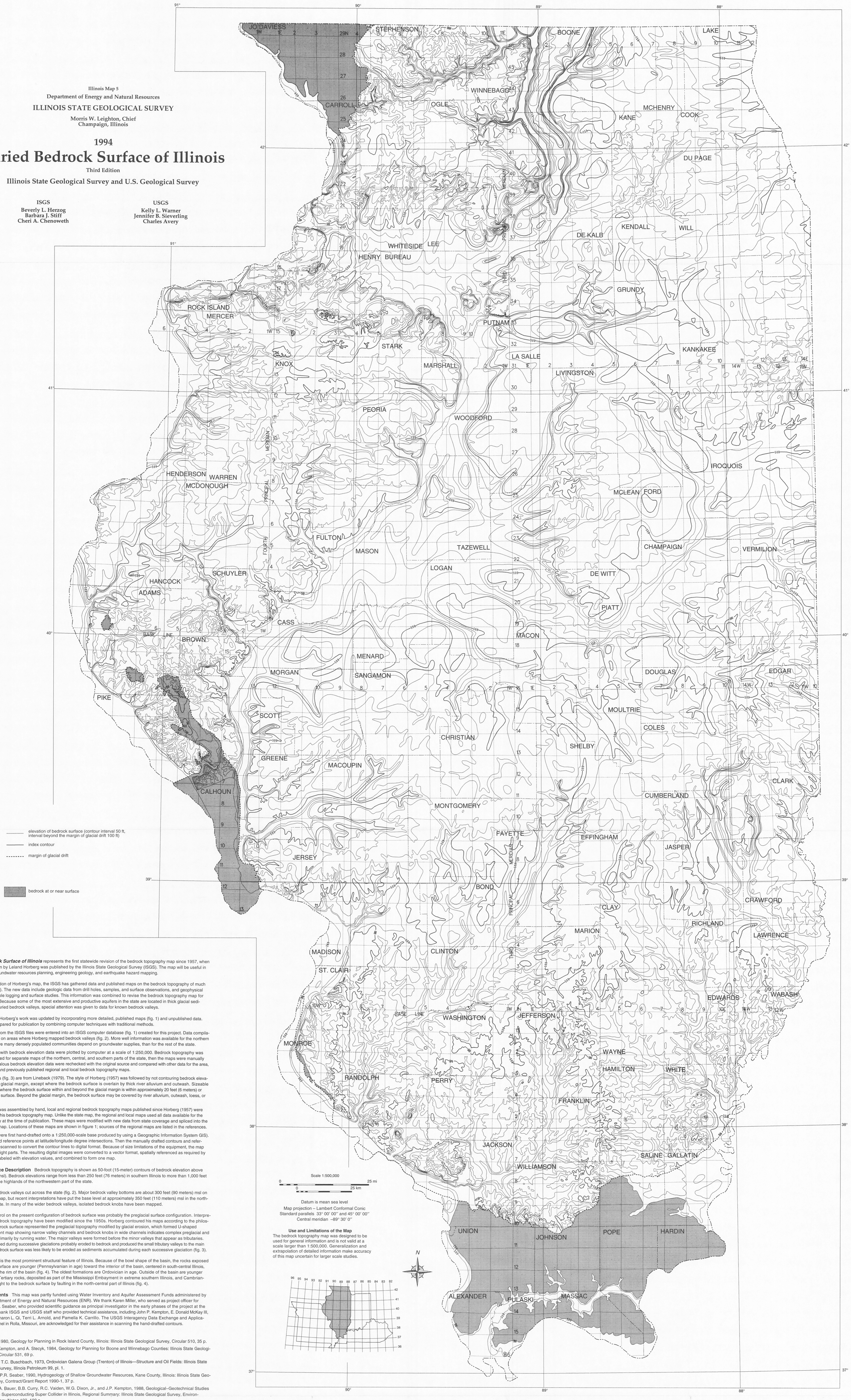

Buried Bedrock Surface of Illinois represents the first statewide revision of the bedrock topography map since 1957, when the second edition by Leland Horberg was published by the Illinois State Geological Survey (ISGS). The map will be useful in fields such as groundwater resources planning, engineering geology, and earthquake hazard mapping.

Since the publication of Horberg's map, the ISGS has gathered data and published maps on the bedrock topography of much of the state (fig. 1). The new data include geologic data from drill holes, samples, and surface observations, and geophysical data from downhole logging and surface studies. This information was combined to revise the bedrock topography map for the entire state. Because some of the most extensive and productive aquifers in the state are located in thick glacial sediments of major buried bedrock valleys, special attention was given to data for known bedrock valleys.

Methodology Horberg's work was updated by incorporating more detailed, published maps (fig. 1) and unpublished data. The map was prepared for publication by combining computer techniques with traditional methods.

- Well log data from the ISGS files were entered into an ISGS computer database (fig. 1) created for this project. Data compilation concentrated on areas where Horberg mapped bedrock valleys (fig. 2). More well information was available for the northern 35 counties, where many densely populated communities depend on groundwater supplies, than for the rest of the state.
- Well locations with bedrock elevation data were plotted by computer at a scale of 1:250,000. Bedrock topography was manually contoured for separate maps of the northern, central, and southern parts of the state, then the maps were manually combined. Anomalous bedrock elevation data were rechecked with the original source and compared with other data for the area, Horberg's maps, and previously published regional and local bedrock topography maps.
- Glacial margins (fig. 3) are from Lineback (1979). The style of Horberg (1957) was followed by not contouring bedrock elevations beyond the glacial margin, except where the bedrock surface is overlain by thick river alluvium and outwash. Sizeable areas are shown where the bedrock surface within and beyond the glacial margin is within approximately 20 feet (6 meters) or less of the ground surface. Beyond the glacial margin, the bedrock surface may be covered by river alluvium, outwash, loess, or residuum.
- After the map was assembled by hand, local and regional bedrock topography maps published since Horberg (1957) were incorporated into this bedrock topography map. Unlike the state map, the regional and local maps used all data available for the areas under study at the time of publication. These maps were modified with new data from state coverage and spliced into the hand-contoured map. Locations of these maps are shown in figure 1; sources of the regional maps are listed in the references.
- The contours were first hand-drafted onto a 1:250,000-scale base produced by using a Geographic Information System GIS). The base included reference points at latitude/longitude degree intersections. Then the manually drafted contours and reference points were scanned to convert the contour lines to digital format. Because of size limitations of the equipment, the map was scanned in eight parts. The resulting digital images were converted to a vector format, spatially referenced as required by the GIS, edited, labeled with elevation values, and combined to form one map.

Bedrock Surface Description Bedrock topography is shown as 50-foot (15-meter) contours of bedrock elevation above mean sea level (msl). Bedrock elevations range from less than 250 feet (76 meters) in southern Illinois to more than 1,000 feet (300 meters) in the highlands of the northwestern part of the state.

Several major bedrock valleys cut across the state (fig. 2). Major bedrock valley bottoms are about 300 feet (90 meters) msl on Horberg's 1957 map, but recent interpretations have put the base level at approximately 350 feet (110 meters) msl in the northern half of the state. In many of the wider bedrock valleys, isolated bedrock knobs have been mapped.

The greatest control on the present configuration of bedrock surface was probably the preglacial surface configuration. Interpretations of the bedrock topography have been modified since the 1950s. Horberg contoured his maps according to the philosophy that the bedrock surface represented the preglacial topography modified by glacial erosion, which formed U-shaped valleys. The current map showing narrow valley channels and bedrock knobs in wide channels indicates complex preglacial and glacial erosion, primarily by running water. The major valleys were formed before the minor valleys that appear as tributaries. Streams that formed during successive glaciations probably eroded to bedrock and produced the small tributary valleys to the main channels. The bedrock surface was less likely to be eroded as sediments accumulated during each successive glaciation (fig. 3).

The Illinois Basin is the most prominent structural feature of Illinois. Because of the bowl shape of the basin, the rocks exposed at the bedrock surface are younger (Pennsylvanian in age) toward the interior of the basin, centered in south-central Illinois, and older toward the rim of the basin (fig. 4). The oldest formations are Ordovician in age. Outside of the basin are younger Cretaceous and Tertiary rocks, deposited as part of the Mississippi Embayment in extreme southern Illinois, and Cambrian-aged rocks brought to the bedrock surface by faulting in the north-central part of Illinois (fig. 4).

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Figure 1
Distribution of well data and areas updated from published bedrock topography maps

1 Berg, Kempton, and Stecyk 1984
2 Larsen 1973
3 Curry and Seaber 1990
4 Larson, Herzog, Vaiden, and Chenoweth 1994
5 Kempton and Visocky 1992 Kempton, Johnson, Heigold, and Cartwright 1991 Kempton, Ringler, Heigold, Cartwright, and Poole 1981
6 Jacobs 1971

Figure 2
Bedrock valleys

from Bristol and Buschbach 1973

Figure 3
Quaternary geology

after Lineback 1979 and Richmond and Fullerton 1986

Figure 4
Bedrock geology

after Willman et al. 1967, Kolata et al. 1978, and Palmer 1983