Depth to Bedrock Map of Sauk County, Wisconsin

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Miscellaneous Map 54

Introduction

This map is part of the Sauk County Groundwater Project, a joint project of the Wisconsin Geological and Natural History Survey, the Sauk County Board of Supervisors, the Wisconsin Department of Natural Resources Bureau of Drinking Water and Groundwater, and the U.S. Geological Survey. The purpose of this project was to compile and analyze data regarding the county's groundwater resources. This information was used to construct this depth to bedrock map, which shows, in a generalized fashion, the distribution and thickness of unlithified deposits across the county. Also shown on the map are areas where water wells are completed in bedrock and areas where wells are completed in unlithified deposits. The information on this map can be used by those interested in natural resource and land-use planning.

Geology of Sauk County

Sauk County consists of three geologically and geographically distinct regions: the Baraboo Hills in the east-central part of the county; the glaciated eastern part of the county; and the unglaciated or Driftless Area, which includes the northern, western, and southern parts of the county (fig. 1). These regions have distinct topographic and geologic features that are the result of their varied geologic histories and that have affected the distribution of unlithified deposits.

The Baraboo Hills consist of Precambrian quartzite that forms a complex doubly plunging syncline. The South Range of the Baraboo Hills rises more than 800 ft above the surrounding land, is fairly continuous, and has relatively flat summit plateaus; the North Range is less extensive, lower in elevation, and more discontinuous. The Baraboo Hills are typically covered by a thin layer of soil and the depth to lithified materials is small. Paleozoic sandstone is present between the two ranges (fig. 2).

The glaciated part of the county is covered by material deposited during the last part of the Wisconsin Glaciation. Although the maximum extent of the glacial ice is marked by the Johnstown moraine, glacial lake sediment and outwash sand and gravel cover a significant part of the land surface west of the moraine (figs. 1 and 2). These deposits range up to approximately 250 ft in thickness. The lake sediments, which typically underlie modern stream valleys, consist primarily of sand with interbedded silt and clay. The maximum depth to bedrock encountered in the glaciated part of the county is about 450 ft.

The Driftless Area consists of narrow uplands with thin soil cover surrounded by steep-sided valleys. In the uplands, the thickness of unlithified material is typically less than 25 ft, although in isolated areas the depth to bedrock ranges up to 100 ft. These areas of thicker deposits in the unglaciated uplands are probably the result of increased mineral weathering (clay and soil formation) or windblown deposition of silt. Nearly flat-lying Paleozoic sand, sandstone, and dolomite are exposed along the valley walls. The valley bottoms contain tens of feet of Pleistocene sediment over layers of sandstone and dolomite.

Data compilation and interpretation

The depth to bedrock map presented here provides a general guide to the distribution and thickness of unlithified materials overlying the bedrock surface. In constructing this map, we considered areas of talus deposits, such as those along the shore of Devils Lake, to be unlithified material.

We plotted locations of 1,337 Wisconsin Geological and Natural History Survey geologic logs (1912–2000) and Wisconsin Department of Natural Resources Well Constructor's Reports (WCRs; 1936–89) in a geographic information system. Locations of WCRs were verified using plat books, U.S. Geological Survey 7.5-minute digital raster graphic maps (USGS, 1996–97), and aerial photographs (USGS, 1992).

Of the records used, 1,147 included a measurement of depth to bedrock. Wells that did not reach bedrock, according to WCRs, gave us minimum depth to bedrock for 190 locations in the county. For interpretive purposes, we estimated land-surface elevations and surface slope from a digital elevation model with 30-meter resolution (USGS, 2001). The Soil Survey Geographic (SSURGO) database of soils information (Natural Resources Conservation Service, 2000) provided us with additional data for areas of shallow bedrock.

We relied upon our interpretation of the geologic map of Sauk County (Clayton and Attig, 1990) to map the depth to bedrock in areas of the county where well records are sparse. The geologic map shows thick unlithified deposits (in the glaciated eastern part of the county and in areas of glacial lake deposits, outwash, windblown silt, and river valley alluvium) and shows bedrock where it is overlain by very thin, unlithified deposits. We used the WCRs to determine that the average depth to bedrock within units mapped by Clayton and Attig (1990) as bedrock having thin soil cover ranged from 16 to 21 ft. Therefore, in upland areas where well data are sparse, we mapped the depth to bedrock as less than 25 ft.

In the upland areas for which more well data were available, some WCRs indicated a depth to bedrock greater than 25 ft. We incorporated those data to depict local areas in the uplands where surficial deposits are thicker. We have also mapped an increase in depth to bedrock in the uplands where an area mapped as windblown silt by Clayton and Attig (1990) is coincident with an increase in the land-surface elevation. Although local increases in the depth to bedrock may also be found in upland areas where well records are not available, we have only mapped a thickening of deposits in the uplands where verified by drilling records or suggested by the presence of windblown deposits and topography.

In the valleys of the Driftless Area and in the glaciated part of Sauk County where geologic-log and well-construction data are sparse, we have inferred the depth to bedrock based on the type of geologic material mapped (Clayton and Attig, 1990) and the topographic relief. For instance, in areas where the Johnstown moraine is present and where there is an increase in land-surface elevation, we have shown an increase in the depth to bedrock. Similarly, we have inferred an increase in the depth to bedrock where a local topographic high is coincident with an area mapped by Clayton and Attig (1990) as windblown deposits. We interpreted a decrease in the depth to bedrock where the topography suggests a modern stream has eroded surficial deposits.

Limitations of the map

Descriptions of the Pleistocene deposits in the county (Clayton and Attig, 1990) indicate that these deposits may vary significantly in character and thickness over short distances. Because of this local complexity, this map should be used only as a guide to the thickness of deposits. The symbols used to represent rock outcrop locations appear large on this map in relation to the actual size of the outcrop. Although some of these symbols appear to fall on the border of the 25- to 50-ft depth interval, the depth to bedrock at the location of the center of the symbol is zero. The accuracy of the interpretation presented on the map varies throughout the county, increasing in areas of greater data density. The map is intended for use at the published scale of 1:100,000. Detailed, site-specific investigations are necessary to verify local conditions.

Sources of information

Clayton, Lee, and Attig, J.W., 1990, Geology of Sauk County, Wisconsin: Wisconsin Geological and Natural History Survey Information Circular 67, 68 p.

Natural Resources Conservation Service, 2000, Soil Survey Geographic (SSURGO) database for Sauk County, Wisconsin: U.S. Department of Agriculture. Online; available at URL: <http://www.ftw.nrcs.usda.gov/ssur_data.html>.

U.S. Geological Survey, [1996–97], Digital raster graphics of topographic quadrangles (7.5-minute series, topographic), Sauk County, Wisconsin.

U.S. Geological Survey, 1992, National Aerial Photography Program. MRSID compression by WDNR.

U.S. Geological Survey, 2001, National elevation dataset. Online; available at URL: <http://gisdata.usgs.net/ned/>.

Wisconsin Department of Natural Resources Well Constructor's Reports (1936–89).

Wisconsin Geological and Natural History Survey published and unpublished geologic logs (1912–2000).

Figure 1. *Major geologic features of Sauk County during the last part of the Wisconsin Glaciation (modified from Clayton and Attig, 1990). The map shows the extent of the area covered by glacial ice, associated outwash plains, and glacial lakes. The locations of the Baraboo Hills and the Driftless Area are also indicated.*

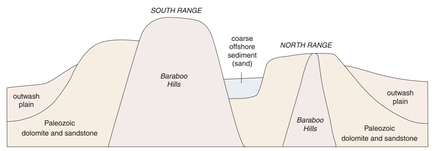

Figure 2. *Generalized north–south cross section showing the relationship between the Precambrian Baraboo Hills, Paleozoic dolomite and sandstone, and unlithified deposits.*

Depth to bedrock (in feet)

valley	upland
0-25	
25-50	25-50
50-100	50-100
100-150	100-150
150-200	
200-250	
250-300	
300-350	
350-400	
400-450	
450+	

Digital cartography and editing by K.C. Roushar

Base map constructed from U.S. Geological Survey Digital Line Graph files (1990, scale 1:100,000), modified by Wisconsin Department of Natural Resources (1992) and Wisconsin Geological and Natural History Survey (2000).

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- well reaching bedrock
- well not reaching bedrock
- rock outcrop location (SSurgo dataset)