UNIVERSITY OF MINNESOTA
MINNESOTA GEOLOGICAL SURVEY
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COUNTY ATLAS SERIES
ATLAS C-26, PART A
Blue Earth County
Plate 6—Bedrock Topography *and* Depth to Bedrock

BEDROCK TOPOGRAPHY

By

Julia R. Steenberg

2012

INTRODUCTION

The configuration of the bedrock surface in Blue Earth County is represented by the colors assigned to 50-foot (15-meter) elevation intervals (example: 751 to 800 feet above sea level) on the Bedrock Topography map. The position of the contour intervals was determined from bedrock outcrop mapping, records of water-well construction, and scientific borings. The somewhat irregular distribution of data can be seen on the Data-Base Map (Plate 1) and should be considered when assessing the reliability of the map at any particular location. Records of drill holes that intersect bedrock are most abundant in the north-central part of the county near populated areas that rely on ground water from bedrock aquifers. There are fewer wells that reach bedrock in rural areas of the county because many of the domestic wells in those areas get sufficient water from sand and gravel beds in the glacial sediment.

The bedrock surface in Blue Earth County varies from more than 950 feet (290 meters) above sea level in the southeastern part to less than 650 feet (198 meters) above sea level in the northwest and north-central parts of the county. The most prominent feature of bedrock topography in Blue Earth County is an extensive, buried valley located in the southwestern and north-central part of the county that deepens to the north. This valley does not appear to follow modern river valleys or lake chains in Blue Earth County. However, north of Mankato in Nicollet and Le Sueur Counties, the valley approximates the position of the modern Minnesota River system. This ancient bedrock valley may have played a role in shaping the modern Minnesota River valley, contributing to the large curve in the valley seen in this area. Based on recent mapping in surrounding areas (Jirsa and others, 2010; Mossler and Steenberg, 2012a, b), this valley continued to drain north crossing northwestern Le Sueur County, western Scott County, and continued east into Dakota County, entering the ancestral Mississippi River drainage network south of the Twin Cities metropolitan region.

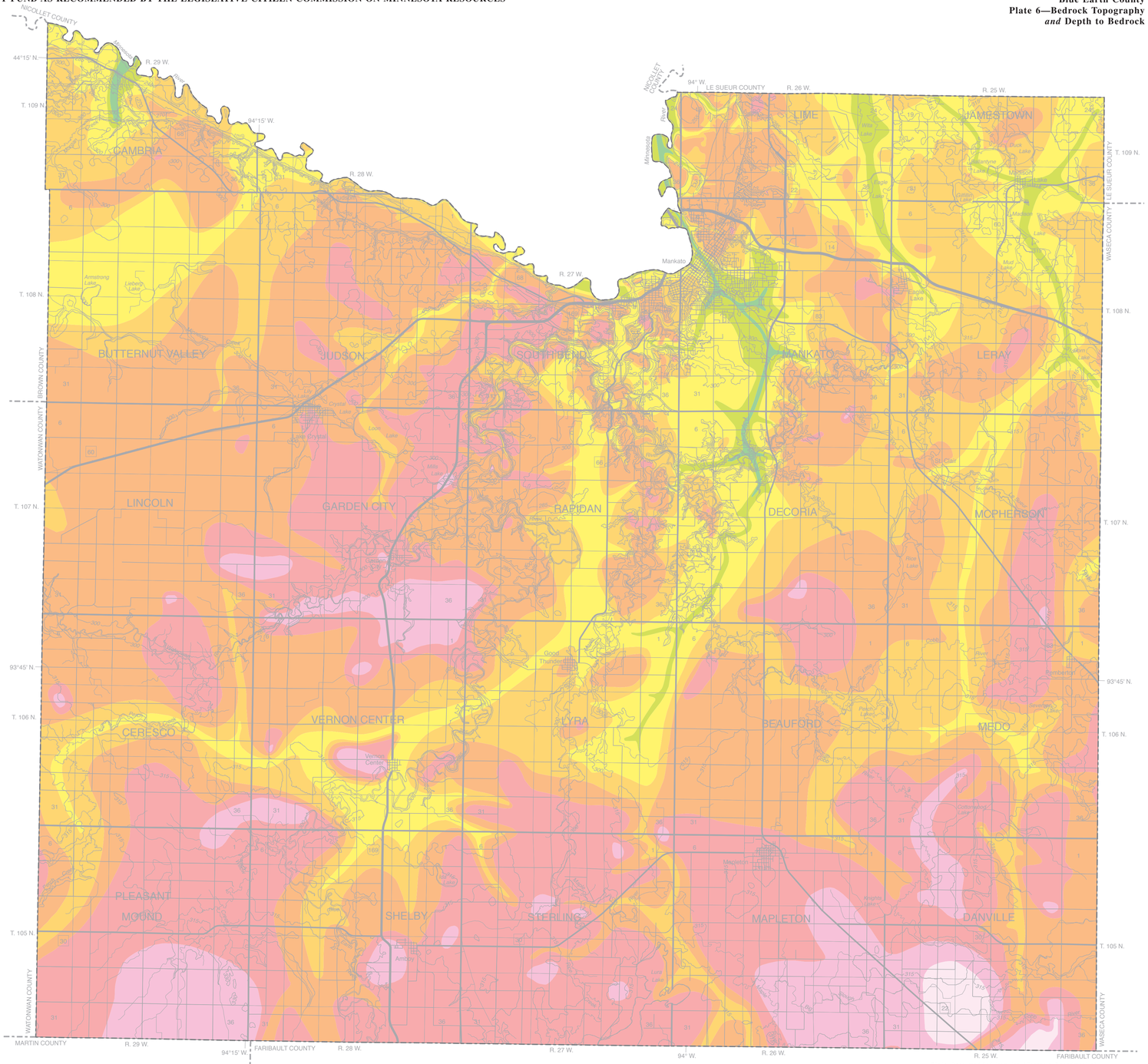
Other highlights of the bedrock topography are the flat uplands developed across the hard, resistant dolostone of the Prairie du Chien Group. The uplands are incised by narrow, steep-sided valleys of softer, less resistant rock formations including the Jordan Sandstone, St. Lawrence Formation, and Lone Rock Formation. These formations also tend to form more shallowly dipping slopes on the bedrock topography surface in the western part of the county.

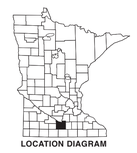
REFERENCES

Jirsa, M.A., Boerboom, T.J., Chandler, V.W., Mossler, J.H., Runkel, A.C., and Setterholm, D.R., 2010, Preliminary bedrock geologic map of Minnesota: Minnesota Geological Survey Open-File Report 10-2, scale 1:1,000,000.

Mossler, J.H., and Steenberg, J.R., 2012a, Bedrock topography, pl. 6 *of* Setterholm, D.R., project manager, Geologic atlas of Nicollet County, Minnesota: Minnesota Geological Survey County Atlas C-25, 6 pls., scale 1:100,000.

———2012b, Bedrock topography, pl. 6 *of* Setterholm, D.R., project manager, Geologic atlas of Sibley County, Minnesota: Minnesota Geological Survey County Atlas C-24, 6 pls., scale 1:100,000.





LOCATION DIAGRAM

SCALE 1:100 000

1 0 1 2 3 4 5 MILES

1 0 1 2 3 4 5 6 7 8 KILOMETERS

CONTOUR INTERVAL 15 METERS

Digital base modified from the Minnesota Department of Transportation BaseMap data; digital base annotation by the Minnesota Geological Survey.

Elevation contours were derived from the U.S. Geological Survey 30-meter Digital Elevation Model (DEM) by the Minnesota Geological Survey.

Universal Transverse Mercator Projection, grid zone 15
1983 North American Datum

GIS compilation by Julia Steenberg and R.S. Lively
Edited by Lori Robinson

DEPTH TO BEDROCK

By

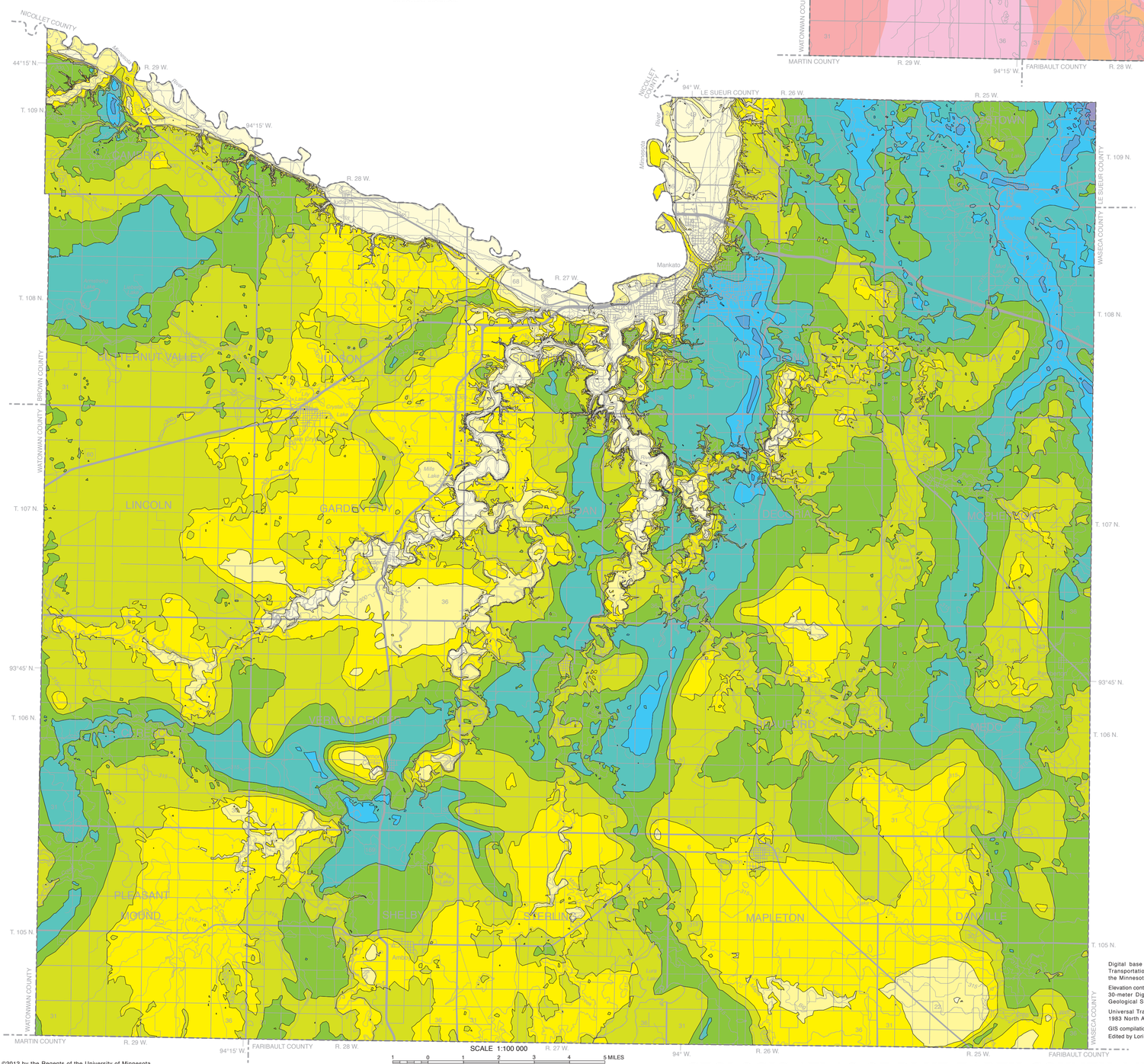
Julia R. Steenberg

2012

INTRODUCTION

The thickness of the glacial sediment is equal to the depth from the land surface to the bedrock surface. To calculate this thickness, a grid of bedrock-surface elevations was subtracted from a corresponding grid of land-surface elevations (30-meter cell size). The surface elevation grid was resampled from the National Elevation 10-meter data set of the U.S. Geological Survey, and the bedrock elevation grid was interpolated from interpretation of outcrops and water well data (see the Introduction to the Bedrock Topography map). The residual grid was then classified at a 50-foot (15-meter) interval to produce the color-coded Depth to Bedrock map. The angular lines on this map are the result of the mathematical process used to create this model. Because the surface of a lake is regarded as the land surface elevation, the thickness of glacial sediment within lake boundaries includes the depth of the lake water. To calculate the true thickness of sediment beneath the lake it is necessary to subtract the water depth at that location. In places the thickness of the glacial sediment varies greatly over short distances, and mapping at this scale (1:100,000) may not properly resolve such prominent variations. For that reason it is best to consult site-specific data, such as water well records, wherever they are available.

The thickest sediments in Blue Earth County occur over deep, pre-glacial valleys in the bedrock surface. These occur in the northern half of the county where several deep valleys have more than 350 feet (107 meters) of sediment overlying the bedrock surface. In contrast, areas where bedrock is at or within 50 feet (15 meters) of the land surface occur in the north-central part of the county along the Minnesota River valley and its tributaries. Most of the details in the Depth to Bedrock map are related to landforms because the model of the bedrock surface is based on much less data than the land surface topography model.



Digital base modified from the Minnesota Department of Transportation BaseMap data; digital base annotation by the Minnesota Geological Survey.

Elevation contours were derived from the U.S. Geological Survey 30-meter Digital Elevation Model (DEM) by the Minnesota Geological Survey. Contour interval 15 meters.

Universal Transverse Mercator Projection, grid zone 15
1983 North American Datum

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Every reasonable effort has been made to ensure the accuracy of the factual data on which this map interpretation is based; however, the Minnesota Geological Survey does not warrant or guarantee that there are no errors. Users may wish to verify critical information; sources include both the references listed here and information on file at the offices of the Minnesota Geological Survey in St. Paul. In addition, effort has been made to ensure that the interpretation conforms to sound geologic and cartographic principles. No claim is made that the interpretation shown is rigorously correct, however, and it should not be used to guide engineering-scale decisions without site-specific verification.

GEOLOGIC ATLAS OF BLUE EARTH COUNTY, MINNESOTA