UNIVERSITY OF MINNESOTA
MINNESOTA GEOLOGICAL SURVEY
D.L. Southwick, Director

Prepared and Published with the Support of
THE BOARD OF COMMISSIONERS, GOODHUE COUNTY, MINNESOTA, AND
THE MINNESOTA DEPARTMENT OF NATURAL RESOURCES, DIVISION OF WATERS

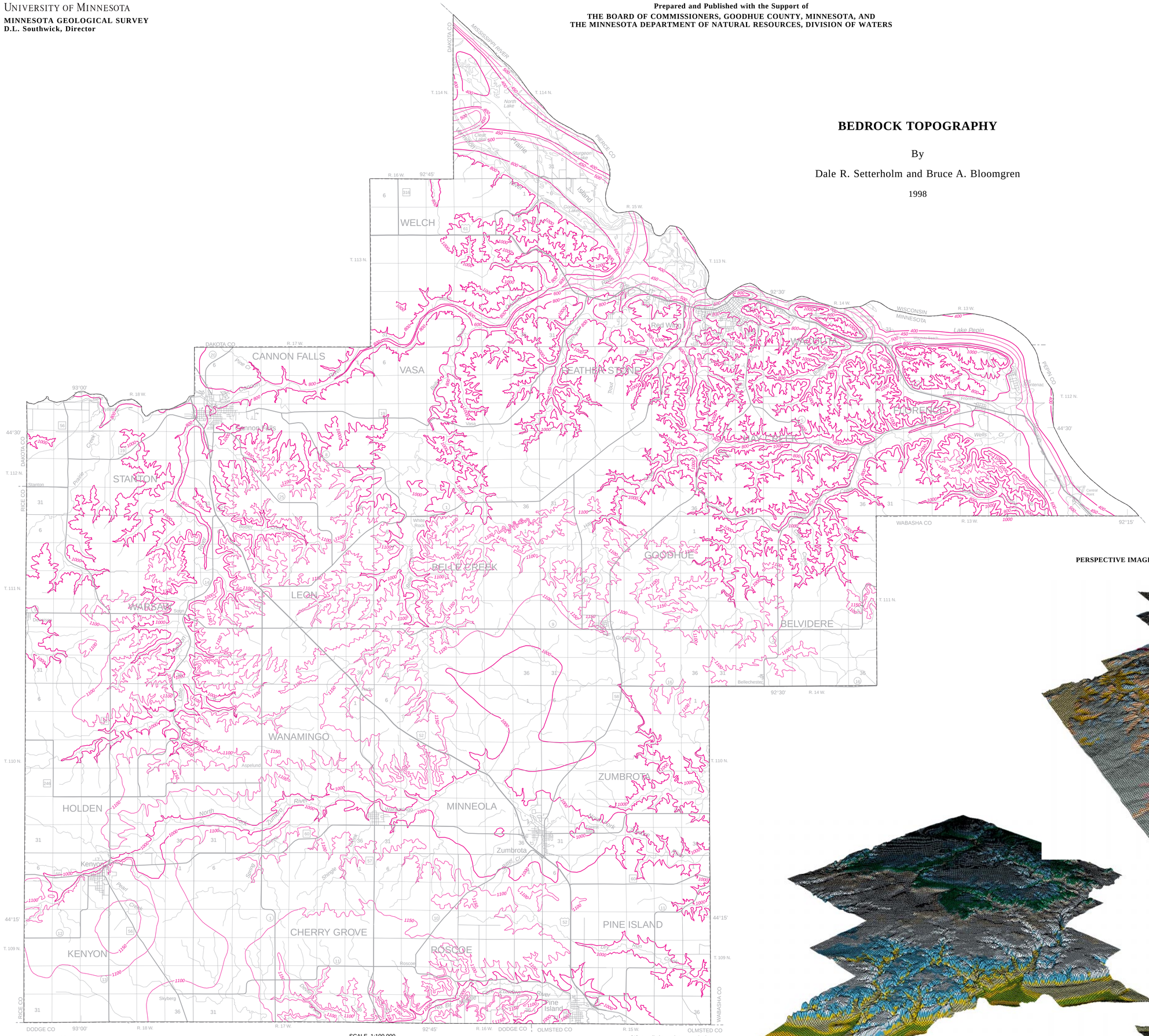
COUNTY ATLAS SERIES
ATLAS C-12, PART A
Plate 5—Bedrock Topography

BEDROCK TOPOGRAPHY

By

Dale R. Setterholm and Bruce A. Bloomgren

1998



SCALE 1:100 000

1 0 1 2 3 4 5 MILES

1 0 1 2 3 4 5 6 7 8 KILOMETERS

Digital base modified from 1990 Census TIGER/Line Files of U.S. Bureau of the Census (source scale 1:100,000); county border files modified from Minnesota Department of Transportation files; digital base annotation by Minnesota Geological Survey

Universal Transverse Mercator Projection, grid zone 15
1927 North American Datum

GIS compilation and cartography by
Joyce Meints and Emily Bauer

EXPLANATION

600

Line of equal elevation on the bedrock surface— In feet above mean sea level. Contour interval 200 feet; supplementary contours at 450, 500, 1100, and 1150 feet.

GOODHUE COUNTY

INTRODUCTION

The landscape of Goodhue County reflects a long and complex interaction of erosion and deposition under climatic conditions that have varied from subtropical to glacial. The earth materials found at the land surface range in age from bedrock formed more than 500 million years ago to sediments that are accumulating today. In much of the county, the present landscape is strongly influenced by the configuration of the underlying bedrock surface.

One of the most prominent features on the landscape is a network of valleys cut into the bedrock. Most of these valleys are oriented north-south or east-west; the valley floors slope downward to join the valley presently occupied by the Mississippi River. The tributary valleys contain a significant thickness of sediment (Plate 3) and were once deeper than they are now. The sediment in the valley of the Mississippi River is more than 350 feet thick in places.

The topography of the land surface between the valleys is similar to the underlying bedrock surface in many places, particularly where that bedrock is covered by less than 50 feet of glacial sediment, as it generally is in the northern half of the county (Fig. 1A; also Plate 3). At least half of the southern part of the county has more than 50 feet of glacial drift overlying bedrock, and in some areas the thickness of these deposits exceeds 250 feet.

MAP PREPARATION METHODS

The bedrock topography was mapped by compiling information on the elevation of the bedrock surface from field mapping of outcrops, soil maps, borings, and records of water-well construction. Where the bedrock surface is near the land surface and information is abundant, the contours that delineate that surface show great detail. In areas where the bedrock is deeply buried, points of known bedrock elevation are more sparsely distributed, and such detail is not possible. The distribution of the data points is shown on the data-base map (Plate 1) and should be considered in assessing the reliability of the map at any particular place.

THE TOPOGRAPHY OF THE BEDROCK SURFACE

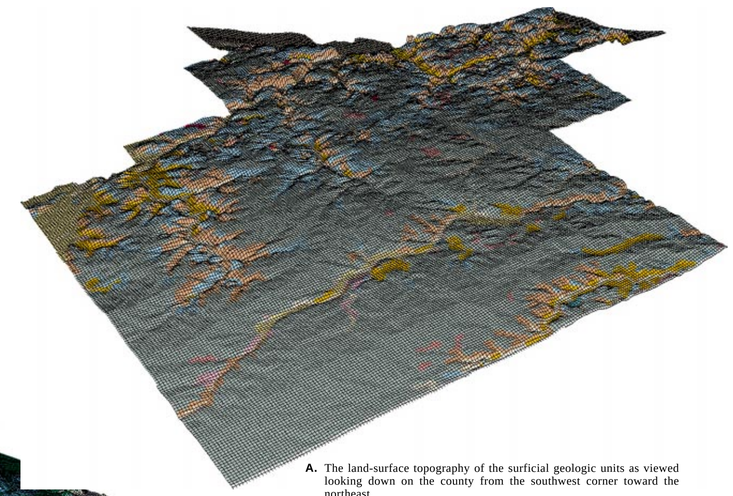
Harder layers of rock are more resistant to weathering and erosion; softer layers are more vulnerable to disintegration. Harder rock types will therefore occupy the greatest area of the bedrock surface, and more erodible rock types will compose the bedrock surface over a much smaller area. Extensive limestone and dolostone formations form the bedrock surface over most of the county. Weaker sandstone and shale units are at the bedrock surface only in and along the edges of valleys cut into the bedrock (Figs. 1B and 1C; also Plate 2).

In most of the western half of the county, resistant limestone of the Galena Group (the Prosser and Cummingsville formations on Plate 2) forms extensive flat areas on the bedrock surface. At the edges of these mesas, the more erodible rocks of the formations underlying the Galena—the Decorah Shale, Platteville Limestone, Glenwood Shale, and St. Peter Sandstone—form the shoulders and walls of valleys cut into the Galena rocks. These same formations form the slope of the escarpment between the Galena Group subcrop and the lower tier of the bedrock surface which is composed of rocks of the Prairie du Chien Group (Shakopee and Oneota formations on Plate 2).

The limestone and dolostone of the Prairie du Chien Group underlie the upland areas of eastern Goodhue County, the northern edge of the western part of the county, and the valley of the Cannon River in that area (Figs. 1B and 1C; also Plate 2). Valleys cut through the Prairie du Chien Group rocks into the Jordan Sandstone, the St. Lawrence Formation, and the Ironton and Galesville Sandstones. In the broad bedrock valley now occupied by the Mississippi River, the Eau Claire Formation and the Mt. Simon Sandstone compose the uppermost bedrock formations (Plate 2).

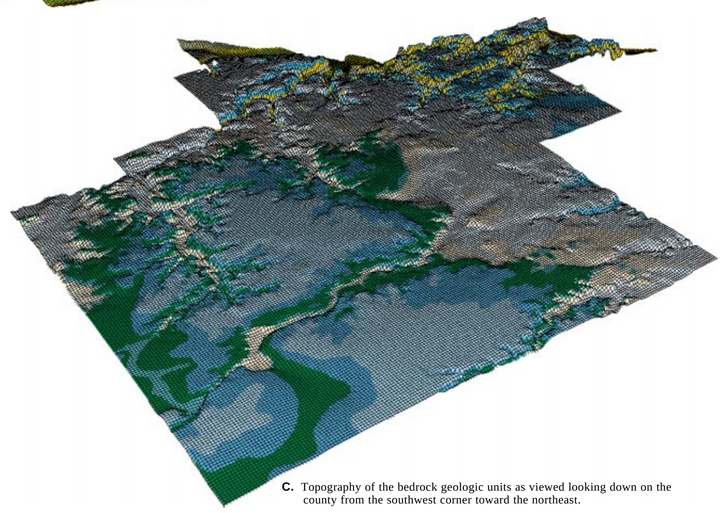
Bedrock valleys are more closely spaced in the northeastern part of the county, possibly owing to more extensive fracturing of the Prairie du Chien Group rocks that is related to the faulting in this area. The valleys are oversized for the streams that now occupy them, an indication that earlier in their history stream flow was much higher.

PERSPECTIVE IMAGES OF GOODHUE COUNTY



A. The land-surface topography of the surficial geologic units as viewed looking down on the county from the southwest corner toward the northeast.

B. Topography of the bedrock geologic units as viewed looking down from the northeast toward the southwest corner of the county.



C. Topography of the bedrock geologic units as viewed looking down on the county from the southwest corner toward the northeast.

Figure 1. Three-dimensional representations of the land and bedrock surfaces of Goodhue County, illustrating the relations between geologic units and the surfaces they form. The portrayal of the present-day land surface (**A**) includes the geologic units described on Plate 3, Surficial Geology. The other two models (**B** and **C**) illustrate the shape of the bedrock surface and the geologic units present at that surface (Plate 2). The scale of each image is 1:400,000; the vertical scale is exaggerated three times.

GEOLOGIC ATLAS OF GOODHUE COUNTY, MINNESOTA