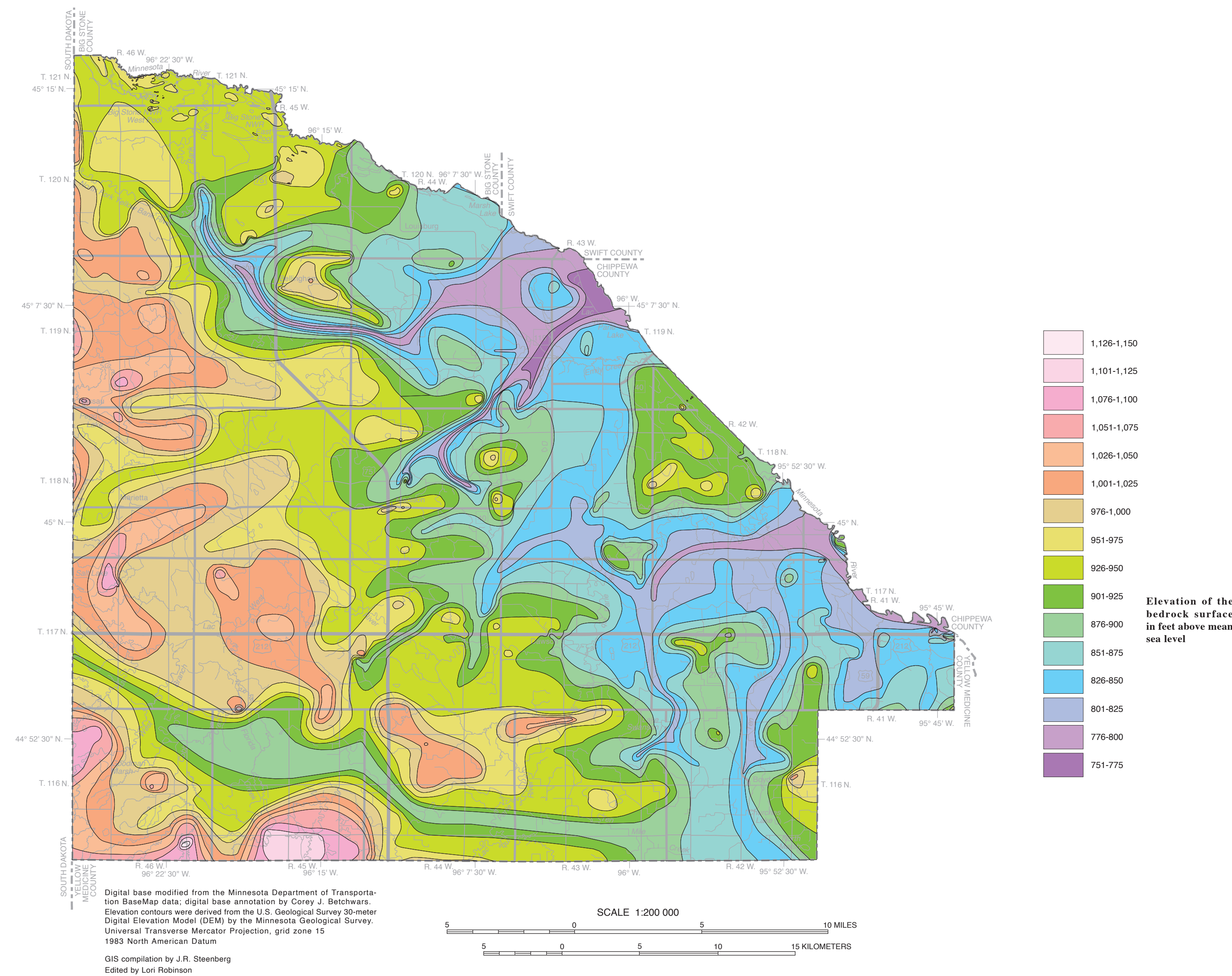


BEDROCK TOPOGRAPHY

By

Julia R. Steenberg and Aaron C. Hirsch

2023



EXPLANATION

The elevation of the bedrock surface in Lac qui Parle County is represented by the colors assigned to 25-foot (7.6-meter) elevation intervals (example: 901-925 feet [275.282 meters] above sea level) on the Bedrock Topography map. For any location within a colored unit, the elevation of the bedrock surface is expected to be between the end values depicted on the legend. Elevation ranges are separated by contours, which represent lines of equal elevation. A grid of the bedrock elevation and all contour lines are available in the supplementary digital and GIS files (<https://oc.umn.edu/arc>). The position of contour intervals was determined from outcrop, water-well construction records and scientific borings from the County Well Index, rotary sonic drill core, and passive seismic measurements collected by the Minnesota Geological Survey. Passive seismic measurements have a greater margin of error than drilling records, so it is important to note that the reliability and accuracy of the bedrock topographic surface in any area is directly related to the density and type of available data (see Plate 1, *Detailed Map*). Areas with a high density of bedrock control points are likely to have accurate interpretations of the bedrock elevation, whereas those areas with widely spaced control points may be less reliable and inappropriate for site-specific needs. The highest density of data points occurs near populated areas that rely on groundwater for their drinking-water needs. Previous topography contours were assessed in the creation of this map and modified where new data warranted changes (Jana and others, 2011).

The elevation of the bedrock surface in Lac qui Parle County varies from more than 1,126 feet (343 meters) above sea level in the southwest part of the county to less than 775 feet (236 meters) above sea level within the Minnesota River valley near Lac qui Parle Lake. The total relief of the bedrock surface across the county is approximately 370 feet (113 meters). The bedrock surface is incised by several deep valleys, one broad valley along the southern part of the county, and three narrow valleys in the northeast. The geometry of these narrow valleys indicates they deepen to the northeast, passing into adjacent Swift and Chippewa Counties.

The bedrock elevation surface shown on the Bedrock Topography map represents the elevation of the top unit of bedrock regardless of its age or composition. The uppermost bedrock unit across most of the county is Cretaceous in age. However, there are local areas where the Cretaceous rocks have completely eroded away, leaving Precambrian bedrock or siltstone as the bedrock surface. The Precambrian bedrock topography was also mapped at 25-foot (7.6 meter) intervals (Fig. 1). This surface precisely matches the mapped bedrock topography surface wherever Precambrian rocks are the uppermost bedrock. The highest Precambrian topography elevations occur in the northwest and south-central parts of the county and the lowest occur within a broad valley through the central part of the county.

REFERENCE

Jana, M.A., Boerboom, T.J., Chandler, V.W., Mosler, J.H., Runkel, A.C., and Setzerholm, D.R., 2011, Geologic map of Minnesota—Bedrock geology: Minnesota Geological Survey State Map S-21, scale 1:500,000.

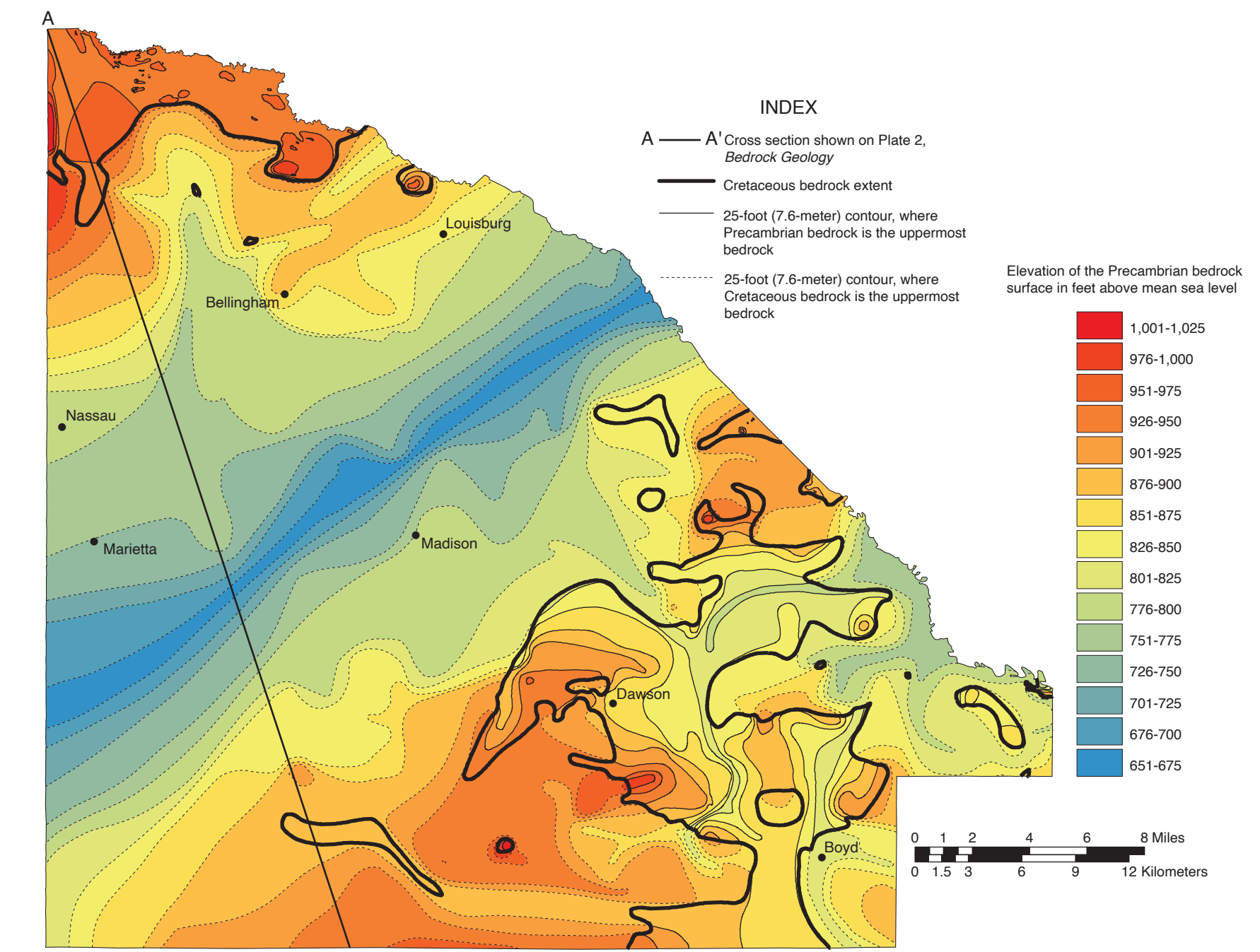


Figure 1. Map of the Precambrian bedrock topographic surface of Lac qui Parle County with 25-foot (7.6-meter) elevation contours. In areas where Cretaceous bedrock is the uppermost bedrock, the Precambrian bedrock topography contours are dashed. The thicker black lines outline the extent of the Cretaceous rocks in the county. A GIS dataset of the Precambrian bedrock-elevation surface as polygons and an interpolated grid are available in the digital files that accompany this atlas. Scale 1:300,000.

DEPTH TO BEDROCK

By

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2023



EXPLANATION

The depth to bedrock map portrays the thickness of unconsolidated material overlying the bedrock surface. The depth to bedrock is equal to the depth from the land surface to the underlying bedrock surface and represents the thickness of the Quaternary glacial sediments. To calculate this thickness, a grid of bedrock-surface elevations was subtracted from a corresponding grid of land-surface elevations. The land-surface elevation grid was recompiled from a 3-foot (1-meter) digital elevation model derived from lidar data created by the Minnesota Department of Natural Resources. The bedrock-surface elevation grid was made from the Bedrock Topography map, which was interpolated from 25-foot (7.6-meter) elevation contours based on outcrop mapping, interpretation of drilling records, engineering test borings, passive seismic data, and geomorphic features characteristic of bedrock near the land surface. The residual grid was then classified at 25-foot (7.6-meter) intervals to produce the color-coded Depth to Bedrock map. Thickness of the unconsolidated material overlying the bedrock surface can vary greatly over short distances, and mapping at this scale (1:200,000) may not properly resolve such prominent variations. For this reason, it is best to consult site-specific data (such as water-well records, engineering test borings, and passive seismic soundings) wherever available (see Plate 1, *Detailed Map*). The dashed appearance of the Depth to Bedrock map is related to surficial landforms because the land surface topography model is based on higher-resolution data than the interpreted bedrock-surface model.

The thickest Quaternary glacial sediments in Lac qui Parle County are in the southwestern part of the county, where the land-surface elevation rises as part of the Coteau des Prairies plateau. Thick Quaternary glacial sediments also occur within the buried bedrock valleys that cut across the southern and northeastern portions of the county, deepening southeastward. The depth to bedrock reaches as much as 352 feet (107 meters). Bedrock is within 50 feet (15 meters) of the land surface along the Minnesota River valley, where Precambrian outcrops are common, and in several places in the central part of the county, where Cretaceous rocks are very close to the land surface.

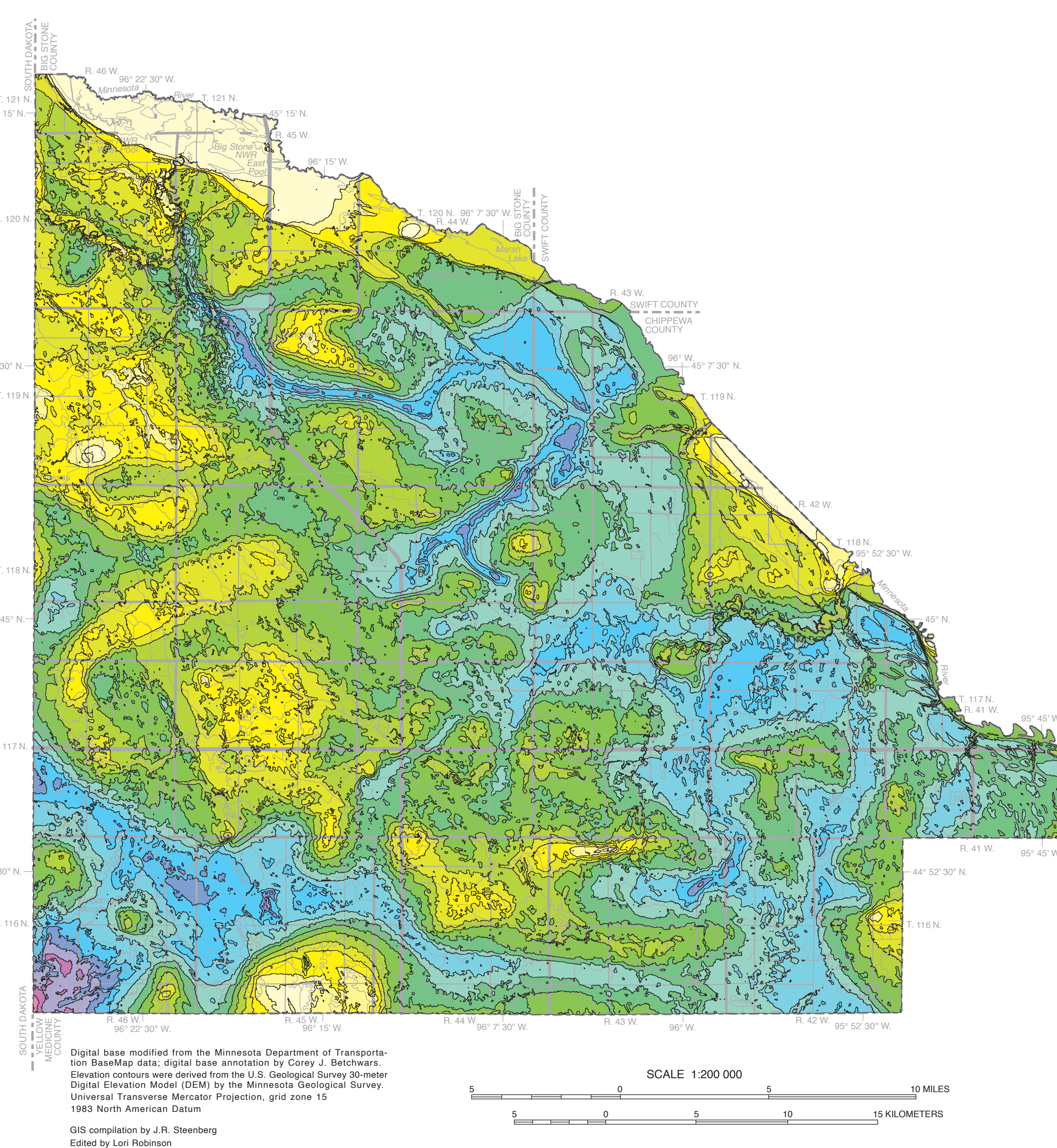


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