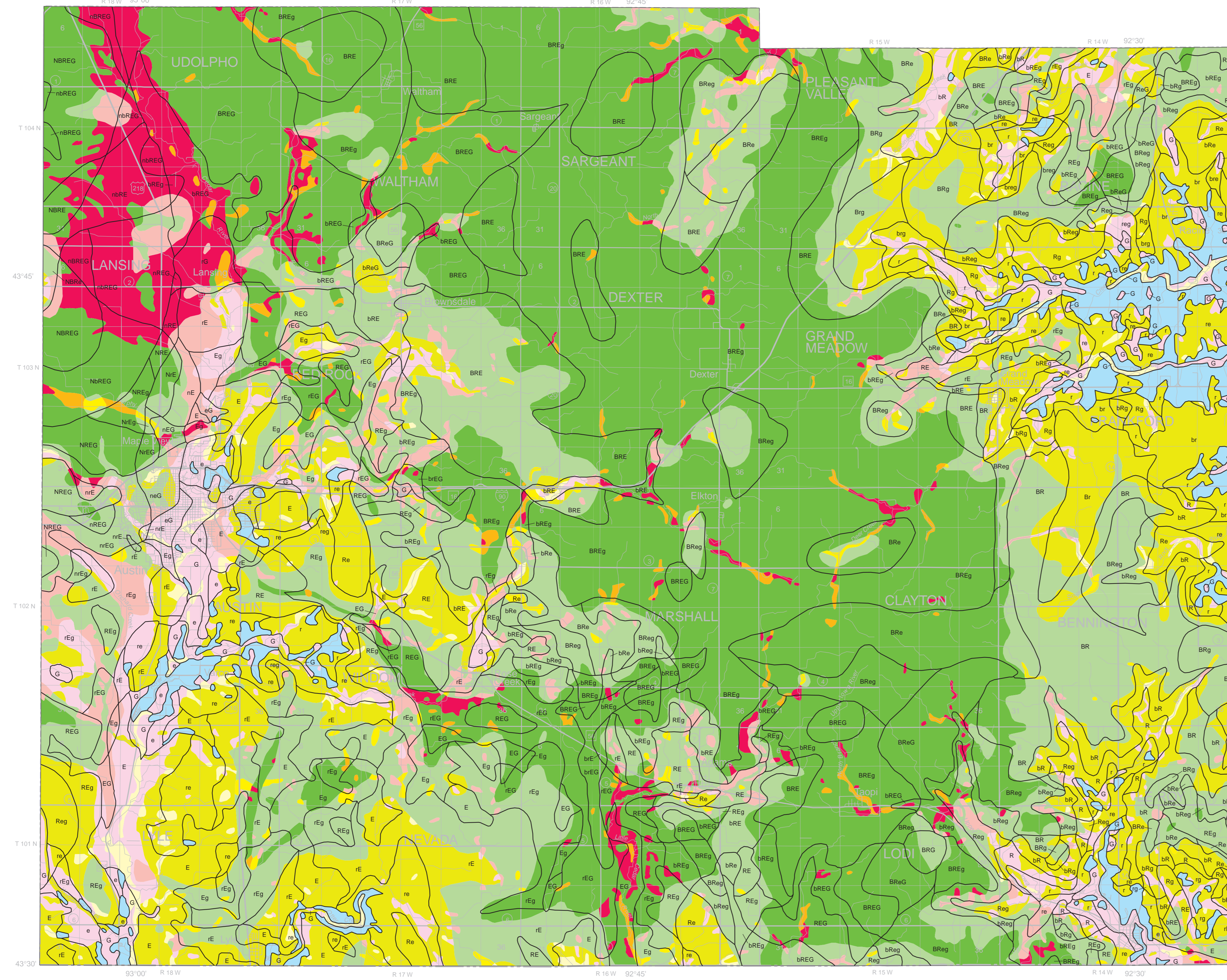


By
Gary N. Meyer and John H. Mossler

1998



Digital base modified from 1990 Census TIGER/Line Files of U.S. Bureau of the Census (source scale 1:100,000). County border lines 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
SCALE 1:100,000
Cartography by Joyce Meints, Emily Bauer, and Philip Heywood
Graphic design by Philip Heywood

Map Showing Quaternary Subsurface Geology
by
Gary N. Meyer

DESCRIPTION OF MAP UNITS
Table 1. Classification of map units by type of surface sediment and depth to bedrock.

SURFACE SEDIMENT	DEPTH TO BEDROCK		
	Less than 50 feet	50-100 feet	More than 100 feet
Till, paleosol, or clayey alluvium	Light Green	Yellow	Orange
Till and sand or sandy loam alluvium	Light Green	Yellow	Orange
Sand to gravel	Light Green	Yellow	Orange
Less than 10 ft thick over bedrock	Light Green	Yellow	Orange

INTRODUCTION TO THE MAP
The map on this plate enables users to readily evaluate the nature of the Quaternary section at any given point in Mower County. The color component of this map (Table 1) can be used to define the thickness of the Quaternary sediment and the type of surface material at a particular location. The unit descriptors (Table 2), such as nREG, define the sediments present at that point along with the general sequence and relative thickness of units that lie between the soil horizon and the bedrock surface.

Surface Sediment and Depth to Bedrock (Table 1)
Color-coded units shown on the above map indicate the type of sediment at the surface and the corresponding depth to bedrock (Table 1). The green map units represent areas where the surface sediment is till, paleosol, or clayey alluvium. The yellow-orange range of map units represents (1) areas of till with patches of sand and gravel, (2) areas where sand and gravel is commonly within 10 feet of the surface, and (3) areas of sandy loam alluvium. The pink-red range of map units represents areas underlain by sand, gravelly sand, or gravel. The blue map unit includes those areas where bedrock is generally within 10 feet of the surface. Paleosols as mapped on Plate 3 are relatively thin and are combined with the underlying till on this map. Organic deposits and open water are minor features in Mower County and are not included on the subsurface map.

Subsurface Tills and Unit Thickness (Table 2)
A second set of descriptors on the map consist of black lines and groupings of letters that define areas by subsurface sediment type and thickness. The four tills mapped are those described on Plate 3: till of the New Ulm Formation (N, n), the Brownville Formation (B, b), the Rose Creek Formation (R, r), and the Elmdale formation (E, e). A capital letter indicates the till is generally greater than 10 feet thick, whereas a lower-case letter indicates the till is patchy to less than 20 feet thick. In any given area, the uppermost till unit is represented by the first letter in the series, and the lowermost till is represented by the last letter in the series. Where a surface unit is stratified sediment (colored in the pink-red or yellow-orange ranges), the first letter in the grouping represents the till immediately below the stratified sediment. If the first till below stratified sediment is very thin or absent, it is designated by a lower-case letter.

Sand beds. If the last letter in a grouping is an upper-case G, at least one sand bed greater than 10 feet thick is commonly present between the uppermost till and bedrock. A lower-case g as the last letter in the group indicates that sand beds are patchy or commonly less than 10 feet thick. The absence of either G or g next to the till unit letters means that sand beds are uncommon to absent. Sand beds are commonly found between the various till units or below the lowermost till (see the cross sections on this plate). Map areas that only contain a G are generally lacking till units between the surface and bedrock. Where this occurs, a green or yellow-to-orange color represents sand that is buried by finer grained stratified sediment.

The presence of sand beds was primarily mapped on the basis of water-well records, which were supplemented by other subsurface data when available (Plate 1). The accuracy of the map in any particular area depends on the amount and quality of subsurface data. Clayey stratified sediment is not thought to constitute a significant part of the Quaternary sequence across most of Mower County; for this reason, various so-called clays described by well drillers were generally interpreted to be part of the sequence of glacial tills. Till units on both the map and cross sections undoubtedly do include some clayey stratified sediment, especially the till of the Elmdale formation. In places, the Elmdale may also include older Pleistocene and pre-Pleistocene sediment. Sand beds overlying bedrock are also likely to contain or entirely consist of sediment older than that of the Elmdale formation.

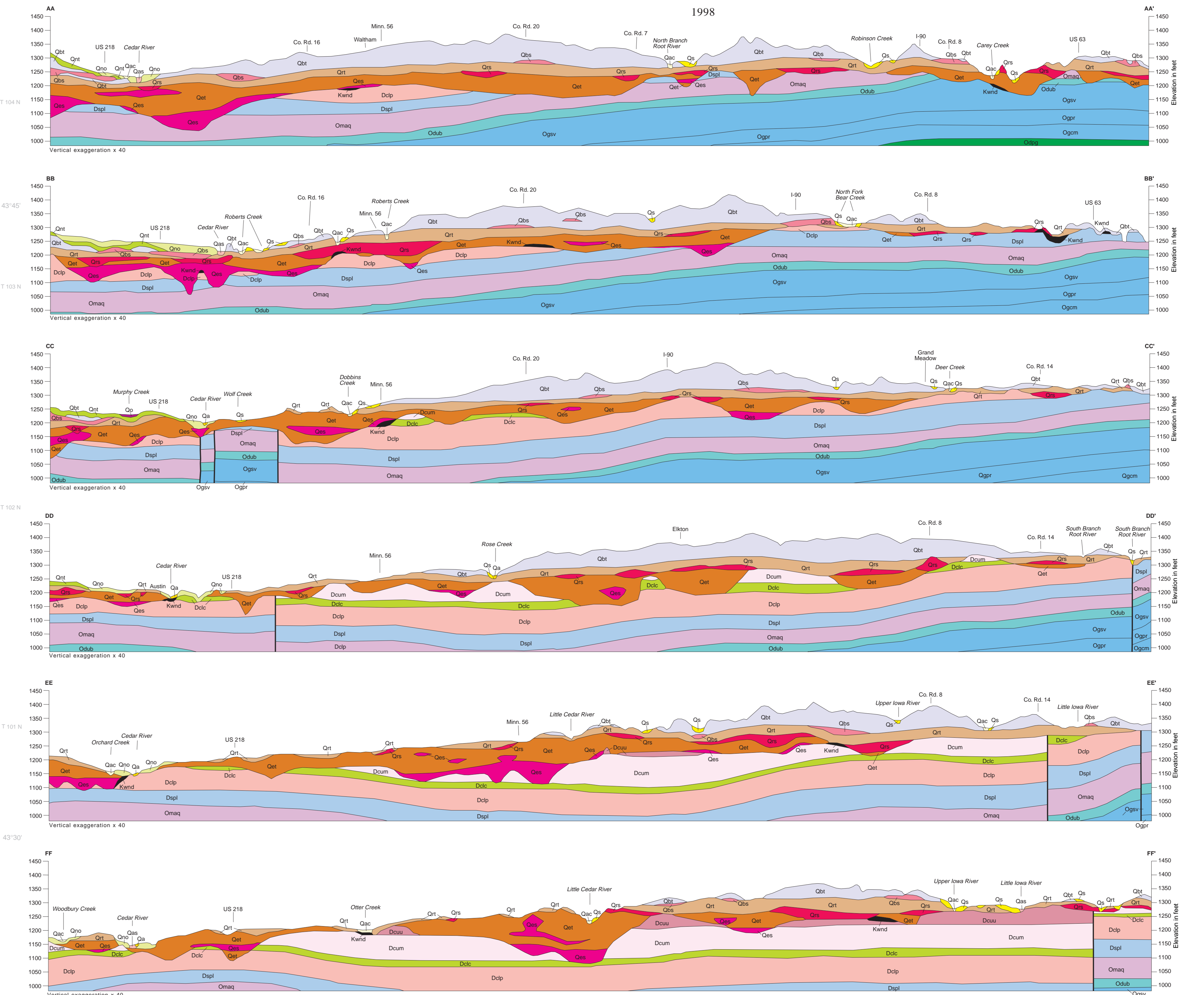
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READING THE QUATERNARY SUBSURFACE MAP

Colored units represent the type of surface sediment and the depth from the land surface to bedrock (see Table 1).
Line-bounded, lettered units represent a composite thickness and stratigraphic order of tills and sand beds from the surface downward (see Table 2).
For example, at points A and B on the inset map:
A Color indicates a depth to bedrock of 50-100 ft, and till is the sediment at the surface.
nREG Lettered unit, bounded by black lines, indicates:
N uppermost till is New Ulm, and it is more than 10 ft thick, next lower till is Rose Creek, and it is more than 10 ft thick, and lowest till is Elmdale, and it is more than 10 ft thick.
G as the last letter indicates that there are no more tills in the sequence, and that sand beds thicker than 10 ft are present within the vertical section.
Maximum depth of the bedrock surface is 100 ft (end of Quaternary section).
B Color indicates a depth to bedrock of more than 100 ft, and sand to gravel is at the surface.
nREG Lettered unit, bounded by black lines, indicates:
n uppermost till is New Ulm, and it is patchy or less than 20 ft thick, next lower till is Rose Creek, and it is patchy or less than 20 ft thick, and lowest till is Elmdale, and it is thicker than 10 ft.
The absence of a G as the last letter indicates that sand beds are unlikely to be present in the sequence.
Depth of bedrock surface is more than 100 ft (end of Quaternary section).



Cross Sections Showing Quaternary and Bedrock Geology

DESCRIPTION OF UNITS ON THE CROSS SECTIONS
The lines of sections are shown on Plate 2, Bedrock Geology, and Plate 3, Surficial Geology. The sections span the county west to east and are spaced four miles apart north to south. The color of the units on the sections are those shown on the bedrock and surficial maps. In a few sections the same color is shared by a surficial and bedrock unit. Each such occurrence is labeled to avoid confusion.

UNITS FROM THE SURFICIAL MAP
See Plate 3 for a detailed description of units. Due to the scale of the cross sections, great vertical exaggeration was necessary to show even the thicker Quaternary deposits. The cross sections greatly simplify the subsurface relationships between individual Quaternary units, in general making those thick enough to be shown to appear more flat-lying and continuous than they actually are. Paleosols mapped on Plate 3 (units Qp, Qr, and Qsp) are combined with the underlying tills in the cross sections. The localized zone at the top of buried units is commonly not as thick as that of the same units at the surface (as described in Plate 3) and may not be present at all.

UNITS FROM THE BEDROCK MAP
See Plate 2 for a detailed description of the units.
Window Formation, undivided.
Lithograph City Formation.

Clayey floodplain alluvium.
Stratified sediment.
Outwash (New Ulm Formation).
Till (New Ulm Formation).
Till (Brownville formation).
Stratified sediment (Brownville formation).
Till (Rose Creek formation).
Stratified sediment (Rose Creek formation).
Till (Elmdale formation).
Stratified sediment (Elmdale formation).
Coralville Formation and upper part of Little Cedar Formation.
Chickasaw Shale of the Little Cedar Formation.
Lower part of Little Cedar Formation, and Pincon Ridge Formation.
Spillville Formation.
Maquoketa Formation.
Dubuque Formation.
Galena Group—
Stewartville Formation.
Prosser Limestone.
Cummingsville Formation.
Decorah, Plattville, and Glenwood formations.

Organic deposits.
Floodplain alluvium.
Sandy floodplain alluvium.