UNIVERSITY OF MINNESOTA

MINNESOTA GEOLOGICAL SURVEY
Harvey Thorleifson, Director

Prepared and Published with the Support of
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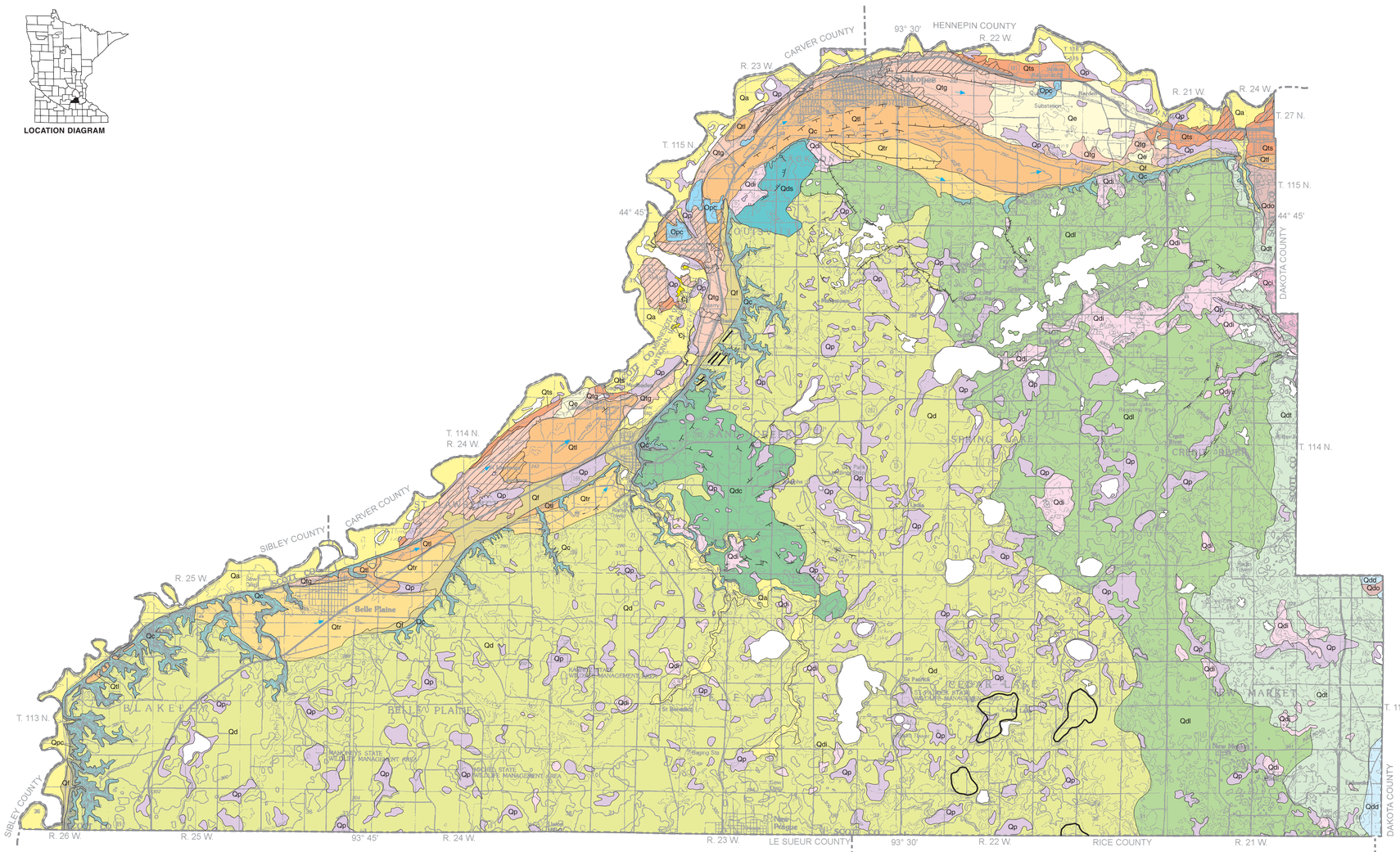
LOCATION DIAGRAM



Base from U.S. Geological Survey St. Paul 1:100,000 quadrangle, 1985.

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

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 10 METERS

GIS compilation by R.S. Lively
Edited by Lori Robinson

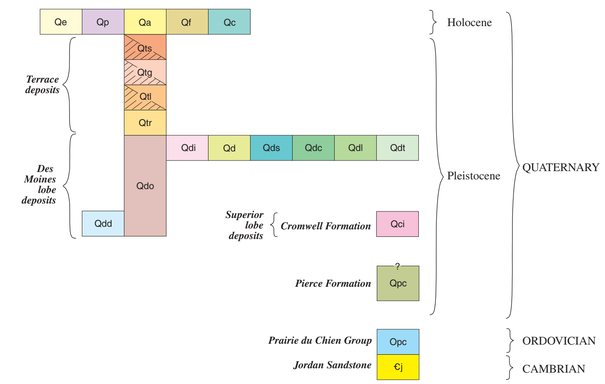
SURFICIAL GEOLOGY

Compiled by

Barbara A. Lusardi

2006

CORRELATION OF MAP UNITS



MAP SYMBOLS

Geologic contact—Approximately located.

General flow direction—Arrow points in the direction glacial meltwater once flowed.

Stream-cut scarp—Hachures are on the downslope side; dashed where discontinuous or obscure. Marks the flanks of a former fluvial channel. Boundaries of terrace units and alluvium are commonly at scarps, so are not shown by a scarp symbol. Where paired, scarps bound stream-scoured areas. Till deposits downslope of scarps are fluvially scoured, and mantled in places by sand and gravel too thin and discontinuous to map separately.

Broad, indistinct, irregular trough—Hachures point downslope; identified by the alignment of depressions and lakes. May mark a collapsed and filled channel.

Elongate ridge—Sinuous ridge of sediment interpreted to have been deposited in an ice-walled channel of a glacial meltwater stream flowing at the base of the ice (esker). The fluvial sediment may be covered by 10 feet (3 meters) or more of till.

Plateau—Broad, relatively level area in a zone of hummocky topography. Plateaus range from 40 to over 640 acres (0.16 to 2.59 square kilometers). Predominantly till; capped in places by 3 to 17 feet (1 to 5 meters) of lake sediment. The plateaus are interpreted to represent saturated debris that was deposited in lows on stagnant ice; the deposits now stand as topographic highs on the landscape. Sorted sediment in the center of the plateau was deposited in standing water.

Linear feature—Identified from aerial photographs. Symbol schematically represents ridge and valley topography interpreted to be inactive slump blocks within unit Qd; features have 10 to 30 feet (3 to 9 meters) of relief.

DESCRIPTION OF MAP UNITS

This map emphasizes the distribution and origin of surficial materials in Scott County. It was compiled from a variety of sources shown on the Index to Mapping and listed in the references below.

Most of the sediments in this area were deposited by ice from the northeast and the northwest, primarily the latter (Fig. 1). About 20,000 years ago, the Superior lobe advanced from the northeast, through Lake Superior, carrying characteristic red sandstone, among other rock types. About 14,000 years ago, ice advanced from the northwest carrying sediment from the Riding Mountain uplands in southwestern Manitoba and from west of the Pembina escarpment in North Dakota. These sediments include abundant, distinctive, gray siliceous shale fragments (Table 1). As the Des Moines lobe crossed the easternmost portion of the county, it incorporated debris left by the Superior lobe. Thus, the till in places is a blend of the northwest and northeast source material; in other places, the till is stratified with distinct brown and red layers, reflecting the two source regions. It is likely that ice from the Superior lobe advance was still melting when the Des Moines lobe moved into the region. Thus, the landscape records the most recent glacial events in the sediments described above, but also reflects the history of earlier glacial events in the landforms and sediments just beneath the surface.

QUATERNARY

Qe **Sand**—Very fine- to medium-grained; more than 3 feet (1 meter) thick; unit forms low-lying dunes. *Windblown sand.*

Qp **Clay, silt, and organic debris**—Partially decomposed plant matter and fine-grained organic matter deposited in marshes and ponded water, as well as marl (calcareous clay). Includes minor alluvial deposits along streams, as well as beach deposits. *Peat and bog sediment.*

Qa **Silty clay loam to sandy loam**—Interbedded with layers of fine-grained sand and gravel. Organic debris may be disseminated in the sediments and/or form discrete peat beds. Sediment in the Minnesota River valley is generally finer-grained and consists of a mixture of silt and clay with variable amounts of very fine-grained sand and organic matter. Coarser-grained sediment may be present within the river channel. *Floodplain alluvium.*

Qf **Loam to loamy fine-grained sand**—Includes beds of silt loam, silty clay loam, fine-grained sand, and gravel. Variable amounts of disseminated organic debris are present. Unit forms coalescing fan-shaped deposits at the base of steep slopes and at the mouths of deep gullies. *Alluvial fan sediment.*

Qc **Clay to boulders**—Friable mixture reworked from glacial or fluvial sediment and deposited on steep slopes. May contain disseminated organic debris. Includes till outcrops, small alluvial fans, and narrow bodies of alluvium. *Colluvium.*

Sand and gravelly sand—Coarsens to cobbly gravel locally. These sediments are mapped at four major levels. A diagonal line pattern indicates areas where bedrock is within approximately 10 feet (3 meters) of the surface. Boulder lags are common at the contact with bedrock. *Alluvial terrace deposits.*

Qts ***St. Mary's terrace***—The terrace is 10 to 20 feet (3 to 6 meters) above the present floodplain level at an elevation of about 725 feet (221 meters). Upstream from Belle Plaine the terrace merges with, and is buried by, the modern floodplain.

Qtg ***Grey Cloud terrace***—The terrace is about 50 feet (15 meters) above the present floodplain level. It ranges in elevation from about 750 feet (229 meters) at Savage to about 770 feet (235 meters) at Belle Plaine.

Qtl ***Langdon terrace***—The main terrace level is about 125 feet (38 meters) above the present floodplain level at an elevation of about 820 feet (250 meters). Locally this terrace is cut by prominent channels.

Qtr ***Richfield terrace***—The terrace is about 160 feet (49 meters) above the present floodplain, and ranges in elevation from about 850 feet (259 meters) at Shakopee to about 880 feet (268 meters) at Belle Plaine.

Sediment associated with the northwest-source Des Moines lobe—Deposits contain abundant gray siliceous shale fragments. The color of till is variable but is typically yellow-brown where oxidized and dark gray where unoxidized.

Qdo **Sand, gravelly sand, and cobble gravel**—Moderately to poorly sorted; crossbedded to flatbedded; interbedded in places with unsorted sediments (till, cobbles, boulders). *Outwash.*

Qdi **Sand, gravelly sand, and cobble gravel**—Stratified, collapsed, typically faulted and folded, and commonly interbedded with, or capped by, sandy to loamy diamicton (mudflow sediment) and silt (lake sediment). Boulders may be present. The proportion of northeast provenance clasts increases from west to east. *Ice contact deposits.*

Qd **Loam to clay loam**—Pebbly, unsorted, with scattered cobbles and rare boulders. Shale clasts generally compose from 25 to 40 percent of the very coarse (1 to 2 millimeter) sand fraction; includes rare lenses of stratified sediment. Overlain in some low-lying areas by 3 feet (1 meter) or more of loamy to clayey, organic-bearing colluvium. *Glacial till.*

Qds **Loam to sandy loam**—Pebbly, unsorted, with cobbles and boulders; commonly capped by, or interbedded with, thin deposits of silty to gravelly stratified sediment. Shale clasts generally compose 25 to 40 percent of the very coarse (1 to 2 millimeter) sand fraction. *Glacial till.*

Qdc **Clay loam**—Pebbly, unsorted, with scattered cobbles and rare boulders. Shale clasts generally compose more than 50 percent of the very coarse (1 to 2 millimeter) sand fraction. Pockets of silt, sand, and gravel are present in places. *Glacial till.*

Qdl **Loam**—Pebbly, unsorted, with cobbles and boulders; generally less than 25 percent shale in the very coarse (1 to 2 millimeter) sand fraction. Inclusions of reddish-brown sediment indicate mixing with Superior provenance sediment when advancing ice incorporated material from the underlying sediments. *Glacial till.*

Qdt **Sandy loam**—Complexly intermixed loam- to sandy loam-textured, unsorted sediment ranging from yellowish-brown to gray and reddish-brown to reddish-gray. Pebbly, with cobbles and boulders; generally less than 20 percent shale in the very coarse (1 to 2 millimeter) sand fraction. Small lenses of stratified sediment are common. *Glacial till.*

Qdd **Loam to sandy loam**—Pebbly, unsorted, with pebbles and scattered cobbles and boulders; generally less than 10 percent shale in the very coarse (1 to 2 millimeter) sand fraction. Generally less than 20 feet (6 meters) thick. May be underlain in places by sand and gravel close to the surface. *Glacial till.*

Sediment associated with the northeast-source Superior lobe—These deposits contain abundant crystalline rocks (basalt and granite) and many red rocks (sandstone and rhyolite). Till color is variable but is typically brown with a red tint (7.5 YR).

Cromwell Formation (Wright and others 1970)—Glacial and fluvial sediment of northeast provenance (Table 1). Sediments are commonly reworked at the top and mantled by as much as 10 feet (3 meters) of the loamy till associated with the Des Moines lobe.

Qci ***Sand, gravelly sand, and cobble gravel***—Stratified; interbedded with, or capped by, sandy to loamy diamicton (mudflow sediment) and silt (lake sediment), and may contain boulders. *Ice contact deposits.*

Sediment associated with an earlier ice advance from the northwest

Pierce Formation (Mickelson and others, 1984)—Glacial and glaciofluvial deposits of northwest provenance (Table 1). Likely represents deposits of more than one glacial advance.

Qpc ***Loam***—Pebbly, unsorted, with cobbles and rare boulders. Includes lenses of sorted sand and gravel in places. Mantled in places by colluvium (unit Qc). *Glacial till and colluvium.*

ORDOVICIAN

Opc **Prairie du Chien Group**—Oolitic sandy dolostone and sandstone of the Shakopee Formation overlies massive dolostone of the Oneota Dolomite. Most of the areas shown in the major river valleys are quarries.

CAMBRIAN

Ꞓj **Jordan Sandstone**—Medium- to coarse-grained sandstone, friable, crossbedded. Mapped in a few small areas north of Jordan.

REFERENCES

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Lusardi, B.A., 1998a, Surficial geologic map of the Jordan East quadrangle, Carver and Scott Counties, Minnesota: Minnesota Geological Survey Miscellaneous Map M-89, scale 1:24,000.

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Meyer, G.N., and Lusardi, B.A., 2000, Surficial geology of the St. Paul 30 x 60 minute quadrangle, Minnesota: Minnesota Geological Survey Miscellaneous Map M-106, scale 1:100,000.

Mickelson, D.M., Clayton, L., Baker, R.W., Mode, W.N., and Schneider, A.F., 1984, Pleistocene stratigraphy of Wisconsin: Geological and Natural History Survey of Wisconsin Miscellaneous Paper 84-1, 97 p.

Mossler, J.H., and Tipping, R., 2000, Bedrock geology and structure of the seven-county Twin Cities metropolitan area, Minnesota: Minnesota Geological Survey Miscellaneous Map M-104, scale 1:250,000.

Wright, H.E., Jr., Mattson, L.A., and Thomas, J.A., 1970, Geology of the Cloquet quadrangle, Carlton County, Minnesota: Minnesota Geological Survey Geologic Map GM-3, 30 p.

Table 1. General characteristics of mapped glacial deposits.

Provenance	Northwest	Northeast
Till texture	loamy	sandy
Color		
oxidized	yellow-brown to olive-brown	red-brown
unoxidized	gray	gray and red-gray
Pebble type		
white to buff carbonate	common	rare to uncommon
dark-gray to gray-green rocks	uncommon to common	common to abundant
red felsite and sandstone	rare to uncommon	common
gray shale	uncommon to abundant	absent

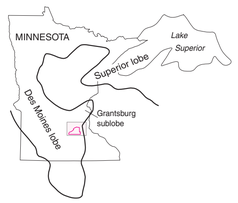
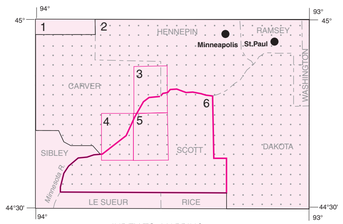


Figure 1. Location diagram showing the location of Scott County in relation to the advance of the Des Moines ice lobe.



INDEX TO MAPPING

1. Meyer and Lusardi (2000)
2. Mossler and Tipping (2000)
3. Lusardi (1998b)
4. Lusardi (1999)
5. Lusardi (1998a)
6. Aronow and Hobbs (1982)

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.

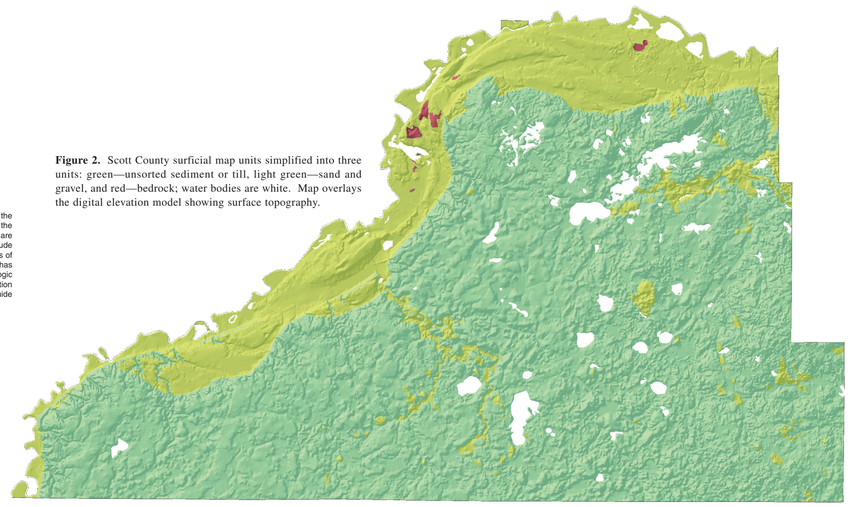


Figure 2. Scott County surficial map units simplified into three units: green—unsorted sediment or till, light green—sand and gravel, and red—bedrock; water bodies are white. Map overlays the digital elevation model showing surface topography.

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GEOLOGIC ATLAS OF SCOTT COUNTY, MINNESOTA