

Minnesota Geological Survey and the Great Lakes Geologic Mapping Coalition

- **Previous** (2011-2012)
 - Subsurface Quaternary geology of Anoka County – cost-share with LCCMR
- **Current** (2012-2013)
 - Subsurface Quaternary geology of Morrison and Sherburne Counties – cost-share with LCCMR
- **Proposed**
 - Enhancement of databases to support subsurface Quaternary geological mapping

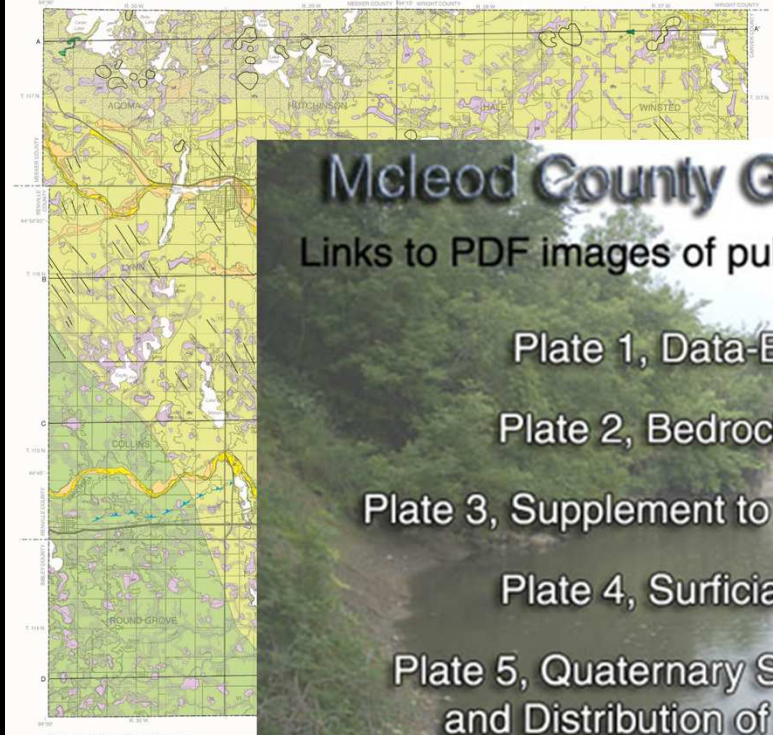
UNIVERSITY OF MINNESOTA
MINNESOTA GEOLOGICAL SURVEY
Harvey Thorleifson, Director

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

COUNTY ATLAS SERIES
ATLAS C-28, PART A
Plate 4—Surficial Geology

SURFICIAL GEOLOGY

By
Barbara A. Lusardi and Carrie E. Jennings
2009



McLeod County Geologic Atlas

Links to PDF images of published maps, Part A

Plate 1, Data-Base Map

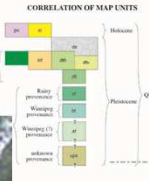
Plate 2, Bedrock Geology

Plate 3, Supplement to Bedrock Geology

Plate 4, Surficial Geology

Plate 5, Quaternary Stratigraphy
and Distribution of Sand Bodies

Plate 6, Bedrock Topography, Depth to Bedrock
and Mineral Endowment



The other deposits were derived from a more westerly source and are abundant crystalline rocks (sand and gravel) and various amounts of brown rock fragments (dimension, dolomite and fossil fragments) (Fig. 4). These units were deposited by glacial outwash from the Des Moines lobe. These units were deposited by glacial outwash from the Des Moines lobe. These units were deposited by glacial outwash from the Des Moines lobe.

ACKNOWLEDGMENT

This project was funded by the McLeod County Board of Commissioners and the Minnesota Department of Natural Resources, Division of Waters.

REFERENCES

Am. Geol. Soc., 1902. Chronology of the last Wisconsinan glaciation in middle North America. *Geological Survey of Minnesota*, U.S. Department of Agriculture, Conservation Service, 1920.
Lusardi, B.A., and Jennings, C.E., 2009. Surficial geology of McLeod County, Minnesota. *Minnesota Geological Survey Open-File Report 09-1*, scale 1:50,000.

Digital data modified from the Minnesota Department of Transportation (Minnesota State Highways) and the Minnesota Department of Natural Resources (Minnesota State Highways).

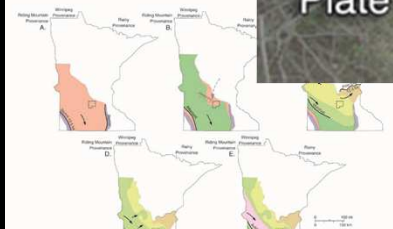


Figure 1. Map showing various geologic units and their distribution in McLeod County. It includes labels for different units and their parent materials.

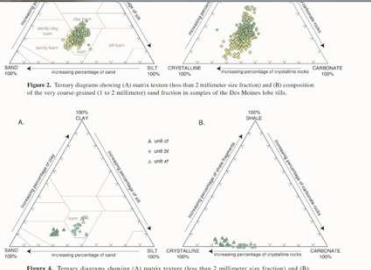


Figure 2. Ternary diagrams showing the composition of sand and gravel fractions. The diagrams plot percentages of sand, silt, and clay for different geologic units.

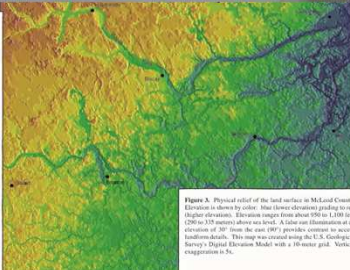


Figure 3. Physical relief of the land surface on McLeod County. The map shows elevation contours and color-coded terrain.

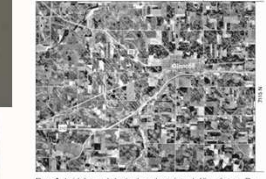


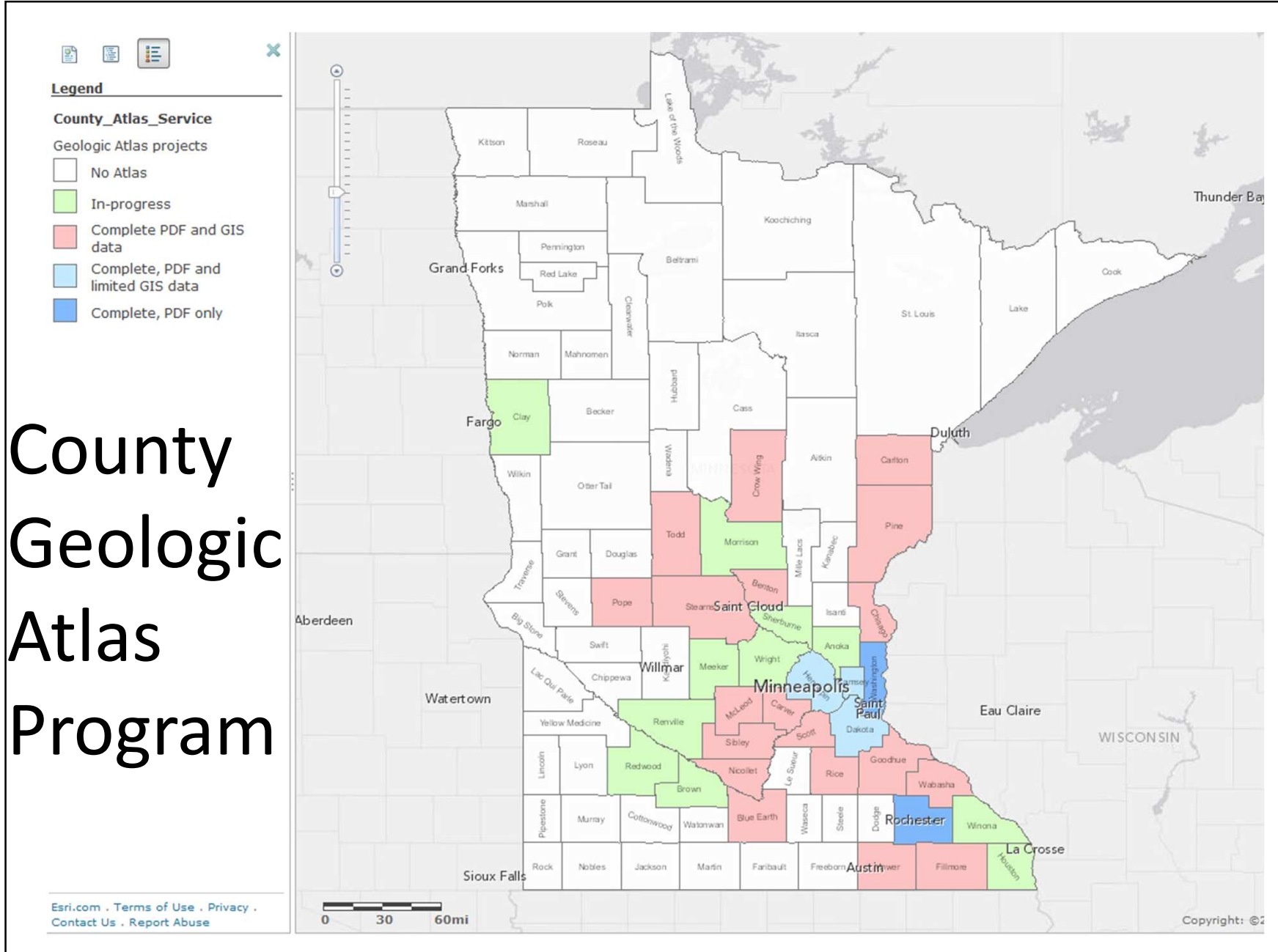
Figure 4. Aerial photograph showing the distribution of glacial deposits. The map includes labels for different units and their parent materials.

SOURCE AREA	NORTHWEST	NORTH-EAST	NORTH-NORTH-EAST
PROVINCE	PLATEAU	PLATEAU	PLATEAU
UNIT	PLATEAU	PLATEAU	PLATEAU
TLT TEXTURE	PLATEAU	PLATEAU	PLATEAU
TLT COLOR	PLATEAU	PLATEAU	PLATEAU
PERM TYPE	PLATEAU	PLATEAU	PLATEAU

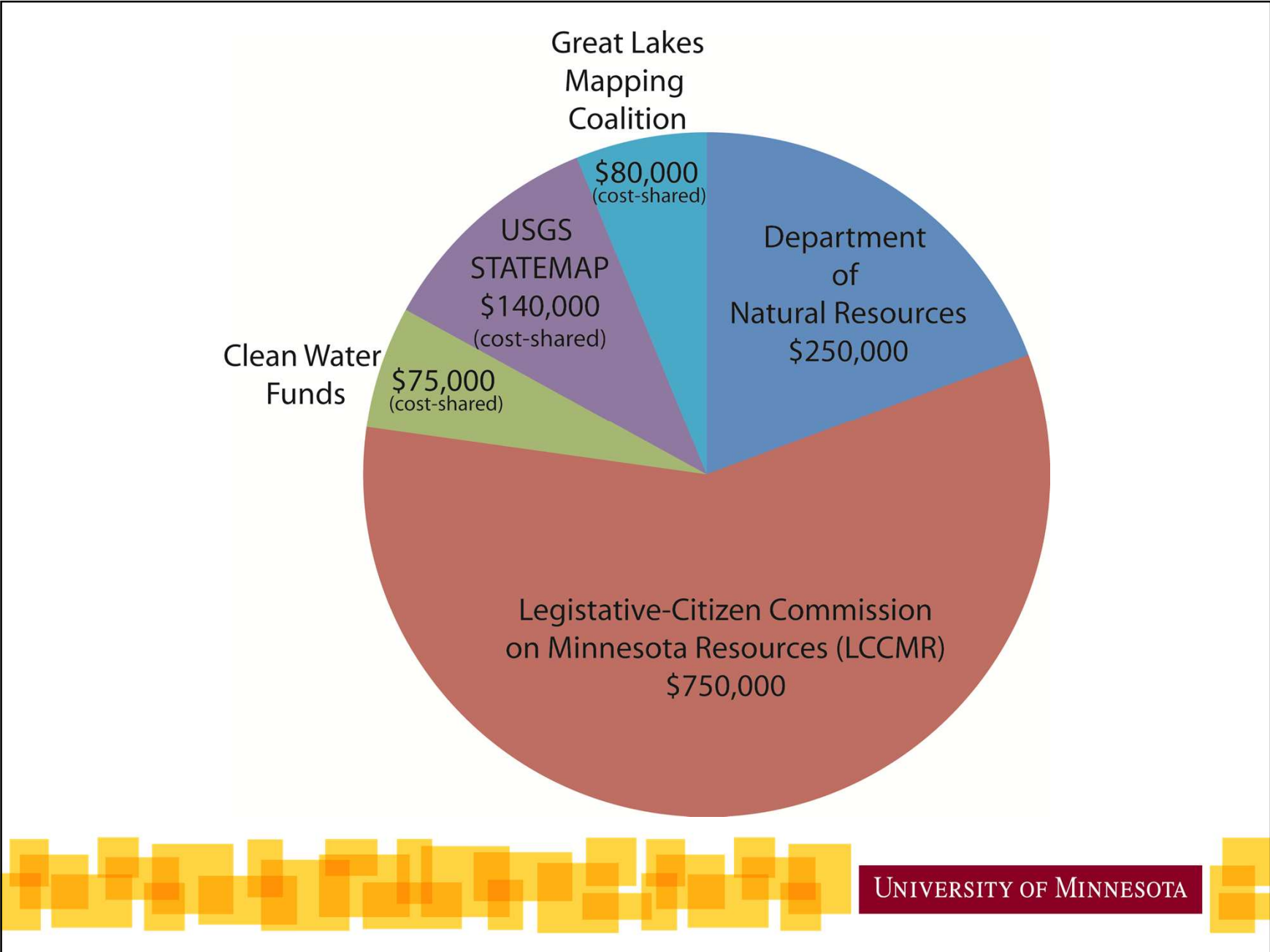
Table 1. Physical characteristics of glacial deposits in the McLeod County region. The table lists various characteristics for different geologic units.

What is a County Geologic Atlas?

- A study of the geology and ground water resources of a county
 - MGS investigates the geology
 - DNR investigates chemistry, quantity, aquifer levels, and pollution sensitivity of the ground water
- Used for planning, resource management, environmental protection, and education
- Maps, databases, and illustrations formatted for a wide range of users

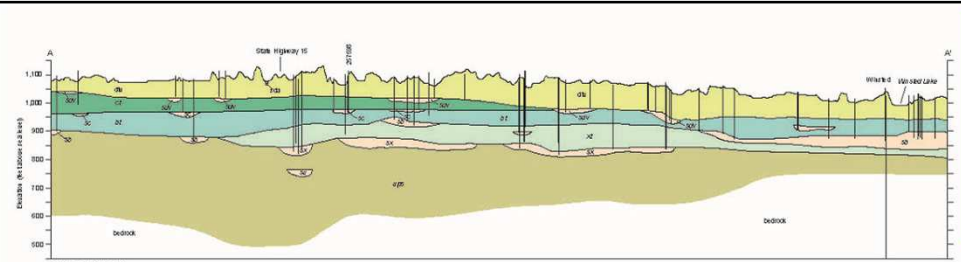


County Geologic Atlas Program

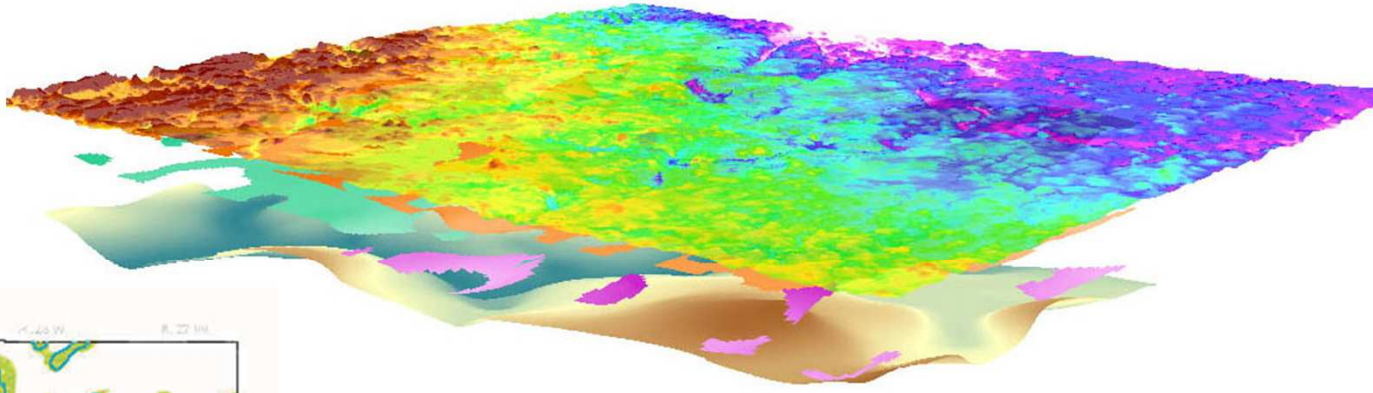


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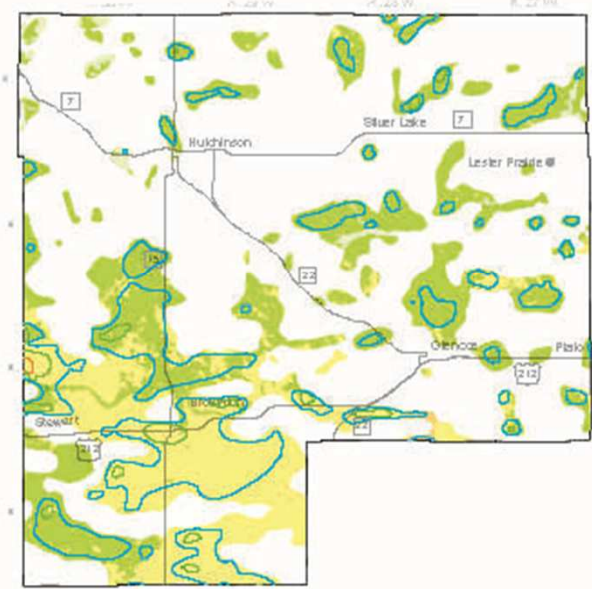
Mapping Buried Glacial Aquifers



2-Dimensional cross sections



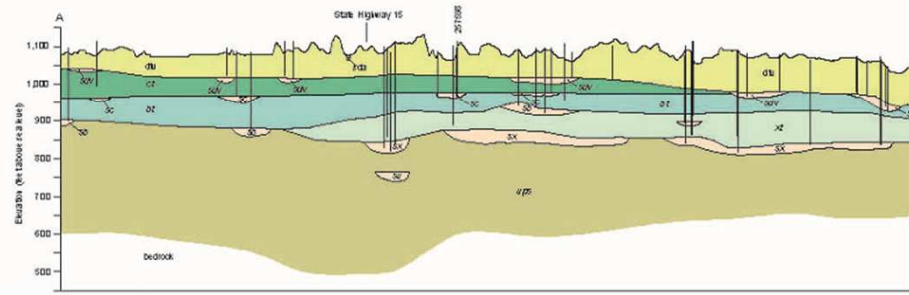
3-Dimensional surfaces



3-Dimensional models of buried sand layers

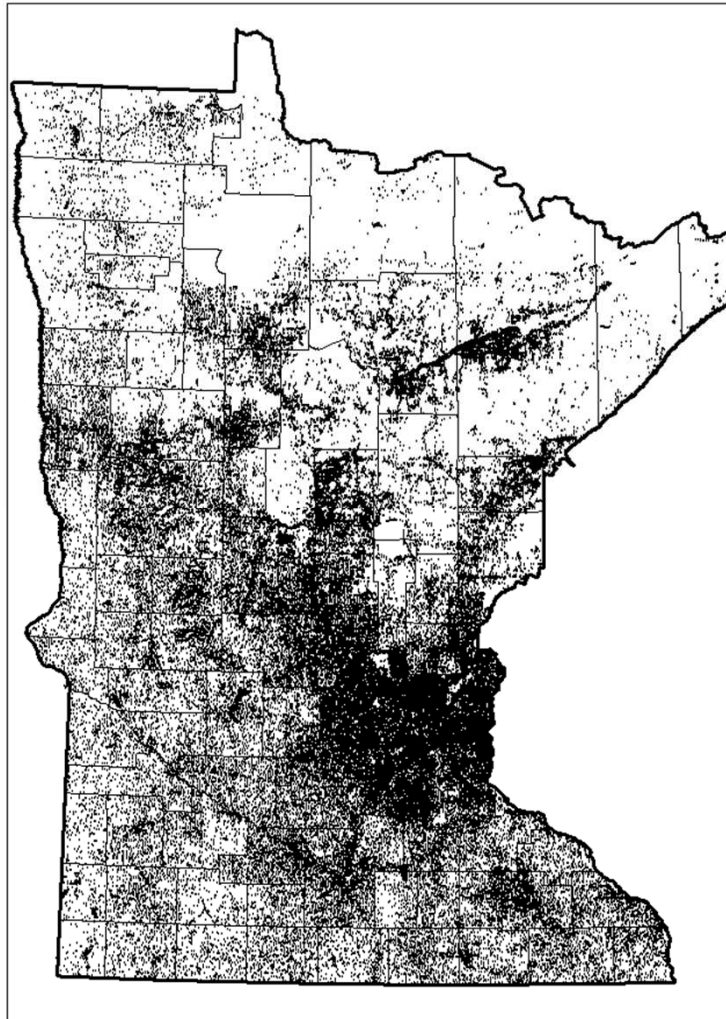


Cross Sections



Minnesota Unique Well No. 779325		County Anoka	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD		Entry Date 09/27/2011
Township 33 25 W 16		Quad CAADDC	Elevation 940 ft.		Update Date 12/27/2011
Well Name STEINKE, DOUG		Subsections		Well Depth 177 ft.	Depth Completed 177 ft.
Elevation 940 ft.		Elevation Method Calc from NED (Nat. Elev. Dataset-30m)		Date Well Completed 07/07/2011	
Well Address 20701 NOWTHEN BL MIN 55303		Drilling Method Non-specified Rotary		Well Hydrofractured? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Geological Material		Color	Hardness	From	To
CLAY	BROWN	SOFT	0	58	
GRAVEL	BROWN	SOFT	58	61	
CLAY/ROCKS		MEDIUM	61	130	
SHALE/SANDROCK		MEDIUM	130	168	
SANDROCK	WHITE	MEDIUM	168	177	
Use Domestic		Casing Type		Plastic Joint Gland Drive Shoe? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Above/Below ft.	
Casing Diameter		Weight		Hole Diameter	
4 in. to 129 ft.		lbs./ft.		8 in. to 130 ft.	
Open Hole from 130 ft. to 177 ft.		Screens NO Make Type			
Diameter		Slot/Gauge	Length	Set Between	
Static Water Level 17 ft. from Land surface Date Measured 07/07/2011		PUMPING LEVEL (below land surface) 20 ft. after 6 hrs. pumping 75 g.p.m.			
Well Head Completion Pitless adapter manufacturer AQUASEAL Model T SERIES		<input type="checkbox"/> Casing Protection <input checked="" type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY)			
REMARKS COULD NOT FIND THE CITY OF NOWTHEN FOR WELL ADDRESS		Grouting Information		Well Grouted? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
		Grout Material: Neat Cement		from 119 to 129 ft. 3 bags	

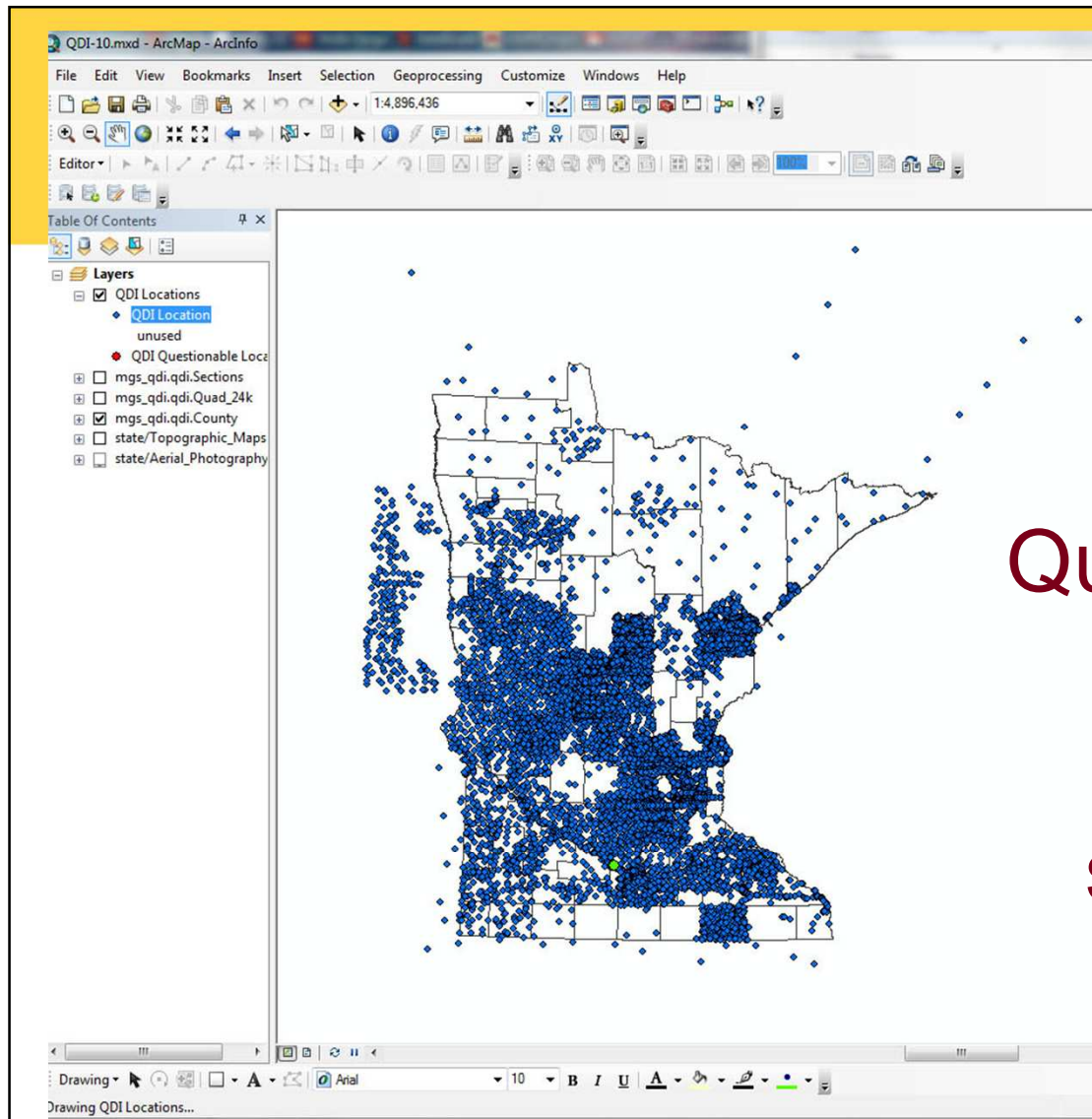




County Well
Index (CWI)
472,048
water-well logs
statewide

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supported by
Great Lakes Mapping Coalition
2010-2011



Quaternary Data
Index (QDI)
21,630
sample sites

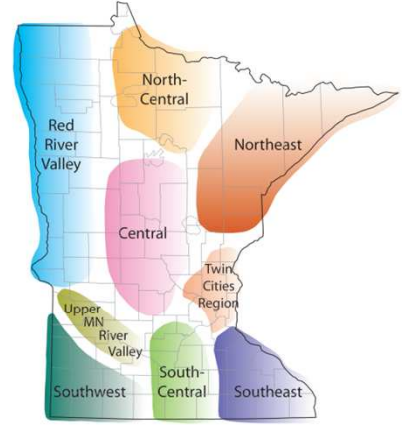
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Minnesota Quaternary Lithostratigraphy

Global Correlations	Red River Valley	Upper Minnesota River Valley	Southwest	South-Central	Southeast	Twin Cities Region	Central	North-Central	Northeast	
MIS 2-5	SHERACK POPLAR RIVER BRENNIA FOREST RIVER Huot Falconer WYLLIE RED LAKE ARGUSVILLE GOOSE RIVER St. Hilaire Heiberg NEW ULM Hawley Villard New York Mills JAMES RIVER GARDAR BUFFALO RIVER SIBEKA RIVER Marcoux	GOOSE RIVER Dahlen glacial lake Minnesota sediment Heiberg NEW ULM Villard Dowry Ivashko Verd 'till unit #7' 'till unit #8'	NEW ULM Dowry Ivashko Verd 'till unit #9' HAWK CREEK	NEW ULM glacial lake Minnesota sediment Heiberg Villard Dowry Garden City Moland TRVERSE DES SIOUX	NEW ULM Moland CROMWELL TRVERSE DES SIOUX	NEW BRIGHTON Twin Cities Falun HILLSIDE SAND Coon Creek Sunrise CROMWELL TRVERSE DES SIOUX	glacial lake Aitkin II sediment AITON Nelson Lake glacial lake Aitkin I sediment glacial lake Basinist sediment South Long Lake HEWITT RIVER FALLS	glacial lake Aitkin II sediment AITON Albion glacial lake Aitkin I sediment INDEPENDENCE Mille Lacs CROMWELL LAKE HENRY Sauk Centre ST. FRANCIS Meyer Lake ST. FRANCIS EAGLE BEND SHOOKS ELMDALE	BLACKDUCK INDEPENDENCE NASHWAUK INDEPENDENCE CROMWELL BROWERVILLE SAUM FUNKLEY ST. FRANCIS EAGLE BEND SHOOKS WIRT MULLIGAN	Knife River Wrenshall Moose Lake Mahtowa CROMWELL
MIS 6-18	SHEYENNE RIVER BROWERVILLE GERVAIS unnamed unit(s) unnamed unit(s) unnamed unit(s)	'till unit #9' HAWK CREEK southern part northern part 'gastropod silts' WHETSTONE 'till unit #10' 'till unit #11'	'SWRA 1' 'SWRA 2' 'SWRA 3' 'SWRA 4' 'SWRA 5' 'SWRA 6' 'SWRA 7'	BROWERVILLE? HAWK CREEK HENDERSON BROWERVILLE unnamed unit(s) unnamed unit(s) unnamed unit(s) unnamed unit(s) ELMDALE	BROWERVILLE? unnamed unit(s) BROWERVILLE unnamed unit(s) Bennington ROSE CREEK unnamed unit(s) ELMDALE	RIVER FALLS unnamed unit(s) unnamed unit(s)	BROWERVILLE unnamed unit(s) LAKE HENRY Sauk Centre ST. FRANCIS Meyer Lake ST. FRANCIS EAGLE BEND SHOOKS ELMDALE	BROWERVILLE SAUM FUNKLEY ST. FRANCIS EAGLE BEND SHOOKS WIRT MULLIGAN	BROWERVILLE SAUM FUNKLEY ST. FRANCIS EAGLE BEND SHOOKS WIRT MULLIGAN	BROWERVILLE SAUM FUNKLEY ST. FRANCIS EAGLE BEND SHOOKS WIRT MULLIGAN
MIS >18			'SWRA 8' 'SWRA 9'			PIERCE				

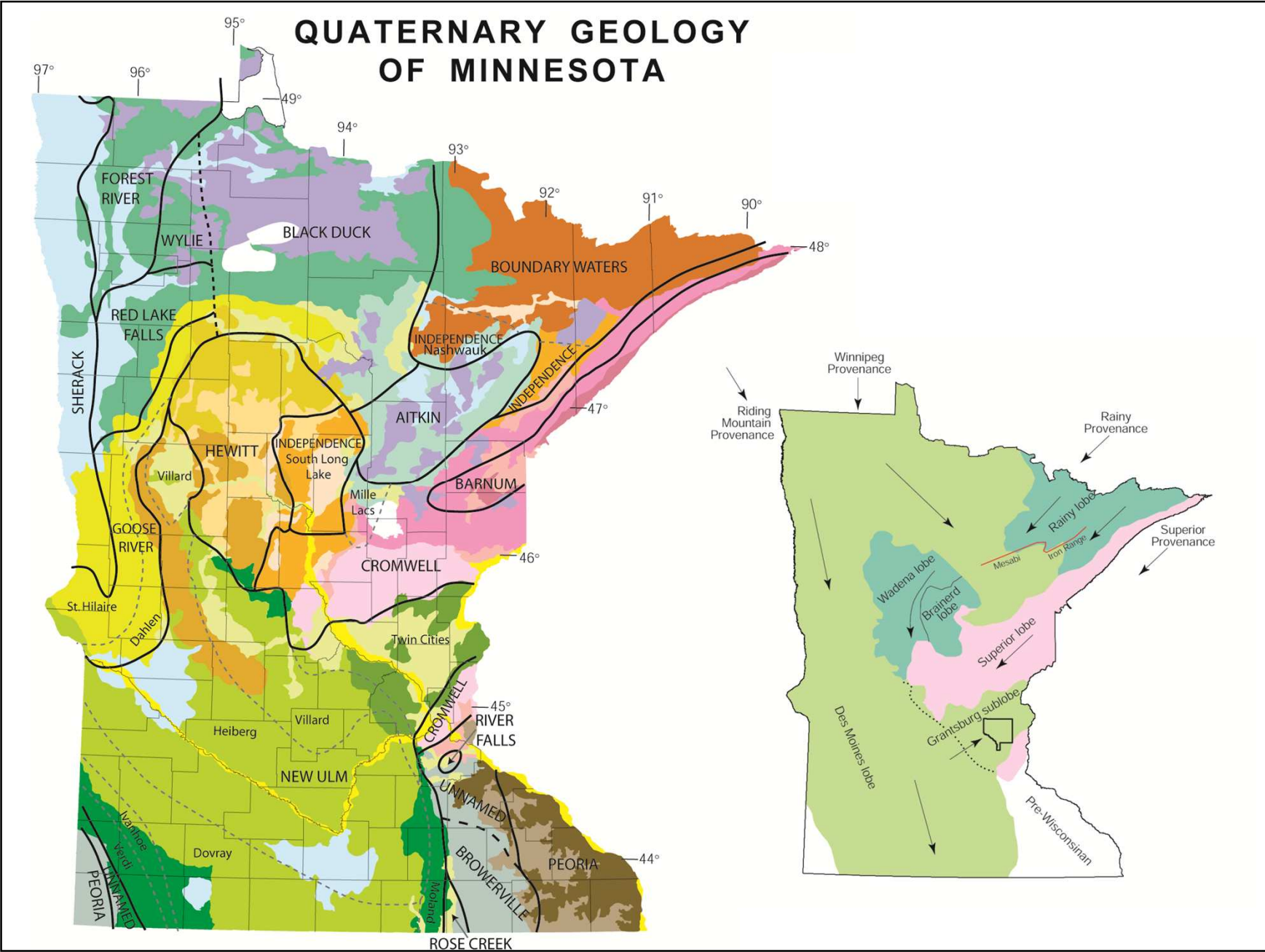
Legend

- silt and clay
- silt
- sand and/or gravel
- Riding Mountain provenance diamiction
- mixed Riding Mountain and Winnipeg
- northwest with reworked Superior
- Winnipeg provenance diamiction
- mixed Winnipeg and Rainy
- Rainy provenance diamiction
- mixed Rainy and Superior
- Superior provenance diamiction
- NEW ULM formation
- Verdi member



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 2010-2011

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Anoka County
 87 cross-section lines
 spaced .5 km apart with
 nearly 27,000 water-well
 records, bridge borings
 and scientific drill holes

