Hubbard County Geologic Atlas (Part A and Part B)

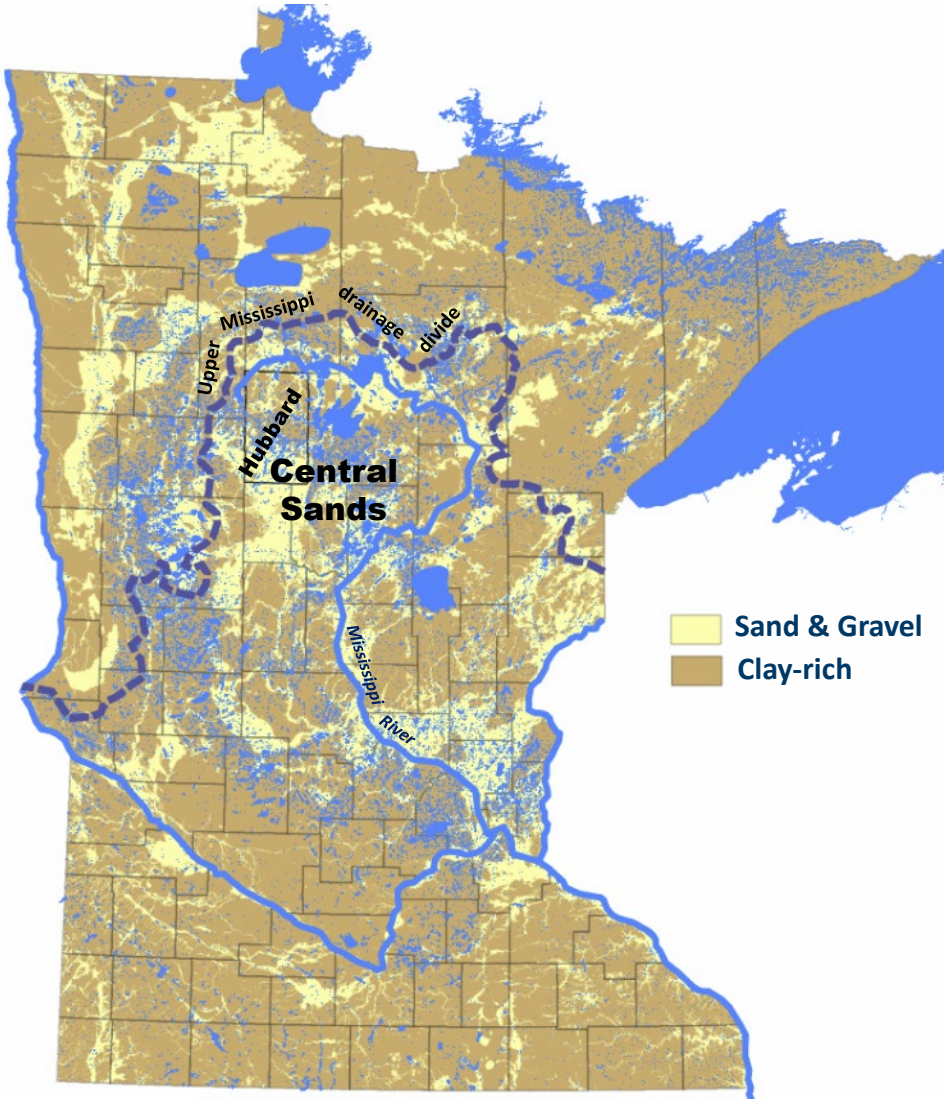
Tony Runkel | Minnesota Geological Survey – University of Minnesota

Vanessa Baratta | Minnesota Department of Natural Resources

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND

CLEAN WATER LAND & LEGACY AMENDMENT

Minnesota's Central Sand Region
County Geologic Atlases, Hubbard Co. Example

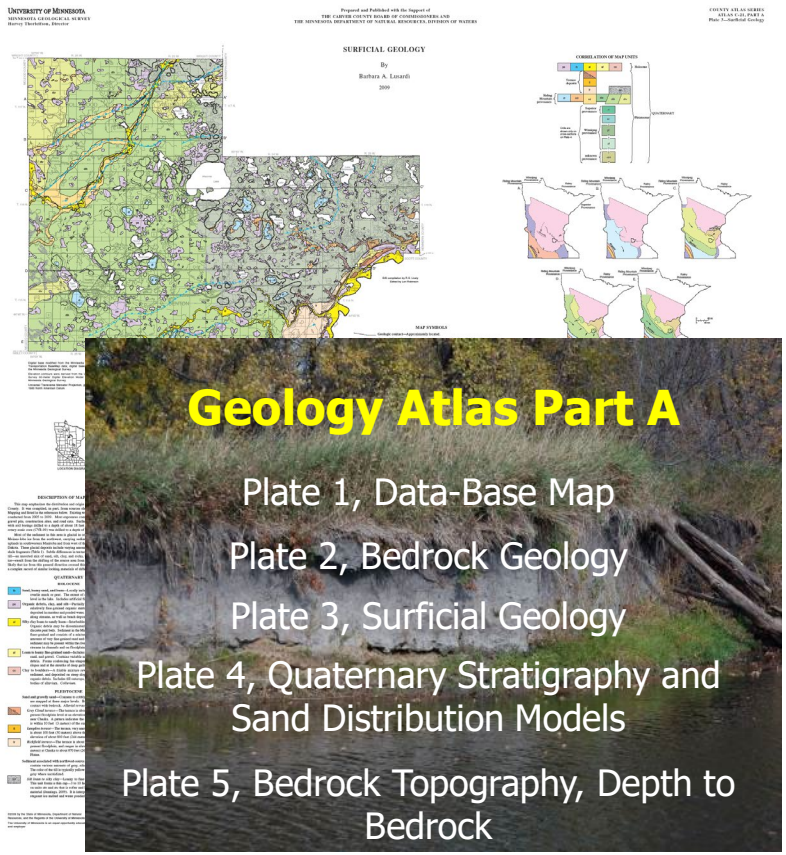


CENTRAL SANDS REGION

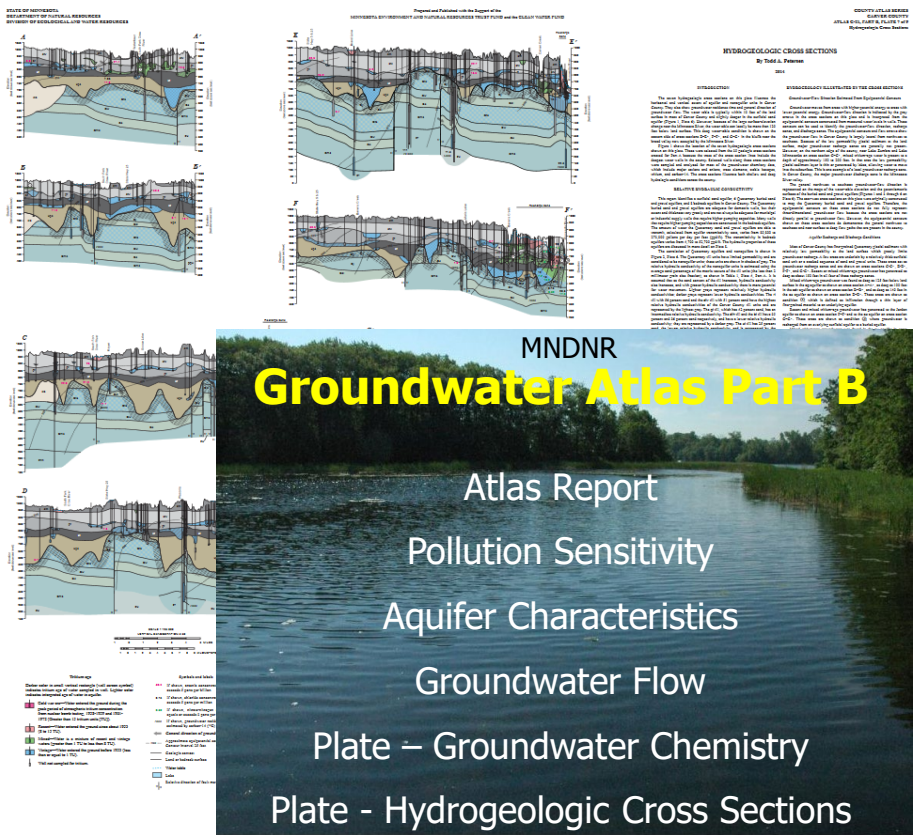
- Headwaters of the Mississippi River
- Many lakes, some very deep
- Abundant sand at surface and shallow depths
- Groundwater connection to lakes and streams

County Geologic Atlas (CGA)

- Geology (Part A)



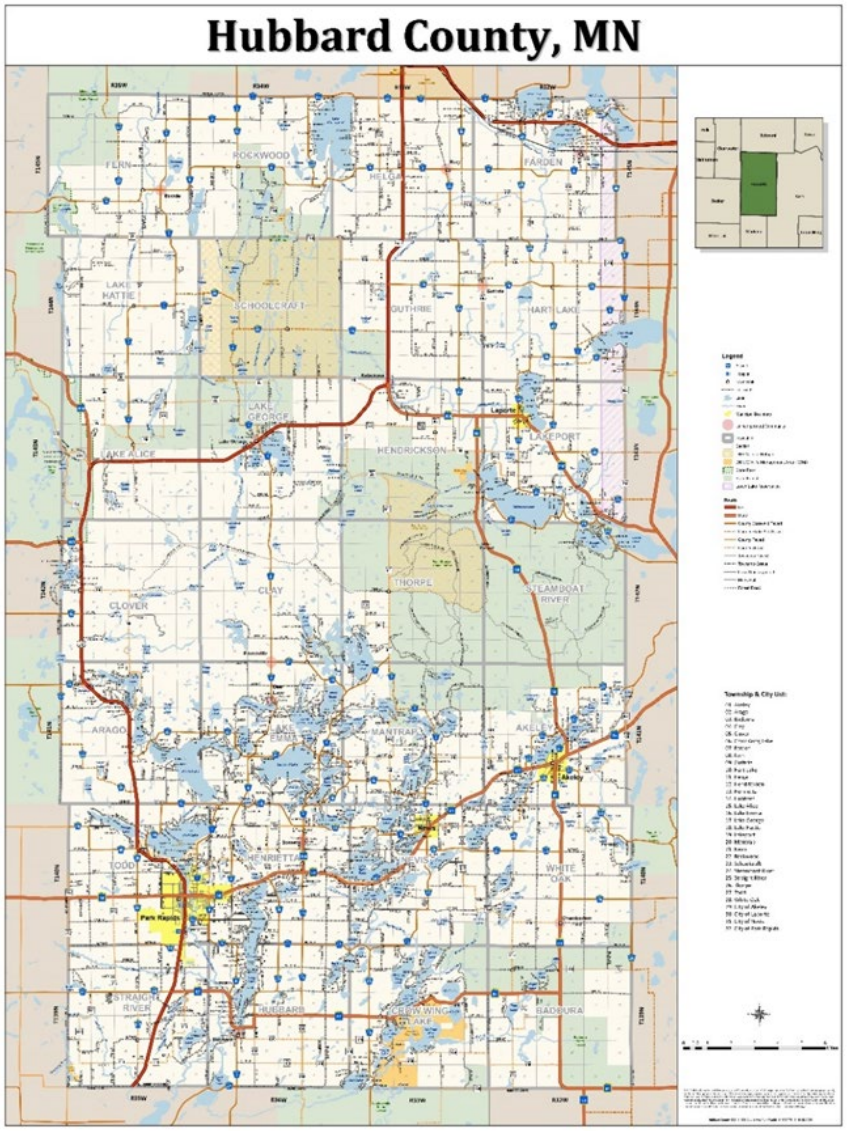
- Groundwater (Part B)



Road Maps

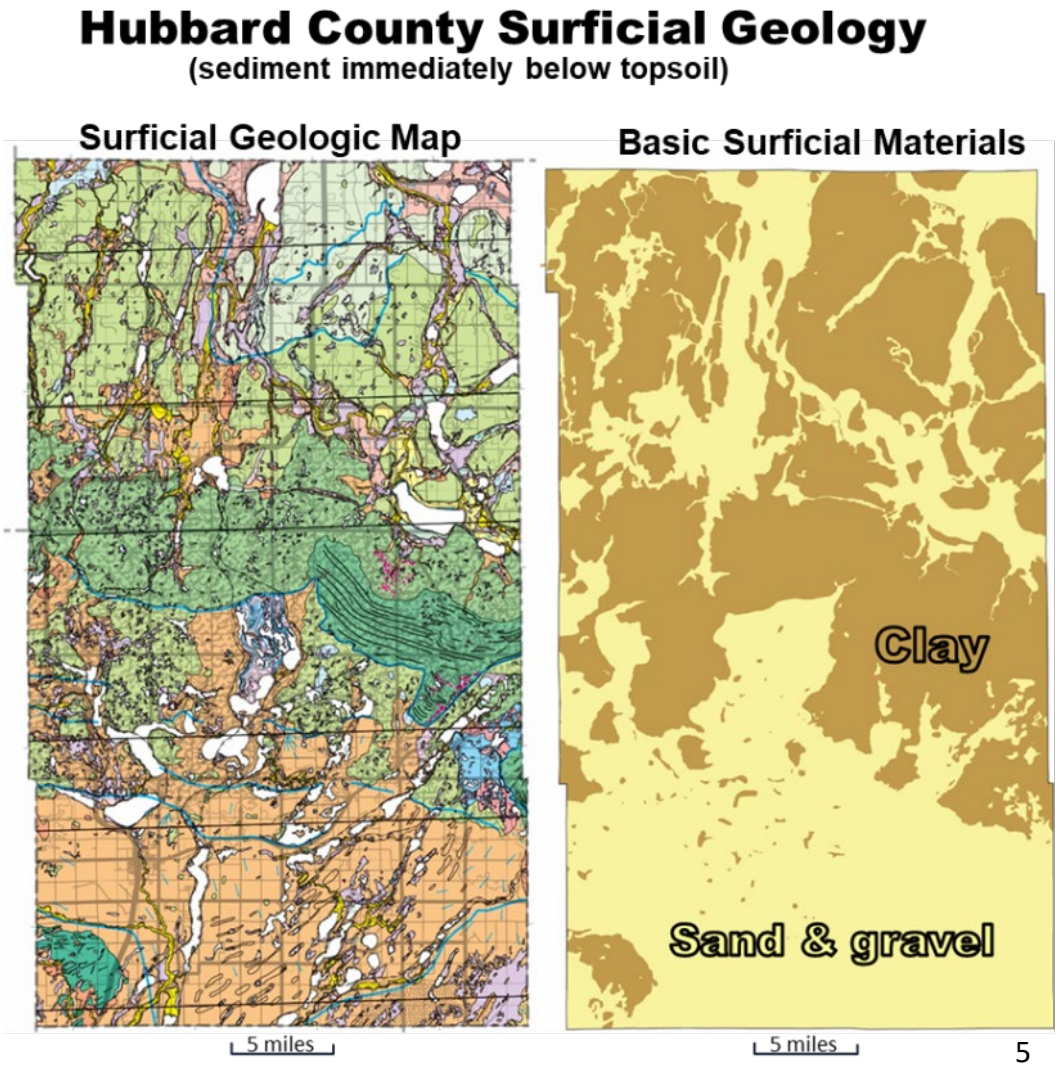
Road Map shows:

- Roads
- Lakes and Rivers
- Cities
- Parks

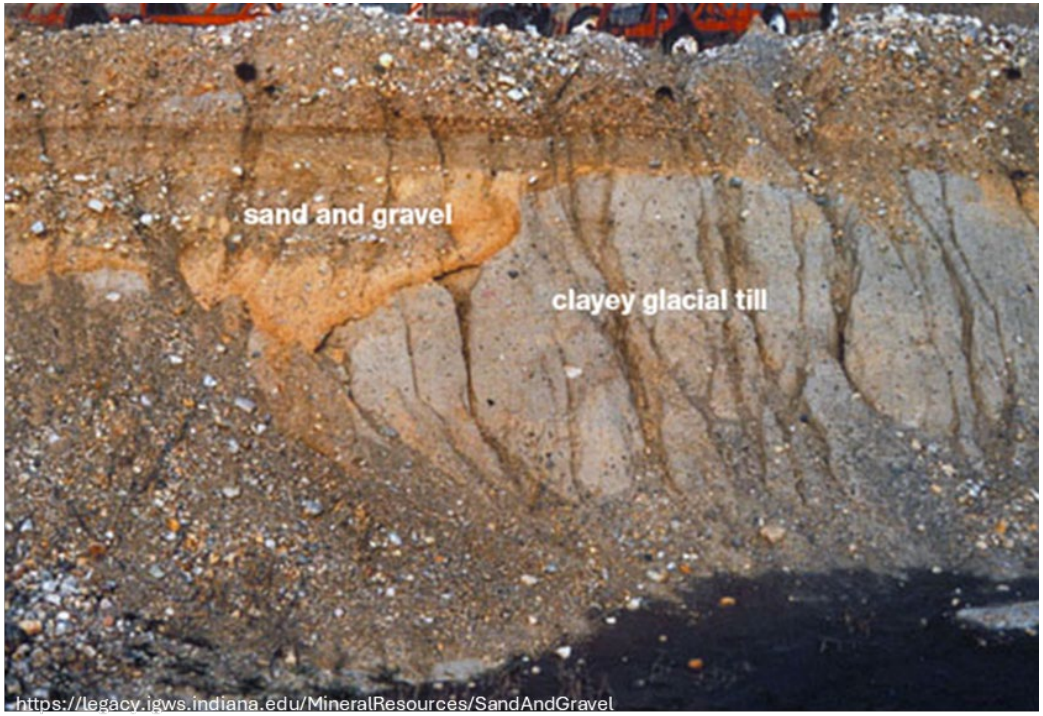


Geologic Maps (CGA Part A)

- **Geologic Maps Show:**
  - Roads
  - Lakes and Rivers
  - **Rocks or Sediments**

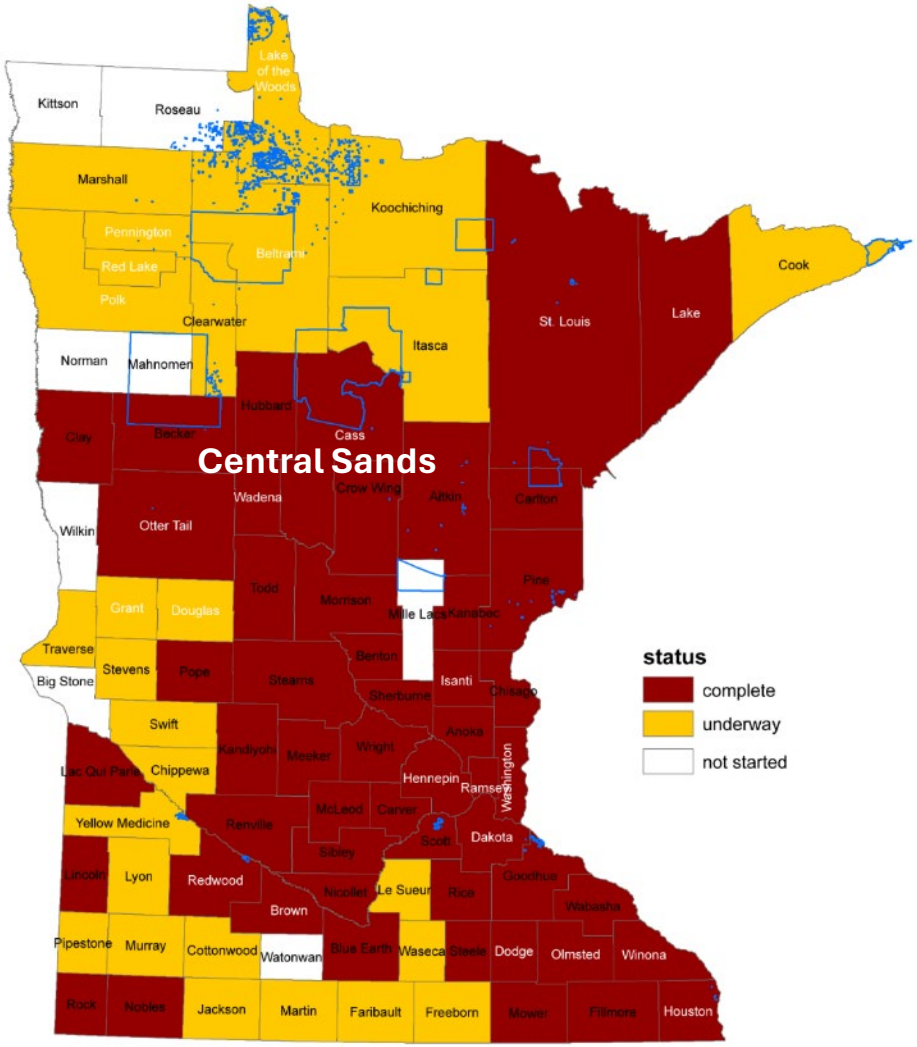


Geologic Resources



- Geology is the “container”
- It holds all our natural resources including: minerals, aggregate, and water
- Maps show the distribution of rocks, sediment, and resources.
- This distribution allows us to predict where to find, plan how to use, and protect groundwater and surface water.

Geologic Atlas Part A Progress

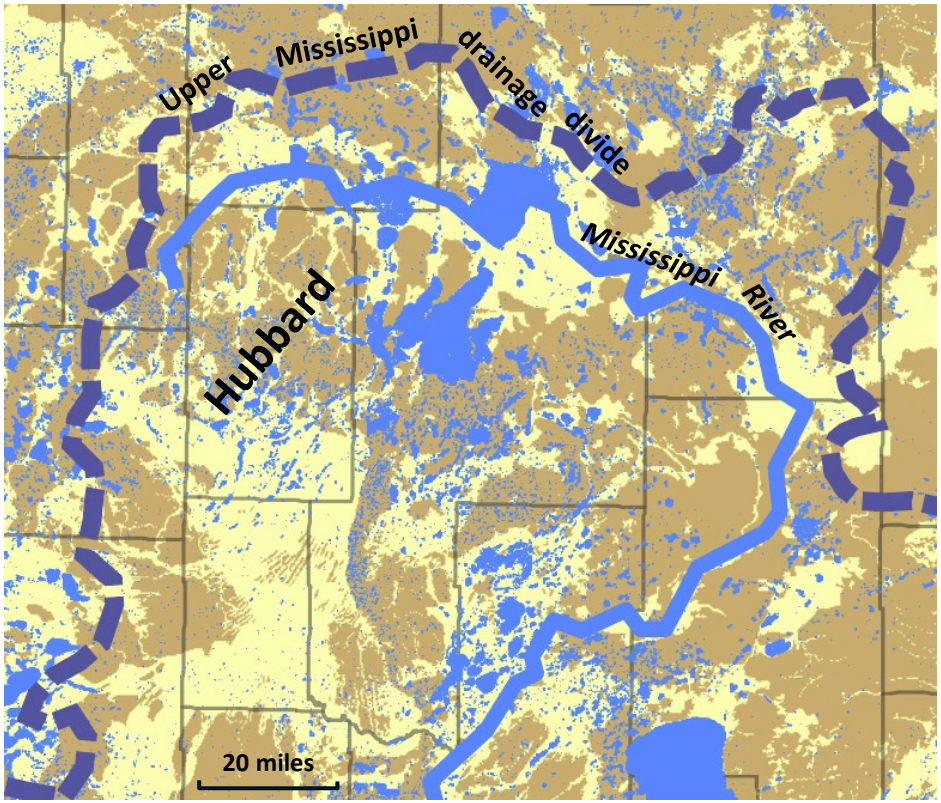


- 52 counties have complete Part A (maroon)
- 27 counties in progress (gold)
- 8 counties have not started (white)
- 23 counties supported all or in part by Clean Water Funds (shown with white labels)

Status as of 5/17/24
Minnesota counties are labeled
Tribal government boundaries (blue outlines)

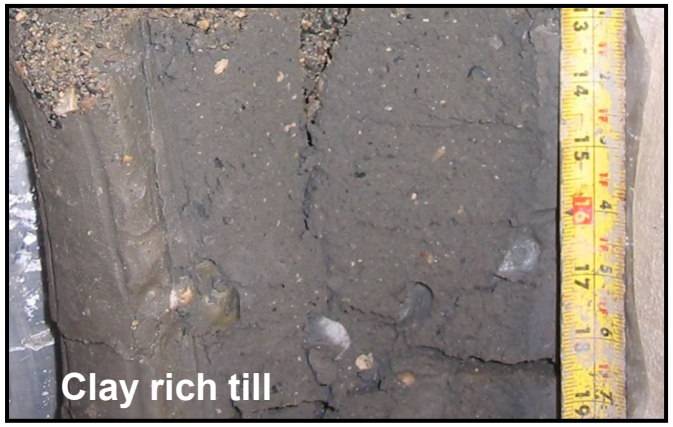
Central Sands Surficial Geology (Shallow Sediment)

Upper Mississippi/Central Sands Region

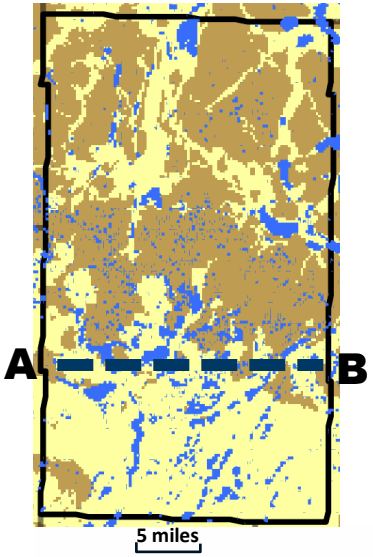


Sand & Gravel

Clay-rich



Geologic mapping is used for the Groundwater Atlas

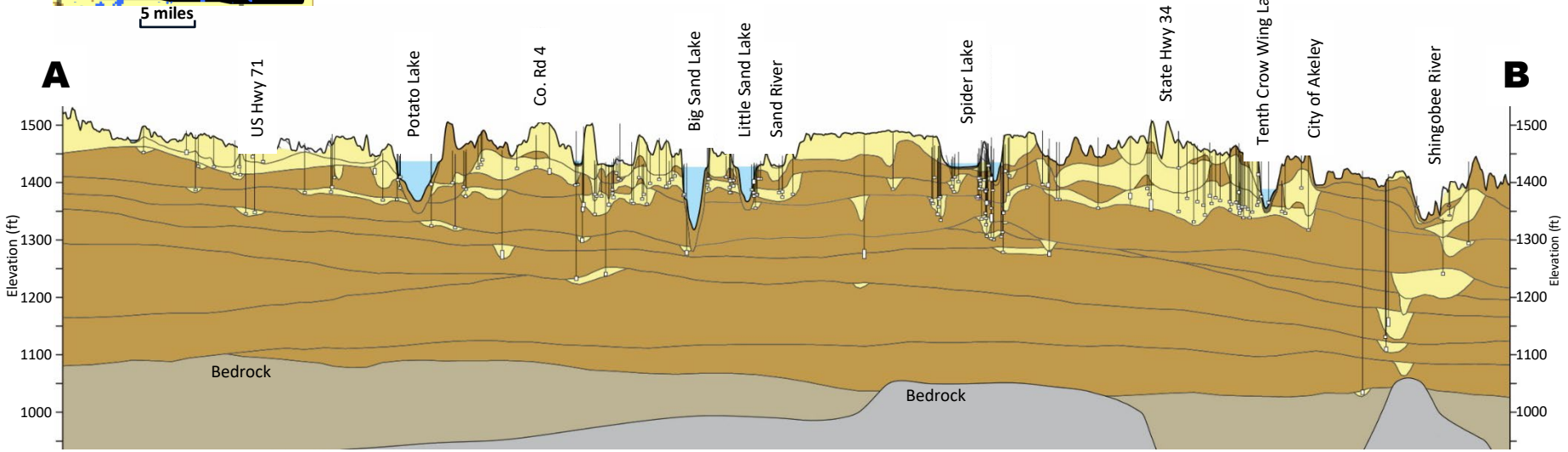


Part A geologic mapping also extends to depths of hundreds of feet

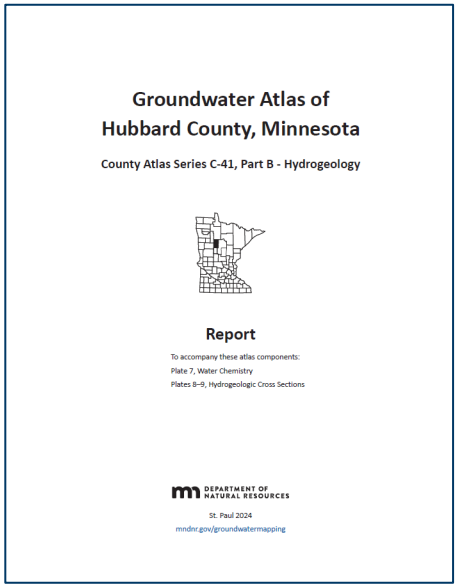
Cross section: profile of Hubbard County geology at depth

Sand & Gravel: high permeability; **potential aquifers**

Clay-rich: low permeability; **aquitards**



Groundwater Atlas of Hubbard County (Part B): DNR


Groundwater Atlas of
Hubbard County, Minnesota

County Atlas Series C-41, Part B - Hydrogeology

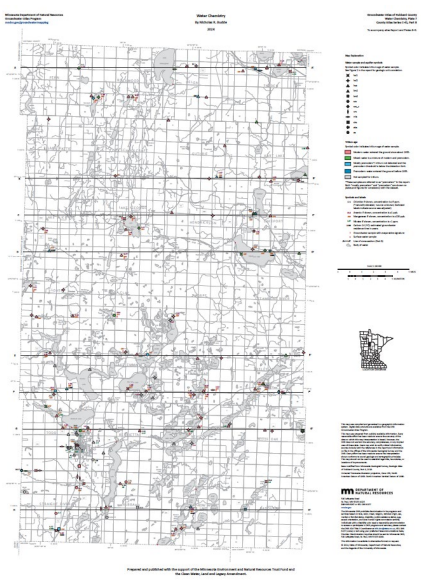
Report

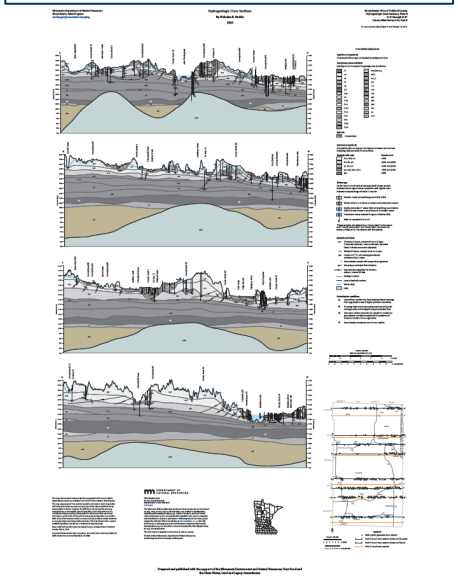
To accompany these atlas components:
Plate 7, Water Chemistry
Plates 8–9, Hydrogeologic Cross Sections

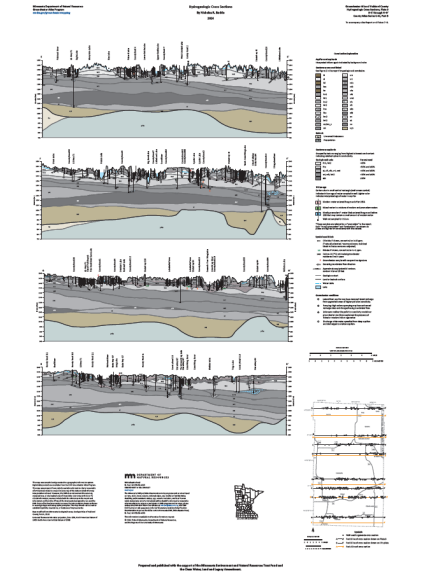
DEPARTMENT OF NATURAL RESOURCES

St. Paul 2024

mndnr.gov/groundwatermapping







Report

- Hydrogeology and Groundwater Flow
- Water Chemistry
- Groundwater Pollution Sensitivity
- Groundwater Use

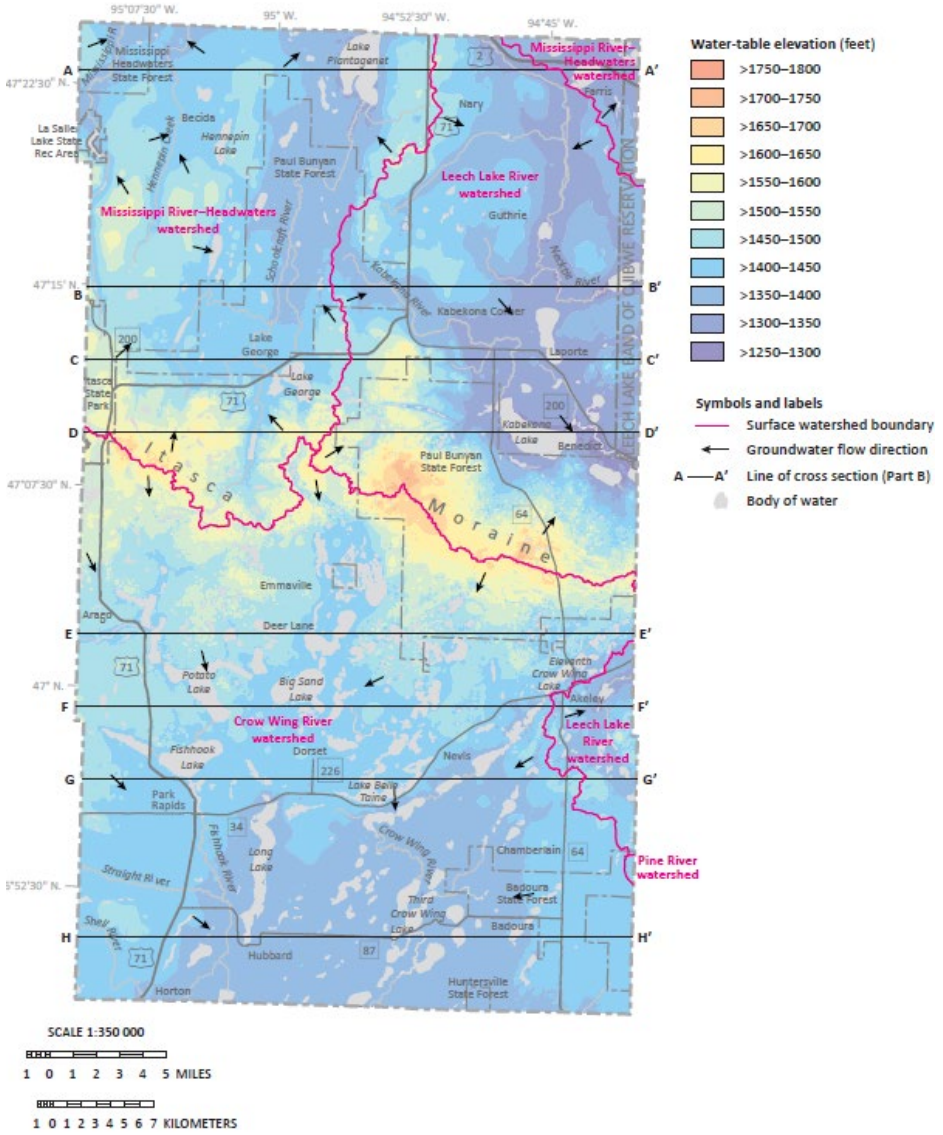
3 Plates

- Water Chemistry
- Hydrogeologic Cross Sections

Electronic Files

- Report and Plates
- GIS files

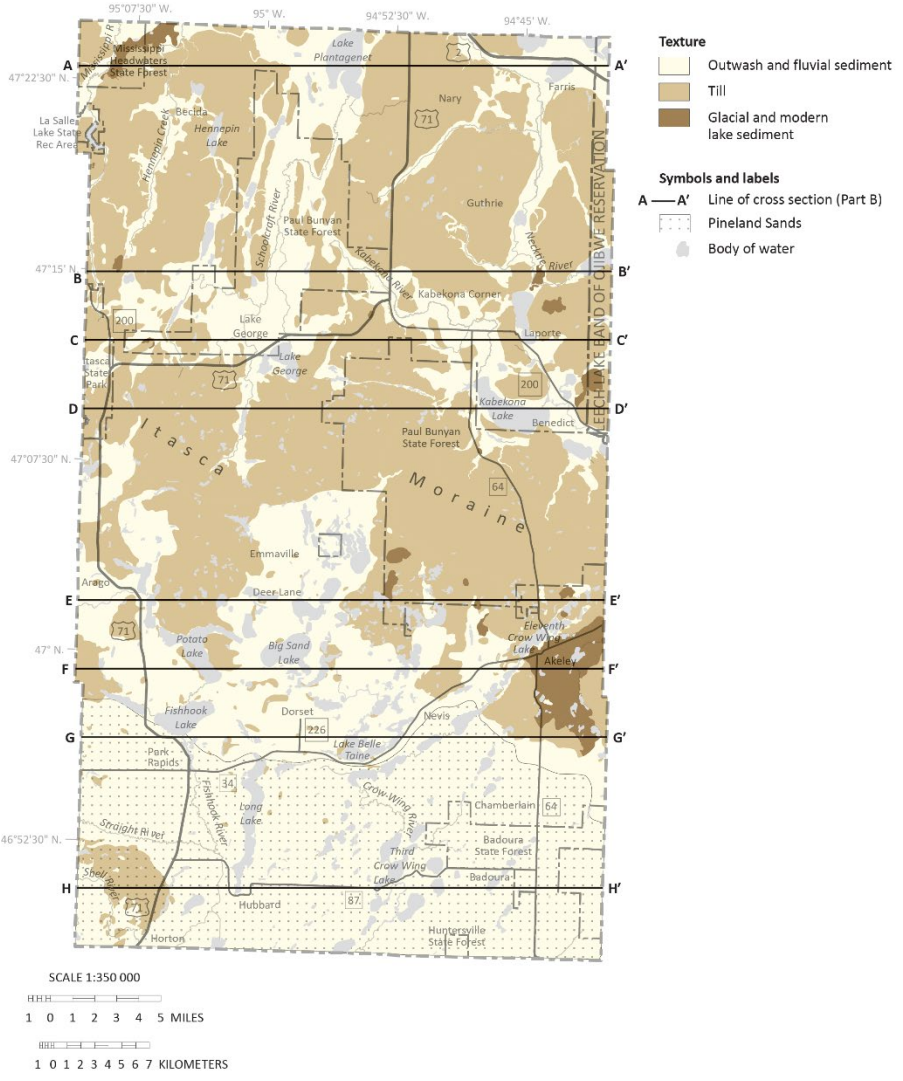
Groundwater Flow - Water Table Elevation

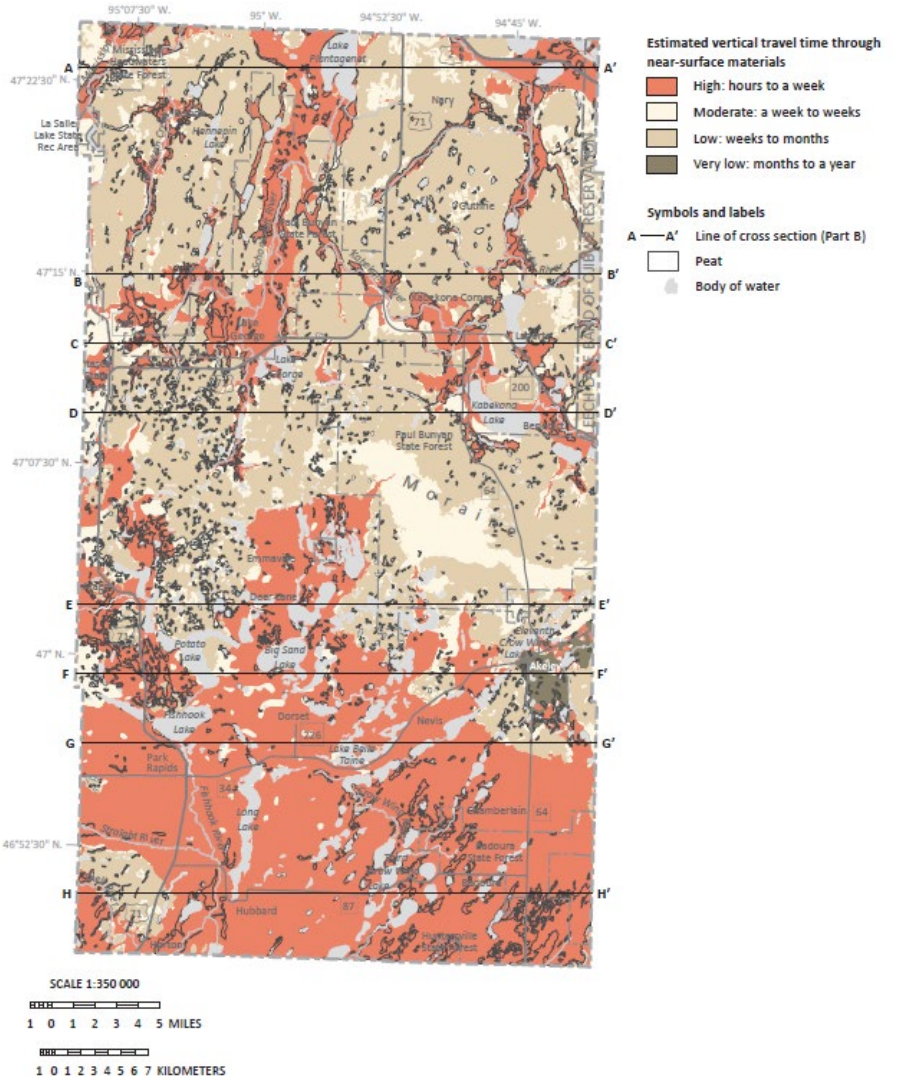


Water Chemistry

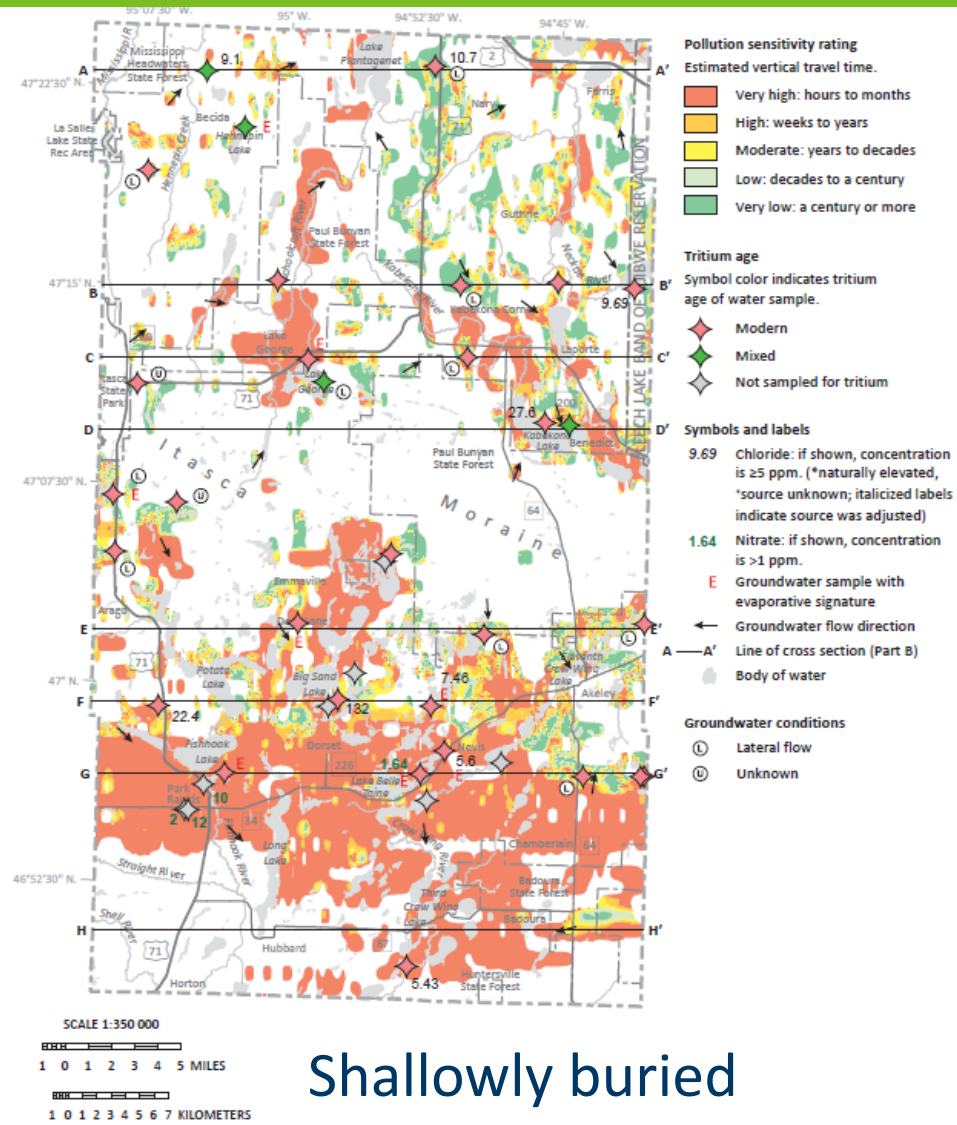
- General Chemistry:
  - Introduced by humans (e.g. Chloride and Nitrate)
  - Naturally-sourced (e.g. Arsenic and Manganese)
- Surface Water Connections
- Time since the water was at the surface (residence time)

Near-surface pollution sensitivity (Upper 10 feet of subsurface)



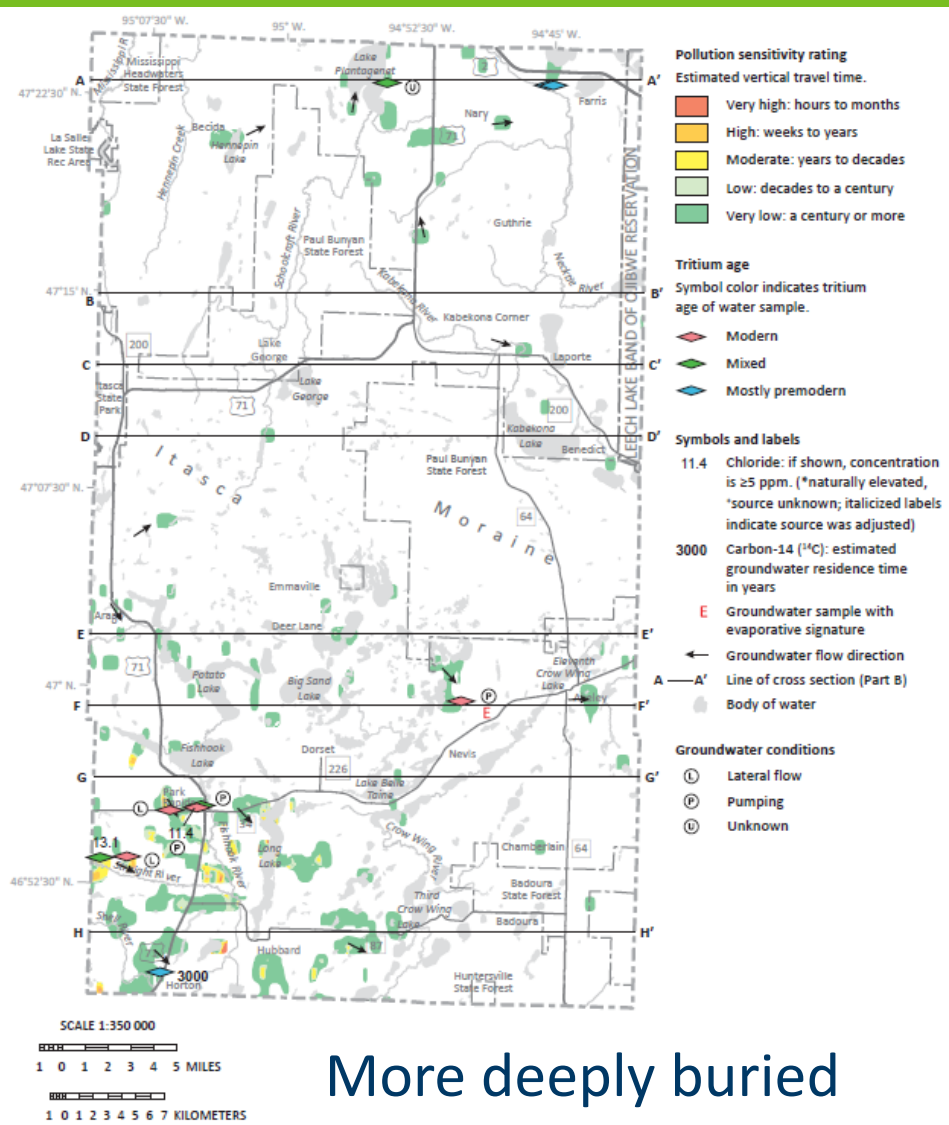


Buried sand aquifer pollution sensitivity (10 figures)



Shallowly buried

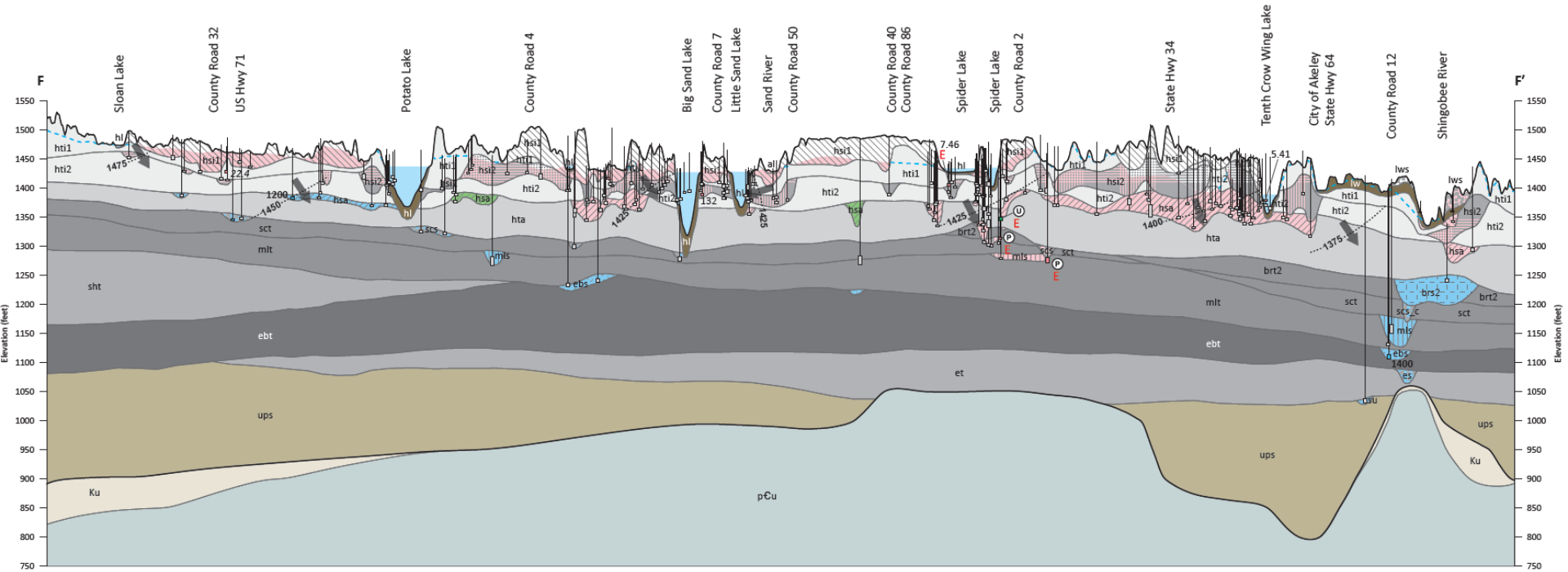
Figure 21. Pollution sensitivity of the hsi2 aquifer and groundwater flow directions



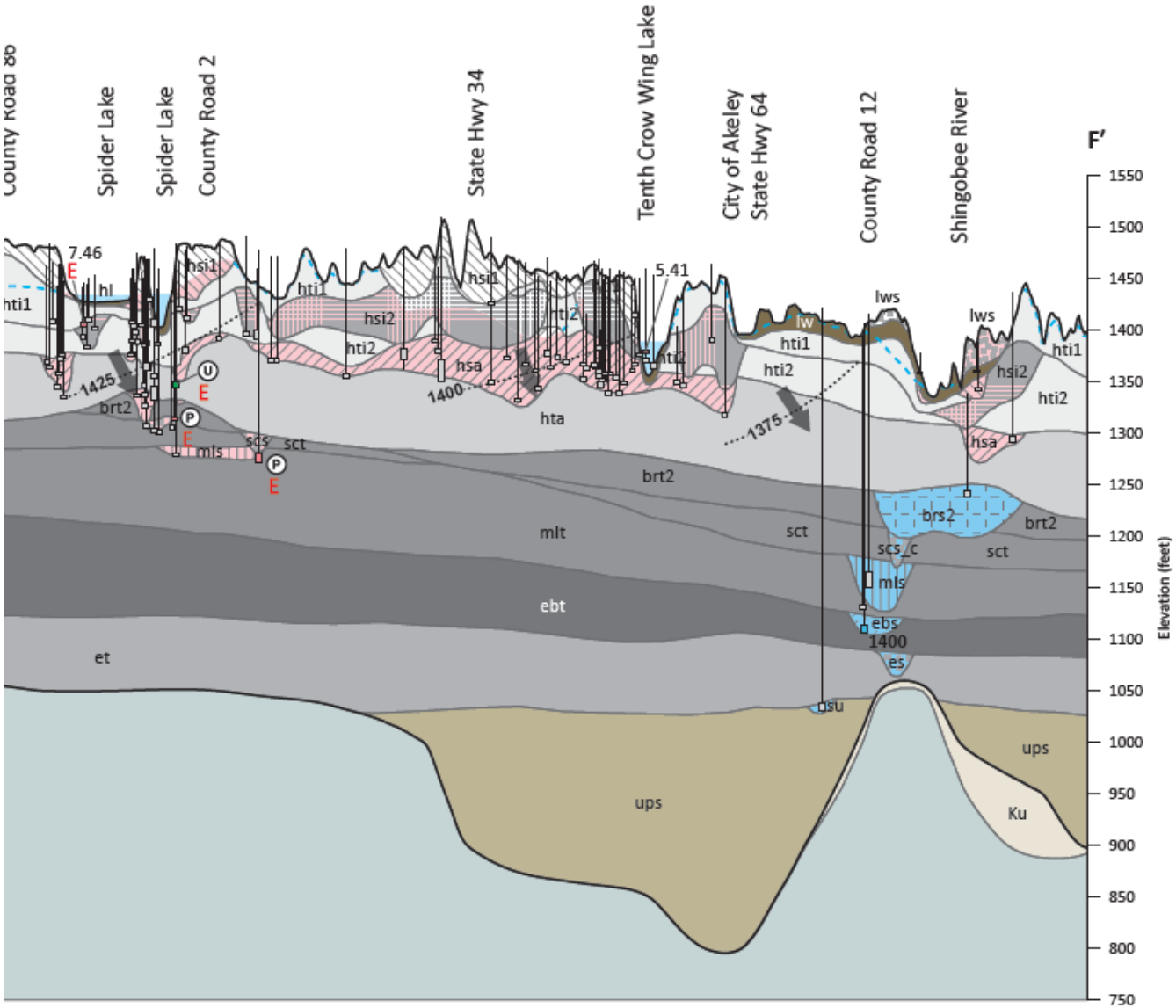
More deeply buried

Figure 27. Pollution sensitivity of the mls aquifer and groundwater flow directions

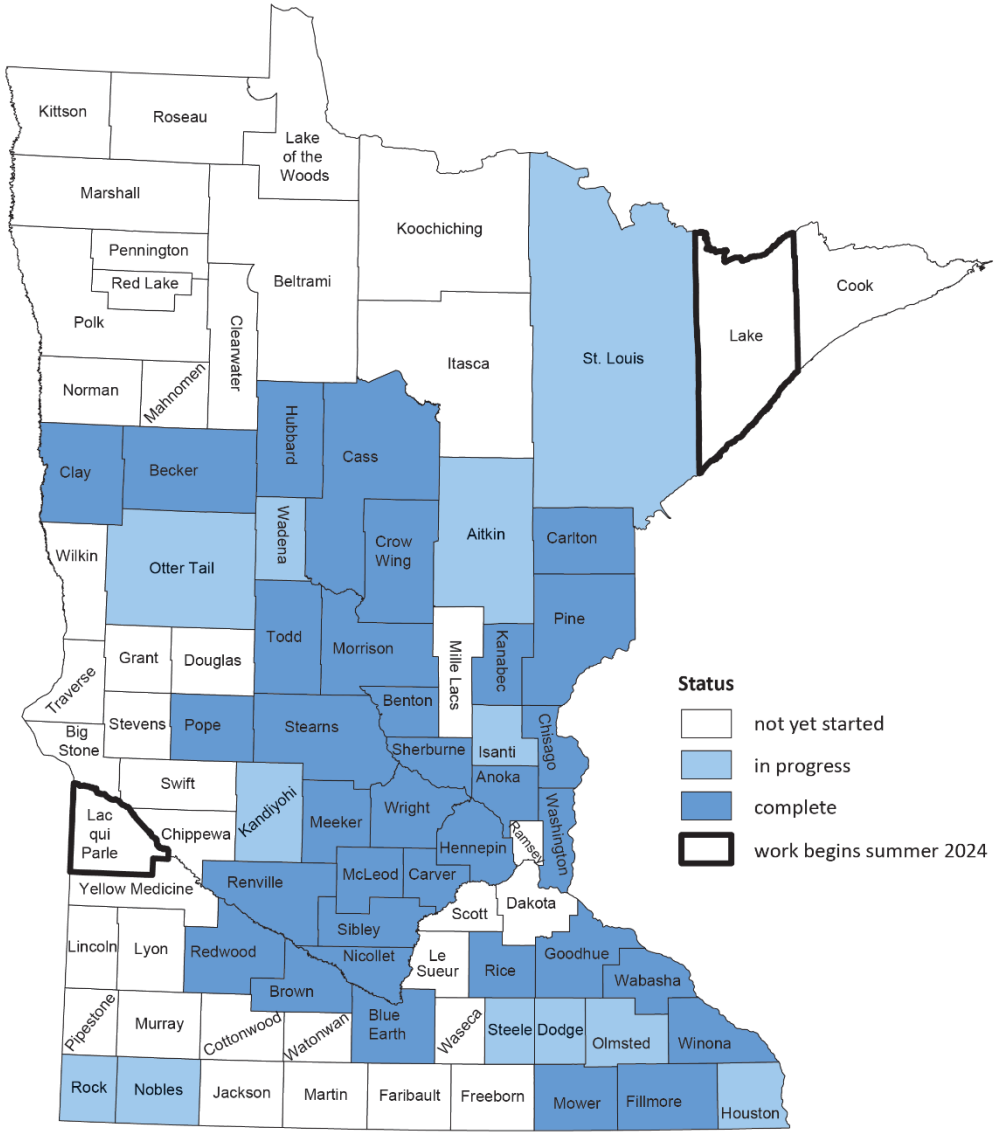
Hydrogeologic Cross-Sections



Hydrogeologic Cross-Sections



County Geologic Atlas (CGA) Part B Status



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Thank You!
Questions?

https://cse.umn.edu/mgs/county-geologic-atlas

mndnr.gov/groundwatermapping