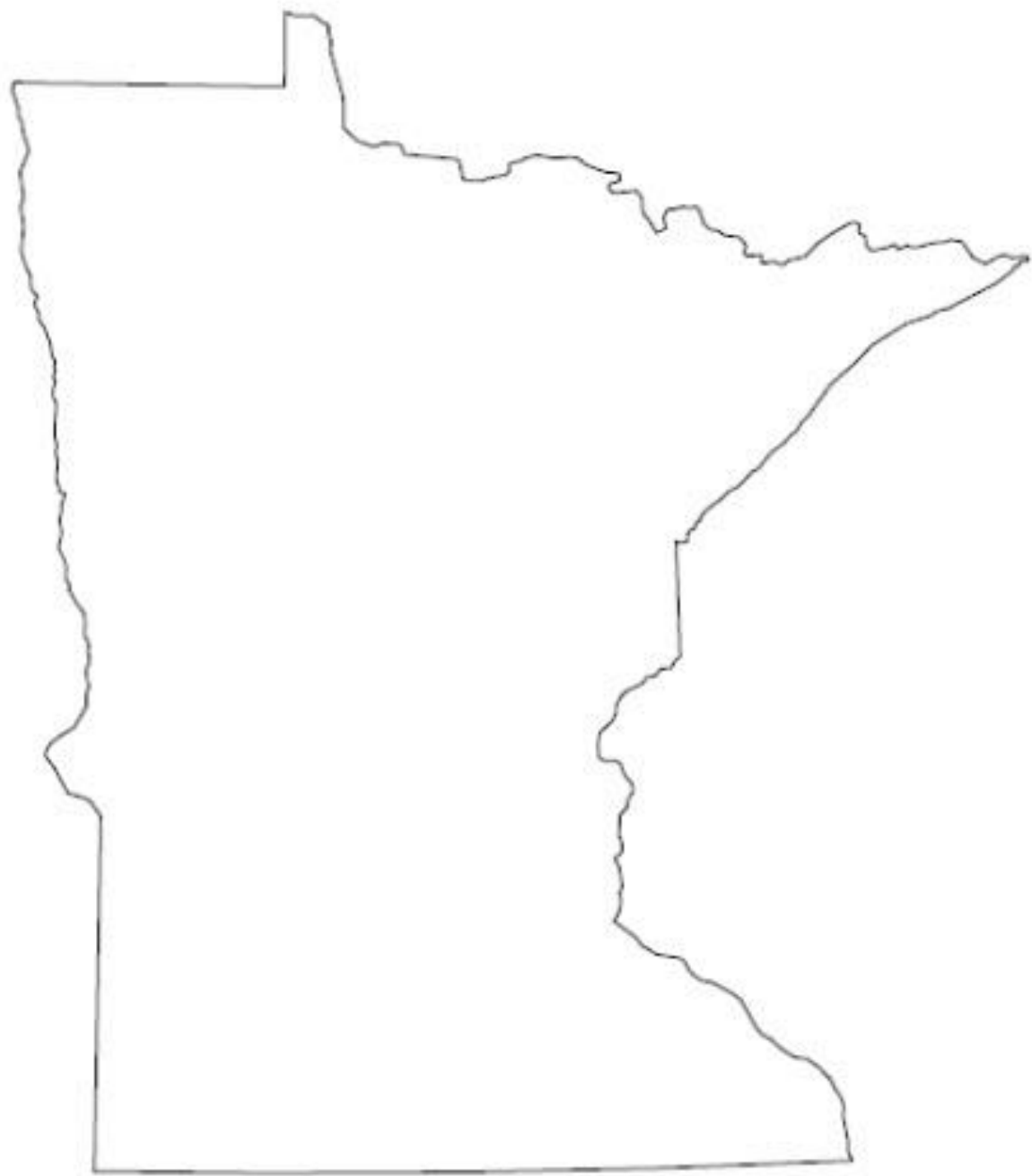
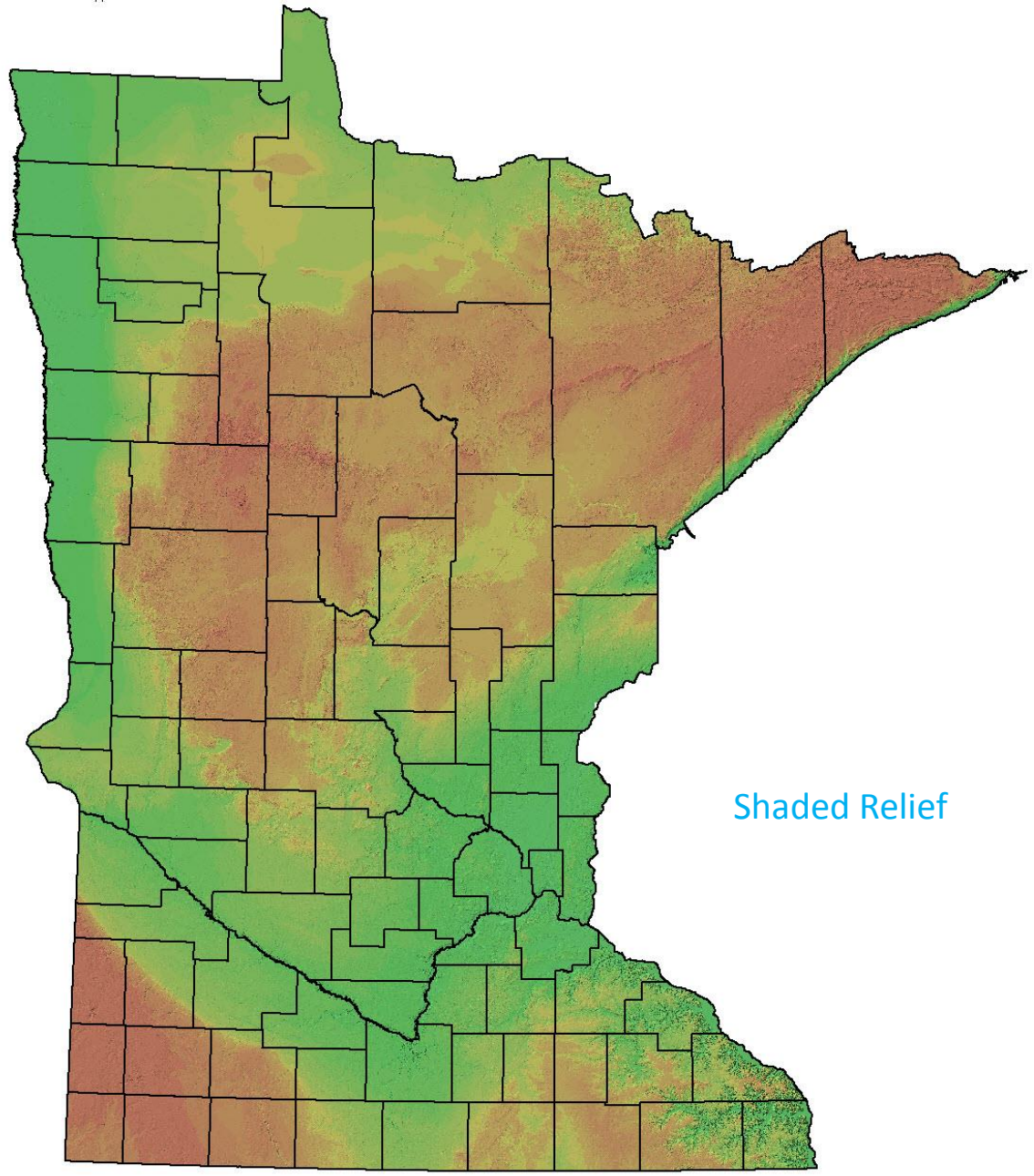




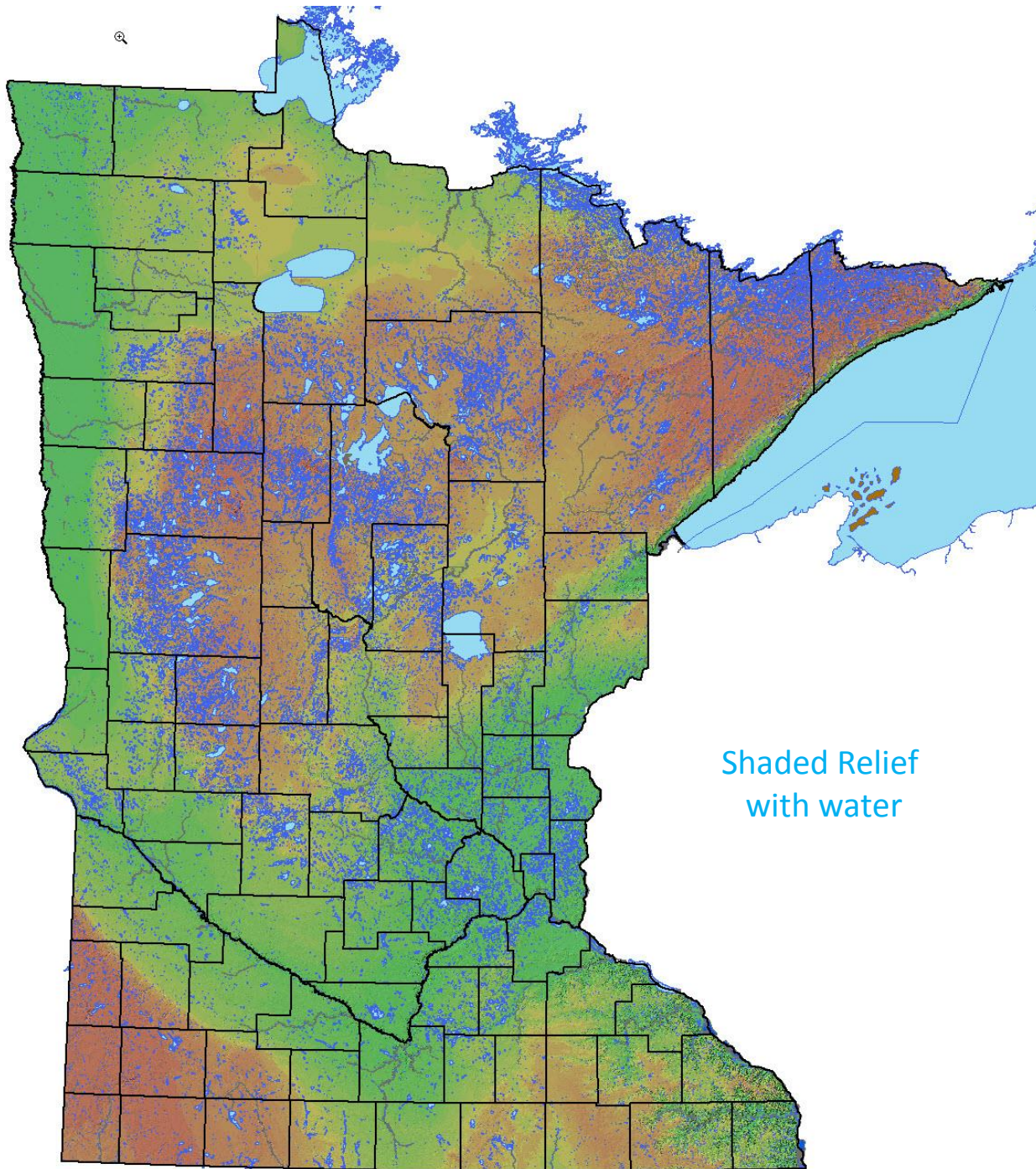
The Pillager Gap

A Story of Glaciers and the Resulting
Landscapes of Central Minnesota

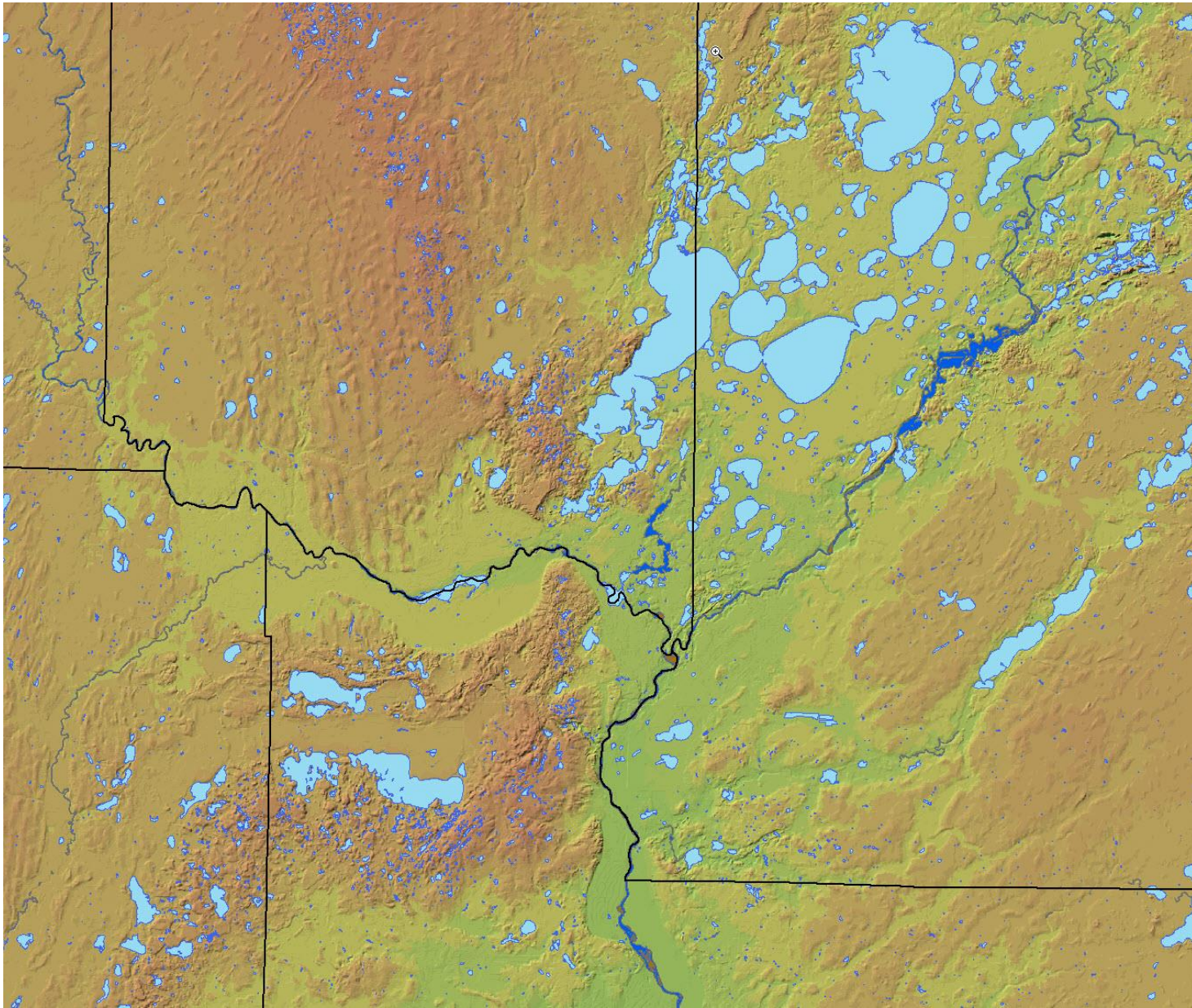




Shaded Relief



Shaded Relief
with water



Shaded Relief
with water-
Central MN



INTRODUCTION

1. The origin of current landscapes in central Minnesota
2. How the landscapes developed
3. The resulting effects of the landscapes on vegetation, soils, topography, water resources and human land use



General Overview

Glaciers

1. Five major glacial periods in the last 2.5 million years
2. The last glacial period is called the Wisconsinan Glacial Episode
3. The Wisconsinan Glacial Episode was from about 110k to 11.7k years ago

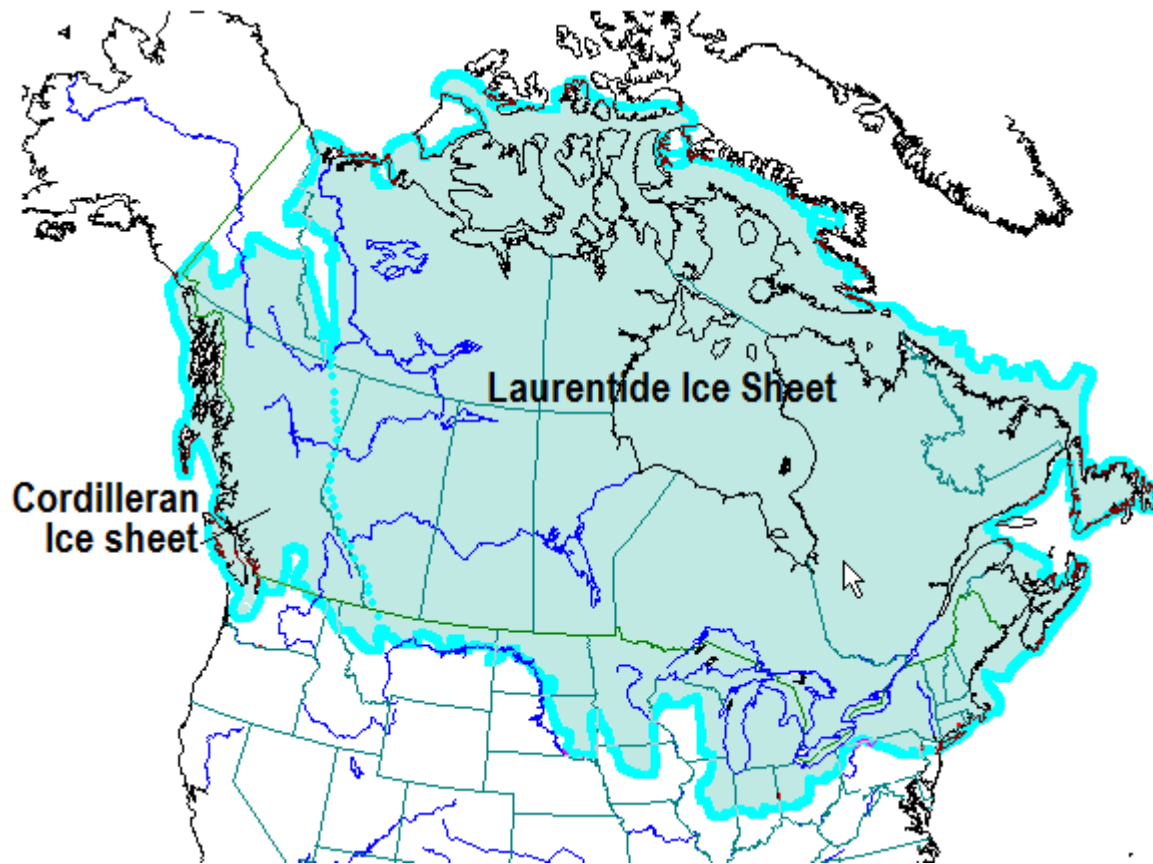


Photo by Alto Crew on Unsplash

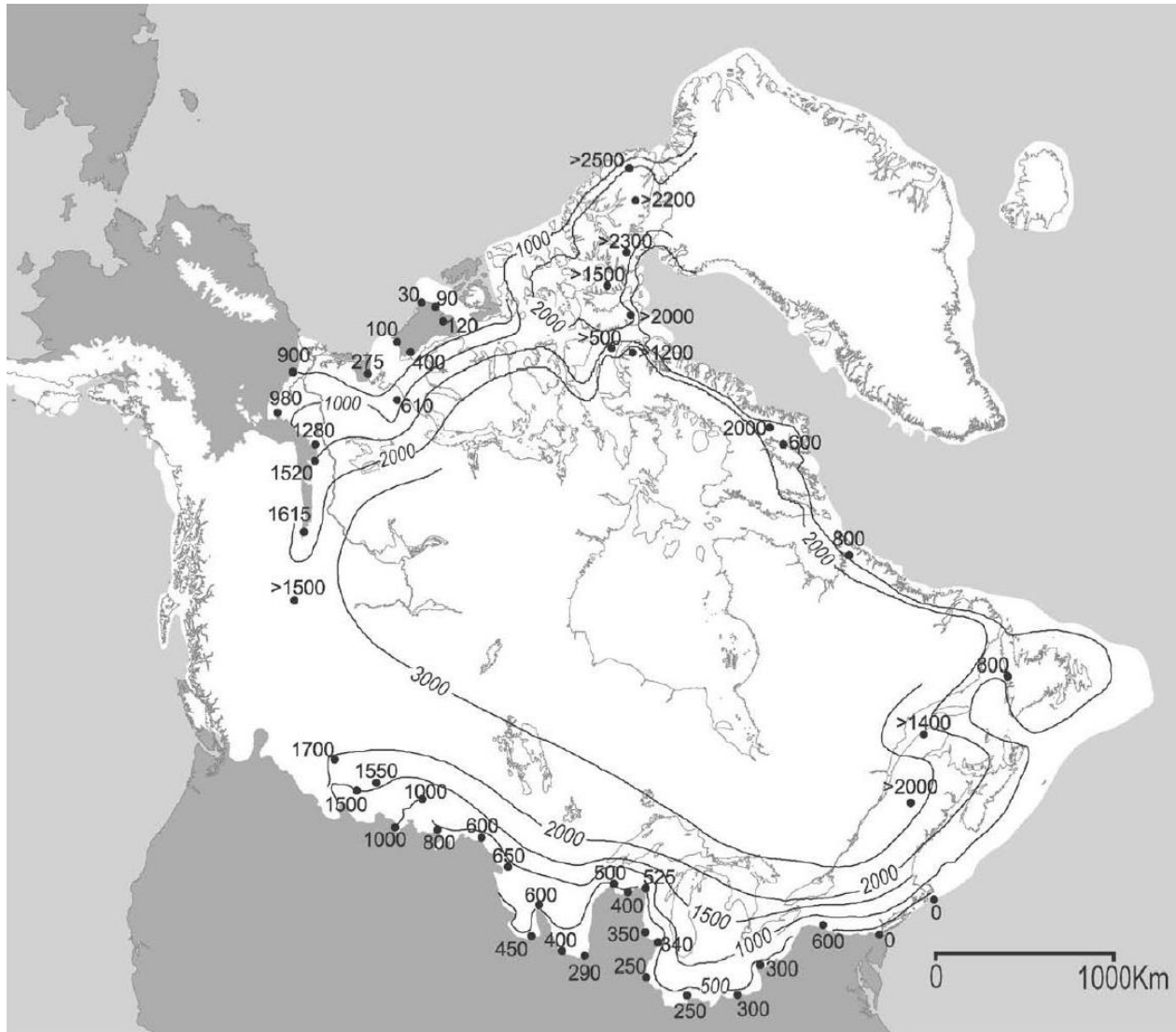
Why have Glacial Periods occurred?

1. The Milankovitch theory
This theory explains the three cyclical changes in the earth's orbit and tilt that cause the climatic fluctuations that have occurred over the last tens to hundreds of thousands of years.
2. Other theories have attributed them to volcanic eruptions or high levels of atmospheric gases or clouds that shut out the warmth of the sun.
3. Yet other theories attribute them to major changes in the ocean currents.
4. Who knows for certain. However, we do know that they occurred.
5. Scientists predict that the next ice age is 50,000 years out.

Greatest extent of the glacial ice in the Wisconsin Glacial Period



How thick was the Laurentide Ice Sheet?





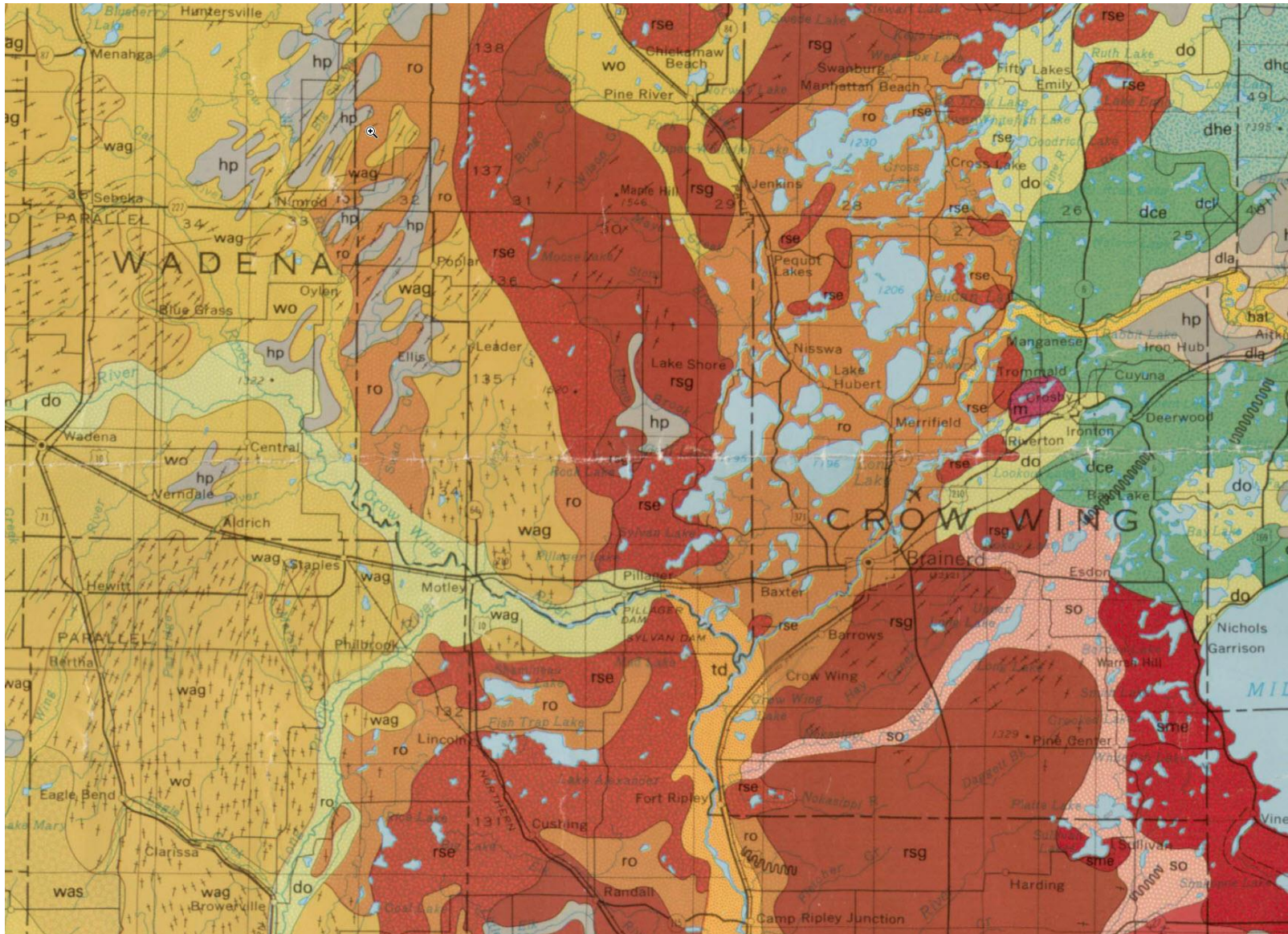
El Capitan

Another consequence of glaciation

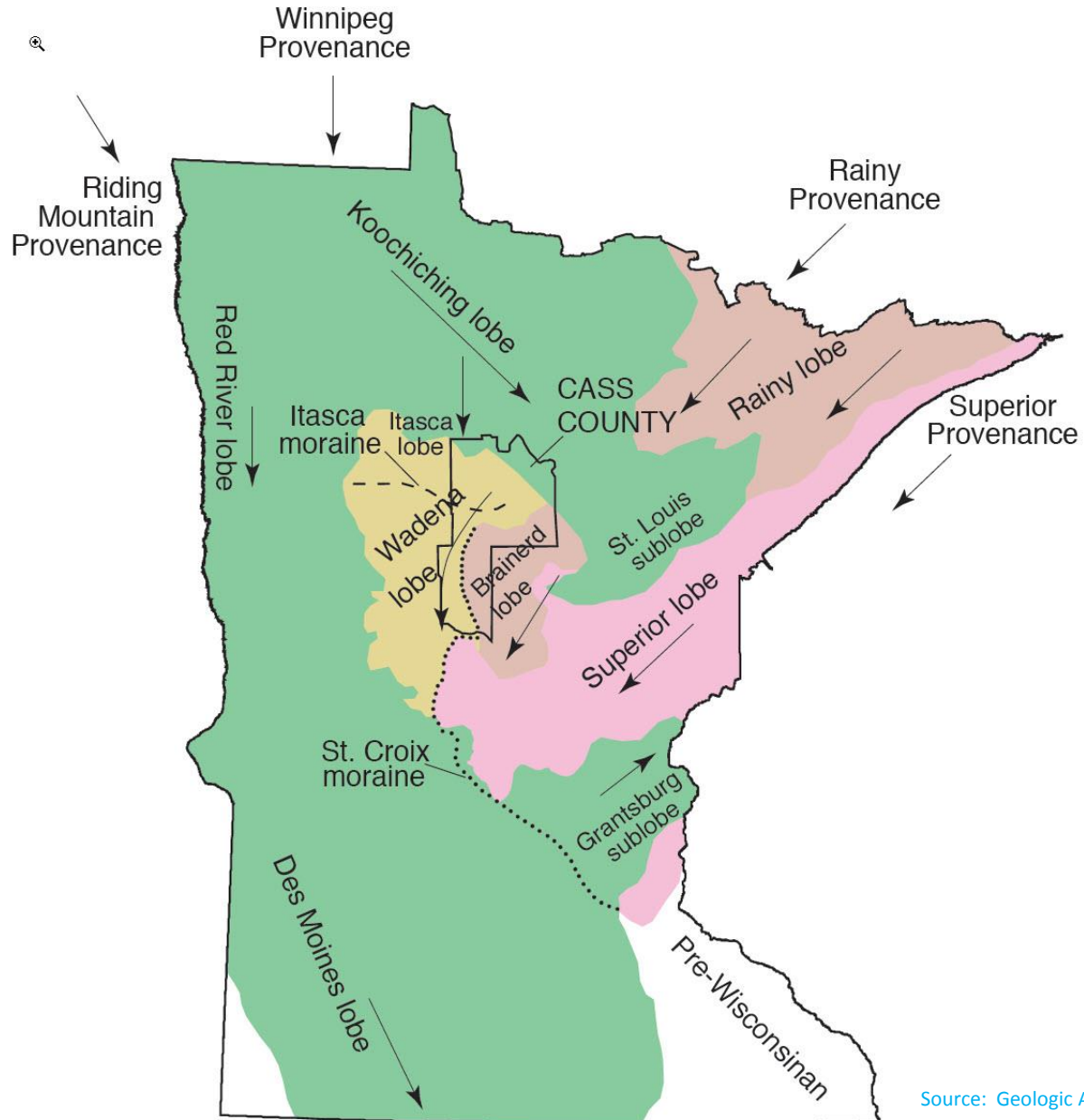


New genetic evidence supports the hypothesis that the first people in the Americas all came from northeast Asia by crossing a land bridge known as Beringia. When sea levels rose after the last ice age the land bridge disappeared. (Julie McMahon)

Quaternary geology of Central Minnesota



The dance of the glacial ice lobes



Glacial landform terms

1. Outwash plain— a plain formed of glacial sediments deposited by meltwater at the terminus or edge of a glacier
2. Moraine – terminal and recessional moraines mark the farthest reaches of a glacier at a given point in time.
3. Drumlin – an elongated hill in the shape of a half buried egg formed by glacial ice acting on unconsolidated till.
4. Esker – a long winding ridge of stratified sand and gravel.

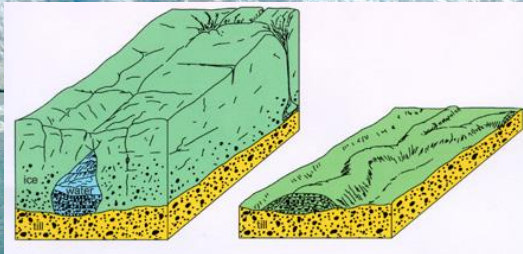
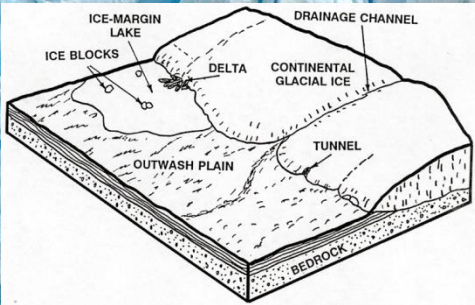


Photo by Alto Crew on Unsplash

Glacial deposit terms

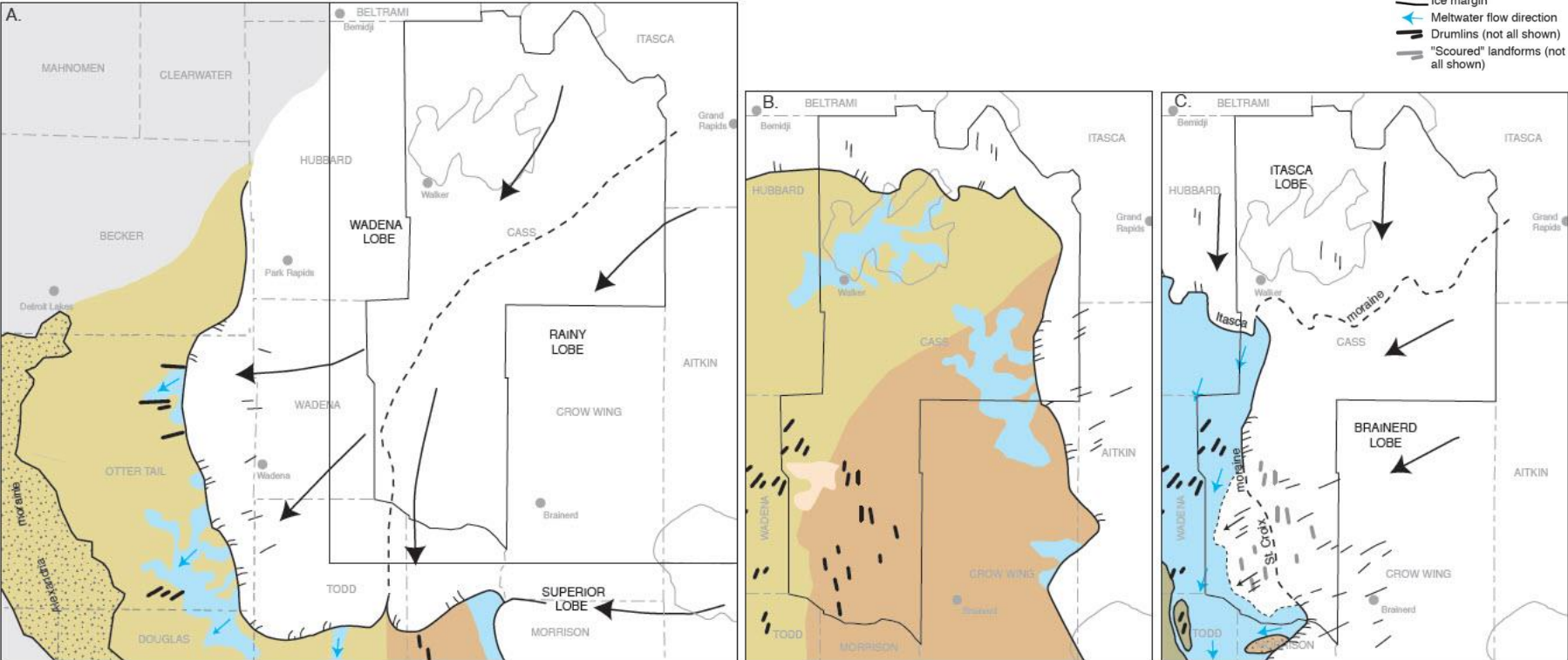
1. Till – unsorted glacial sediment.
2. Outwash – deposits of sand and gravel carried by running water from melting glacial ice and laid down in stratified deposits.
3. Erratic boulders – large rocks dropped by glaciers far from their origin
4. Lake deposits – sediment deposited at the bottom of glacial lakes.



Detailed glacial history of Cass County

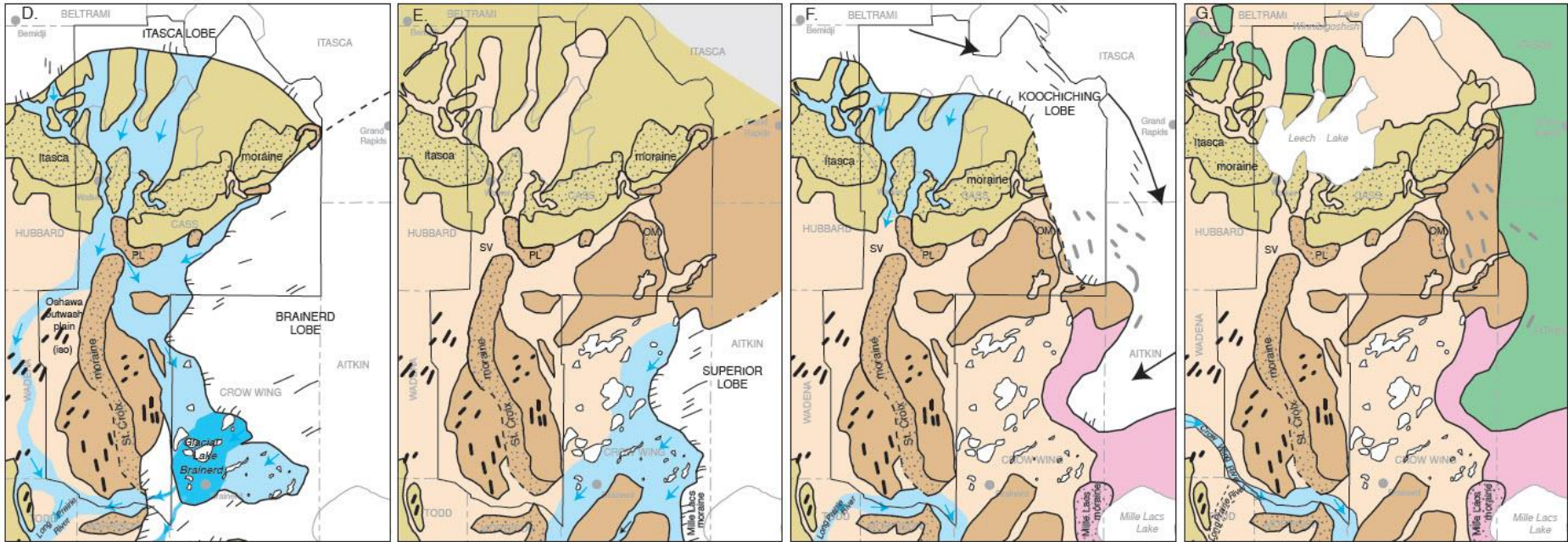
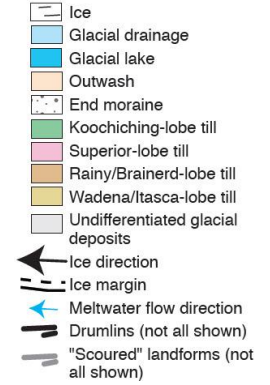
Source: Geologic Atlas of Cass County, MN
Lusardi and Nguyen, 2018

- Ice
- Glacial drainage
- Glacial lake
- Outwash
- End moraine
- Koochiching-lobe till
- Superior-lobe till
- Rainy/Brainerd-lobe till
- Wadena/Itasca-lobe till
- Undifferentiated glacial deposits
- Ice direction
- Ice margin
- Meltwater flow direction
- Drumlins (not all shown)
- "Scoured" landforms (not all shown)



Detailed glacial history of Cass County

Source: Geologic Atlas of Cass County, MN
Lusardi and Nguyen, 2018







What is the result?

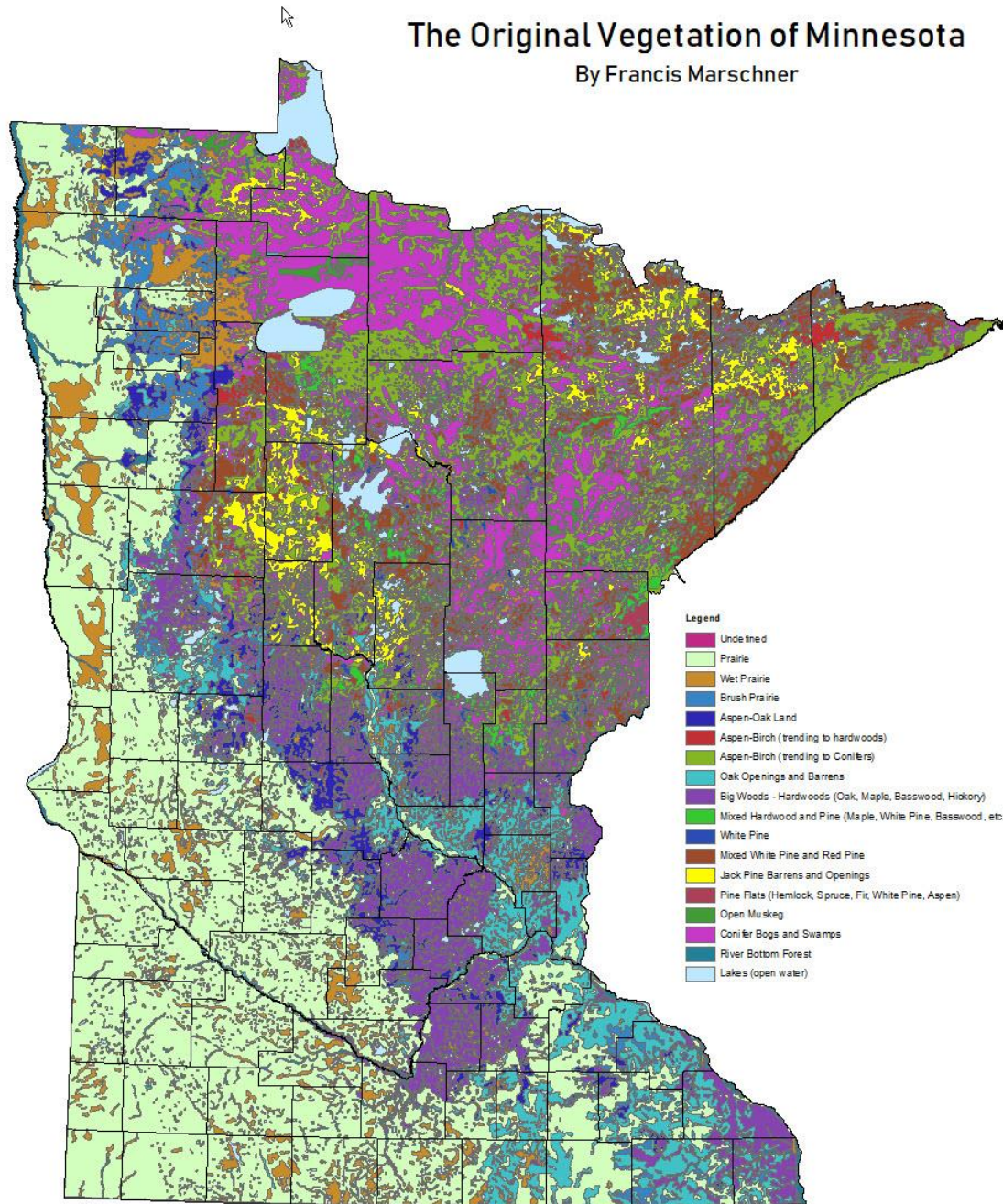
1. Vegetation
2. Soil
3. Hydrography – Lakes, rivers, streams and wetlands
4. Land use
 1. Agriculture
 2. Forestry
 3. Tourism
 4. Mining

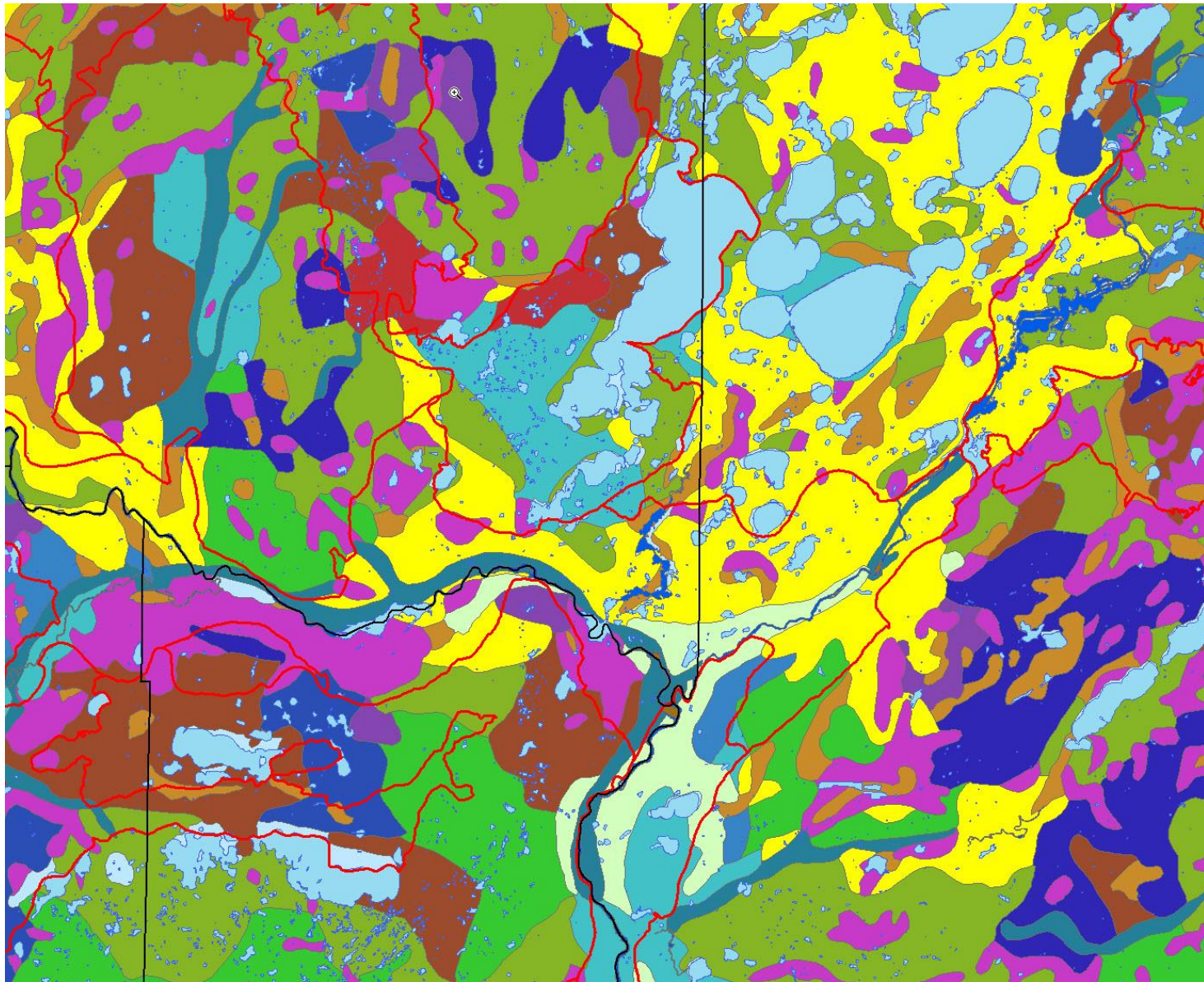


Photo by Alto Crew on Unsplash

The Original Vegetation of Minnesota

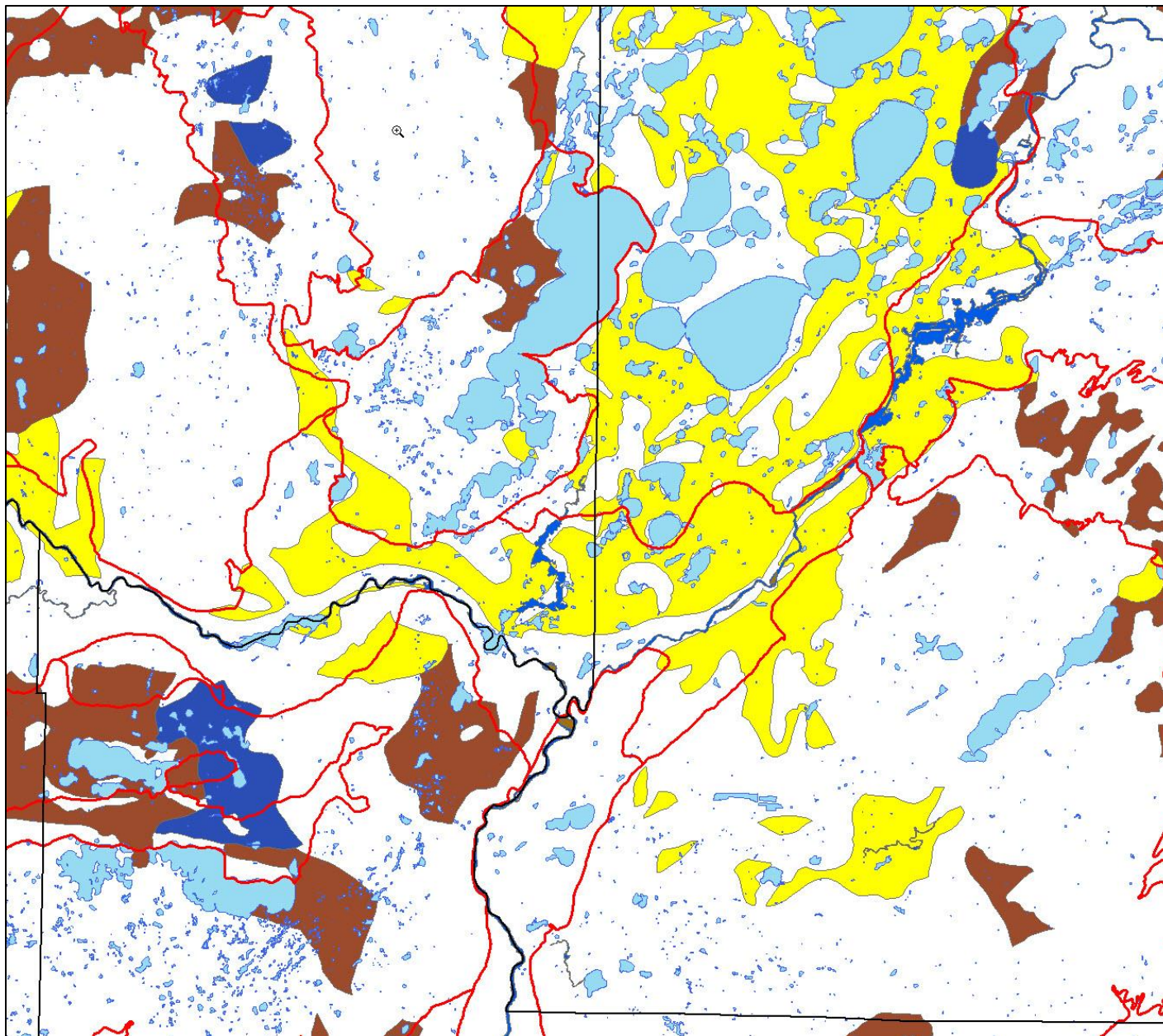
By Francis Marschner





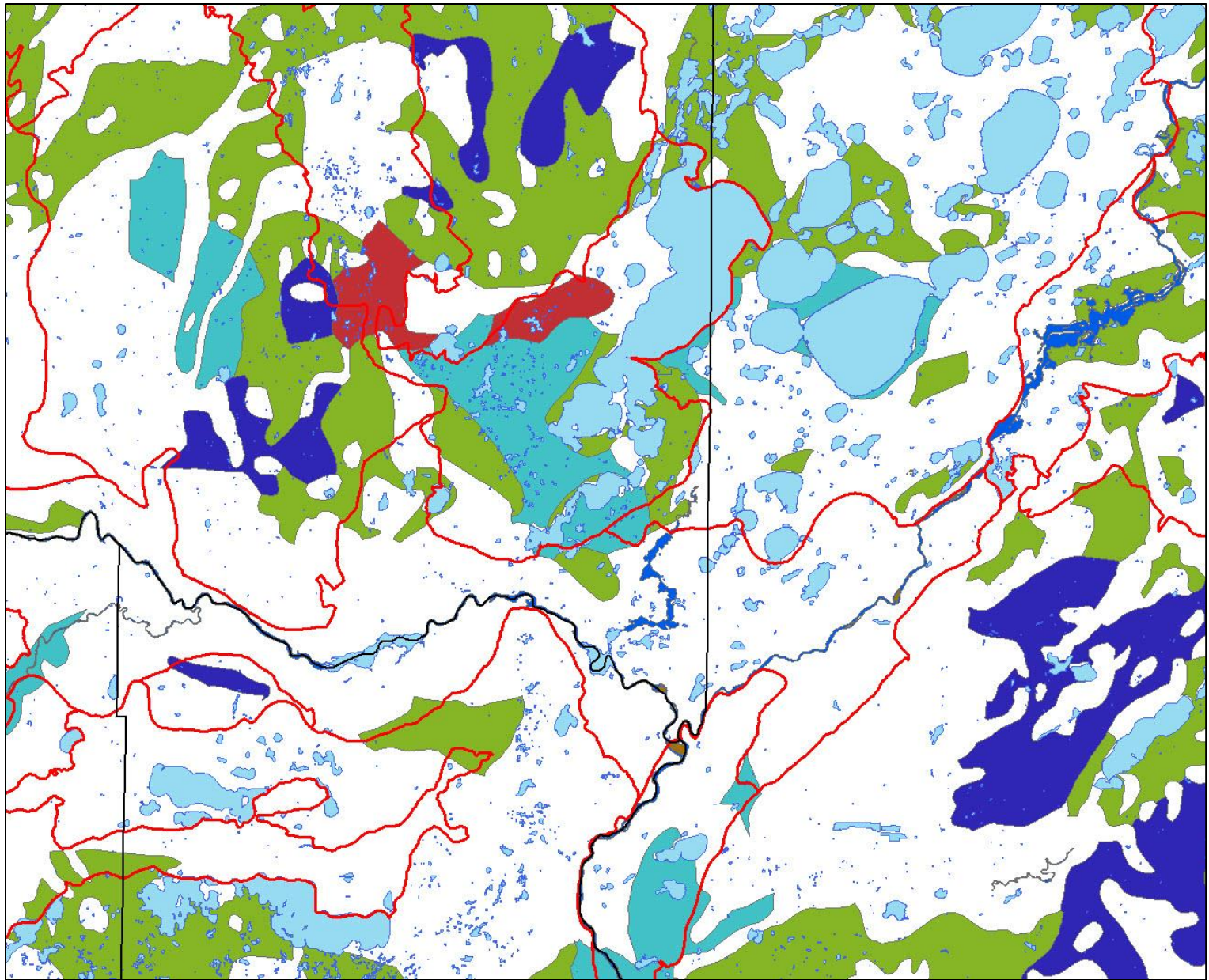
Legend

- Undefined
- Prairie
- Wet Prairie
- Brush Prairie
- Aspen-Oak Land
- Aspen-Birch (tending to hardwoods)
- Aspen-Birch (tending to Conifers)
- Oak Openings and Barrens
- Big Woods - Hardwoods (Oak, Maple, Basswood, Hickory)
- Mixed Hardwood and Pine (Maple, White Pine, Basswood, etc.)
- White Pine
- Mixed White Pine and Red Pine
- Jack Pine Barrens and Openings
- Pine Flats (Hemlock, Spruce, Fir, White Pine, Aspen)
- Open Muskeg
- Conifer Bogs and Swamps
- River Bottom Forest
- Lakes (open water)



Legend

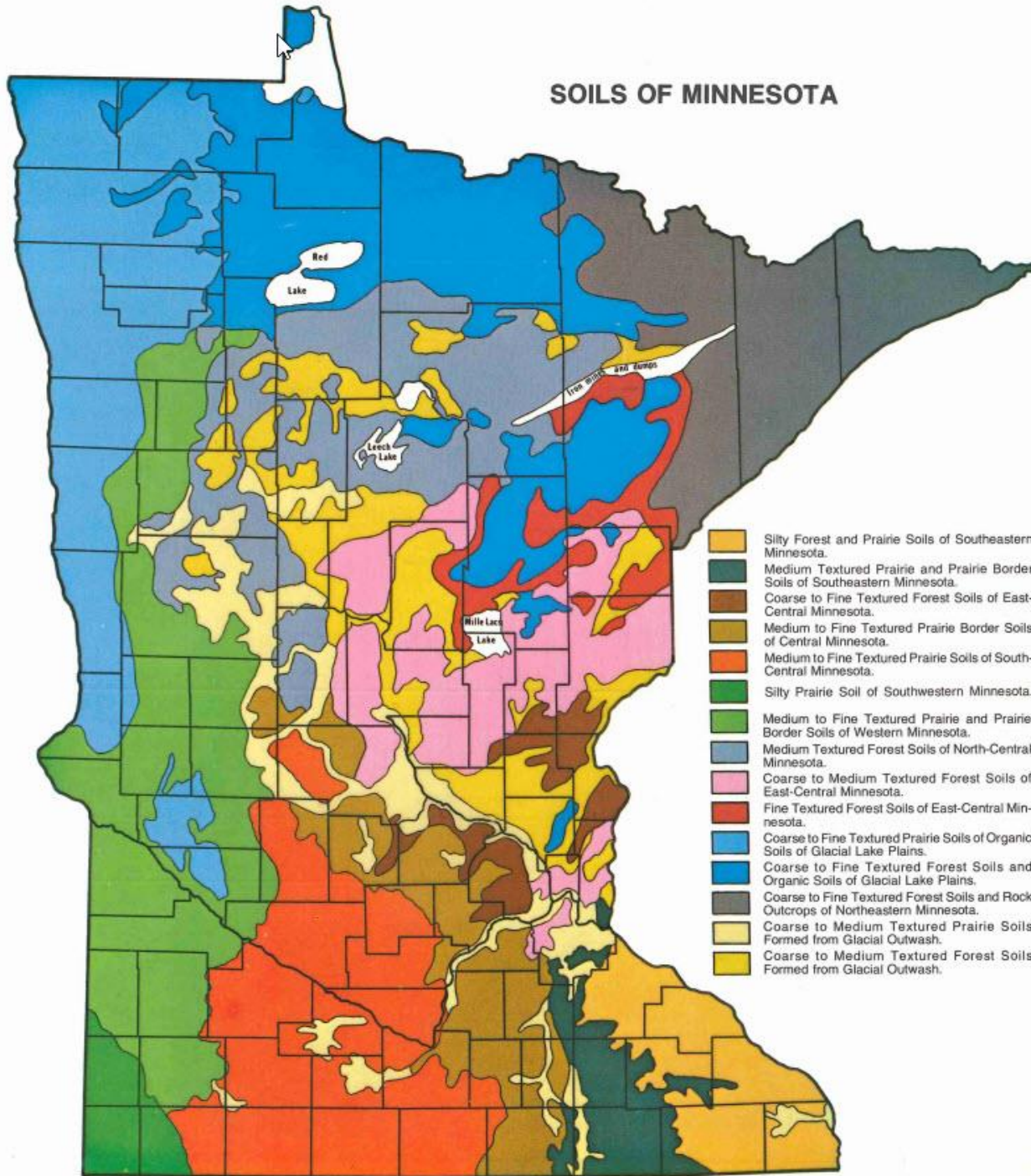
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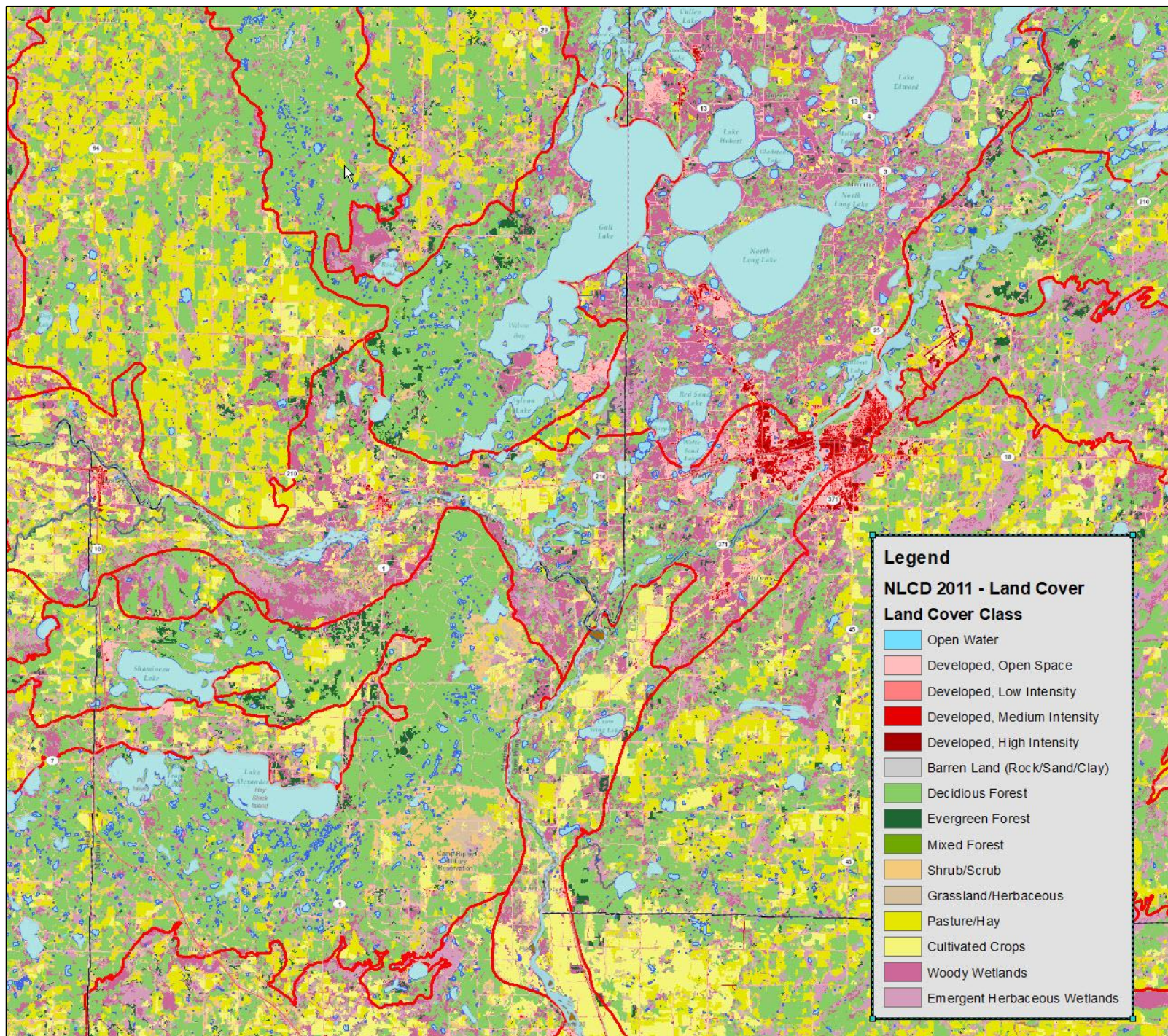
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SOILS OF MINNESOTA













Mining





BIRCH ISLAND RD

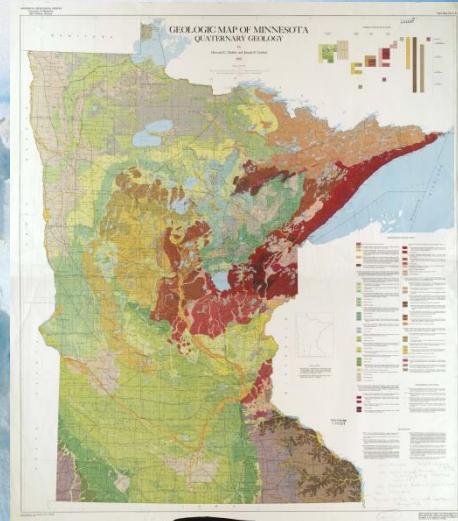
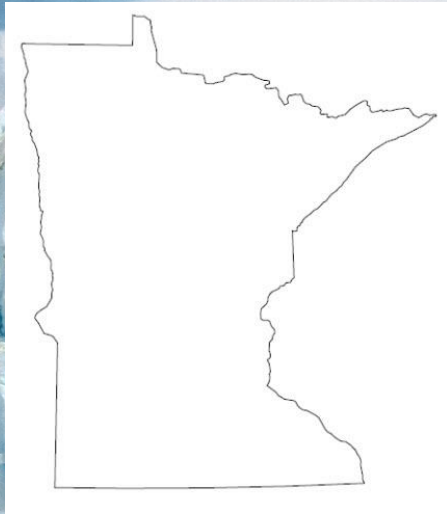
BIRCH ISLAND

87-387

GOVT LOT 7

Conclusion

We started with a clean slate:



We ended with a full plate: the glacial history and the resulting landforms that affected our current use of the land in central Minnesota..

We also found out the Pillager gap was created during the last glacial event resulting in the Crow Wing River flowing through it on its journey to the Mississippi River and the Gulf of Mexico.