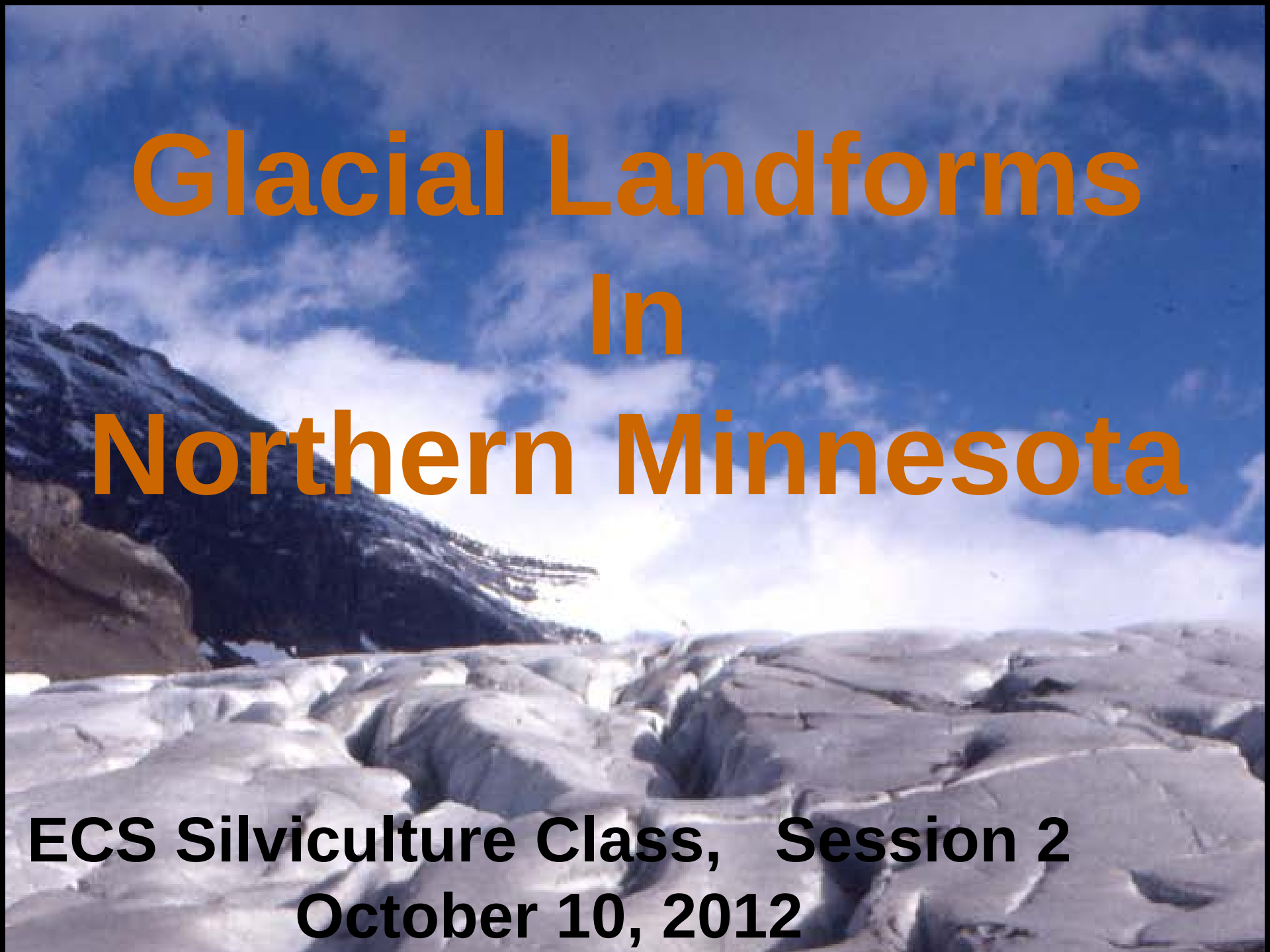
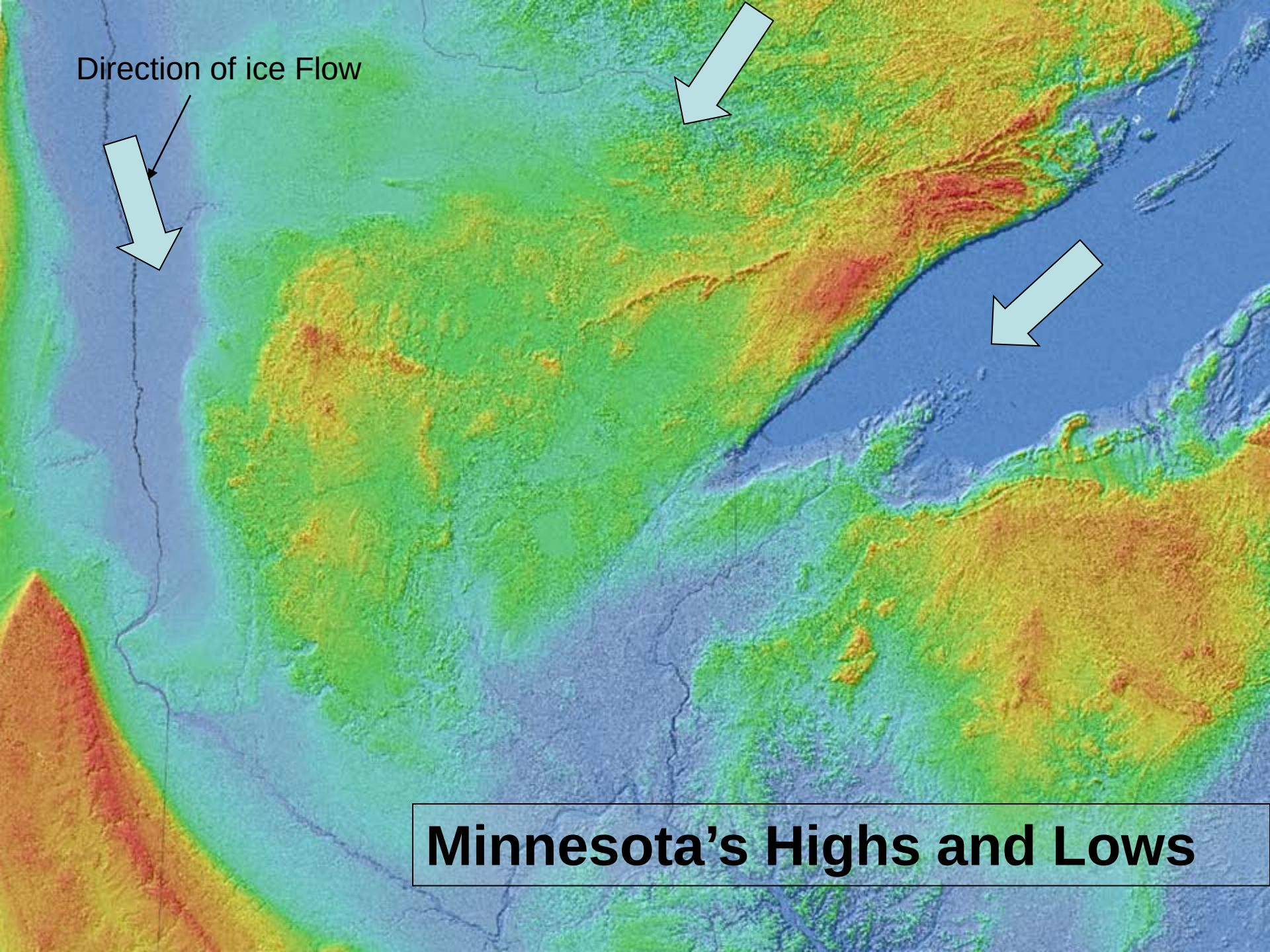


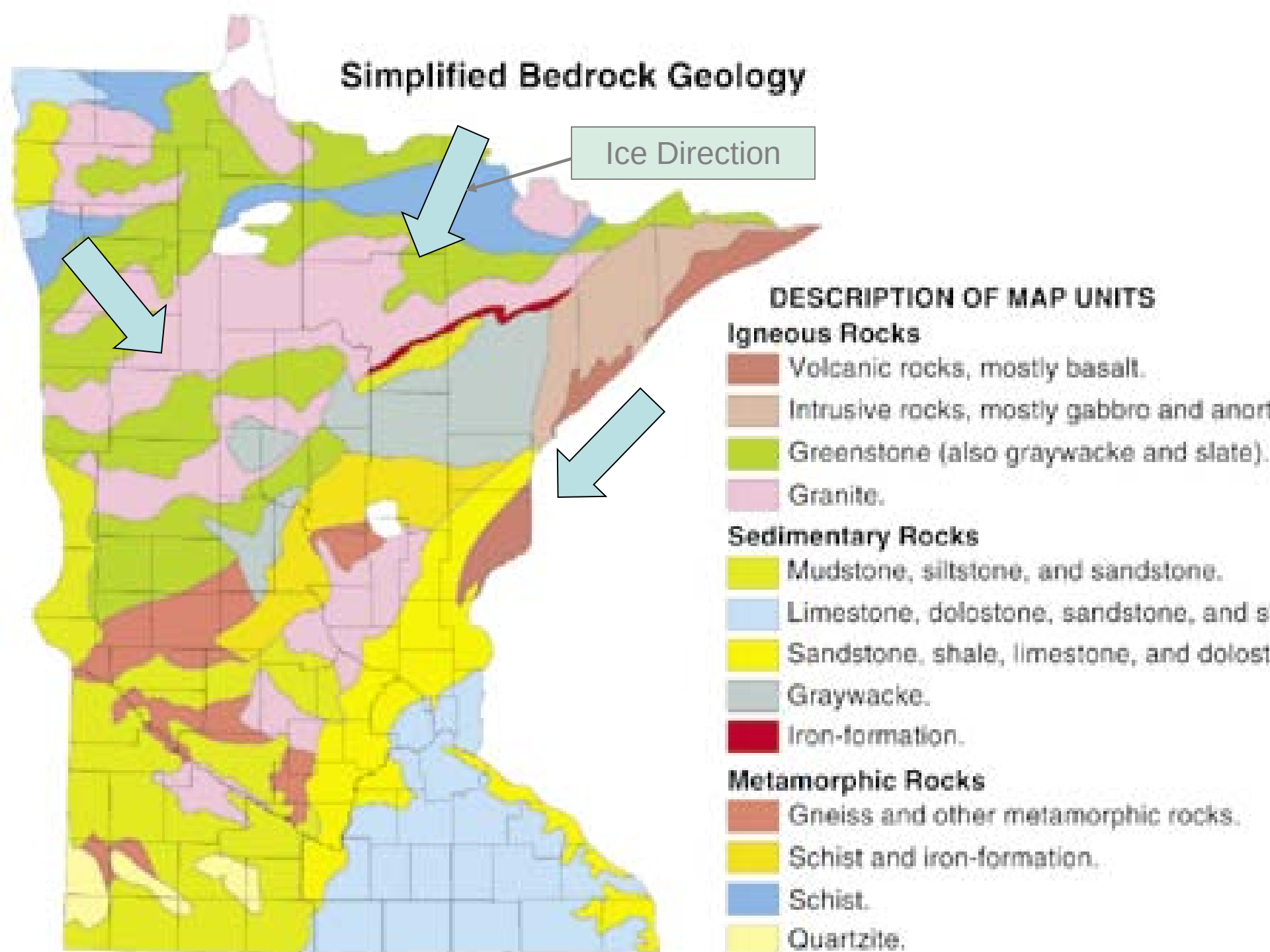
Glacial Landforms In Northern Minnesota

ECS Silviculture Class, Session 2
October 10, 2012

Keewatin Ice Sheet
Ice Sheet
Labradoran Ic



Minnesota's Highs and Lows


Simplified Bedrock Geology
Ice Direction
DESCRIPTION OF MAP UNITS
Igneous Rocks
Volcanic rocks, mostly basalt.
Intrusive rocks, mostly gabbro and anort
Greenstone (also graywacke and slate).
Granite.
Sedimentary Rocks
Mudstone, siltstone, and sandstone.
Limestone, dolostone, sandstone, and s
Sandstone, shale, limestone, and dolost
Graywacke.
Iron-formation.
Metamorphic Rocks
Gneiss and other metamorphic rocks.
Schist and iron-formation.
Schist.
Quartzite.

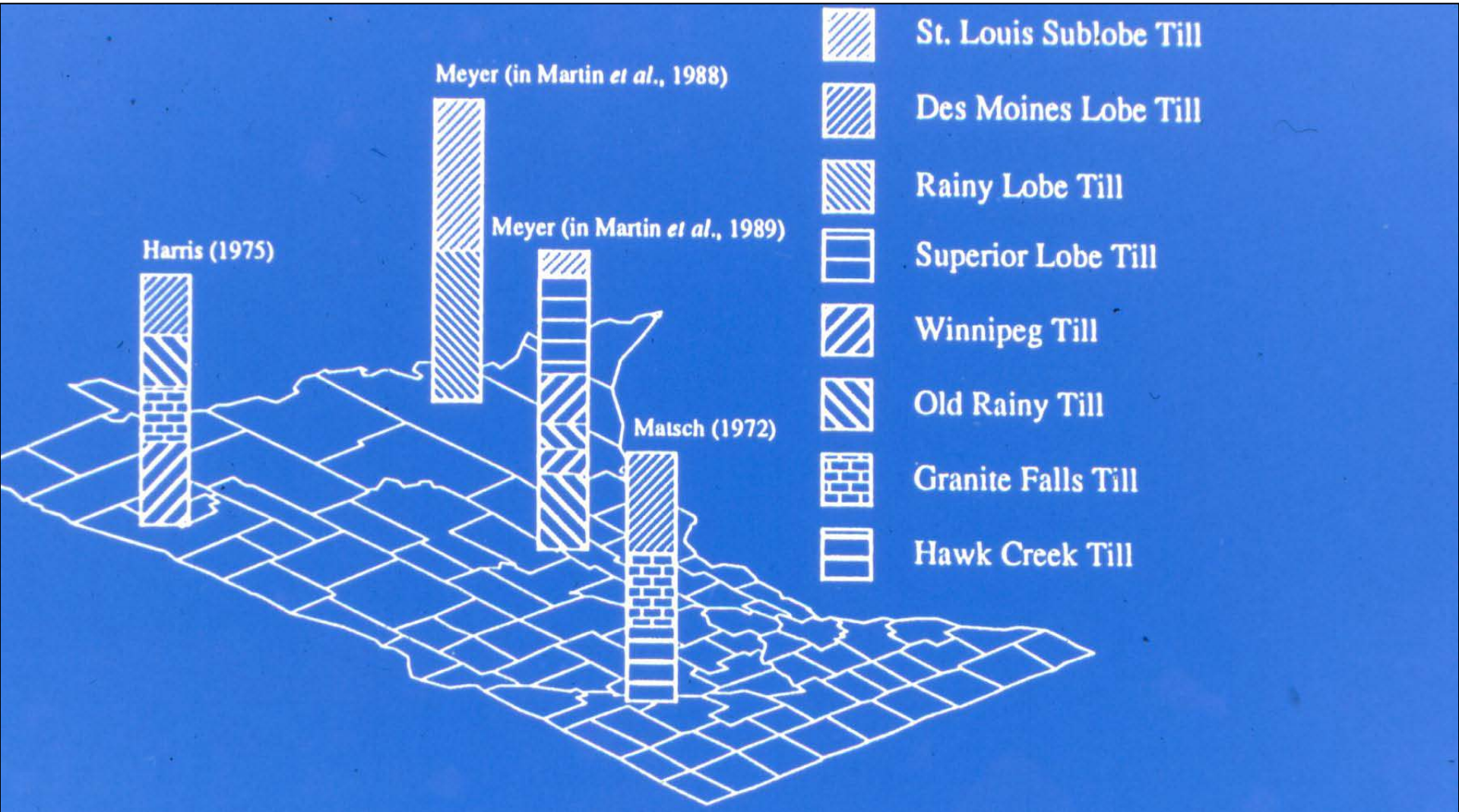
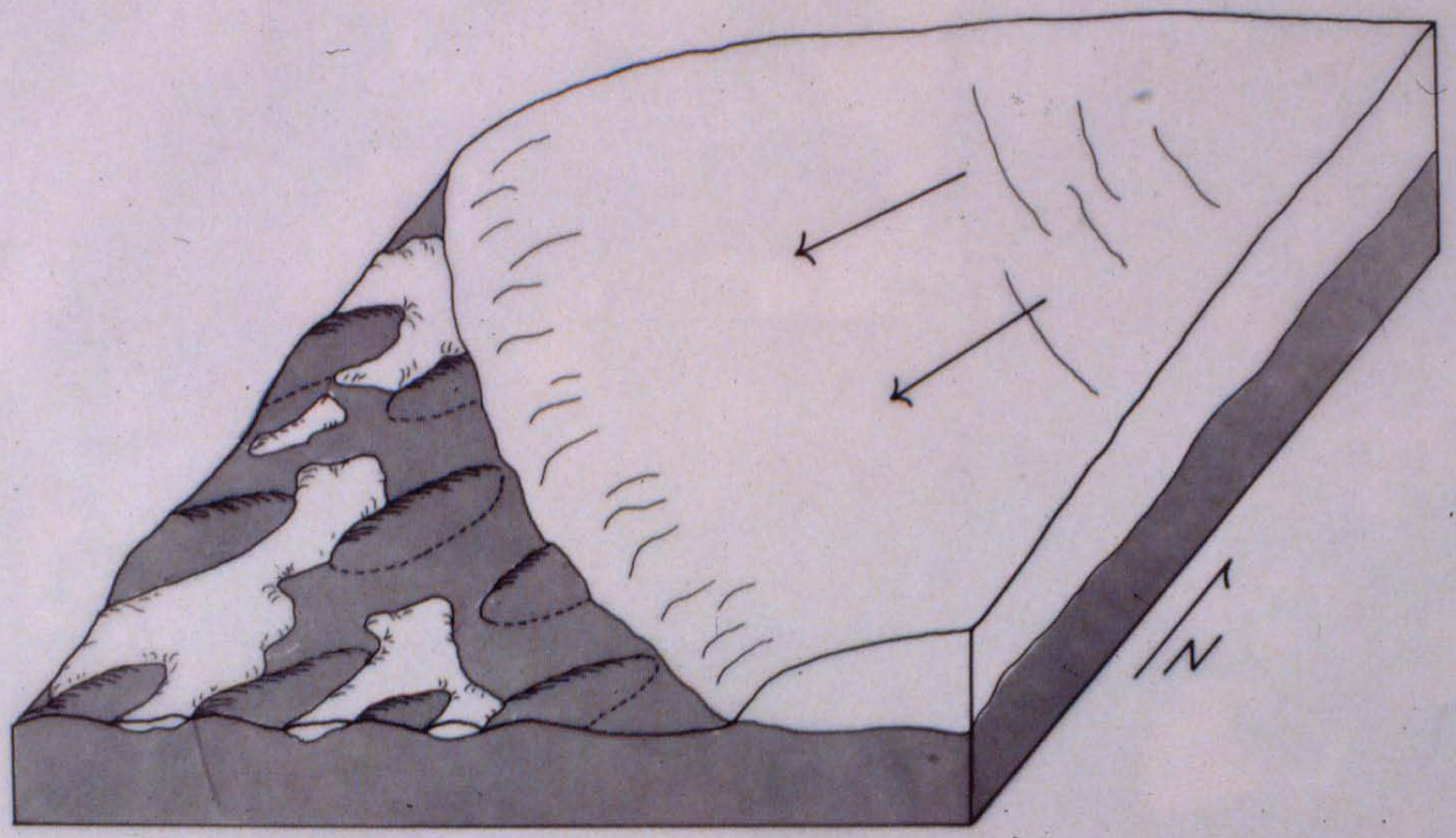


Figure 9. Generalized glacial stratigraphy of Minnesota. Units in columns are not to scale, nor are they an accurate protrayal of relative thicknesses in the area.

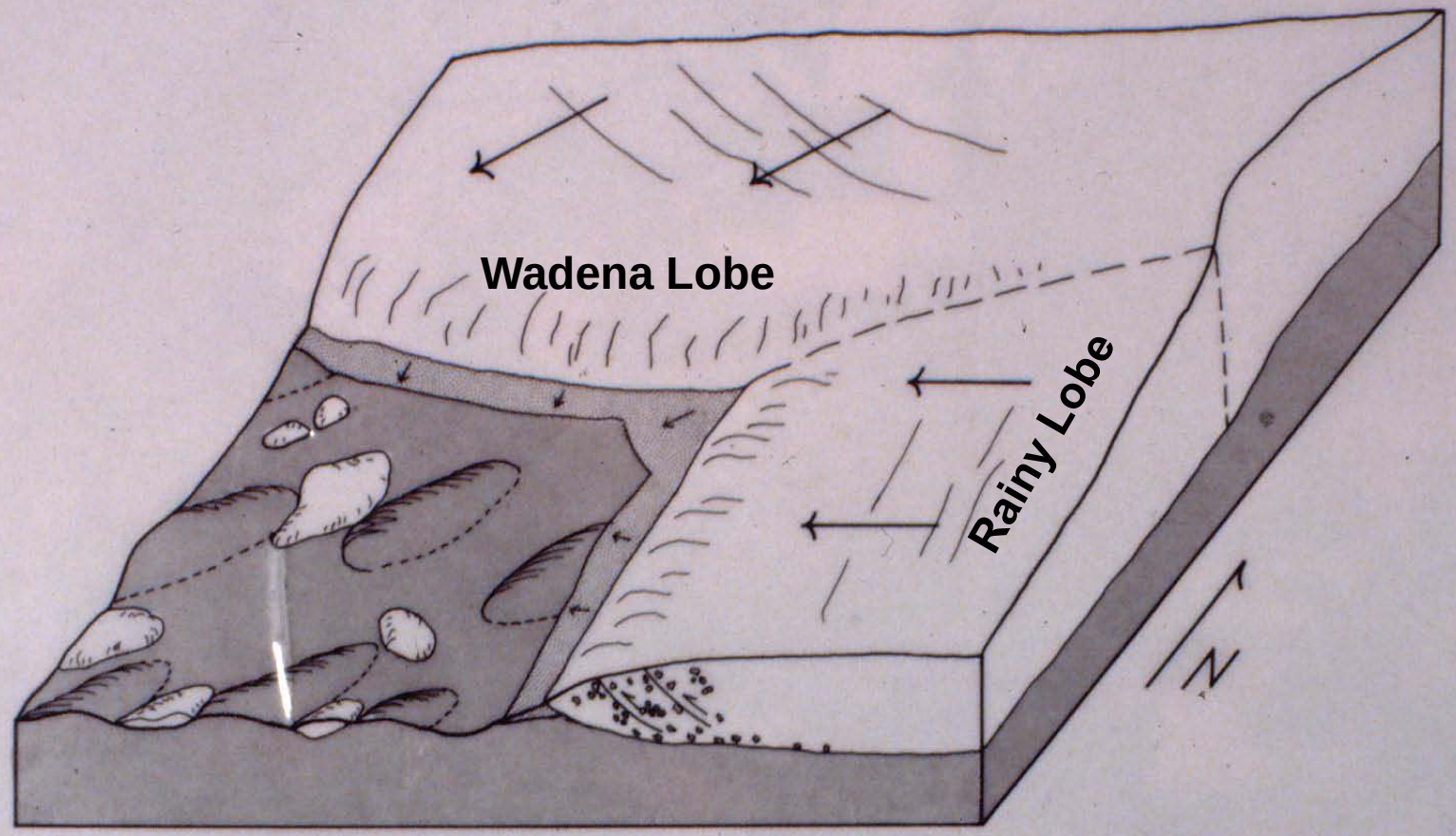
Early to Mid-Wisconsinan (20,000 – 30,000 BP?)

-Ice advances from the NE



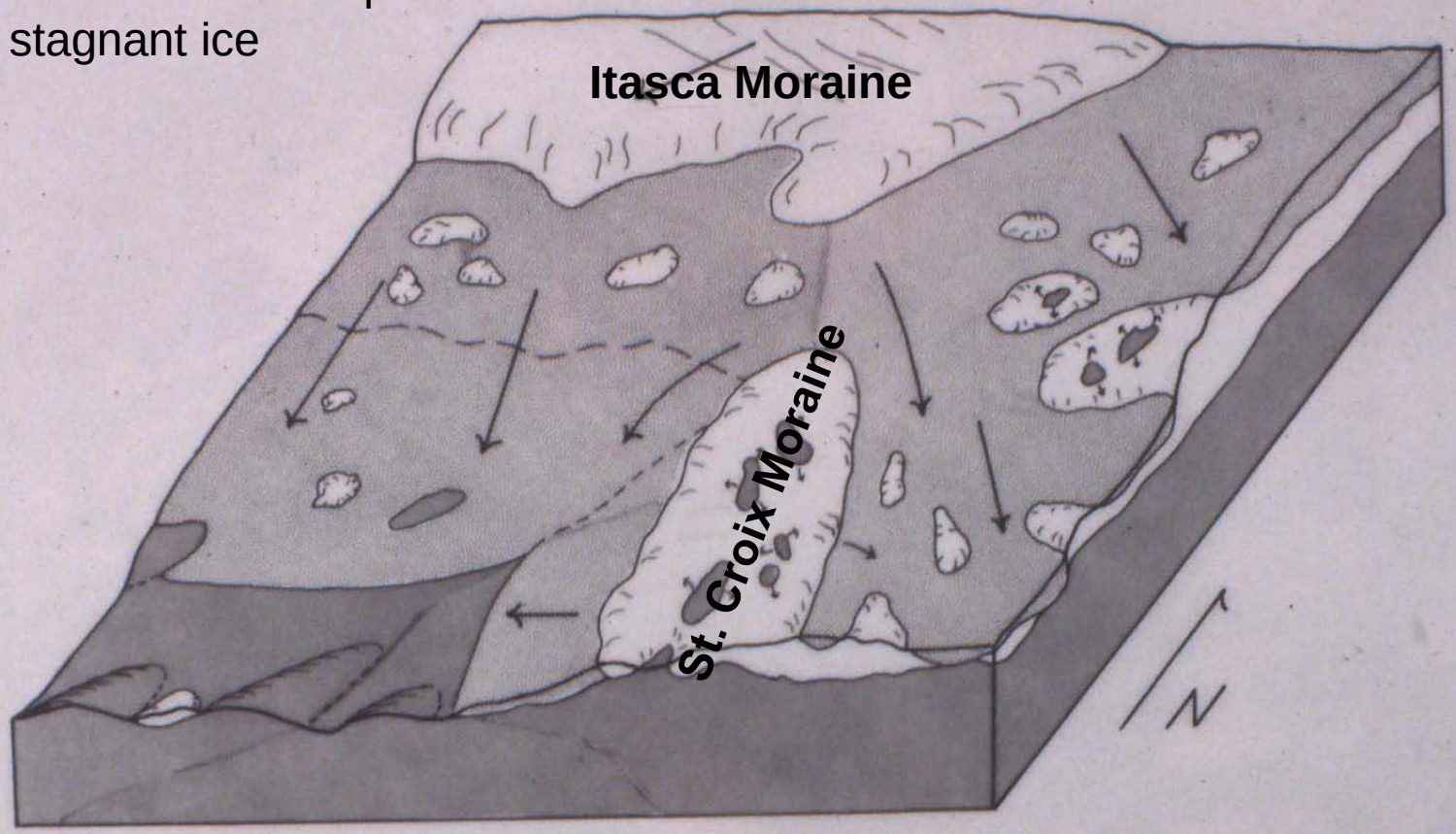
Late Wisconsinan (15,000 – 20,000 BP?)

- Warming climate results in retreat of glaciers

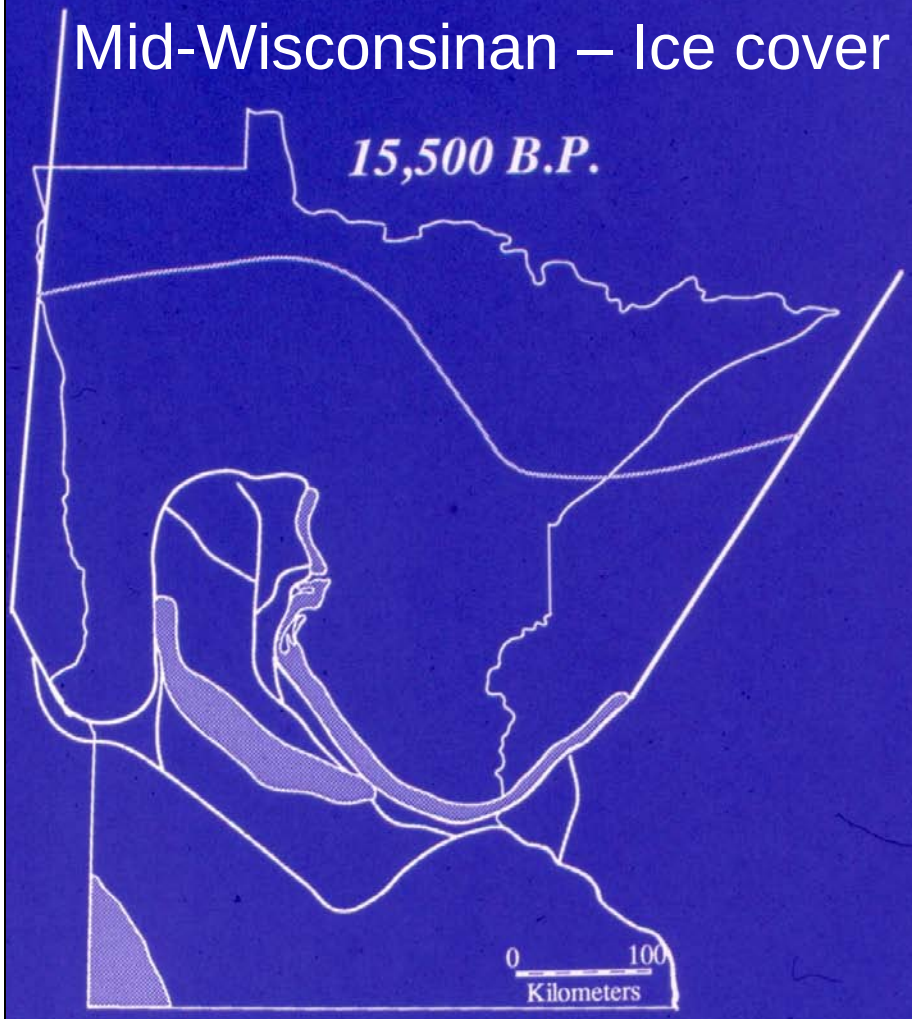


“Later” Wisconsinan

- Outwash fans are deposited over stagnant ice



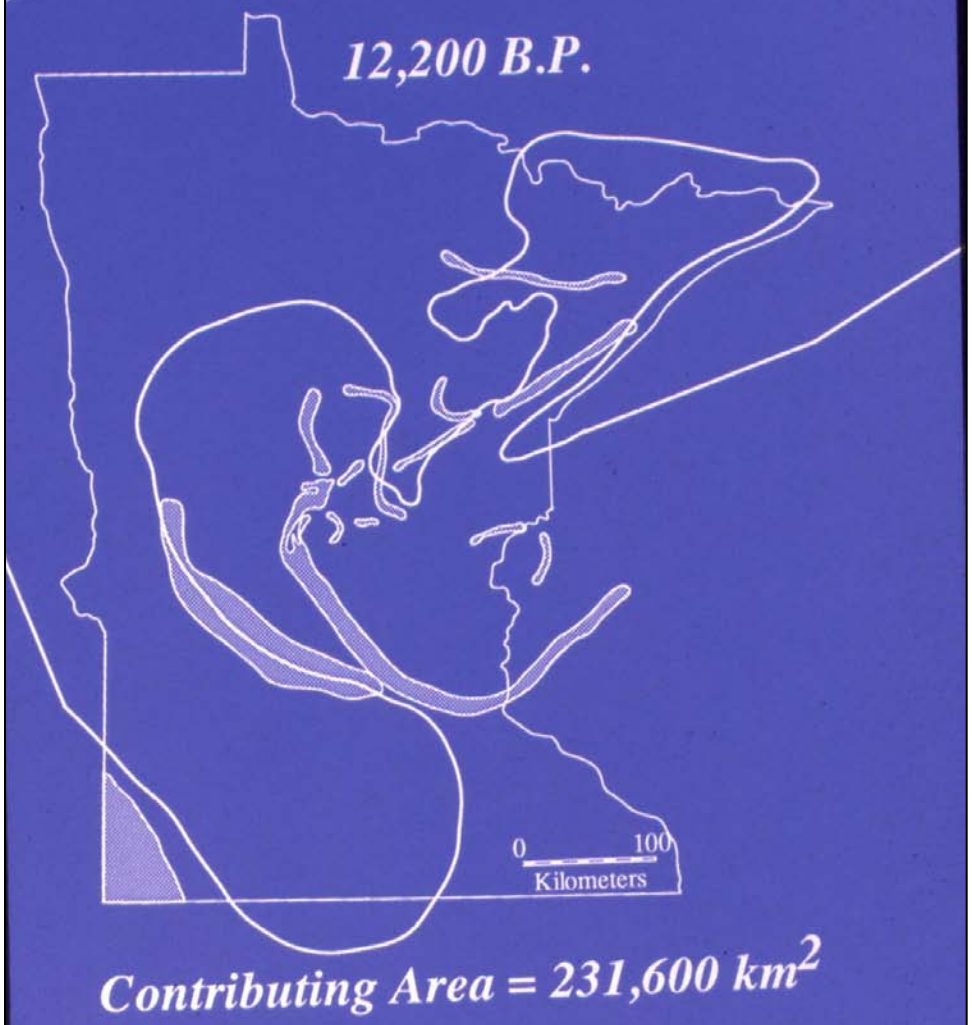
Mid-Wisconsinan – Ice cover



Contributing Area = 106,600 km^2

VERY Late Wisconsinan -

Advance of the St. Louis Sublobe from the NW across most of Minnesota

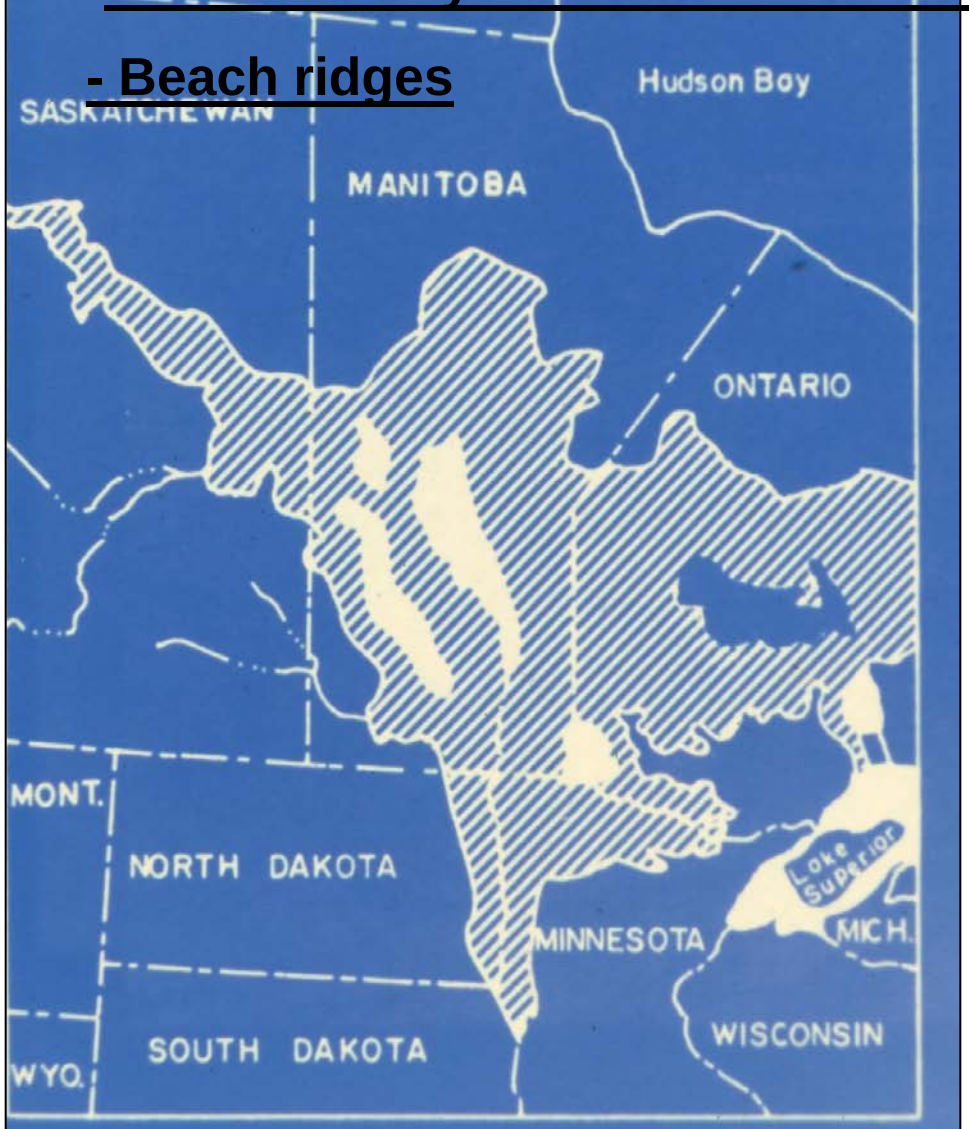


Schematic from H. Mooers, UMD

Glacial Lake Agassiz

-Extensive clay-rich lake sediments

- Beach ridges

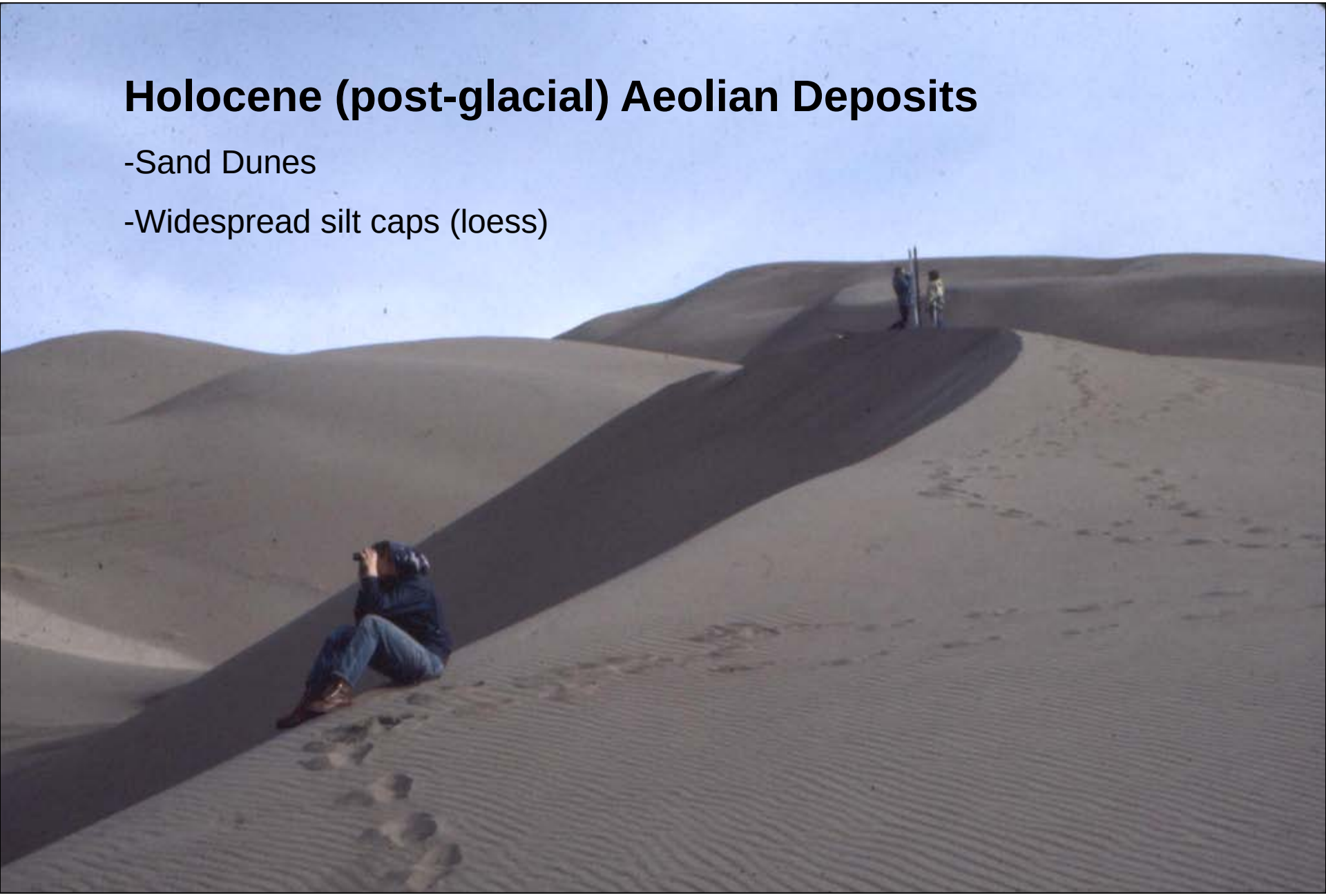


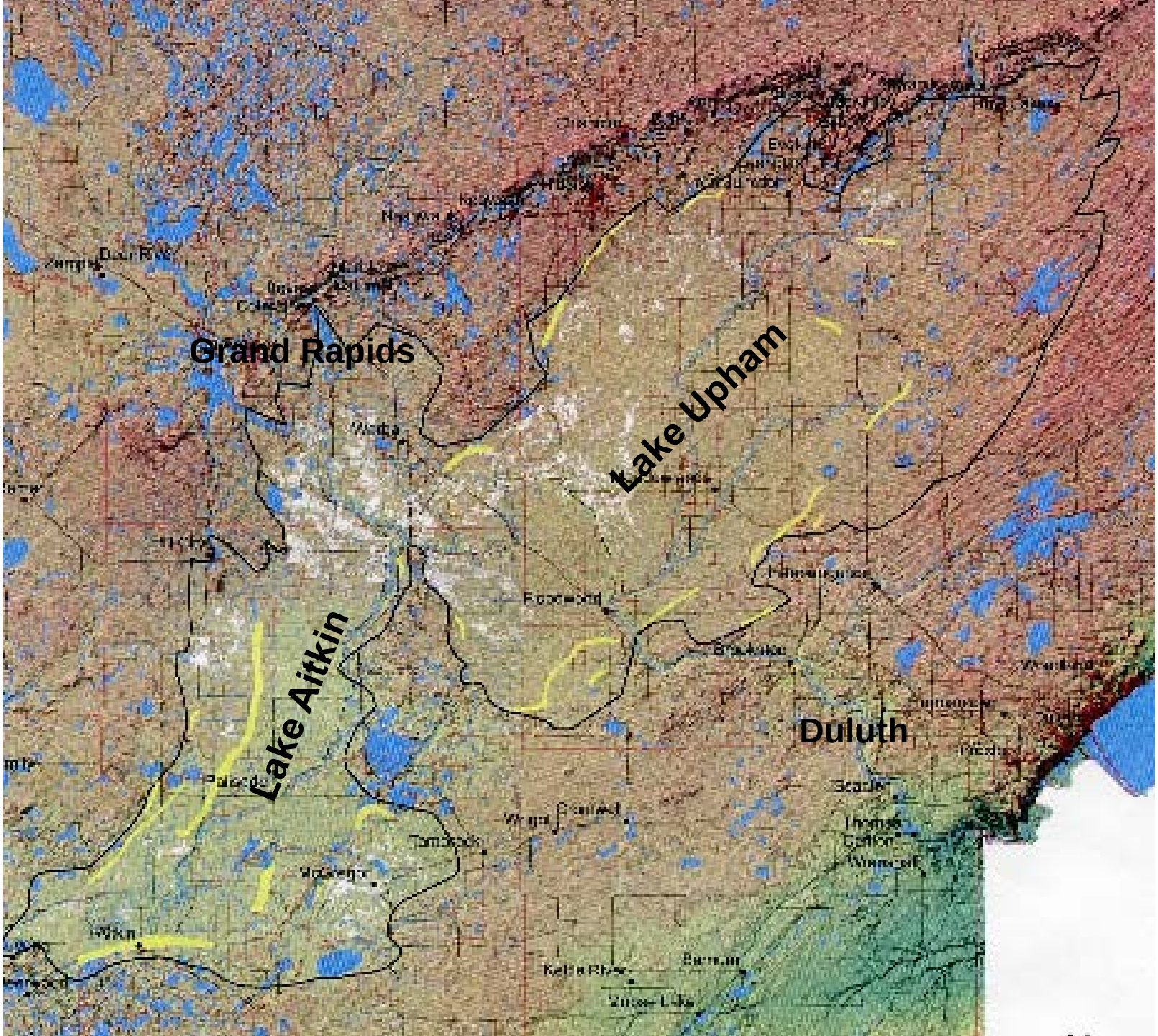
20. Map showing the area covered by glacial Lake

Holocene (post-glacial) Aeolian Deposits

-Sand Dunes

-Widespread silt caps (loess)

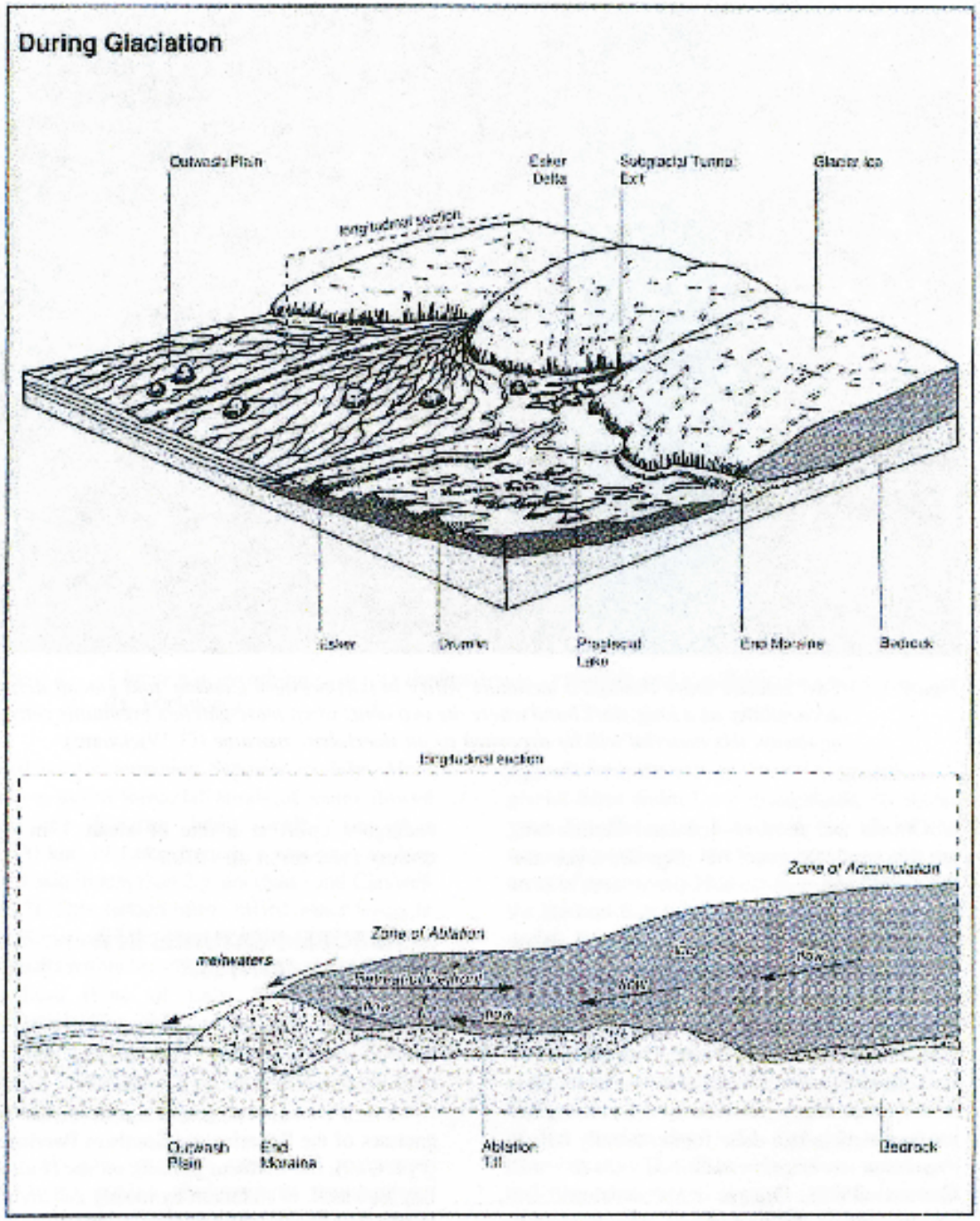


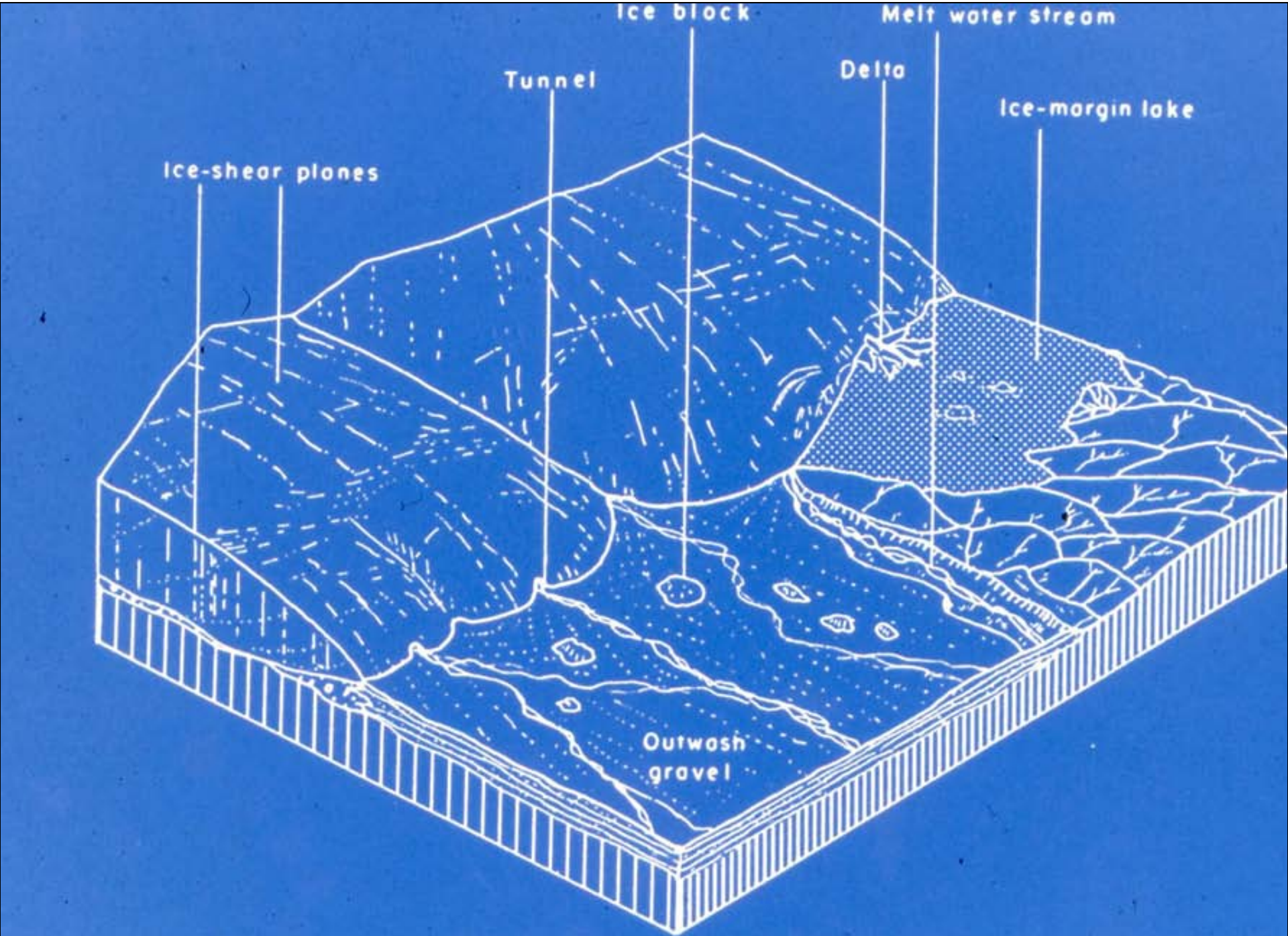

Grand Rapids
Lake Upham
Lake Aitkin
Duluth

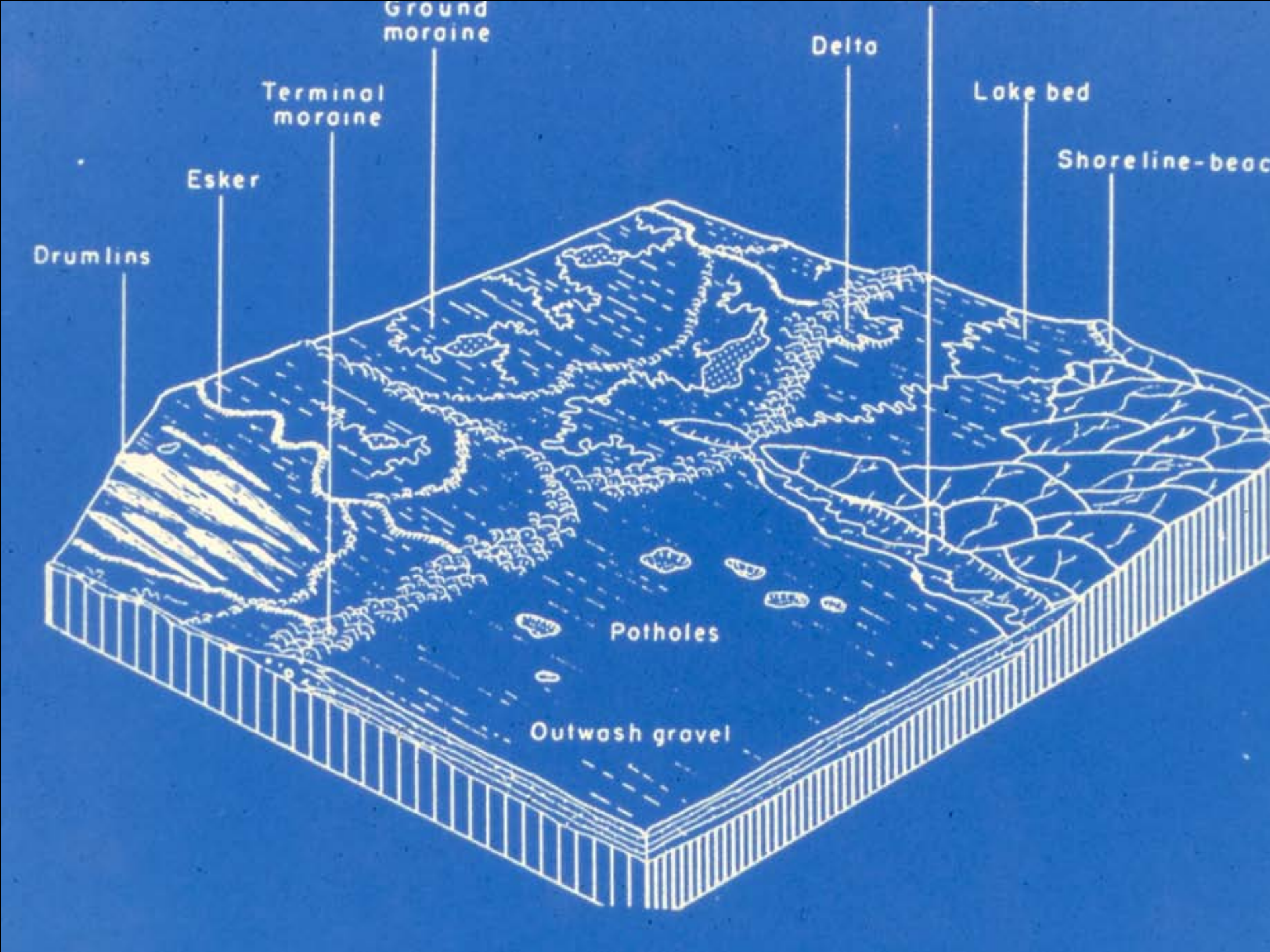
Post-Glacial Landform Development in Present-day Northern Canada

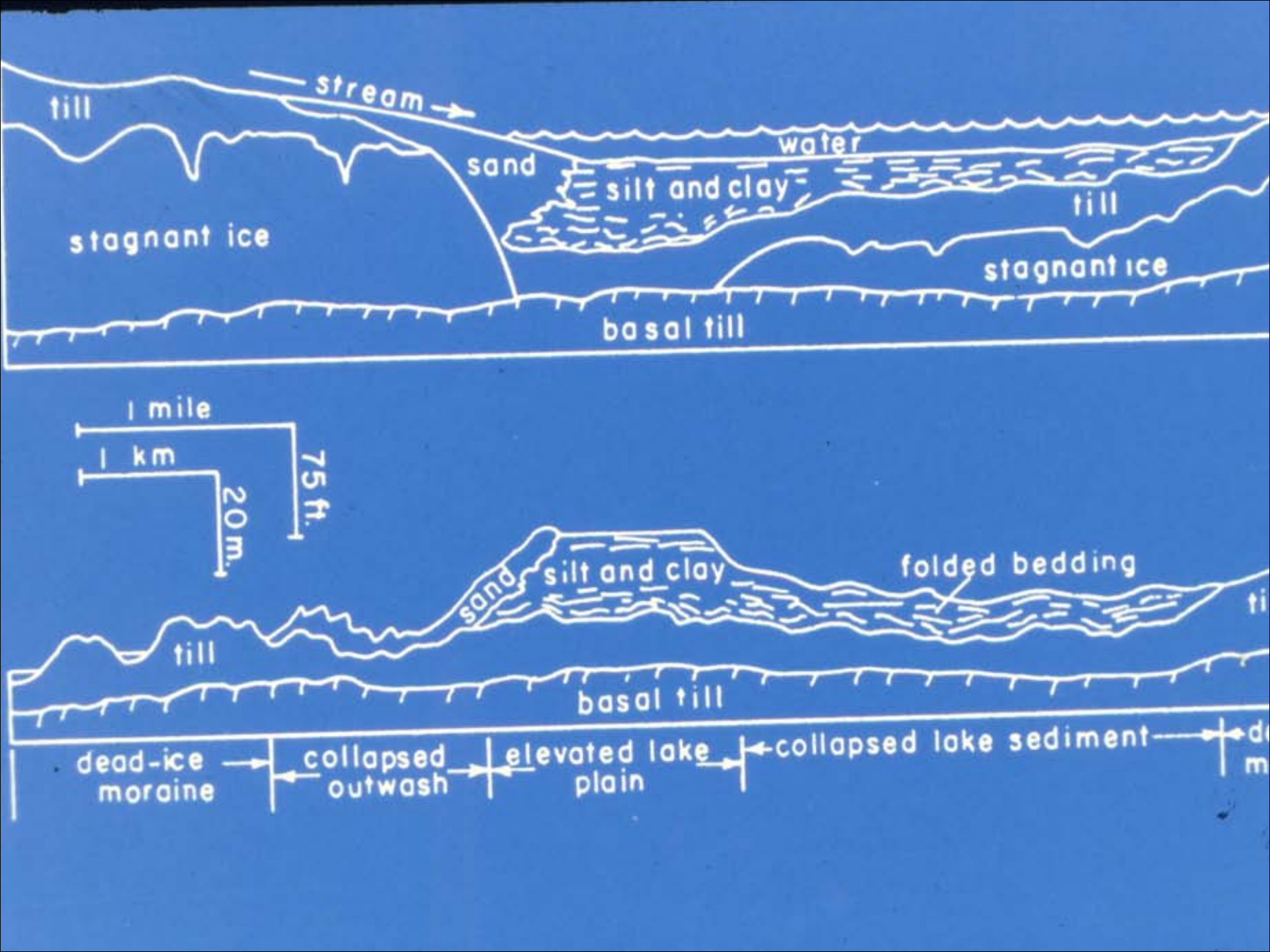
Glacial Landforms Terminology and Descriptions

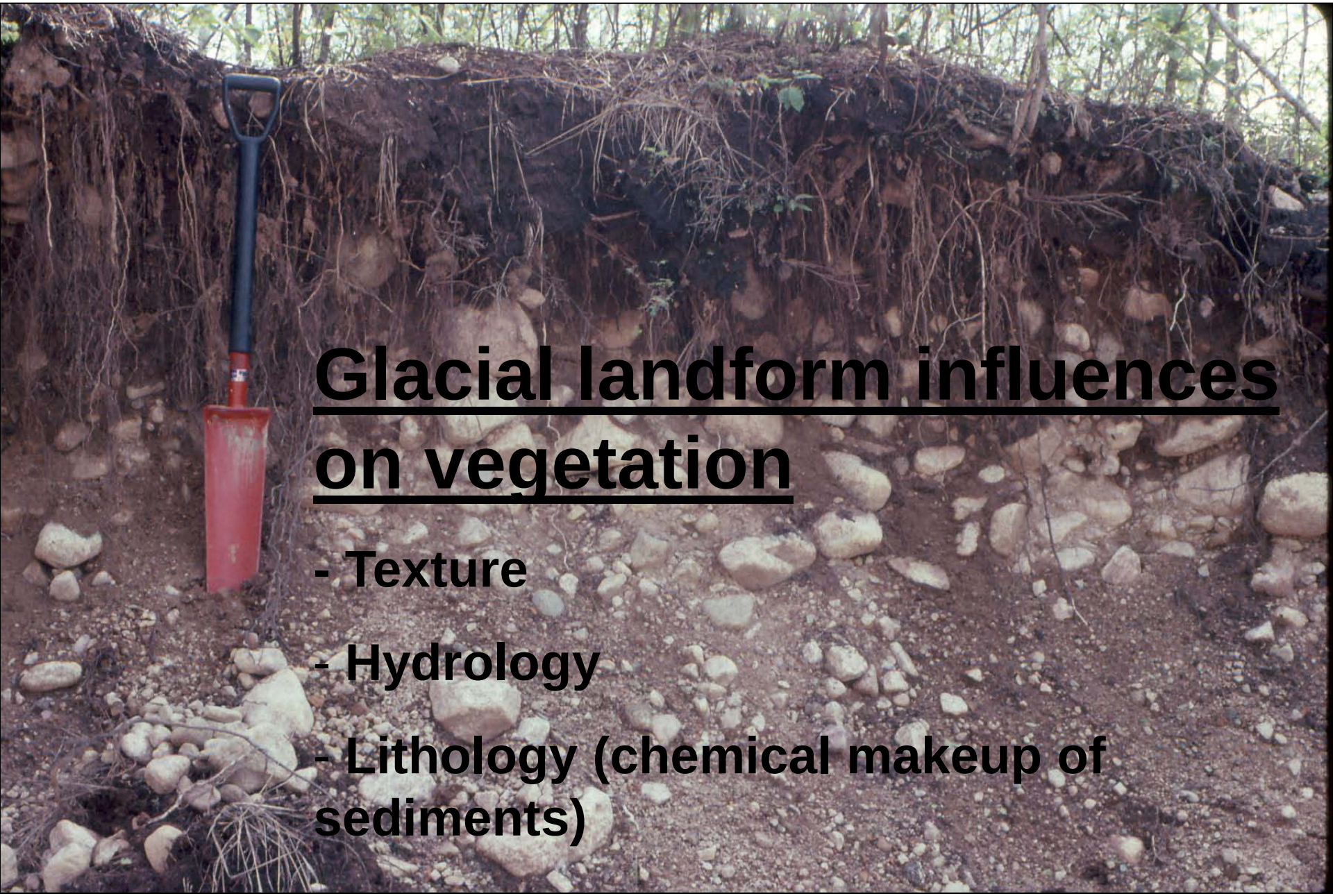
- **<u>Ice-related Landforms:</u>**
  - Supra-glacial
  - Sub-glacial
  - Pro-glacial
- **<u>Post-glacial Landforms:</u>**
  - Fluvial (river sediments)
  - Aeolian (dunes, loess)


During Glaciation
Outwash Plain
Esker Delta
Subglacial Tunnel Exit
Glacier Ice
longitudinal section
Esker
Drumlin
Proglacial Lake
End Moraine
Bedrock
longitudinal section
Zone of Accumulation
Zone of Ablation
meltwaters
Outwash Plain
End Moraine
Ablation Till
Bedrock


Ice block
Melt water stream
Tunnel
Delta
Ice-margin lake
Ice-shear planes
Outwash gravel


Ground moraine
Delta
Terminal moraine
Lake bed
Shoreline-beac
Esker
Drumlins
Potholes
Outwash gravel


stream
till
water
sand
silt and clay
till
stagnant ice
stagnant ice
basal till
1 mile
1 km
75 ft.
20 m.
sand
silt and clay
folded bedding
till
basal till
dead-ice moraine
collapsed outwash
elevated lake plain
collapsed lake sediment



Glacial landform influences on vegetation

- Texture
- Hydrology
- Lithology (chemical makeup of sediments)