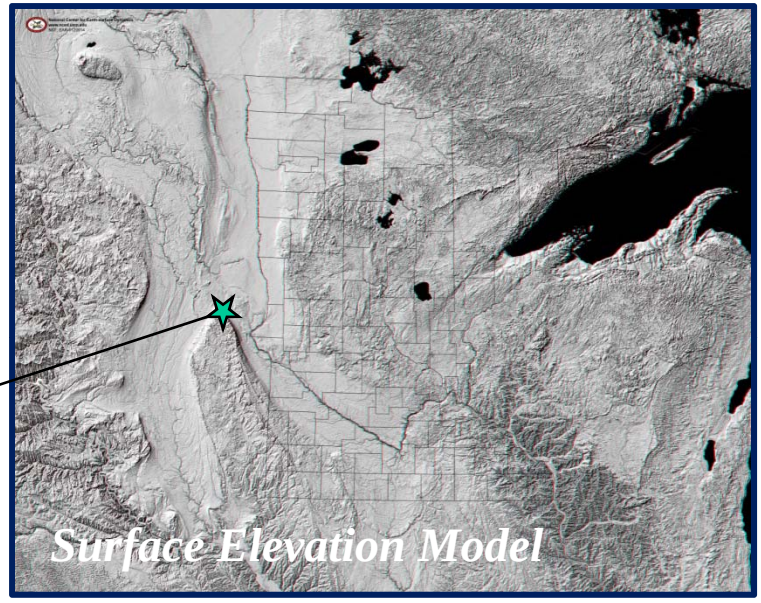
Aggregate Resource Mapping Program
Geologic Processes

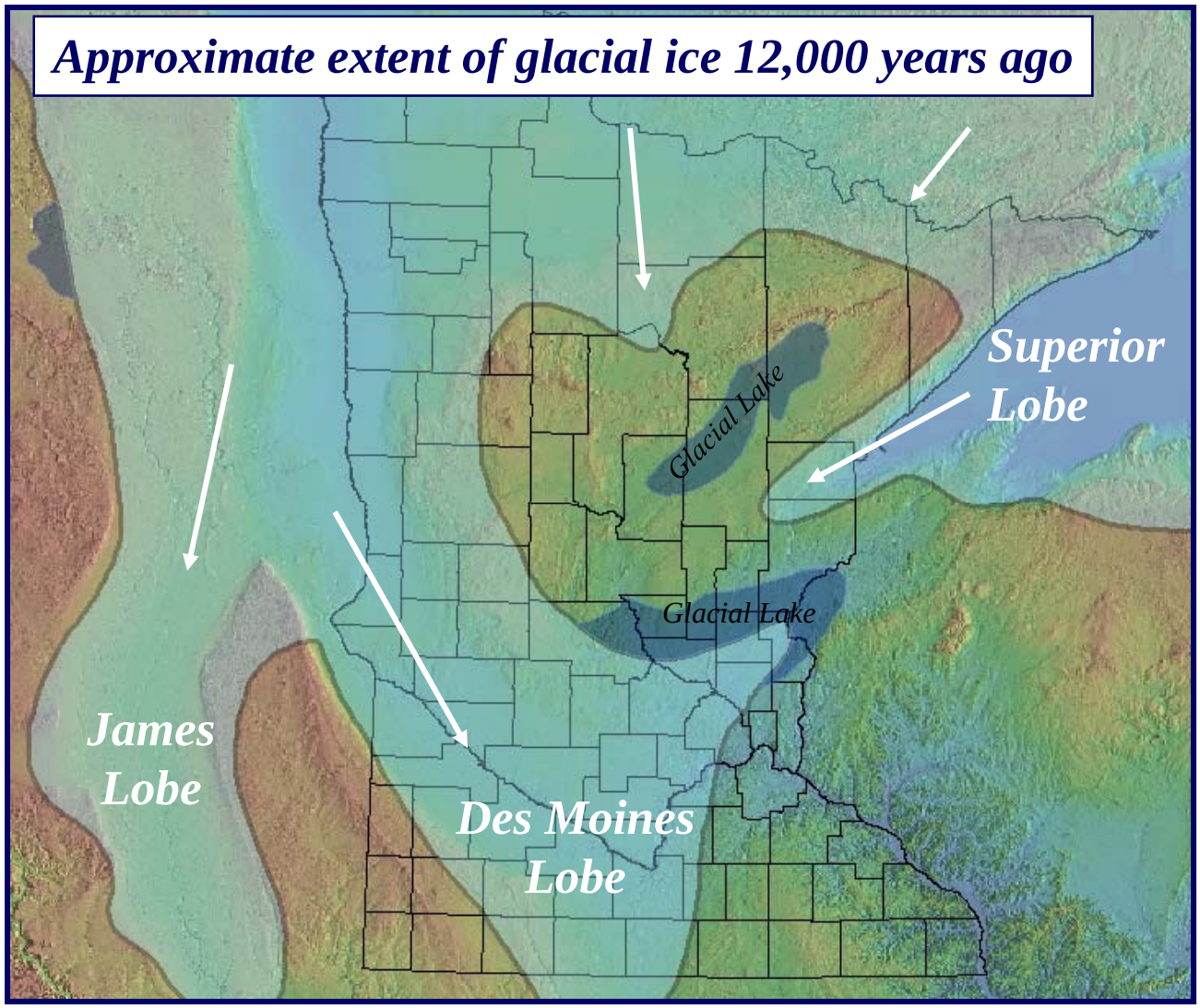


Geology and Aggregate Resources

- All mineral resources were created by geologic processes

- Understanding the geologic story helps to determine the distribution and usability of aggregate resources

Minnesota and Glaciers



- Minnesota has been repeatedly glaciated over the past 2 million years

- Lobes of ice flowed from Canada into Minnesota

- Most of Minnesota's present landscape was formed by the last glaciers to advance (10,000 to 20,000 years ago)

How Glaciers Deposit Sand and Gravel

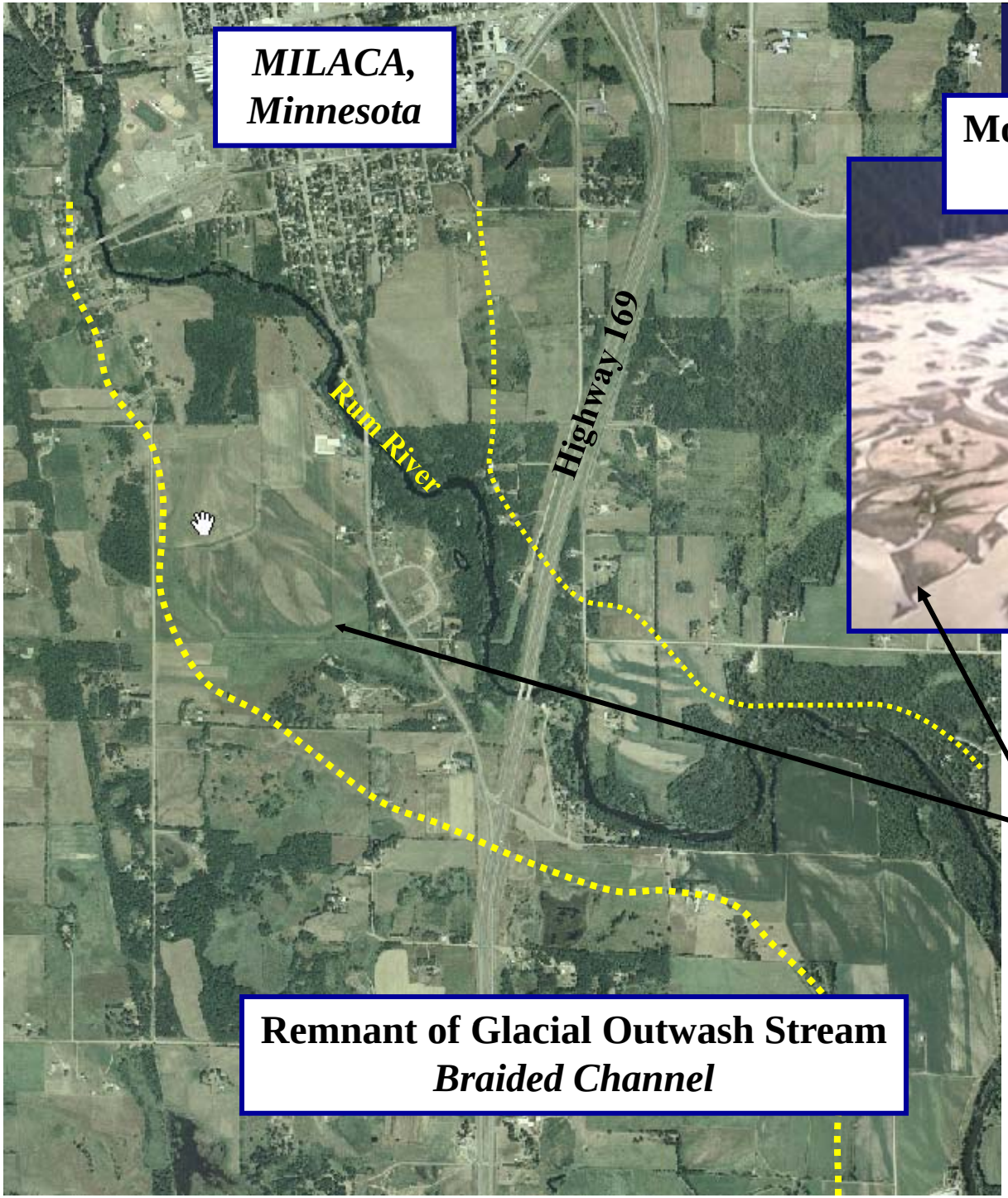
- This is a margin of modern glacier (Left)
- When glaciers melt, large volumes of water create meltwater streams
- Meltwater streams sort and deposit sand and gravel also called outwash (Bottom)

Glaciers and Glacial Landscapes Past and Present

Glaciers from the past created the same landforms that are observable by modern glaciers

In Minnesota, the glaciers are long gone, but the landforms are still here for us to observe

On the next page, the deposit of a braided outwash channel is observable in an air photograph. The outwash stream existed over 10,000 years ago



Modern Outwash Stream
Braided Channel

Note: The stream patterns and presence of gravel bars in both modern and past glacial outwash deposits

This outwash channel contains 20 to 50 feet of Superior Lobe sands and gravels.

Geology and Aggregate Resources

Understanding geologic processes and Minnesota's glacial history is the key to mapping and classifying aggregate resources