# Geology and Aquifers of Wisconsin

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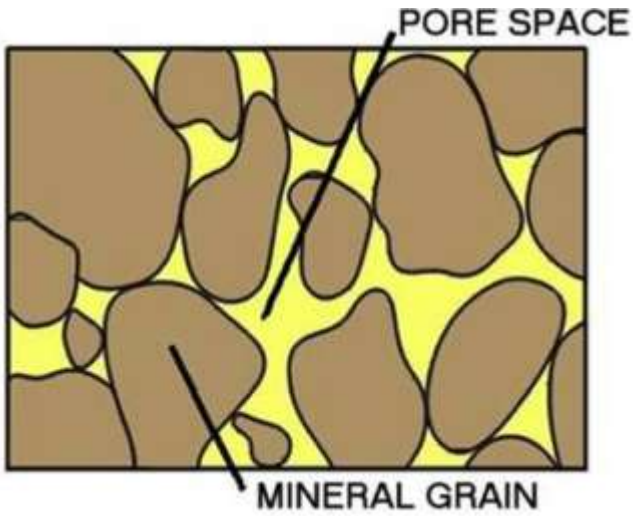
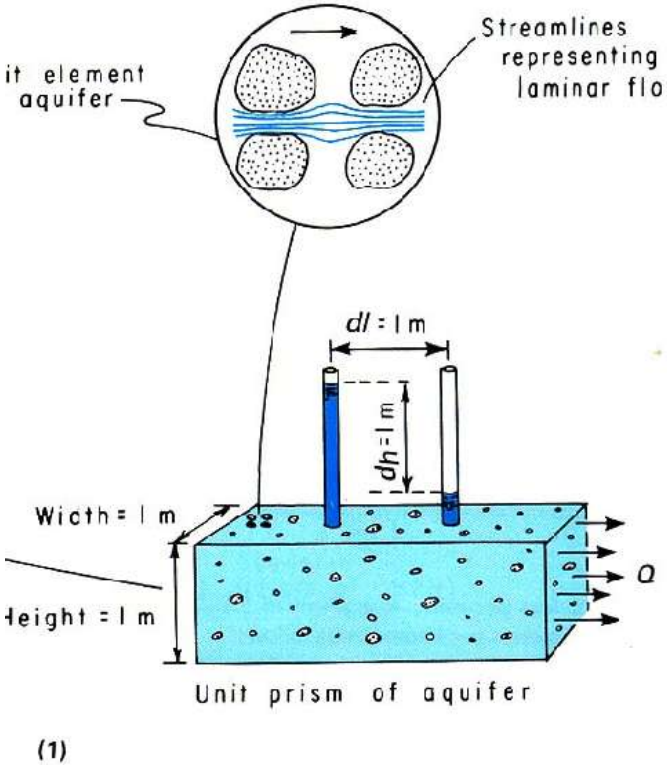
http://wisconsingeologicalsurvey.org/


# Objective

- Understanding of Wisconsin's different aquifers.
  - The different rocks and sediments have different flow properties
  - The rocks and sediment vary across the state.
  - Groundwater isn't available everywhere in the same amounts.

# Different rocks and sediment have different hydraulic properties




Porosity – percent of void spaces in rock or sediment

Hydraulic conductivity - the ease with which water can move through pore spaces or fractures

# Different rocks and sediment have different hydraulic properties

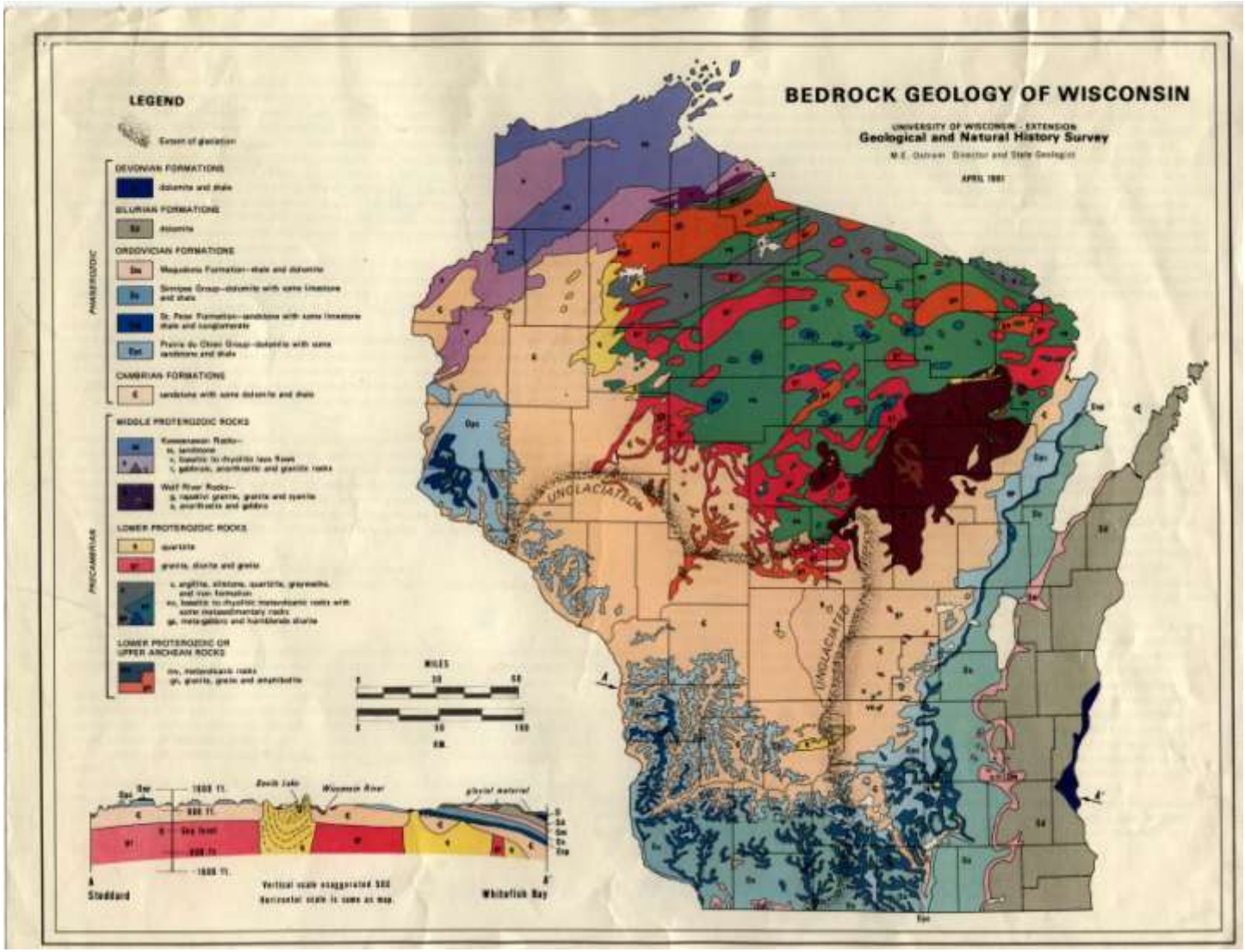
- Sandstone – ↑ porosity, ↑ conductivity

- Shale – ↑porosity, ↓ conductivity

- Dolomite – ↓ porosity, ↑ conductivity (fractures)

- Crystalline Bedrock – ↓ porosity, ↓ conductivity

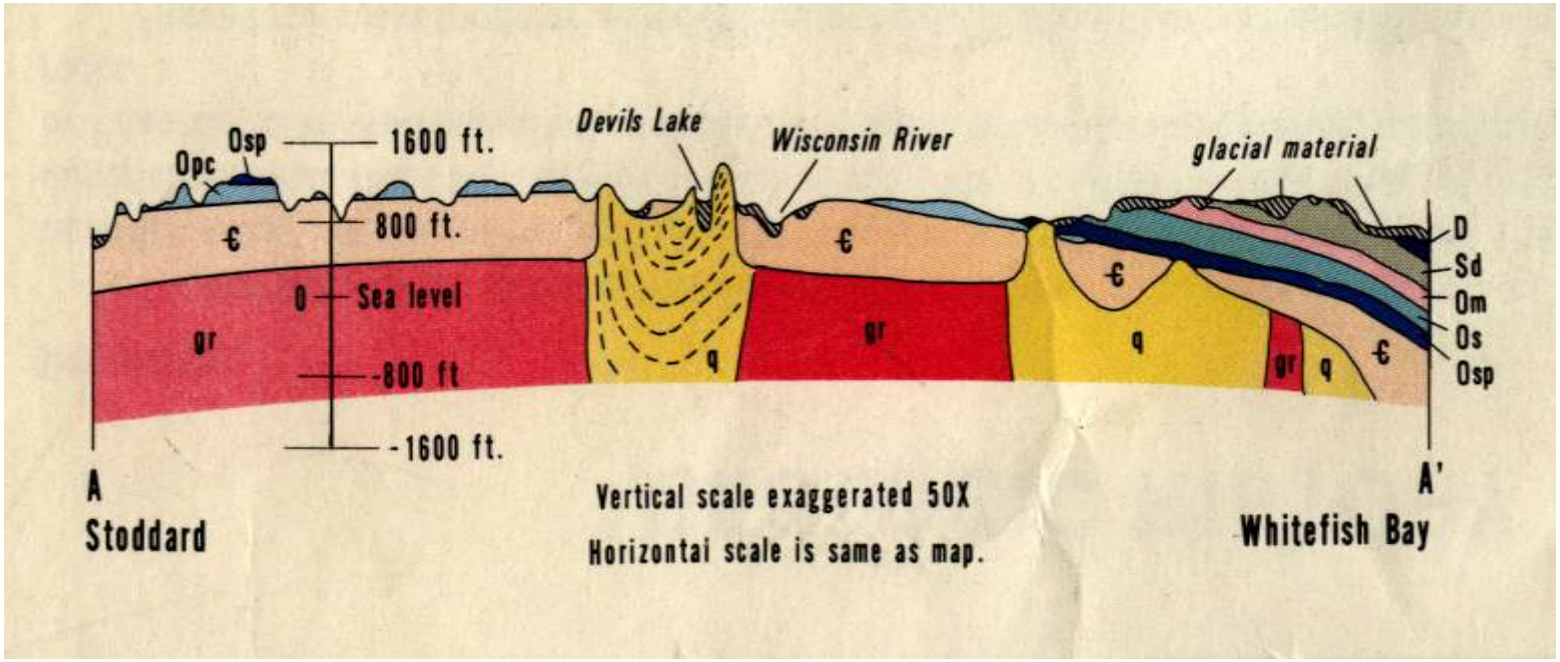
# Wisconsin Bedrock Geology



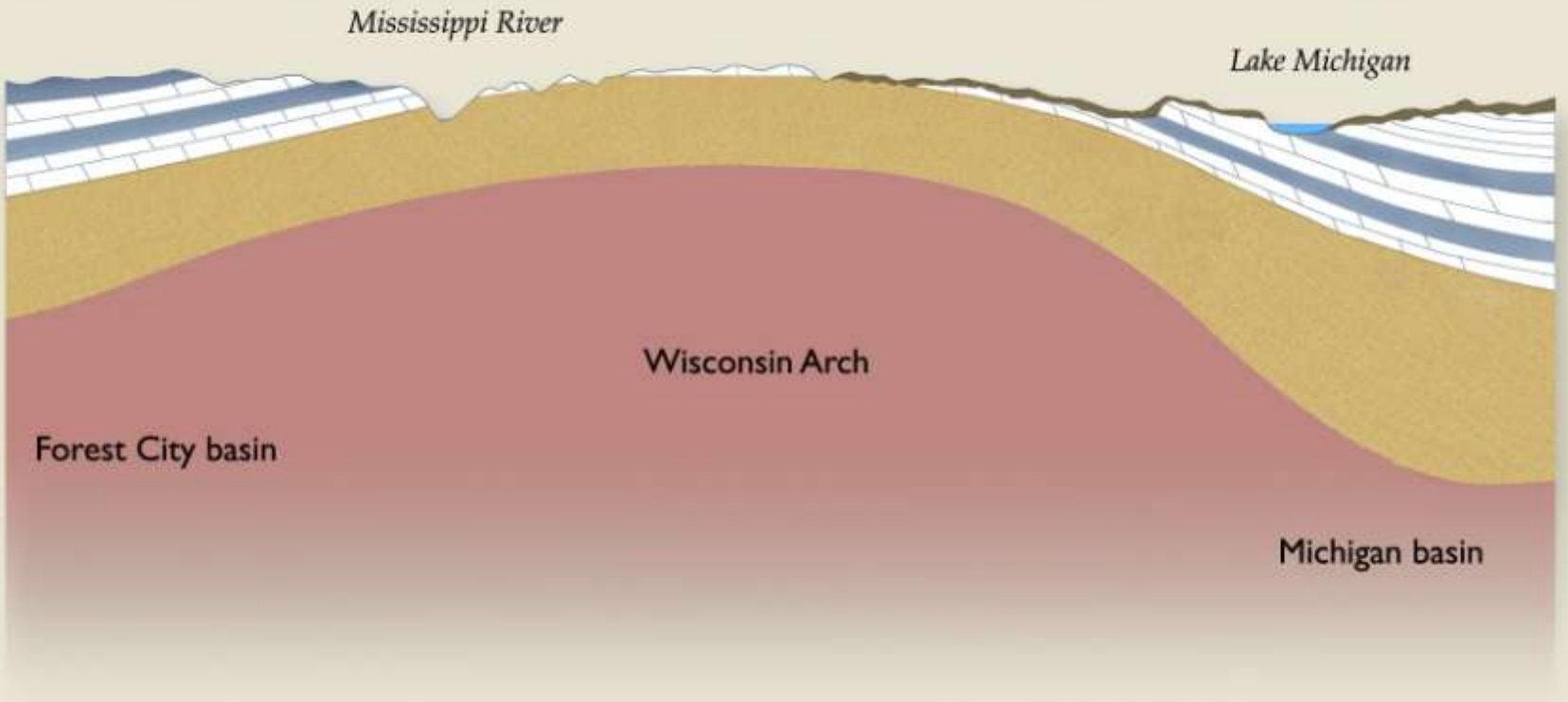

3/29/2012

# More Wisconsin Geology

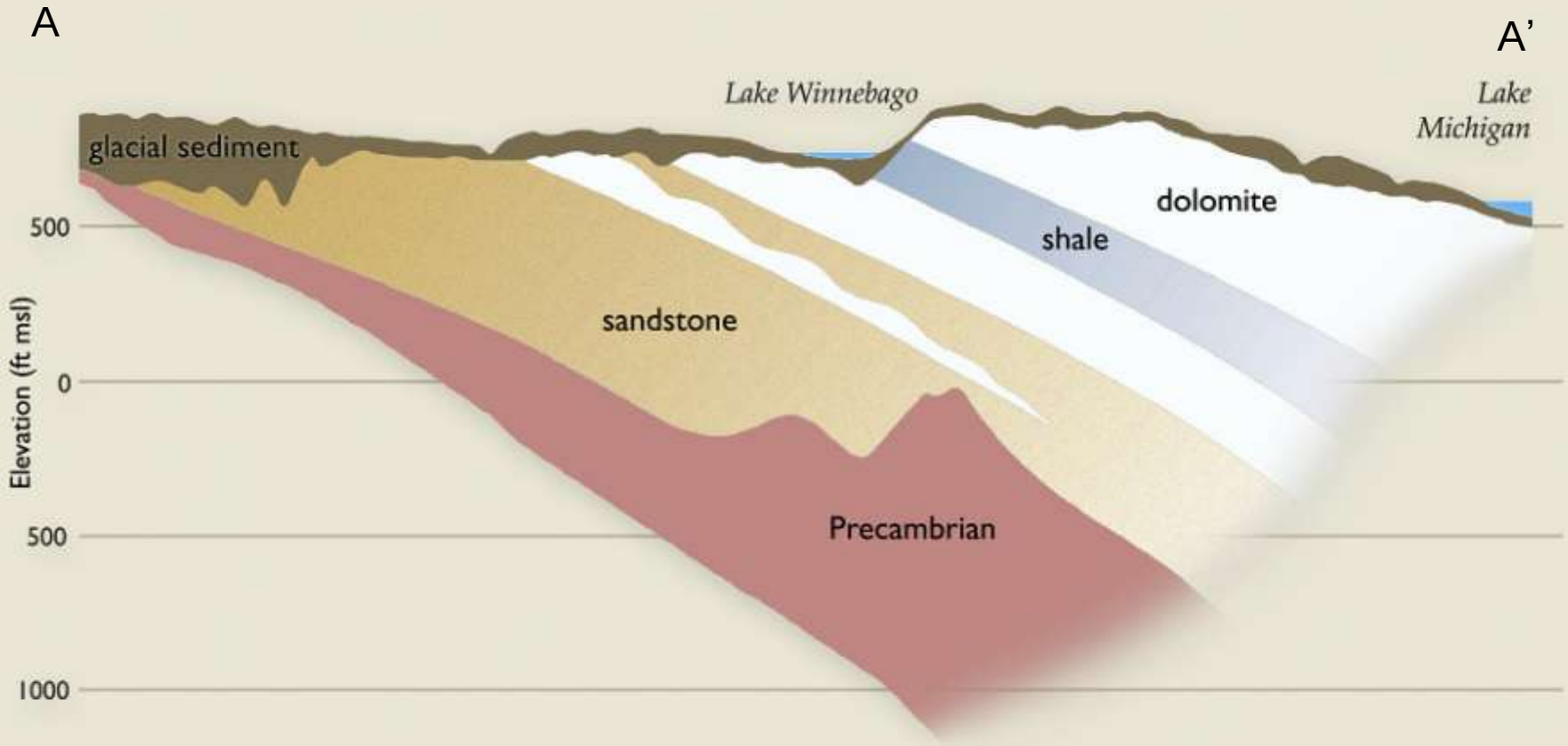
## View of a Cross Section



# Wisconsin arch



# Bedrock geology of eastern Wisconsin



# Wisconsin's Bedrock Aquifers

**PreCambrian aquifer:**

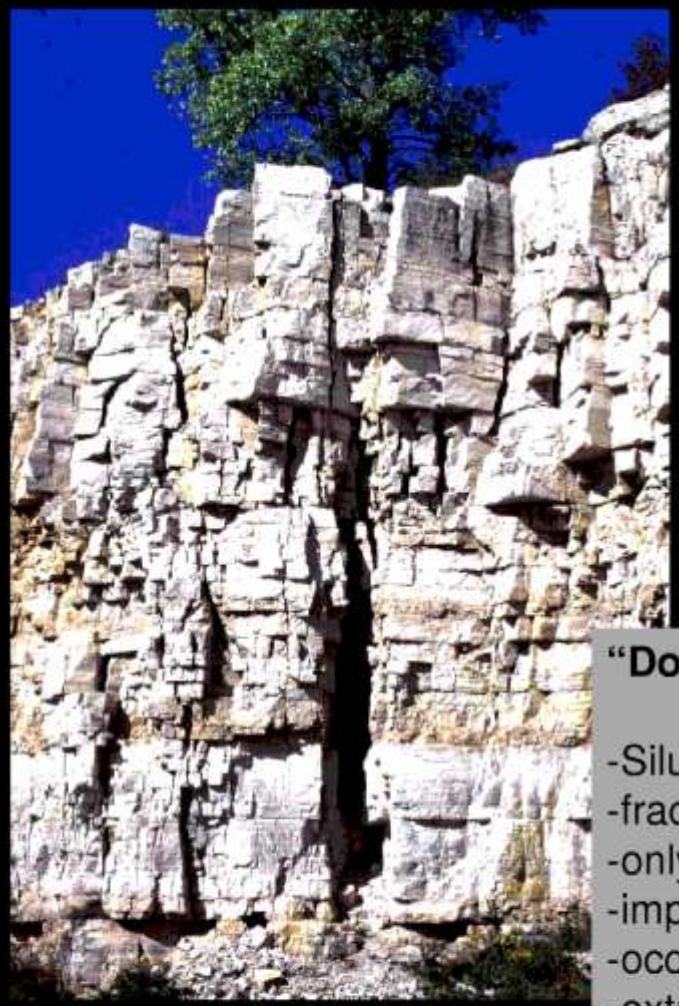
-crystalline (granite, quartzite)

-fracture dominated flow

-generally low well yields

**“Sandstone” aquifer:**

-sandstone, dolomite
-regionally extensive
-excellent aquifer
-porous flow
-most high-capacity wells
-occurs beneath shale in east



**“Dolomite” aquifer:**

-Silurian dolomite
-fracture dominated flow
-only present in east
-important for municipal and domestic wells
-occurs above Maquoketa Shale
-extremely vulnerable if exposed

# Crystalline bedrock aquifer

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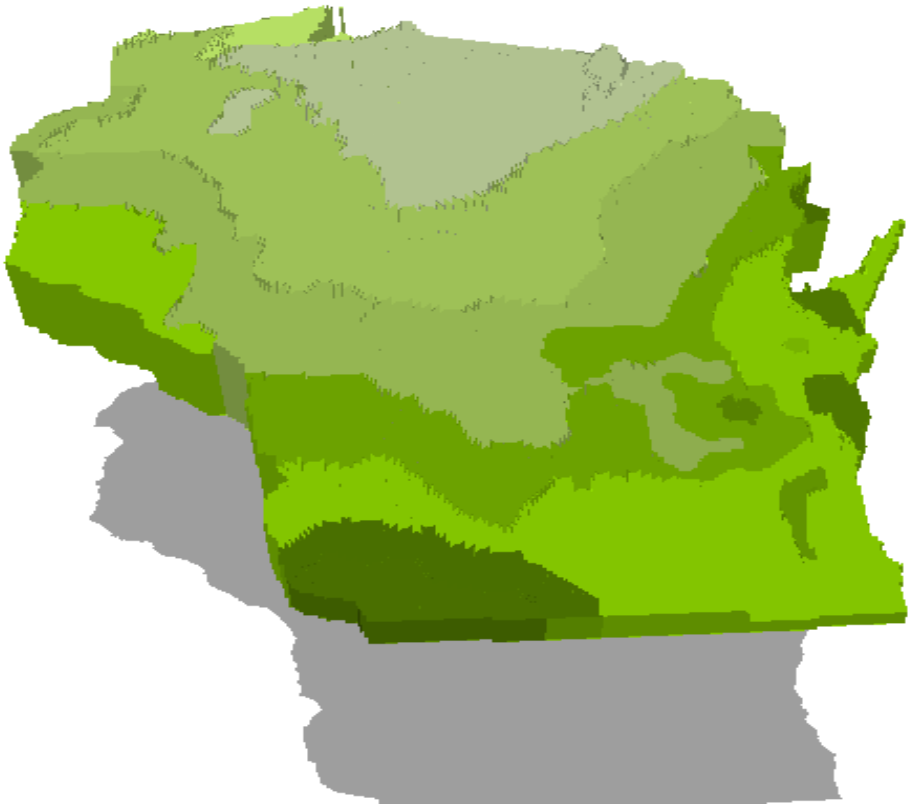

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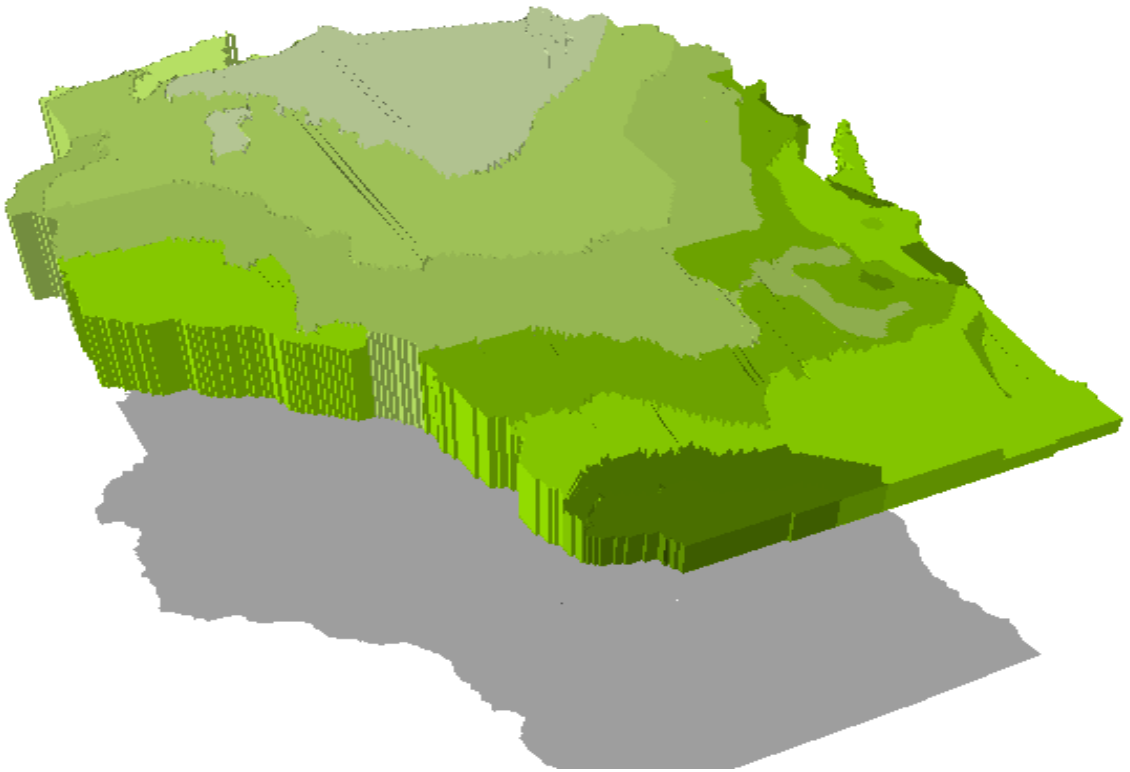

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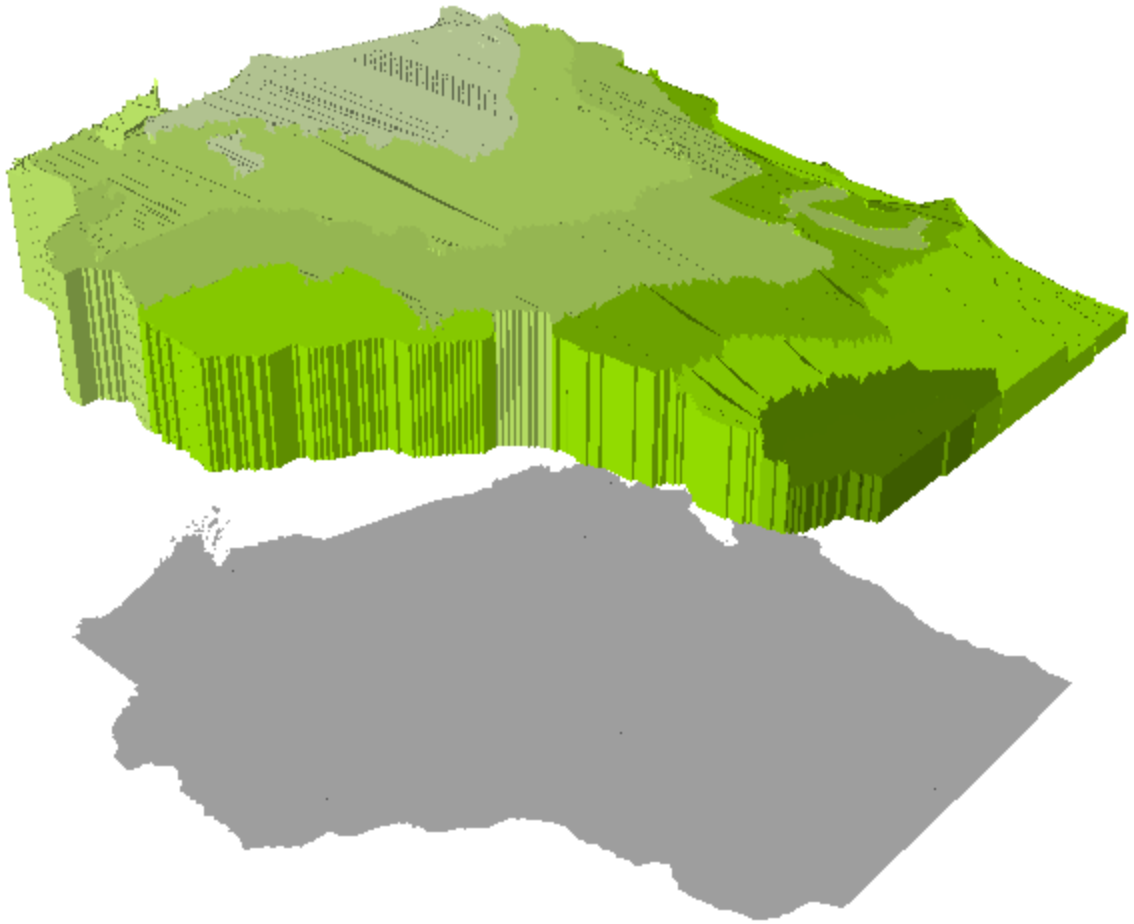
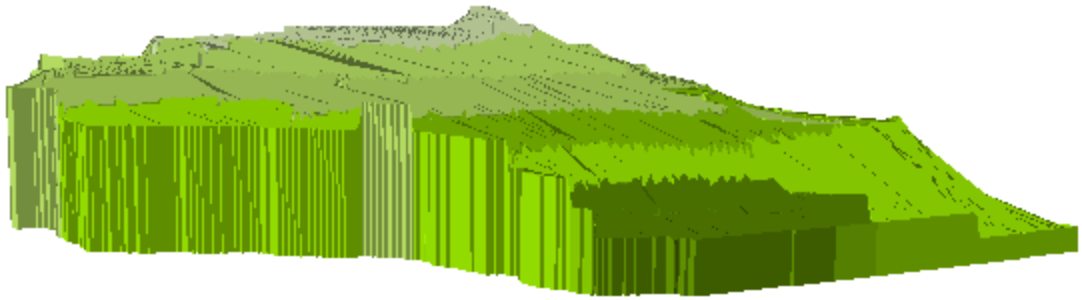
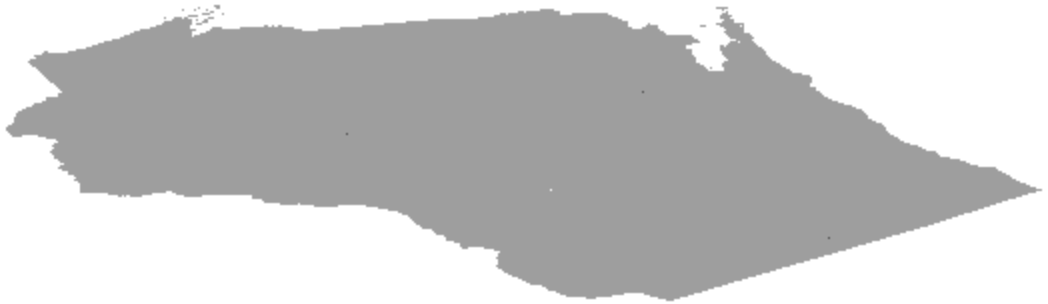


# Wisconsin arch





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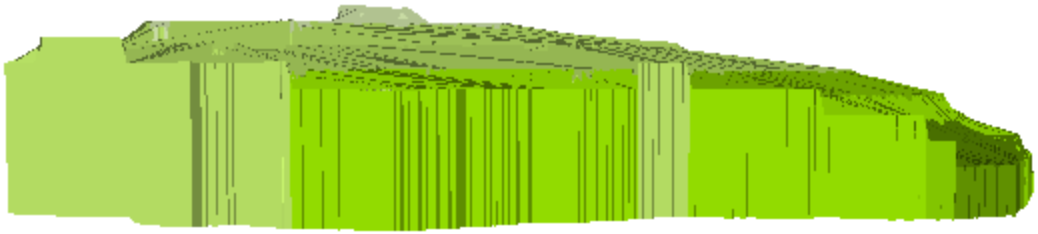
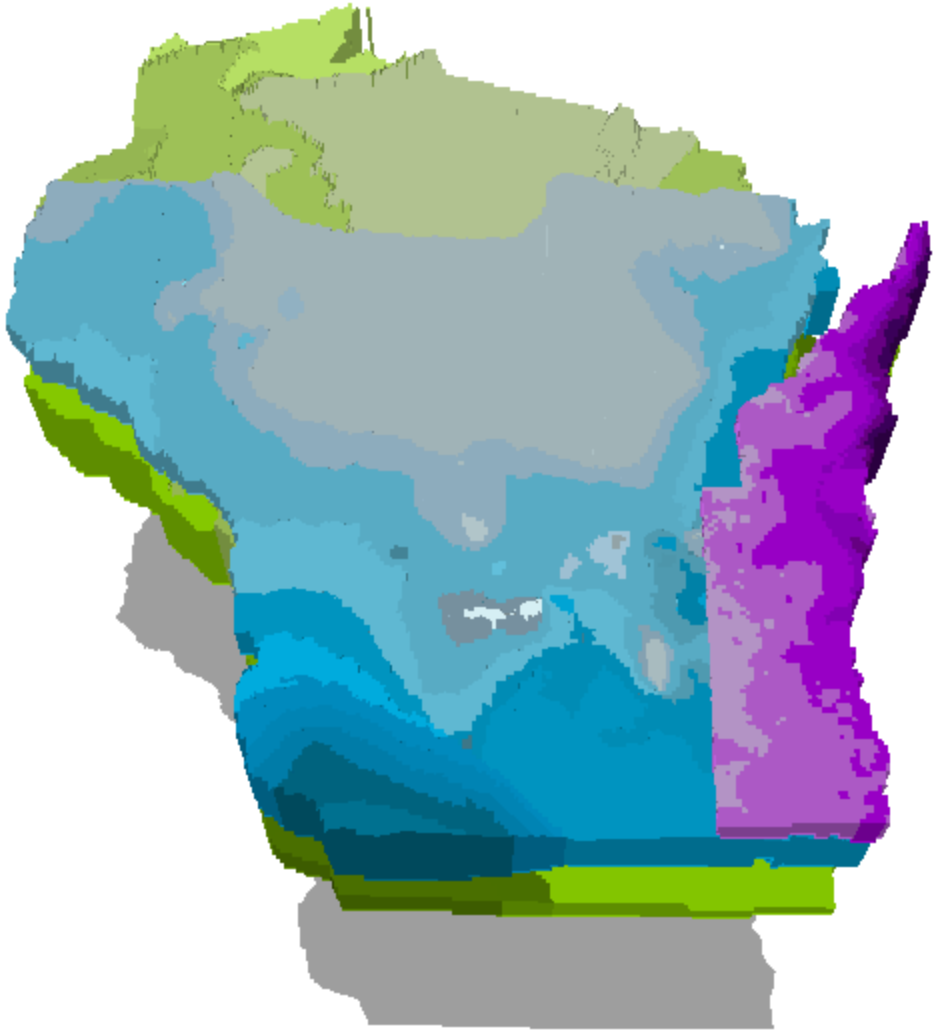


# Sandstone and dolomite aquifer

# Eastern dolomite aquifer



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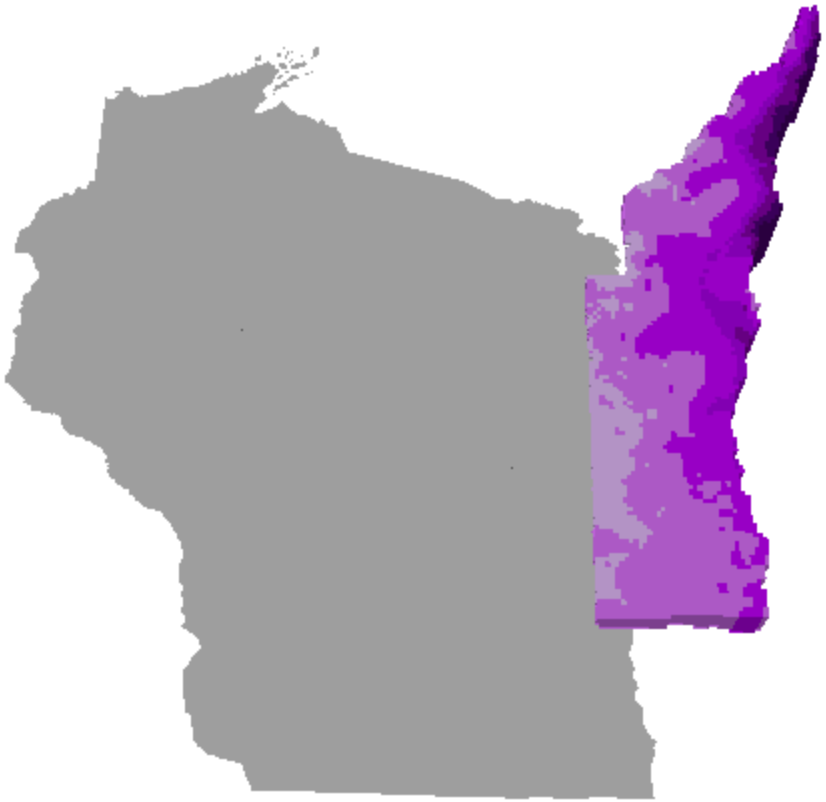

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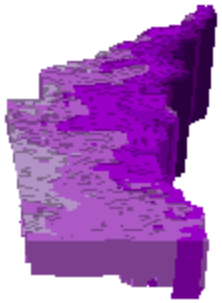

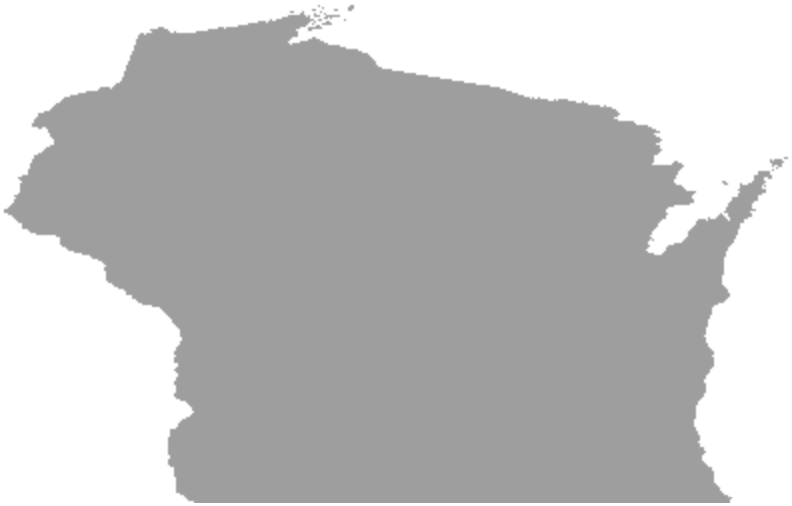

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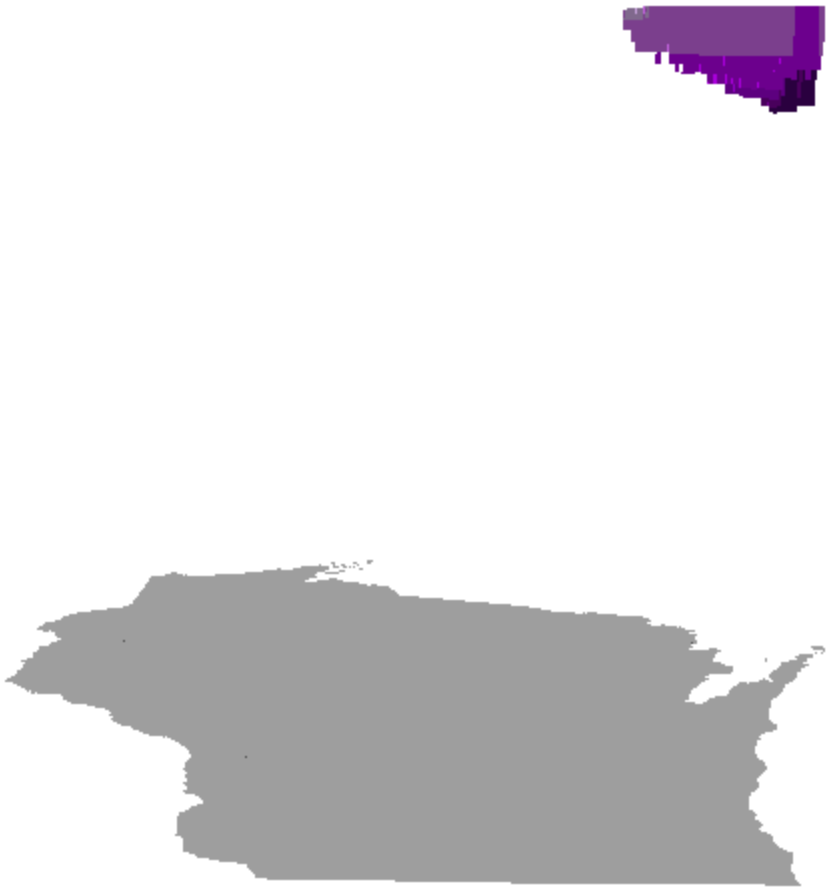
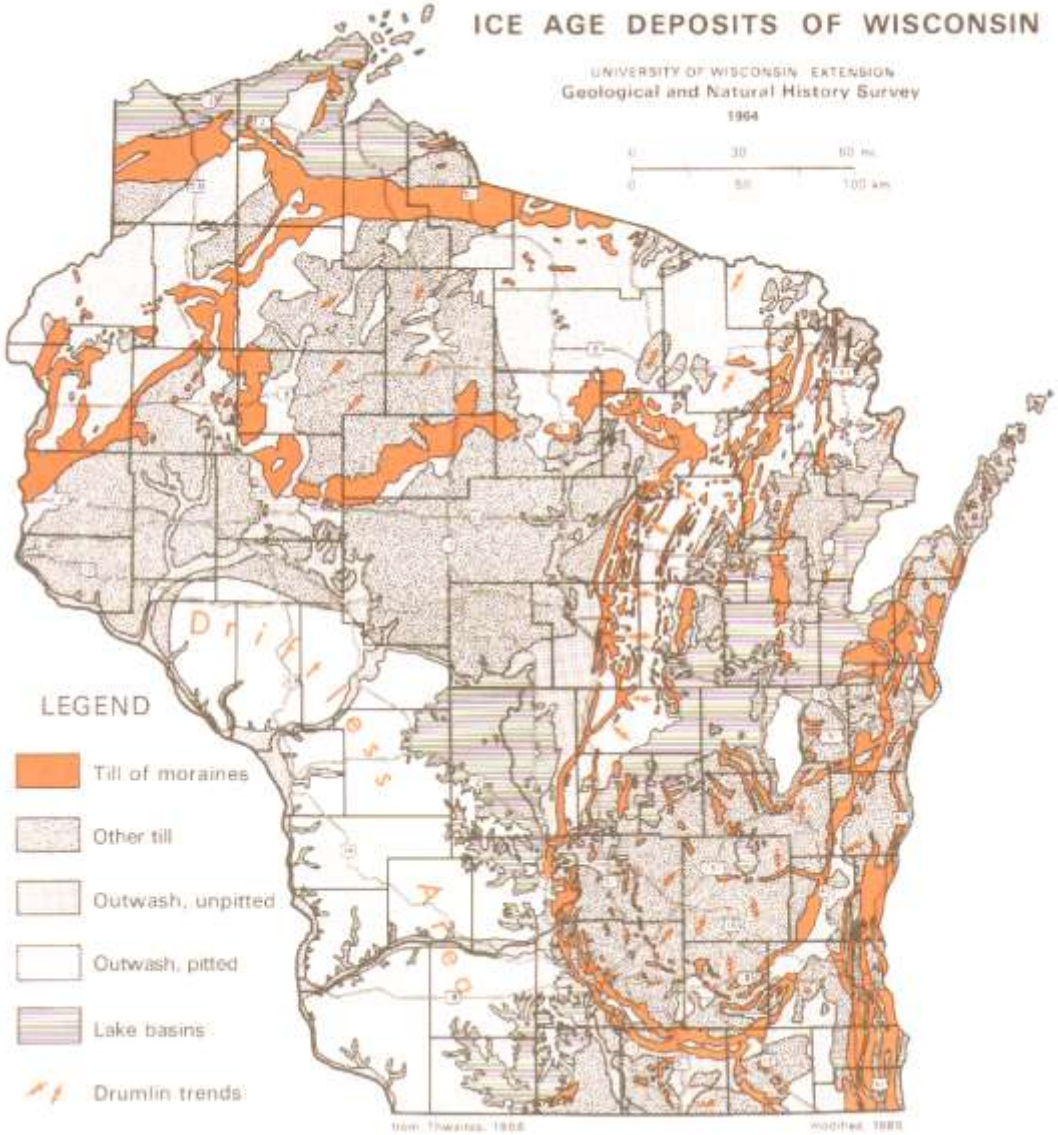
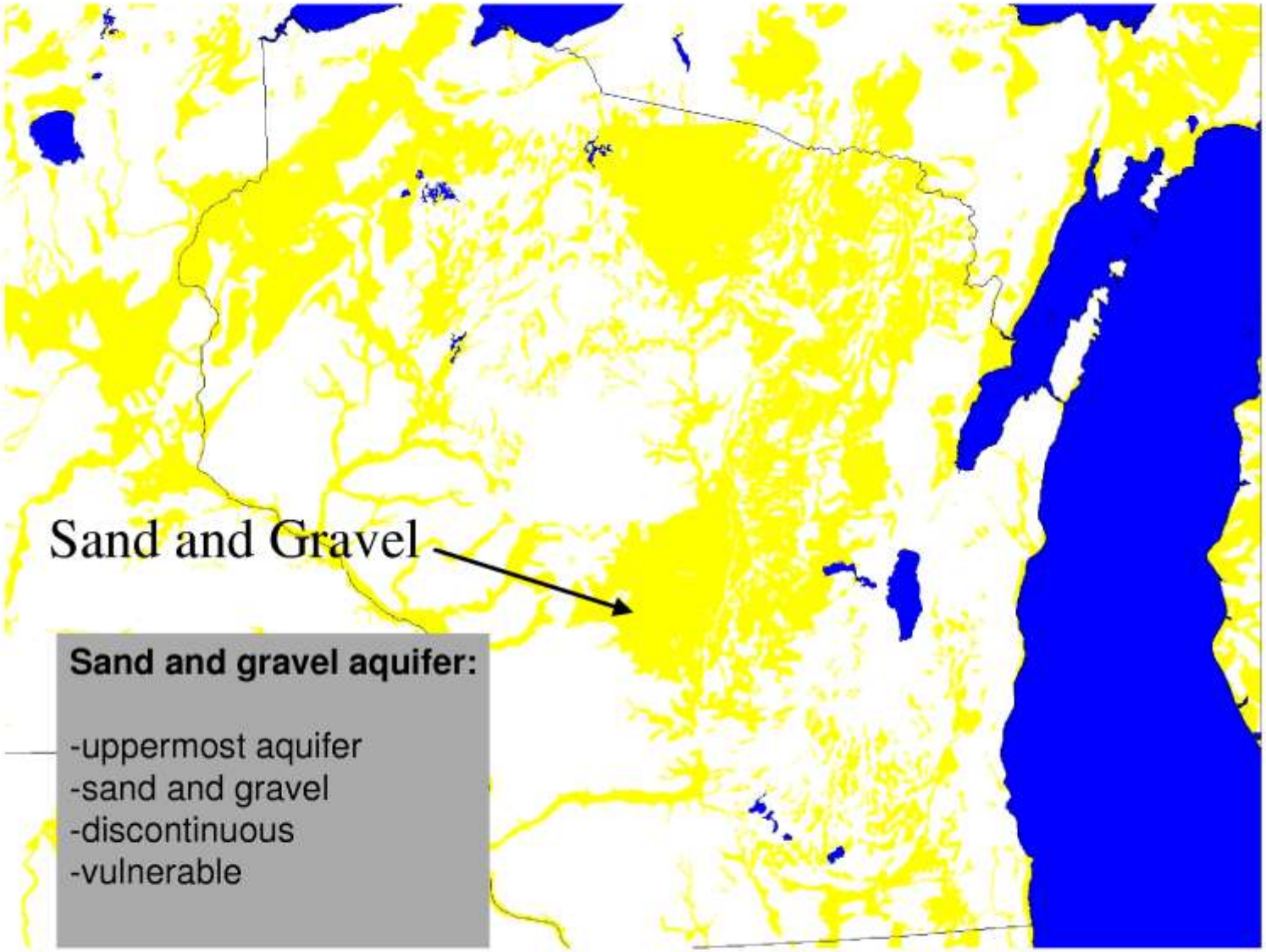


# Glacial Geology



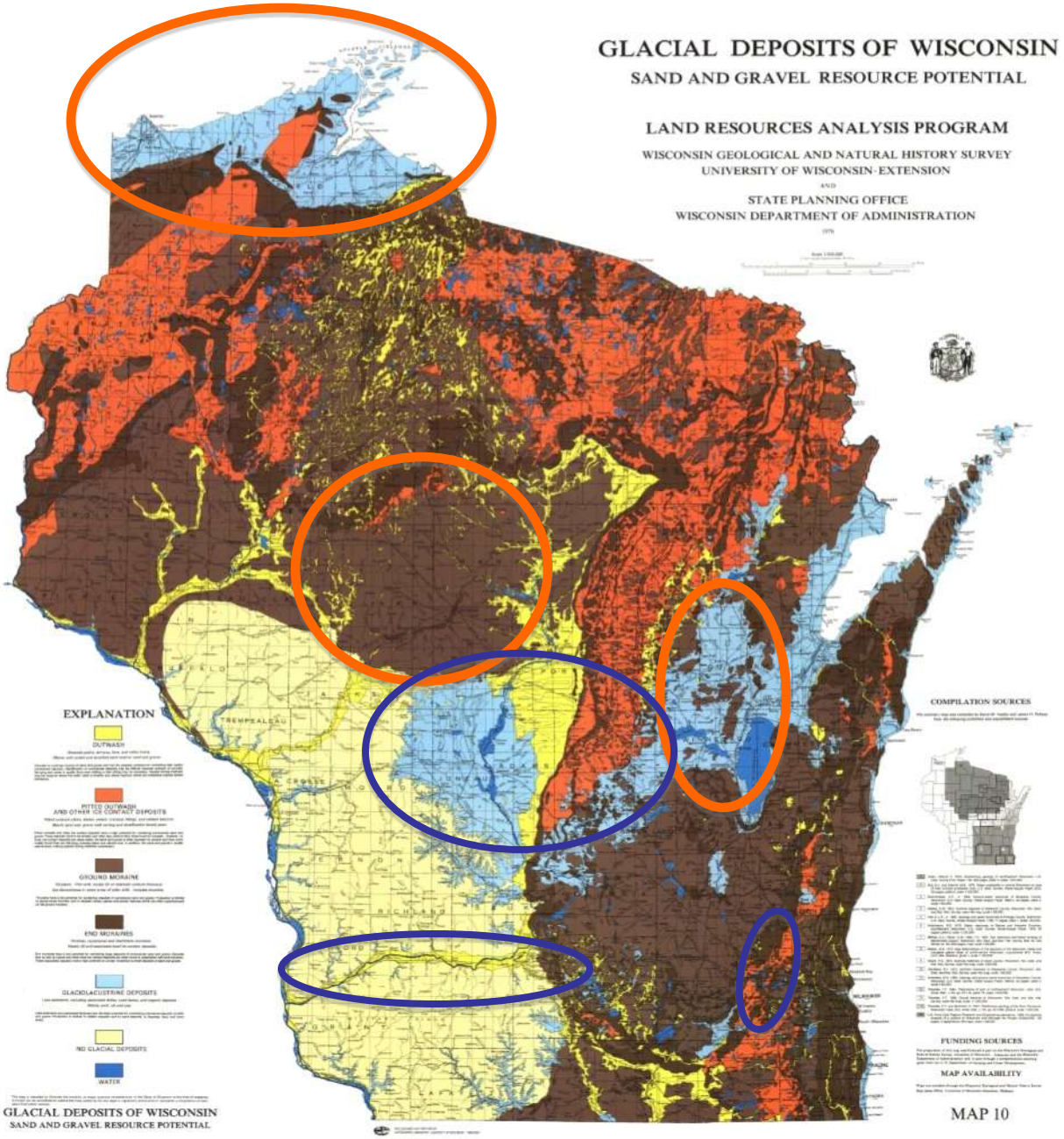

Sand and Gravel
Sand and gravel aquifer:
-uppermost aquifer
-sand and gravel
-discontinuous
-vulnerable

# Geology controls where we get our groundwater

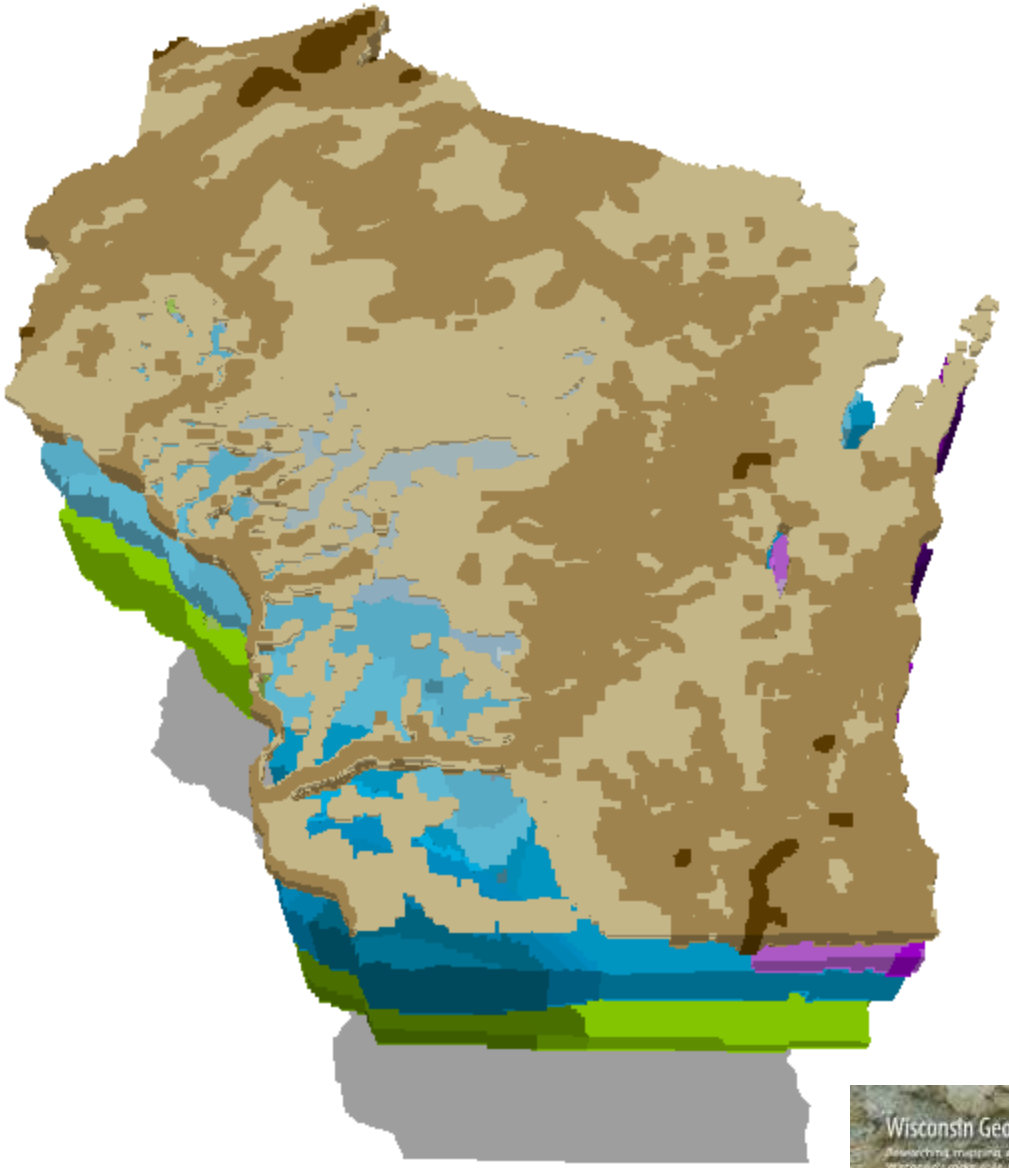
Some glacial deposits provide lots of water while others provide very little

High well capacity
Sands and gravels

Low well capacity
Silts and clays



# Sand and gravel aquifer



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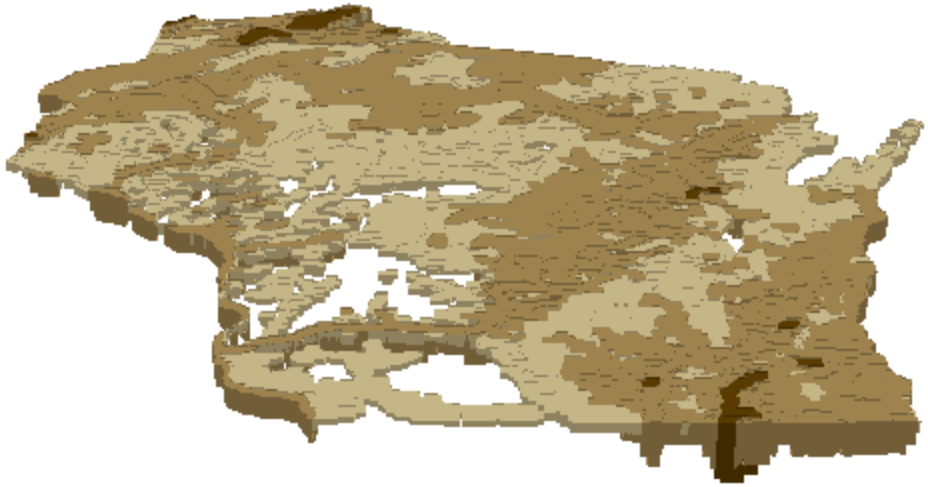

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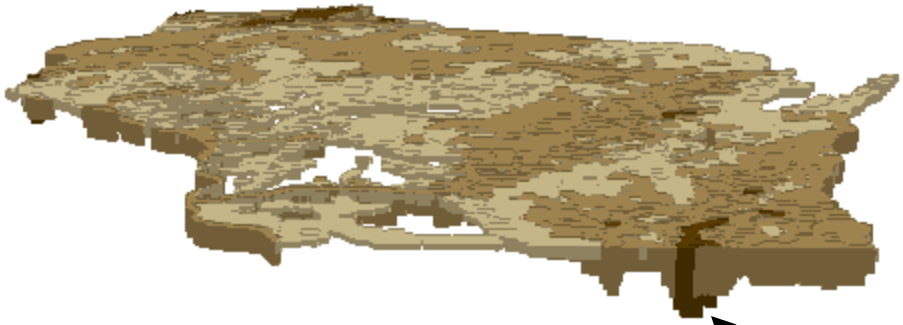
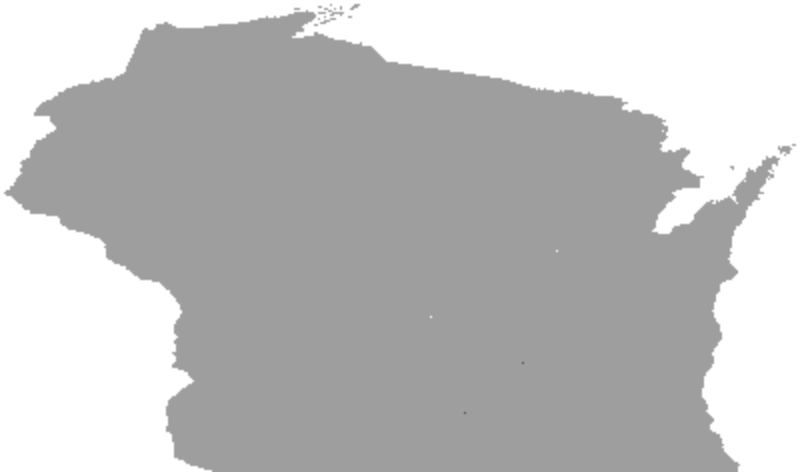


Troy Valley



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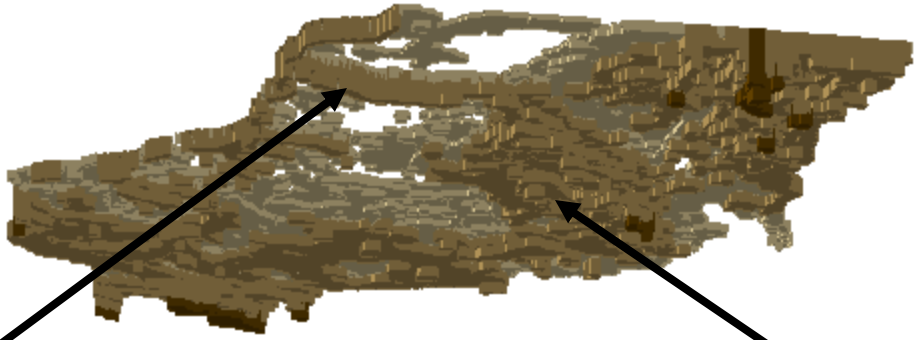
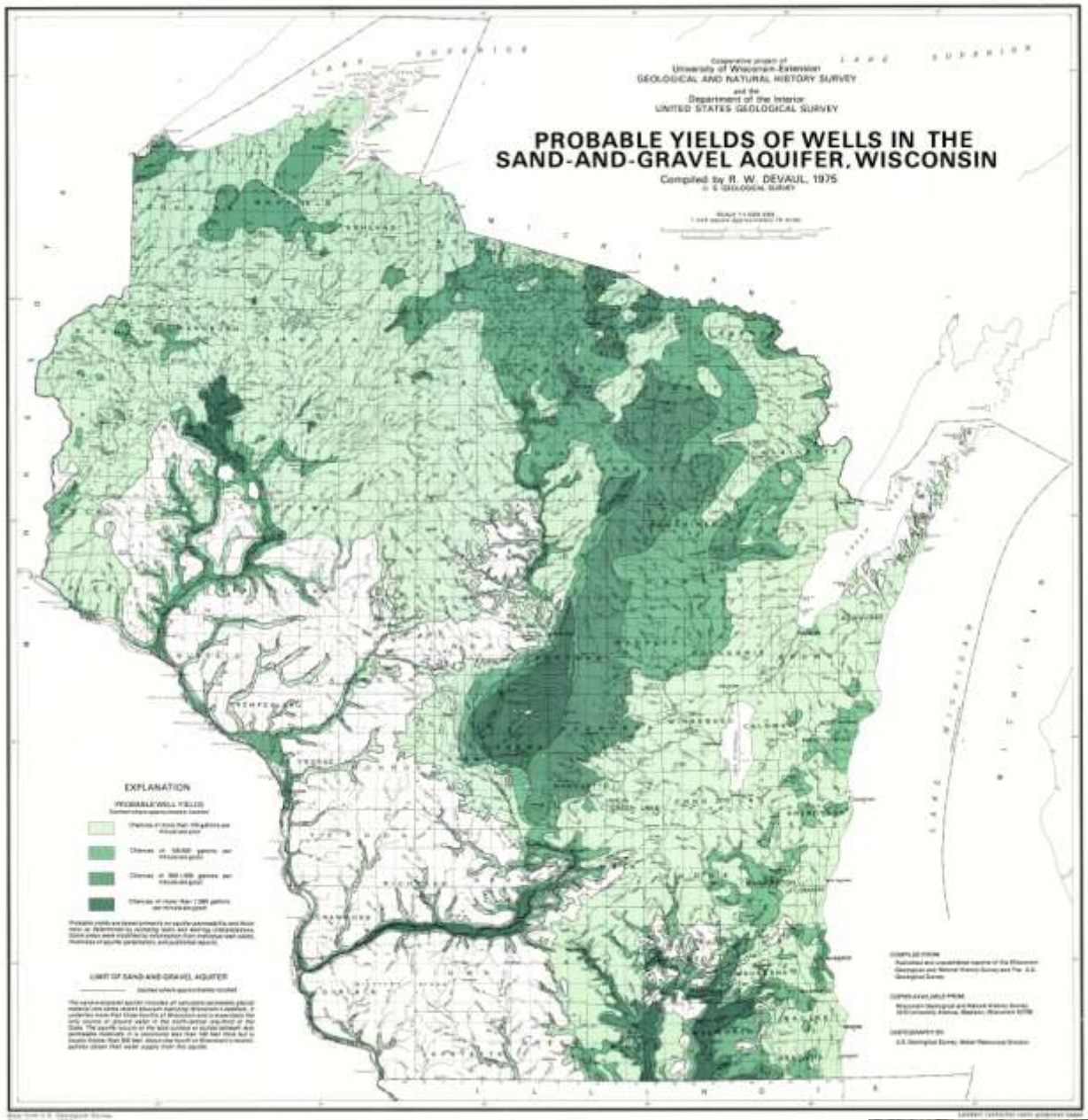
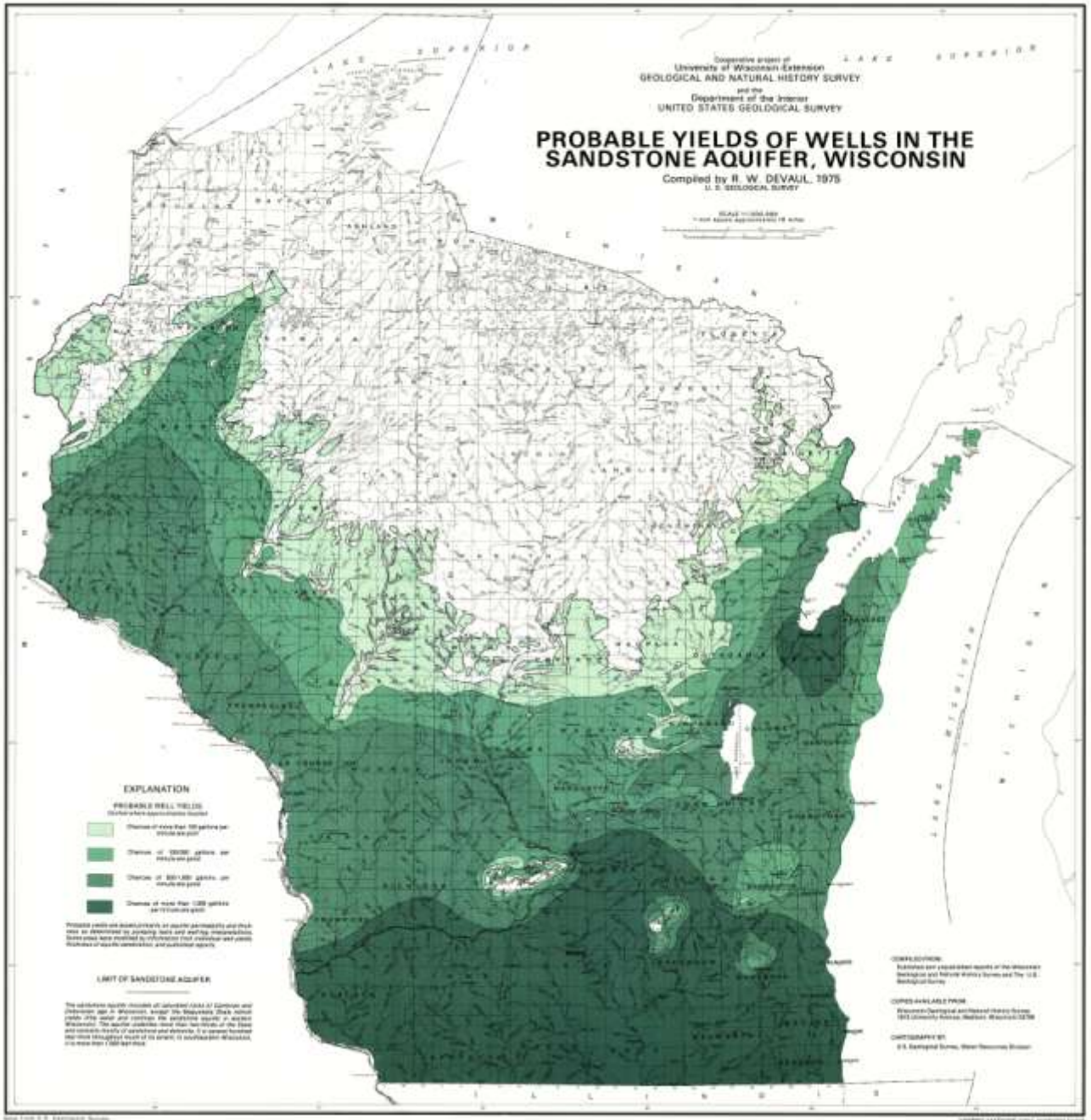
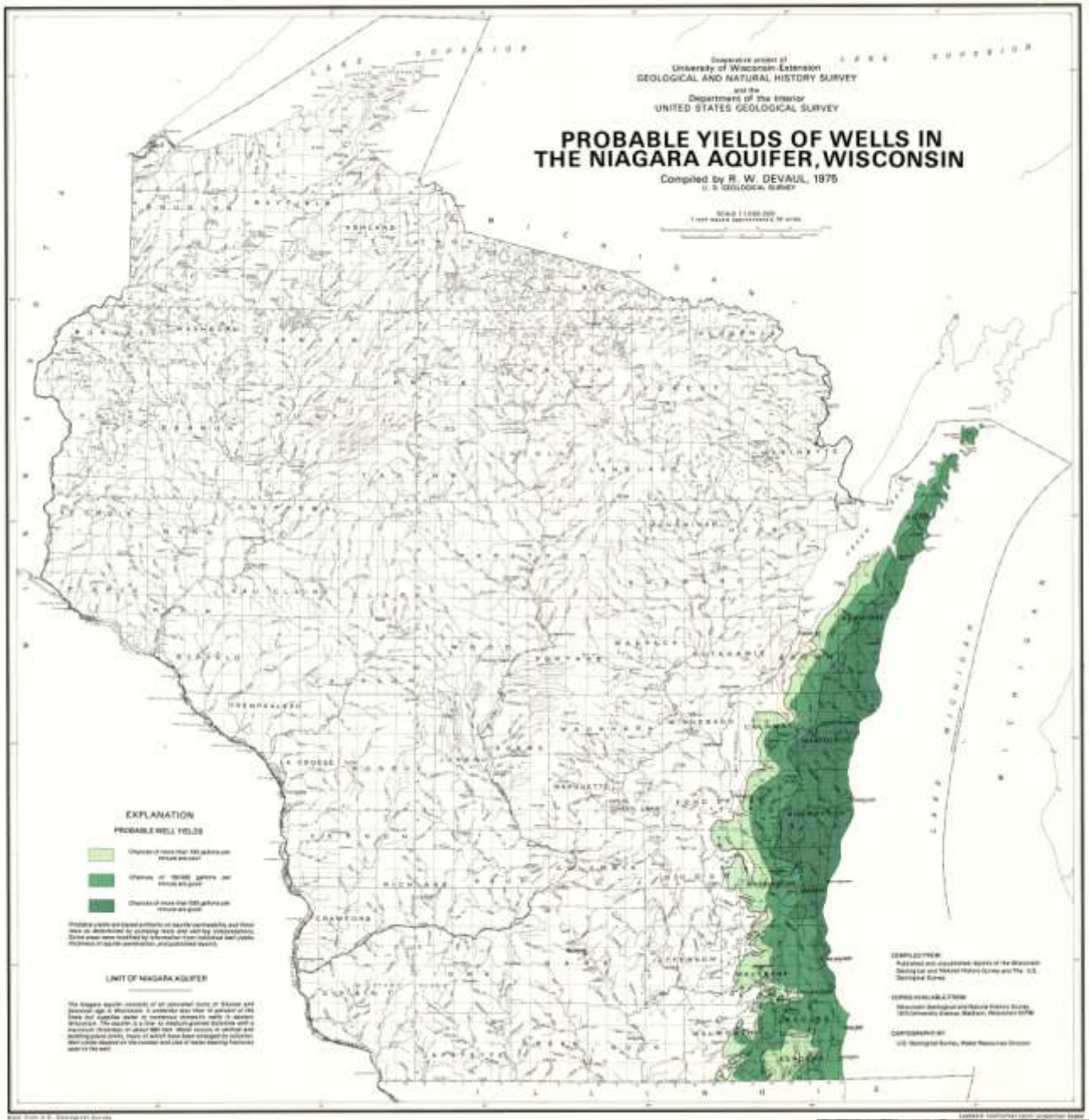


Wisconsin River Valley

Central Sand Plains







# Crystalline Bedrock Aquifer

- No map because more than 100 gpm are not expected anywhere in the aquifer, even after hydrofracturing.

## Wisconsin's Aquifers Activity

***Introduction***

An aquifer is a rock or soil formation that can store or transmit water. Wisconsin's groundwater reserves are held in four principal aquifers: the sand and gravel aquifer, the eastern dolomite aquifer, the sandstone and dolomite aquifer, and the crystalline bedrock aquifer. This activity helps students understand the properties and locations of those aquifers in 3-D.

***Concepts***

- Wisconsin's aquifers have different thicknesses and abilities to let water flow.
- The aquifers often overlie each other. (Principal of Superposition – Younger rocks overlie older rocks)
- The aquifers are generally horizontally extensive (Principal of Original Horizontality – The rocks deposited at the same time make flat layers.)
- Geologists use wells and geologic cores and the two principals above to understand rock layers in 3-D.

***Supplies***

Play dough – four colors: green, blue, red, and orange. 1 to 2 cups of each.
Laminated map of Wisconsin's aquifers
Buried treasure publication
Large (1/4") straw to collect play dough plugs (core)
Plunger to extract core

***What to do***

1. Using the description of Wisconsin's aquifers in the Buried Treasure handout, sculpt Wisconsin's aquifers.
    a. Start at the bottom with the Crystalline bedrock aquifer. Make sure to include the Wisconsin arch and the Wisconsin dome so that the aquifer is lowest at the edges.
    b. Make the Sandstone and Dolomite aquifer. This aquifer is draped over the Crysalline aquifer. It is thick in the west and east and is thinner in the middle. It was completely eroded away in north central and eastern Wisconsin.
    c. Make the Eastern Dolomite Aquifer. This aquifer is located only on the eastern edge of Wisconsin. You can show the Niagara escarpment on the western edge of this aquifer even though it isn't clearly shown in the handout.
    d. Make the Sand and Gravel Aquifer. Show the river valleys filled with sand and gravel and the thick sands in the central sand plains.
2. Use the straw to collect 4 to 5 cores (or plugs) along two lines, one from the north to the south and one from west to east.