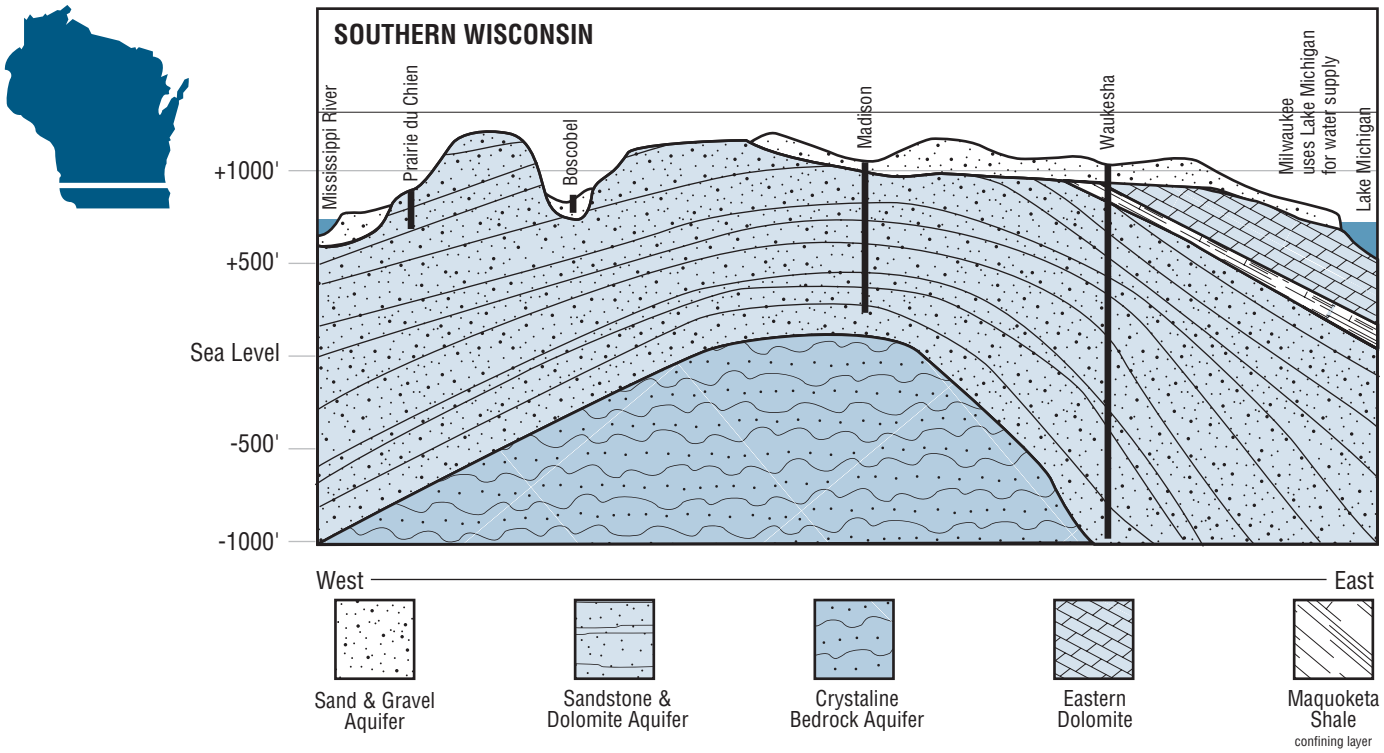
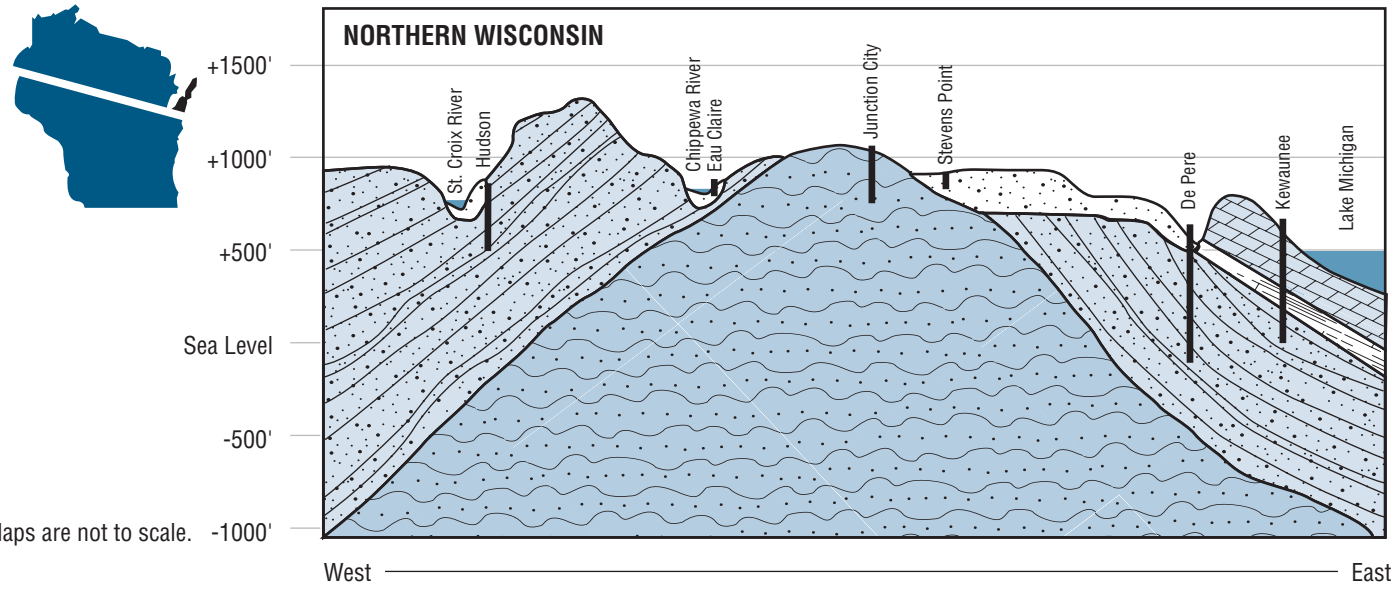
# Wisconsin's Major Aquifers




Maps are not to scale.

**Learning Objectives:** Students will: (1) identify the state's four major aquifers, (2) describe the geologic arrangement of the aquifers, (3) explain the significance of confining layers, (4) estimate the depths of several wells and (5) interpret the information to make conclusions about groundwater quality in the aquifers.

**Subjects:** Science, Health Education and Math

**WMASs: SC:** A.8.1, A.8.6

**HE:** D.8.2

**M:** D.8.4

**Grades:** 6–9

**Materials:**

- Wisconsin's Aquifers—activity sheet*
- colored pencils

* Two cross-sections of the state are provided. You may choose a northern or southern cross-section for this activity.

**Background:** An *aquifer* is an underground formation that can store and transmit water. Most of Wisconsin is underlain by thick, permeable deposits. These layers of rock and soil make up our state's four major aquifers: 1) the sand and gravel aquifer, 2) the eastern *dolomite* aquifer, 3) the sandstone and

dolomite aquifer and 4) the crystalline bedrock aquifer. A few areas in northern Wisconsin are made up of clay soils overlying granite or other non-porous materials. Since these materials can't store or transmit much water, substantial well water supplies aren't available there (see *Groundwater: Wisconsin's Buried Treasure* for more information).

**1)** The sand and gravel aquifer covers most of Wisconsin, except for the unglaciated areas in the southwestern part of the state. This aquifer layer was deposited by glacial ice and river floodplains between 10,000 and 1 million years ago. Many of the irrigated farmlands in southern and northwestern Wisconsin tap this aquifer. Because the top of the sand and gravel aquifer is also the land surface, the groundwater it contains may easily become contaminated.

**2)** The eastern dolomite aquifer lies beneath the sand and gravel aquifer in eastern Wisconsin, and extends from Door County to the Wisconsin-Illinois border. It is made up of the Niagara dolomite formation underlain by the Maquoketa shale formation. These layers were deposited about 400 million years ago.

Dolomite is like limestone and contains groundwater in interconnected cracks. The yield of water from wells in this aquifer is variable and depends on the number of fractures through which a well passes. Where this fractured formation is close to the land surface, groundwater may easily be contaminated.

The underlying Maquoketa shale layer doesn't transmit water readily. This formation isn't important as an aquifer but as a confining layer or barrier between the eastern dolomite aquifer and the sandstone and dolomite aquifer.

**3)** The sandstone and dolomite aquifer is made up of layers of sandstone and dolomite bedrock. Water is found in fractures in the dolomite layers. In the sandstone, water also occurs in pore spaces between the loosely cemented sand grains. This aquifer covers the entire state, except for the north central region. Materials in the sandstone and dolomite aquifer were deposited between 425 and 600 million years ago. This is the principal bedrock aquifer for southern and western portions of the state. Most cities and industries in eastern Wisconsin also tap this deep aquifer.

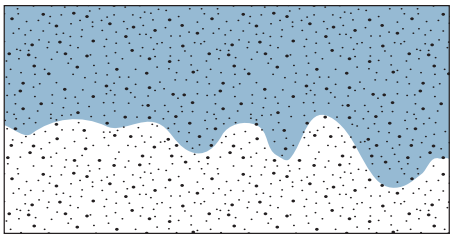
**4)** The crystalline bedrock aquifer is made up of a variety of rock types formed between 600 and 4,000 million years ago. This granite-like rock formation underlies the entire state. In the north central region this aquifer lies directly beneath the sand and gravel aquifer. Water is stored in cracks that may be many feet apart. To draw water from this aquifer a well must pass through some of these cracks. Good quality water can be obtained from shallow wells in this formation, but wells that penetrate deep into the aquifer have been found to yield salty water because the water becomes concentrated with naturally occurring salts and minerals as it passes through many rock layers.

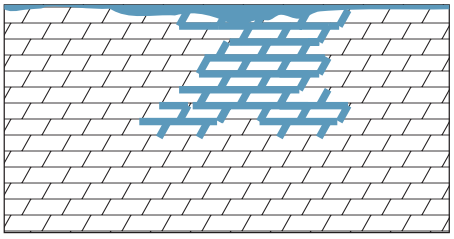
## Procedure:

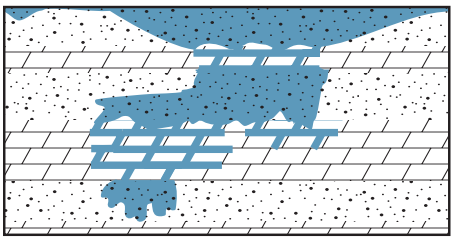
1. Discuss the background information.
2. Complete the activity sheet for either the northern or southern cross-section.
3. Discuss your answers.

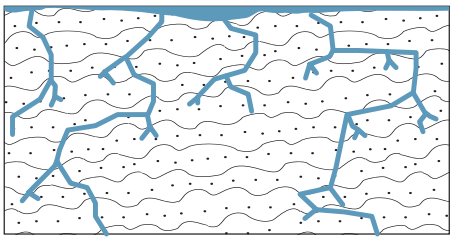
## Going Beyond:

1. Investigate what aquifer your town well taps, its depth, and how much water is pumped per minute, per day and per year. Investigate the water quality and treatment methods used. Visit or contact your local water department for this information. You can also obtain information by visiting the DNRs Bureau of Drinking Water and Groundwater website at **dnr.wi.gov/org/water/dwg/index.htm**. Click on "Public Water Systems" or "Well construction" and type in the name of your community. Also see the "Where Does it Come From? …Where Does it Go? exercise.


Sand & gravel aquifer


Dolomite


Sandstone & dolomite


Crystalline bedrock

2. Construct a geological model of your area using topographic, geologic, and groundwater susceptibility maps. Maps are available from the Wisconsin Geologic and Natural History Survey (visit **uwex.edu/wgnhs**). Using modeling clay, markers, and labels, show local soil and rock types, topography, depth to bedrock, depth to groundwater, and groundwater susceptibility. (This activity could be used as an art class project.)

From: *GREAT: Groundwater Resources and Educational Activities for Teaching,* 1989, Iowa Department of Natural Resources, Wallace Building, Des Moines, IA 50319.