

Water Resources in Southeastern Wisconsin: Hydrologic Realities and Misperceptions

Reality: Lake Michigan is disconnected from the deep aquifer.

Misperception #1: Ground water pumped by Southeastern Wisconsin (SEW) communities from the deep sandstone aquifer is from Lake Michigan.

- There is a general misperception about the time scales involved in the hydrology of our region. Water that SEW communities are pumping enters the aquifer under the western edge of the Maquoketa shale and flows slowly east. This flow pattern has been in place over the past several thousand years. Water that entered the aquifer during the last advance of Pleistocene ice (~12,000 years ago) still exists under eastern Waukesha County and it is appropriate to consider this aquifer as a fossil reservoir.

Misperception #2: The ground water Southeastern Wisconsin communities drink today was destined for Lake Michigan.

- This is a variation on misperception #1. The rate of flow from this aquifer to Lake Michigan is so slow that it will not reach the lake for 1000's of years – by which time, Lake Michigan as we know it will likely no longer exist. Some groundwater entered the aquifer before modern day Lake Michigan was even formed. The deep aquifer and Lake Michigan are hydrologically separate and should be treated as so for any hydrologic planning purposes within the next few hundred years.
- We need to manage ground water resources according to current patterns of aquifer flow and recharge. It makes sense to focus on the effect that pumping has on the current hydrologic regime (diminished surface water and lowered water levels in the aquifer), not on what will happen thousands of years in the future.

Misperception #3: SEW is forcing Lake Michigan to recharge the deep aquifer.

- Aquifer replenishment directly from Lake Michigan is insignificant. All of SEW pumps about 33.3 mgd (million gallons per day) from the deep aquifer. Of the ground water flowing in to replace this deep aquifer supply:
 - Only 1.3 mgd of the replacement water is drawn directly from Lake Michigan itself. This is equivalent to the average amount lost from the lake surface by evaporation in less than 5 seconds.
 - 71% (23.7 mgd) of replacement water originates in the Mississippi River basin. This water is river water that would naturally feed tributaries of the Mississippi River (“captured baseflow”).
 - 29% (9.7 mgd) of replacement water originates in the Lake Michigan watershed.

Reality: Southeastern Wisconsin is not hydrologically unique.

Misperception #4: Waukesha is unique.

- Other straddling counties in Wisconsin and other Great Lakes states, particularly Northeastern Illinois, have similar hydrologic characteristics (communities are outside the surface water divide but within the Great Lakes ground water divide). A diversion exception based on the City of Waukesha's location would not be unique.

Potential Reality: Southeastern Wisconsin can become a leader in sustainable water management.

Misperception #5: The deep aquifer in SEW is in a ground water quantity crisis that can be easily reversed.

- Water quality – radium contamination – is the more pressing issue forcing us to deal with water resource management in our region.
- Water quantity – declining water levels – is a longer-term issue. We have both time and management options available to avoid rush decisions that only shift the mismanagement of the resource to another water body.
- Shifting the City of Waukesha to Lake Michigan water will marginally improve the water quantity deficit in the deep aquifer. Calculations we have made indicate that eliminating City of Waukesha pumping causes very little in the way of water level recovery outside Waukesha County.

Closing Comments:

Southeastern Wisconsin should not shift mismanagement of water resources east to Lake Michigan, west to other parts of the deep aquifer, or up to the shallow aquifer. The region has time to develop and apply science-based alternatives for long term resource management. The region also has time to incorporate water resource management principles into its current land use planning.

The University of Wisconsin-Milwaukee and the Great Lakes WATER Institute have been integral to the building of a regional foundation of ground water and Great Lakes research and knowledge, and are continuing to do this work with support from the Brico Fund, SEWRPC and the State.

UWM and WATER Institute researchers are available as scientific sources for water resource information. We are a part of the regional dialogue on water-related issues, and will help the general public by providing a much needed source of unbiased, factual information.

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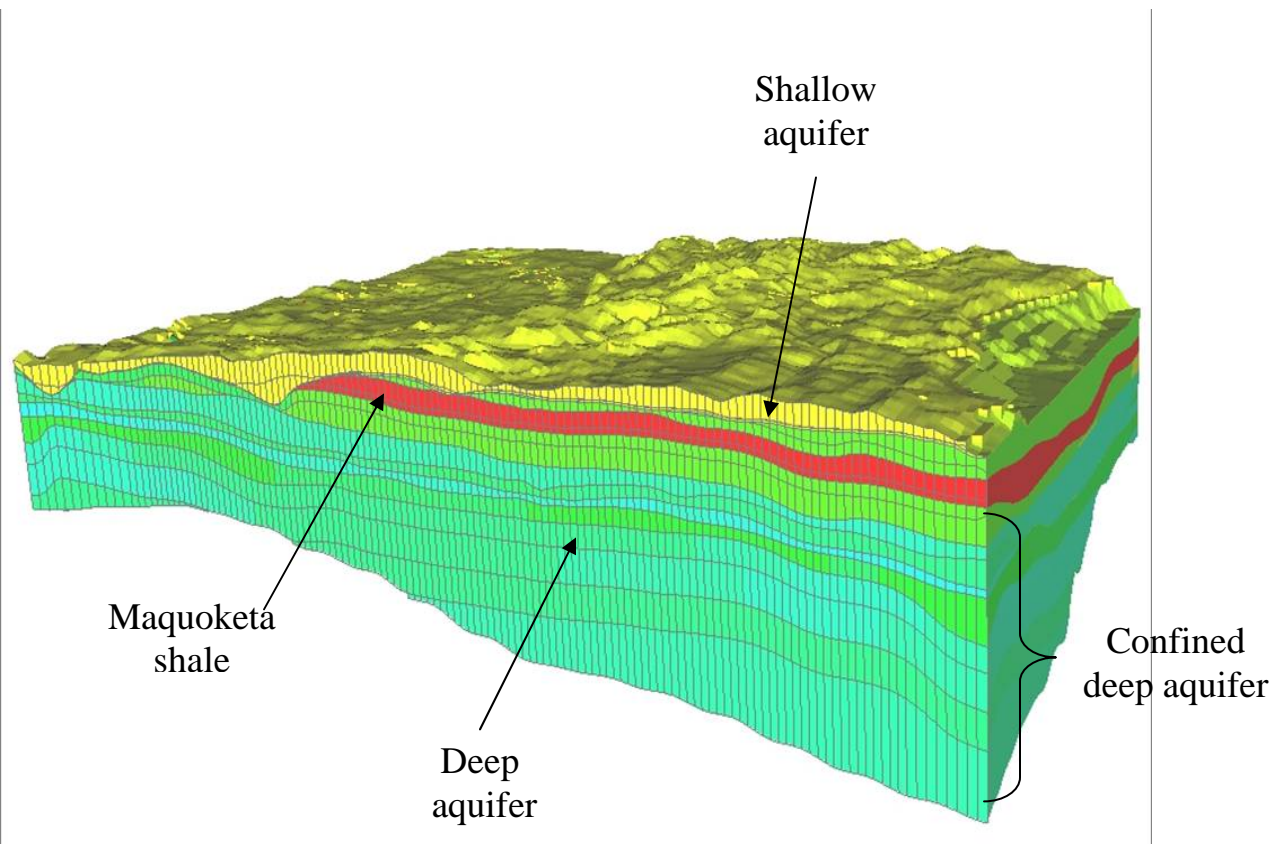


Figure 1. General aquifer characteristics in Southeastern Wisconsin.

Source: Ken Bradbury, Wisconsin Geological and Natural History Survey



Figure 2. Key geologic features.

Source: USGS

Shallow aquifer – sand, gravel and clay left behind by glaciers plus uppermost dolomite bedrock layers.

Deep aquifer – thick sandstone layers extending over 2000 feet underground in some areas.

In most of our region, a thick sheet of rock called the *Maquoketa shale* separates the two aquifers. It “confines” the deep aquifer, restricting flow from the shallow aquifer. Ground water enters the confined aquifers from beyond the shale’s western edge.

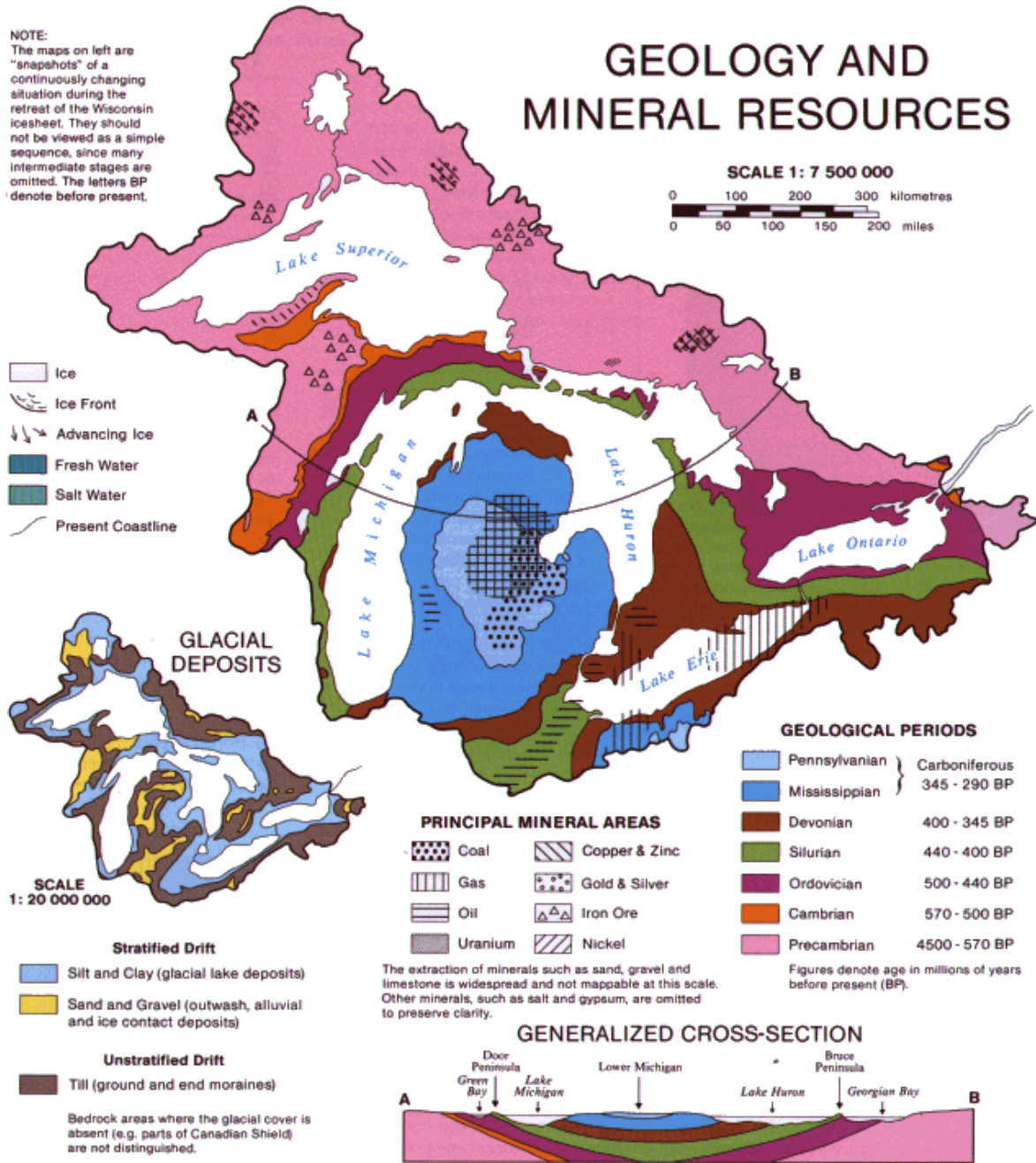
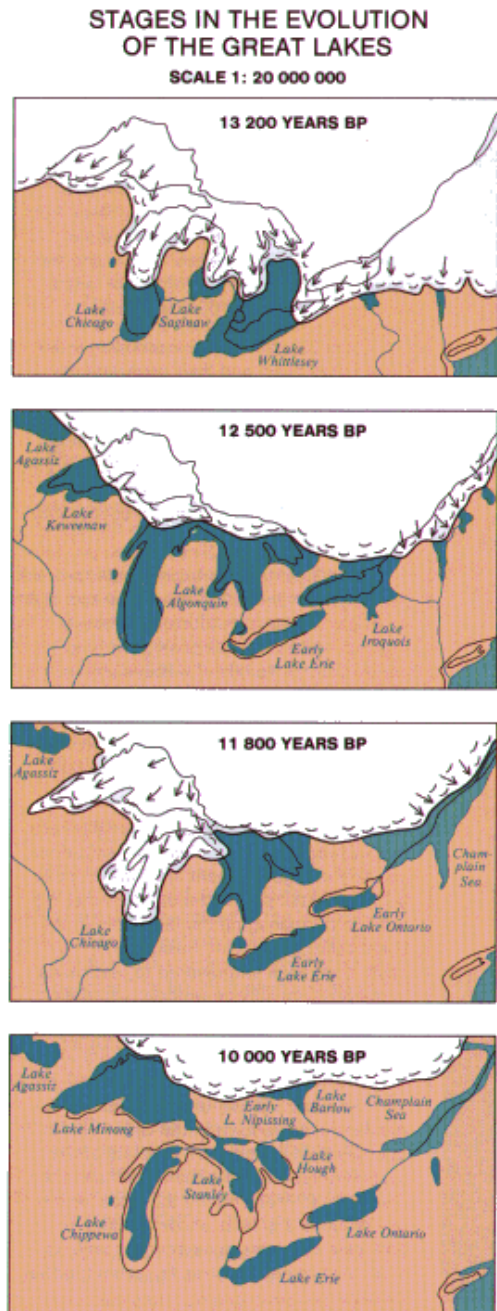


Figure 3. Geology of the Great Lakes region and recent history of the Great Lakes.

Source: "The Great Lakes: An Environmental Atlas and Resource Book," U.S. Environmental Protection Agency and Government of Canada, 2002.