

Wisconsin's aquifers

Sand and gravel aquifer

The sand and gravel aquifer is the surface material covering most of the state except for parts of southwest Wisconsin. It is made up mostly of sand and gravel deposited from glacial ice or in river floodplains. The glacial deposits are loose, so they're often referred to as soil — but they include much more than just a few feet of topsoil. These deposits are more than 300 feet thick in some

places in Wisconsin.

The glaciers, formed by the continuous accumulation of snow, played an interesting role in Wisconsin's geology. The snow turned into ice, which reached a maximum thickness of almost two miles. The ice sheet spread over Canada, and part of it flowed in a general southerly direction toward Wisconsin and neighboring states. This ice sheet transported a great amount of rock debris, called **glacial drift**.



Eastern dolomite aquifer

The eastern dolomite aquifer occurs in eastern Wisconsin from Door County to the Wisconsin-Illinois border. It consists of Niagara dolomite underlain by Maquoketa shale.

These rock formations were deposited 400 to 425 million years ago. Dolomite is a rock similar to limestone; it holds

groundwater in interconnected cracks and pores. The water yield from a **well** in this aquifer mostly depends on the number of fractures the well intercepts. As a result, it's not unusual for nearby wells to vary greatly in the amount of water they can draw from this layer.

Groundwater in shallow portions of the eastern dolomite aquifer can easily become contaminated in places where

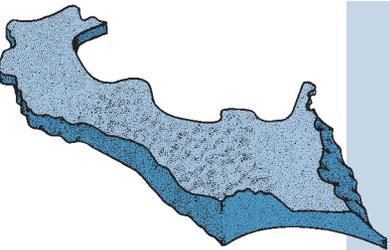


Sandstone and dolomite aquifer

The sandstone and dolomite aquifer consists of layers of sandstone and dolomite bedrock that vary greatly in their water-yielding properties. In dolomite, groundwater mainly occurs in fractures. In sandstone, water occurs in pore spaces between loosely cemented

sand grains. These formations can be found over the entire state, except in the north central portion.

In eastern Wisconsin, this aquifer lies below the eastern dolomite aquifer and the Maquoketa shale layer. In other areas, it lies beneath the sand and gravel aquifer. These rock types gently dip



Crystalline bedrock aquifer

The crystalline bedrock aquifer is composed of various rock types formed during the Precambrian Era, which lasted from the time the Earth cooled more than 4,000 million years ago, until about 600 million years ago, when the rocks in the sandstone and dolomite aquifer began to be formed. During this lengthy period, sediments, some of which were rich in



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.



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As the ice melted, large amounts of sand and gravel were deposited, forming "outwash plains." Pits formed in the outwash where buried blocks of ice melted; many of these pits are now lakes. The sand and gravel aquifer was deposited within the past million years.

The sand and gravel outwash plains now form some of the best aquifers in Wisconsin. Many of the irrigated agricultural lands in central, southern and northwestern Wisconsin use the glacial out-

wash aquifer. Other glacial deposits are also useful aquifers, but in some places, large glacial lakes accumulated thick deposits of clay. These old lake beds of clay do not yield or transmit much water.

Because the top of the sand and gravel aquifer is also the land surface for most of Wisconsin, it is highly susceptible to human-induced and naturally occurring pollutants.

the fractured dolomite bedrock occurs at or near the land surface. In those areas (such as parts of Door, Kewaunee and Manitowoc counties), there is little soil to filter pollutants carried or leached by precipitation. Little or no filtration takes place once the water reaches large fractures in the dolomite. This has resulted in some groundwater quality problems, such as bacterial contamination from human and animal wastes. Special care

is necessary to prevent pollution.

The Maquoketa shale layer beneath the dolomite was formed from clay that doesn't transmit water easily. Therefore, it is important not as a major water source, but as a barrier or shield between the eastern dolomite aquifer and the sandstone and dolomite aquifer.



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to the east, south and west, away from north central Wisconsin, becoming much thicker and extending to greater depths below the land surface in the southern part of the state.

The rock formations that make up the sandstone and dolomite aquifer were deposited between 425 and 600 million years ago. The sandstone and



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dolomite aquifer is the principal bedrock aquifer for the southern and western portions of the state. In eastern Wisconsin, most users of substantial quantities of groundwater, such as cities and industries, tap this deep aquifer to obtain a sufficient amount of water.

iron and now form iron ores, were deposited in ancient oceans; volcanoes spewed forth ash and lava; mountains were built and destroyed, and molten rocks from the earth's core flowed up through cracks in the upper crust.

The rocks that remain today have a granite-type crystalline structure. These are the "basement" rocks that underlie the entire state. In the north central region, they are the only rocks

occurring beneath the sand and gravel aquifer.

The cracks and fractures storing and transmitting water in these dense rocks are not spaced uniformly. Some areas contain numerous fractures while others contain very few. To obtain water, a well must intersect some of these cracks; the amount of water available to a well can vary within a single home site. The crystalline bedrock aquifer often cannot

provide adequate quantities of water for larger municipalities, large dairy herds, or industries.

Many wells in the crystalline bedrock aquifer have provided good water. However, most of these wells do not penetrate deeply into the rock. Water samples from deep mineral exploration holes near Crandon and deep iron mines near Hurley have yielded brackish water. 

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