

# **Bedrock Aquifer Systems of Steuben County, Indiana**

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The occurrence of bedrock aquifers depends on the original composition of the geologic material and subsequent changes which influence the hydraulic properties. Post-depositional processes, which promote jointing, fracturing, and solution activity of exposed bedrock, generally increase the hydraulic conductivity (permeability) of the upper portion of bedrock aquifer systems. Because permeability in many places is greatest near the bedrock surface, bedrock units within the upper 100 feet are commonly the most productive aquifers.

The yield of a bedrock aquifer depends on its hydraulic characteristics and the nature of the overlying deposits. Shale and glacial till act as aquitards, restricting recharge to underlying bedrock aquifers. However, fracturing and/or jointing may occur in aquitards, which can increase recharge to the underlying aquifers. In general, hydraulic properties of bedrock aquifers are highly variable. Most bedrock aquifers overlain by thick glacial deposits, such as in Steuben County, are under confined conditions. In other words, the potentiometric surface (water level) in most wells completed in bedrock rises above the top of the water-bearing zone.

The susceptibility of bedrock aquifer systems to surface contamination is largely dependent on the type and thickness of the overlying sediments. Because the bedrock aquifer systems have complex fracturing systems, once a contaminant has been introduced into a bedrock aquifer system, it will be difficult to track and remediate.

## **Devonian and Mississippian -- Coldwater, Ellsworth, and Antrim Shales Aquifer System**

One bedrock aquifer system is identified for Steuben County; the Devonian and Mississippian age Coldwater, Ellsworth, and Antrim Shales. The shales subcrop throughout the entire county and thicken from south to north. Oil and gas drillers' logs show that the shales attain a thickness of about 300 feet in the southern part of the county and thicken to over 700 feet in the north. These shales are commonly considered an aquitard; therefore, the system is an extremely limited ground-water resource.

Steuben County has a complex glacial history and was subjected to multiple glacial advances from the north, northeast, and east resulting in glacial sediment deposits completely covering the county. The unconsolidated sediments range in thickness from greater than 150 feet northeast of Fremont to over 400 feet in southwestern areas of the county. Major sand and gravel aquifers occur in these unconsolidated deposits overlying the bedrock. Because of the availability of the overlying unconsolidated resources, no water wells utilize the Coldwater, Ellsworth, and Antrim Shales Aquifer System in Steuben County.

Since the permeability of shale materials is considered low and the overlying unconsolidated deposits are thick, this bedrock system is not very susceptible to contamination introduced at or near the surface.

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