BEDROCK AQUIFER SYSTEMS OF JENNINGS COUNTY, INDIANA

The occurrence of bedrock aquifers depends on the original composition of the rocks 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. In Jennings County, rock types exposed at the bedrock surface are poor to moderately productive limestones and dolomites with varying amounts of interbedded shales to poorly productive shale.

Bedrock aquifer systems in the county are overlain by unconsolidated deposits of varying thickness. Refer to the map of unconsolidated aquifer systems for more information. Most of the bedrock aquifers in the 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 formation.

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. Hydraulic properties of the bedrock aquifers are highly variable.

Three bedrock aquifer systems are identified for Jennings County. They are, from west to east and youngest to oldest: New Albany Shale of Devonian and Mississippian age; Silurian and Devonian Carbonates; and the Maquoketa Group of Ordovician age. The county is nearly evenly divided between the New Albany Shale and the Silurian and Devonian Carbonates by a northwest to southeast trending contact. The Silurian and Devonian Carbonates are also exposed in many major stream valleys where the New Albany Shale has been eroded away. The Maquoketa Group is only exposed in the eastern part of the county where streams have incised deeply enough into the gently southwest-dipping strata to completely remove overlying Silurian and Devonian age rocks. Bedrock aquifers are not highly productive in this county. However, bedrock wells represent over 80% of all wells completed in the county.

The quality of water in bedrock aquifer systems in this county is generally acceptable for domestic use. However, some drillers report "sulfur water" in scattered wells within the outcrop/subcrop area of the New Albany Shale. The susceptibility of bedrock aquifer systems to surface contamination is largely dependent on the type and thickness of the overlying sediments. Just as recharge for bedrock aquifers cannot exceed that of overlying unconsolidated deposits, susceptibility to surface contamination will not exceed that of overlying deposits. However, 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 -- New Albany Shale Aquifer System

The New Albany Shale Aquifer System in Jennings County is an extremely limited ground-water resource. This aquifer system consists mostly of brownish-black carbon-rich shale, greenish-gray shale, along with minor amounts of dolomite and dolomitic quartz sandstone.

In Jennings County the thickness of the New Albany Shale ranges from 0 to about 120 feet and generally thickens as it dips southwest. The outcrop/subcrop area for the New Albany Shale includes much of the central, southern, and western parts of the county. It is overlain by unconsolidated deposits that range in thickness from about 0 to 90 feet, but are commonly 15 to 50 feet thick.

This aquifer system is considered a poor aquifer resource and is often described as an aquitard. Over 95 percent of the wells penetrating this system are completed in the underlying Silurian and Devonian Carbonates Aquifer System. However, there are a few wells in the county that utilize the New Albany Shale Aquifer System whose production is suitable for domestic needs. The permeability of shale materials is considered low. The New Albany Shale Aquifer System, therefore, has a low susceptibility to contamination introduced at or near the surface.

Silurian and Devonian Carbonates Aquifer System

In Jennings County this aquifer system consists primarily of middle Devonian age carbonates of the Muscatatuck Group and underlying Silurian carbonates. It is composed of only Silurian carbonates along the eastern edge of the county and in several stream valleys where Muscatatuck Group rocks have been removed by erosion. Because individual units of the Silurian and Devonian systems are composed of similar carbonate rock types and cannot easily be distinguished on the basis of water well records, they are considered as a single water-bearing system. Total thickness of the Silurian and Devonian Carbonates Aquifer system ranges from 0 to about 200 feet.

In nearly half of the county this aquifer system is overlain by New Albany Shale, which is commonly 5 to 30 feet thick. However, in almost all cases drillers bypass the shale to complete wells in the underlying Silurian and Devonian carbonates because the New Albany Shale is considered to be a poor aquifer. Although recharge may be reduced in these areas, productivity of the Silurian and Devonian Carbonates Aquifer System is not significantly different in areas where the New Albany Shale is present. Wells penetrating this system have reported depths ranging from 28 to 298 feet, but are commonly 60 to 115 feet deep. The amount of rock penetrated in the Silurian and Devonian Carbonate Aquifer System typically ranges from 25 to 75 feet, although a few of the deeper wells may also reach the upper portion of the underlying Maquoketa Group.

Water wells in the Silurian and Devonian Carbonates Aquifer System are generally capable of meeting the needs of domestic users in this county. Typical yields range from 2 to 15 gallons per minute (gpm). However, several dry holes have been reported. Static water levels typically range from 20 to 50 feet below land surface.

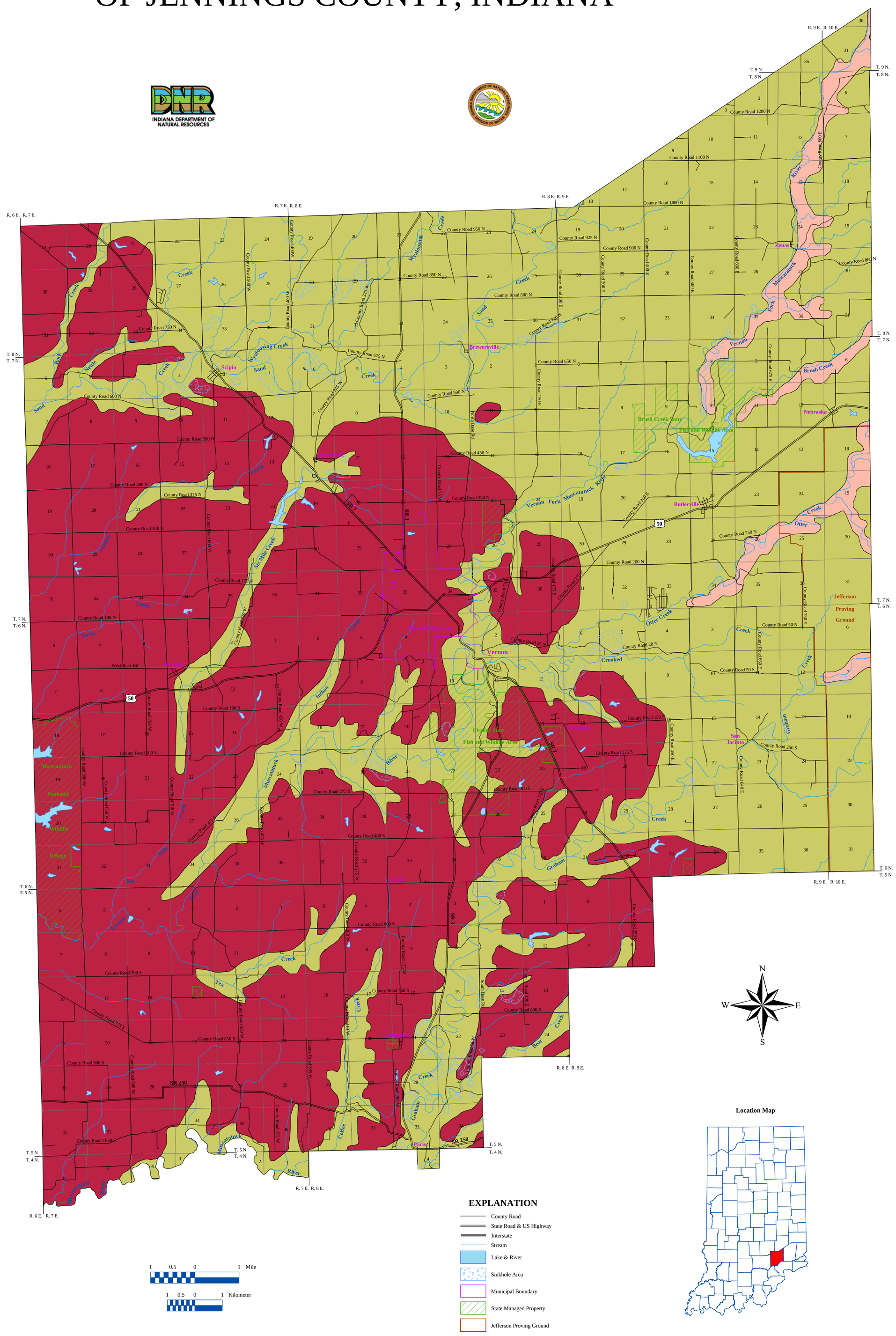
The Silurian and Devonian Carbonates Aquifer System is generally not very susceptible to contamination from the land surface, except where karst (see Karst Features and the Dissolution of Carbonate Rocks) development is significant or where overlying clay-rich till and residuum is thin or absent. This system is also at low risk to contamination where it is overlain by New Albany Shale.

Ordovician -- Maquoketa Group Aquifer System

The outcrop/subcrop area of the Maquoketa Group is limited to the deeply incised stream valleys in the eastern part of the Jennings County. The Maquoketa Group consists in ascending order of the Kope, Dillsboro, and Whitewater Formations. The Maquoketa Group consists mostly of shales with interbedded limestone units. Few wells have been completed in or near the outcrop/subcrop area of the Maquoketa group in this county. These wells generally use little more than the top 100 feet for water production, although this system is approximately 700 to 850 feet thick in the county.

The Maquoketa Group is considered a minor ground-water source in the county. Although well data are sparse for this aquifer system in Jennings County, expected water production from the Maquoketa Group should be similar to that in neighboring Ripley County, where most wells for homes, irrigation, and stock produce between 1 and 5 gpm. Localized yields may exceed 20 gpm. However, (pumped) dry holes are quite common in this system in Ripley County and dry holes have also been reported in Jennings County.

Except in areas of significant karst development or where overlying clay-rich till and residuum is thin or absent, this aquifer system is not very susceptible to contamination from the land surface. In this system, karst development is predominately confined to the outcrop/subcrop area of the Whitewater Formation, the uppermost formation in this aquifer system.



EXPLANATION

- County Road
- State Road & US Highway
- Interstate
- Stream
- Lake & River
- Sinkhole Area
- Municipal Boundary
- State Managed Property
- Jefferson Proving Ground

Location Map

Map generated by Jennifer K. Mc Millan and Gregory P. Schrader
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This map was created from several existing shapefiles. Township and Range Lines of Indiana (line shapefile, 20020621), Land Survey Lines of Indiana (polygon shapefile, 20020621) and County Boundaries of Indiana (polygon shapefile, 20020621), were all from the Indiana Geological Survey and based on a 1:24,000 scale, except the Bedrock Geology of Indiana (polygon shapefile, 20020318), which was at a 1:500,000 scale and Sinkhole Areas and Sinking-Stream Basins in Southern Indiana (polygon shapefile, 20020717), which were based on a 1:126,720 scale. Draft road shapefiles, System1 and System2 (line shapefiles, 2003), were from the Indiana Department of Transportation and based on a 1:24,000 scale. Populated Areas in Indiana 2000 (polygon shapefile, 20021000) was from the U.S. Census Bureau and based on a 1:100,000 scale. Streams27 (line shapefile, 20000420) was from the Center for Advanced Applications in GIS at Purdue University. Managed Areas 96 (polygon shapefile, various dates) was from IDNR.

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