BEDROCK AQUIFER SYSTEMS OF FAYETTE COUNTY, INDIANA

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. Hydraulic properties of bedrock aquifers are highly variable.

Most bedrock aquifers are under confined conditions, mainly a result of low vertical hydraulic conductivity clay-rich materials, such as glacial till, overlying the bedrock. Therefore, 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.

Two bedrock aquifer systems are identified for Fayette County. They are, from west to east and younger to older: the Silurian and Devonian Carbonates; and the Maquoketa Group of Ordovician age. Bedrock aquifer systems in Fayette County are overlain by unconsolidated deposits ranging from 5 feet thick along Sanes Creek in the southwestern corner to about 350 feet thick in the northwestern corner of Fayette County.

The unconsolidated sand and gravel outwash aquifers near the Whitewater River have far greater groundwater potential than any of the bedrock aquifers in the county. However, bedrock aquifers are used in Fayette County where unconsolidated sediments are relatively thin and unproductive. Approximately 20 percent of all wells in this county are completed in bedrock.

Silurian and Devonian Carbonates Aquifer System

In Fayette County the Silurian and Devonian Carbonates Aquifer System is located in much of the western portion of the county and consists only of the older Silurian age carbonates.

Wells completed in the Silurian and Devonian Carbonates Aquifer System are generally capable of meeting the needs of most domestic users. The depth to bedrock is commonly 25 to 100 feet. Domestic wells utilizing this system in Fayette County have reported depths ranging from 25 to 175 feet, but are commonly 65 to 120 feet deep. The amount of rock penetrated in this system ranges from 10 to 42 feet with a maximum penetration of 122 feet. Typical yields for domestic wells range from 2 to 10 gallons per minute (gpm), and static water levels are generally 10 to 25 feet below land surface. Significant drawdowns have been reported for this system. There are no registered significant groundwater withdrawal facilities utilizing this system.

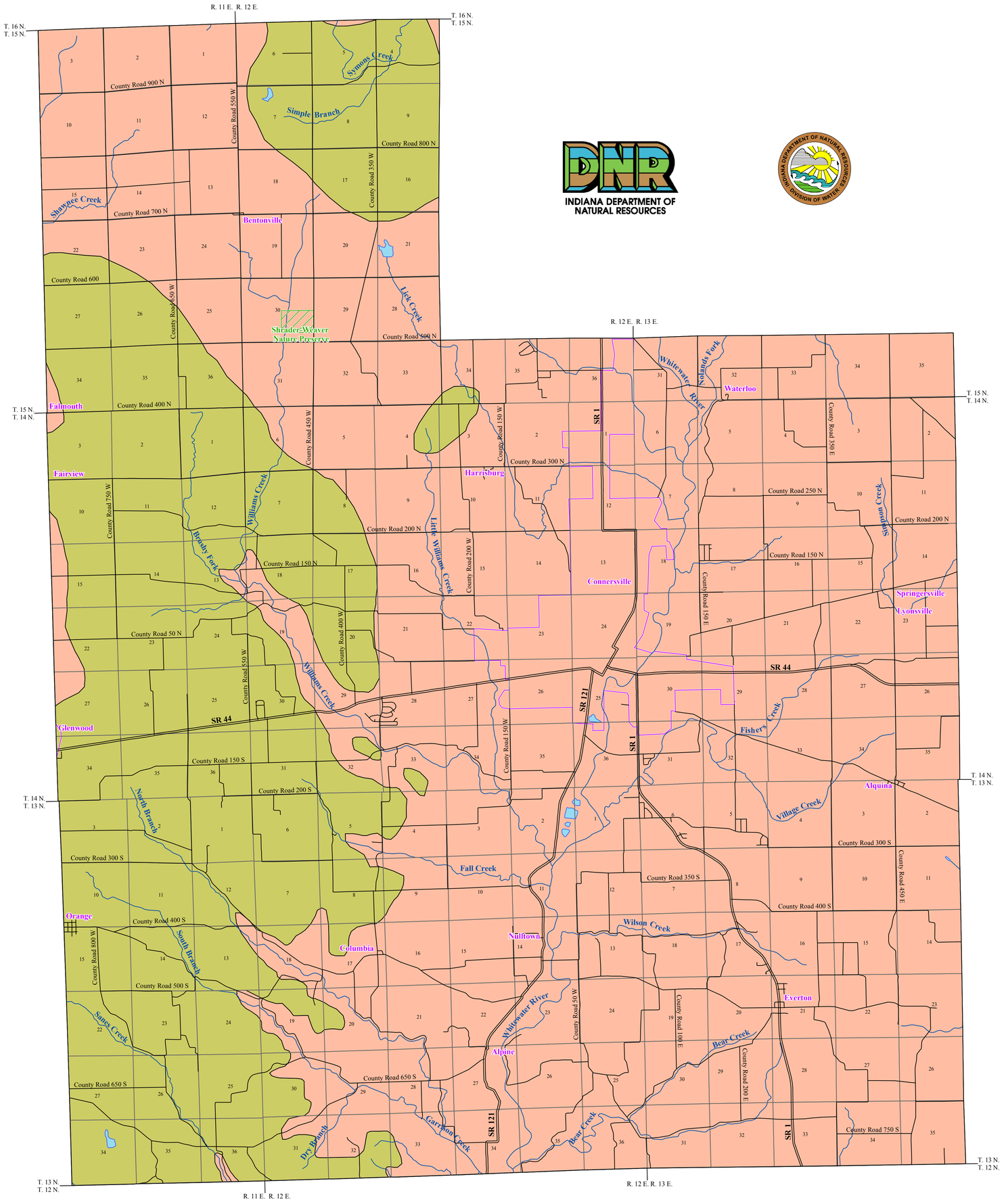
This aquifer system has a low susceptibility to surface contamination due to thick clay deposits over most of the county. However, the Silurian and Devonian Carbonates Aquifer System is moderately susceptible where overlying clay-rich till and residuum are thin or absent.

Ordovician -- Maquoketa Group Aquifer System

The Maquoketa Group aerial extent is nearly two thirds of Fayette County. The Maquoketa Group consists in ascending order of the Kope, Dillsboro, and Whitewater Formations. This bedrock aquifer system includes mostly shale with some interbedded limestone units and is considered a limited groundwater resource.

Depth to the bedrock surface in the Maquoketa Group Aquifer System ranges from 5 to 350 feet with reported total well depths between 25 to 361 feet, however, wells are typically constructed at depths between 60 and 145 feet. The amount of rock penetrated by these wells is commonly 12 to 66 feet with a maximum penetration of 279 feet. Well yields vary from about 2 to 8 gpm with static water levels ranging from 15 to 45 feet below surface. There are no registered significant groundwater withdrawal facilities in the Maquoketa Group Aquifer System.

Most of the Maquoketa Group Aquifer System in Fayette County is overlain by thick clay deposits. These areas are considered at low risk to contamination. However, in some places clay and residuum deposits are thin and/or sands and gravels directly overlie the bedrock surface. These areas are considered at high risk to contamination.



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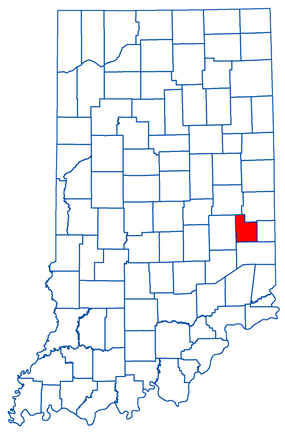
Location Map



1 0.5 0 1 Mile

1 0.5 0 1 Kilometer

EXPLANATION

- Stream
- County Road
- State Road & US Highway
- Municipal Boundary
- State Managed Property
- Lake & River

Map generated by Scott H. Dean
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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, 20050621) were all from the Indiana Geological Survey and based on a 1:24,000 scale, except the Bedrock Geology of Southwestern Indiana (polygon shapefile, 20001124), which was at a 1:500,000 scale. System1 and System2 were from the Indiana Department of Transportation (line shapefile, 2003) and based on a 1:24,000 scale. Managed Areas96 (polygon shapefile, various dates) was from IDNR. City Areas in Southwestern Indiana (polygon shapefile, 1999) was from ESRI and based on a 1:100,000 scale. Streams27 (line shapefile, 20000420) was from the Center for Advanced Applications in GIS at Purdue University.

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June 2011