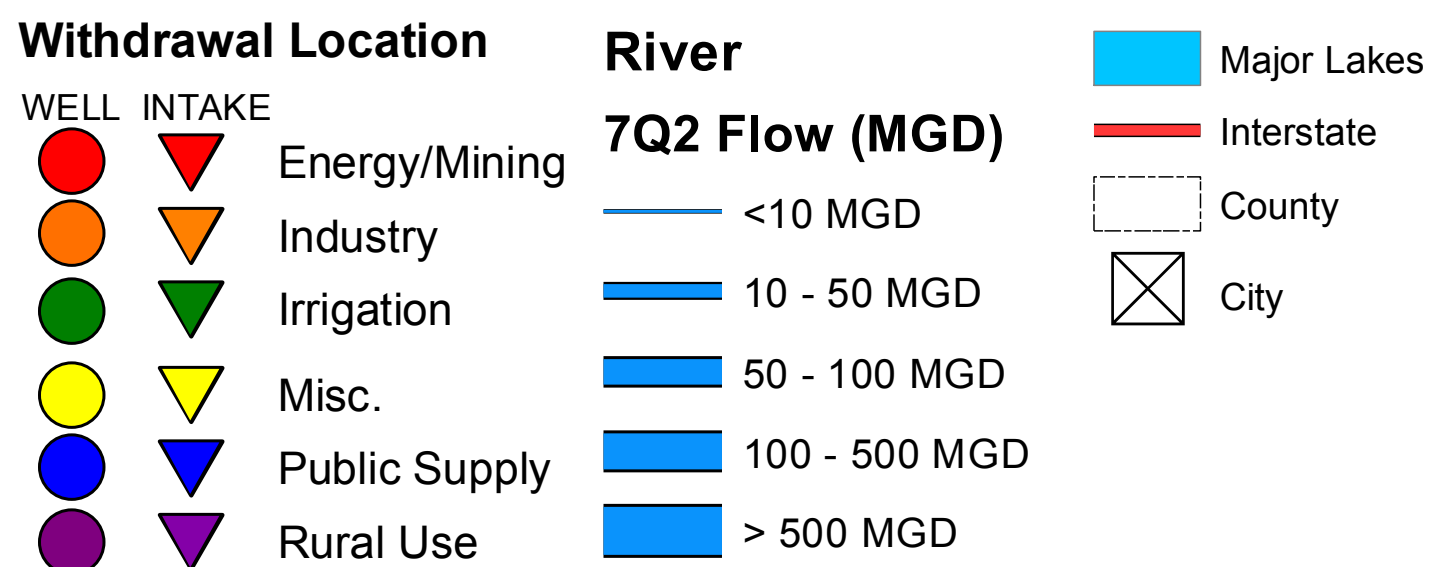


# Water Resources and Use in Fayette County

Data Sources: U.S. Geological Survey and Indiana Department of Natural Resources



# 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.

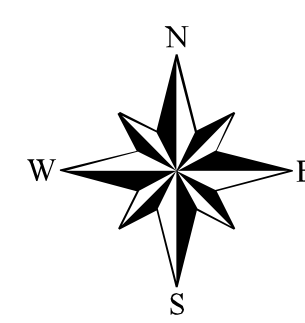
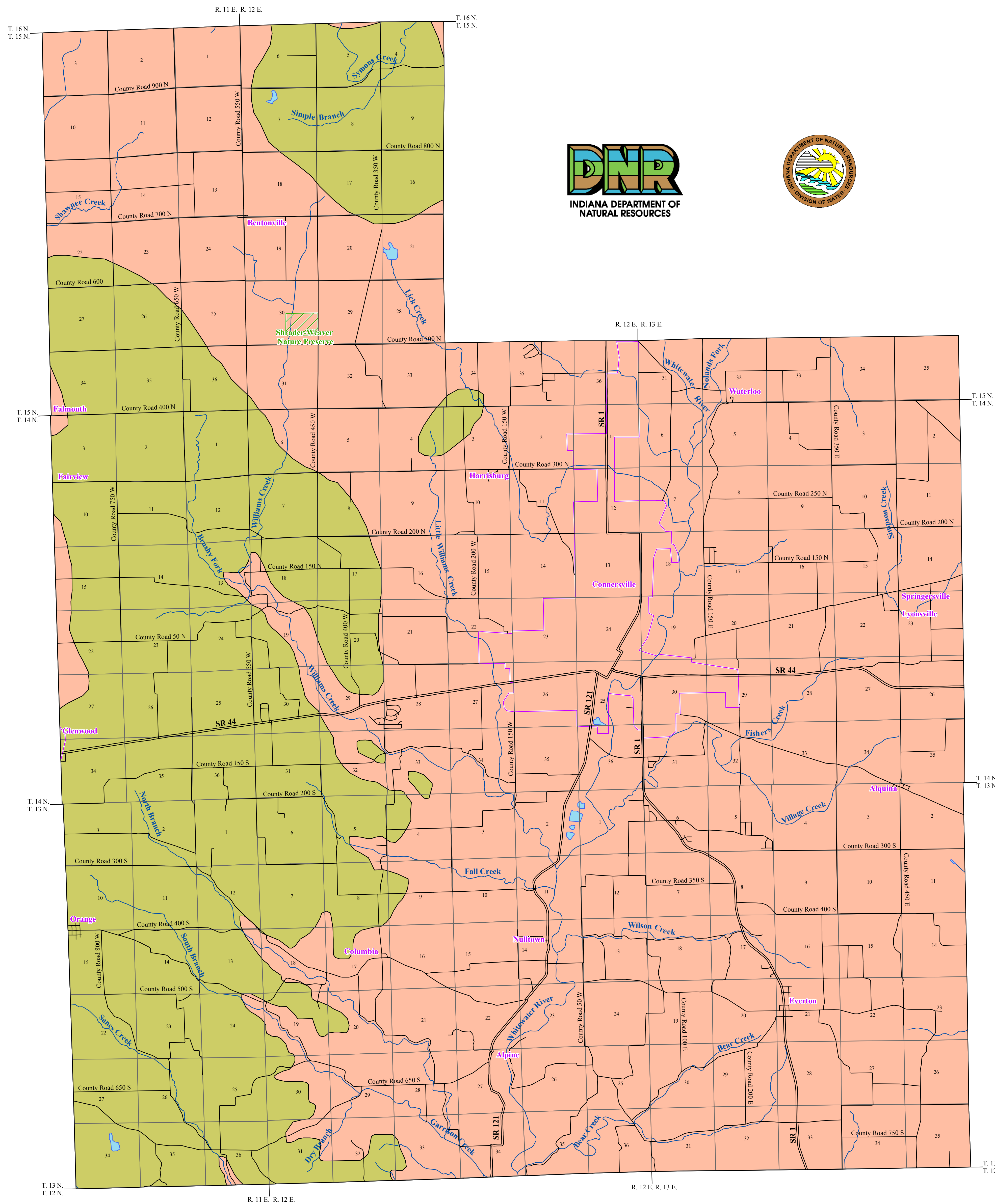
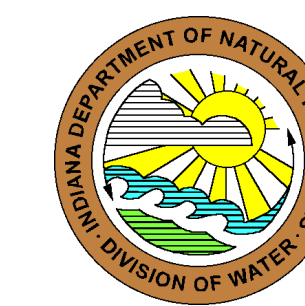
This aquifer system has a low susceptibility to surface contamination due to thick clay deposits over most of the county. However, the Silurian and Devonian Carbonates Aquifer System is moderately susceptible where overlying clay-rich till and residuum are thin or absent.

## Ordovician -- Maquoketa Group Aquifer System

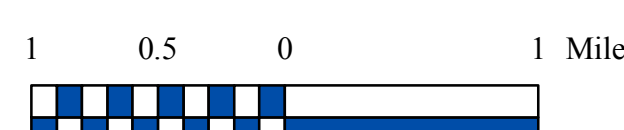
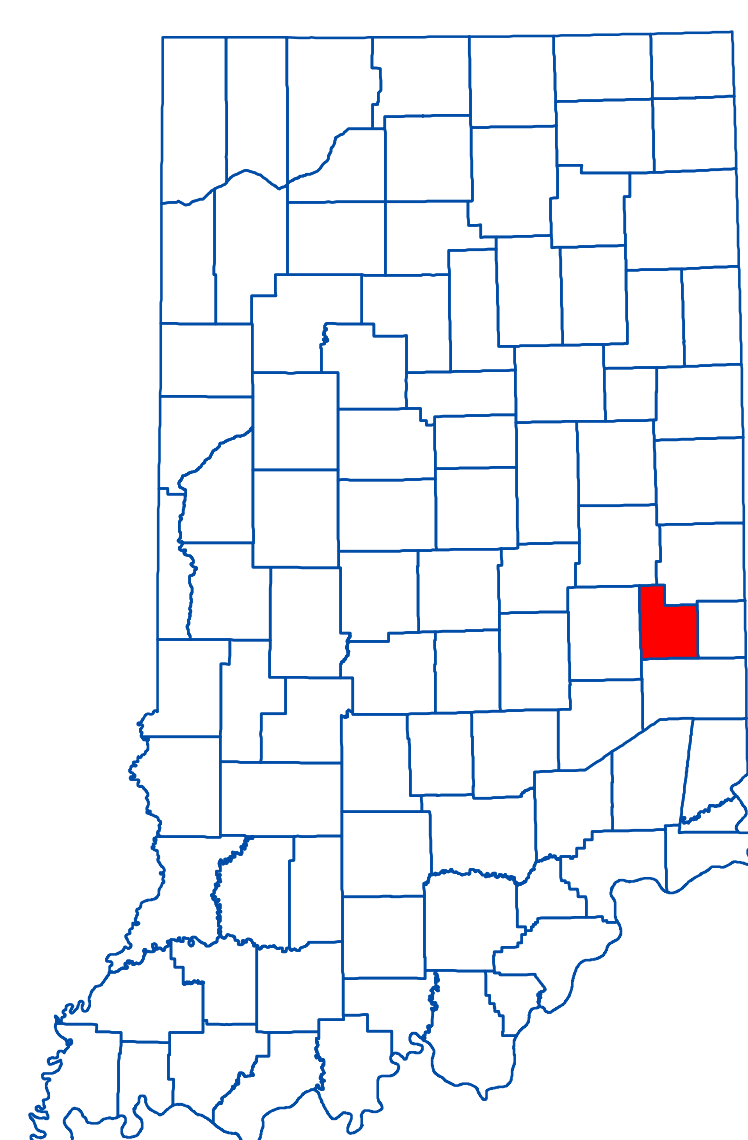
The Maquoketa Group aerial extent is nearly two thirds of Fayette County. The Maquoketa Group consists in ascending order of the Kope, Dillsboro, and Whitewater Formations. This bedrock aquifer system includes mostly shale with some interbedded limestone units and is considered a limited groundwater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



Location Map



### EXPLANATION

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

### Map Use and Disclaimer Statement

We request that the following agency be acknowledged in products derived from this map: Indiana Department of Natural Resources, Division of Water.

This map was compiled by staff of the Indiana Department of Natural Resources, Division of Water using data believed to be reasonably accurate. However, a degree of error is inherent in all maps. This product is distributed "as is" without warranties of any kind, either expressed or implied. This map is intended for use only at the published scale.

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.

### Bedrock Aquifer Systems of Fayette County, Indiana

by  
Robert A. Scott  
Division of Water, Resource Assessment Section

June 2011

# UNCONSOLIDATED AQUIFER SYSTEMS OF FAYETTE COUNTY, INDIANA

The unconsolidated aquifer systems of Fayette County are composed of sediments deposited by, or resulting from, a complex sequence of glacial, glacial meltwaters, and post-glacial precipitation events. Six unconsolidated aquifer systems have been mapped in Fayette County: the Dissected Till and Residuum / Till Veneer; the Dearborn Upland / New Castle Till; the Dearborn Upland / New Castle Till Subsystem; the Dearborn Upland / New Castle Complex; the Whitewater River Valley Outwash; and the Whitewater River Valley Outwash Subsystem. Because of the complicated glacial geology, boundaries of the aquifer systems in this county are commonly gradational and individual aquifers may extend across aquifer system boundaries. Approximately 80 percent of all wells in this county are completed in unconsolidated deposits.

The thickness of unconsolidated deposits in Fayette County is quite variable due to the deposition of glacial material over an uneven bedrock surface. Unconsolidated deposits reportedly are from 5 feet thick along Sines Creek in the southwest corner of Fayette County to about 350 feet thick in the northwest corner.

Regional estimates of aquifer susceptibility to contamination from the surface can differ considerably due to a wide range of variation within geologic environments. In addition, man-made structures such as poorly constructed water wells, unplugged or improperly abandoned wells, and open excavations can provide contaminant pathways that bypass the naturally protective clays.

## Dissected Till and Residuum / Till Veneer Aquifer System

The Dissected Till and Residuum / Till Veneer Aquifer System is mapped throughout much of Fayette County and is mapped as one system because they are similar in composition and aquifer characteristics. The Till Veneer Aquifer System includes areas in Fayette County where thin till, generally less than 50 feet thick, directly overlies an uneven bedrock surface. The Dissected Till and Residuum Aquifer System is located in the south-central part of Fayette County where glacial deposits are thin and includes weathered bedrock materials. Also, along some of the major streams this system may include thin alluvium and surficial sands and gravels that directly overlie the bedrock surface.

The potential for groundwater production in the Dissected Till and Residuum / Till Veneer Aquifer System is generally low with the majority of wells being completed in the underlying bedrock. Wells producing from this system are often large-diameter bored (bucket rig) wells that produce water from thin seams of coarse-grained material. Typically these wells are constructed at depths of 25 to 38 feet with either 30 or 36 inch diameter porous casing; these wells are built to maximize storage and are generally adequate for domestic use.

Wells in this system typically have reported capacities of 5 gallons per minute (gpm) or less with some wells being reported as "dry". Static water levels range between 6 to 22 feet below the surface. There are no registered significant groundwater withdrawal facilities utilizing this system.

The Dissected Till and Residuum / Till Veneer Aquifer System is generally not very susceptible to contamination from surface sources because of the low permeability of the near-surface materials. However, there are areas where protective clay layers are thin or absent. These areas are very susceptible to contamination.

## New Castle Till Aquifer System

The New Castle Till Aquifer System is mapped along the western portion of Fayette County as well as areas in the central, northeastern, and southeastern parts of the county. This system is capable of meeting the needs of some domestic users in the county. However, about 10 percent of wells started in this subsystem in Fayette County are completed in the underlying bedrock aquifer system.

Potential aquifer materials in the New Castle Till Aquifer System include discontinuous intertill sand and gravel deposits that range in thickness from 2 to 16 feet and are generally overlain by 10 to 60 feet of till. The wells producing from this system are completed at depths ranging from 40 to 85 feet. Domestic well yields are generally 10 to 20 gpm and static water levels range from 10 to 40 feet below the surface. There is one registered significant groundwater withdrawal facility (2 wells) in the New Castle Till Aquifer System. The reported production for each of the high-capacity wells is 115 gpm and 270 gpm.

A small part of the New Castle Till Aquifer System overlies a buried bedrock valley in northwestern Fayette County that is approximately 300 feet deep. The wells completed in this portion of the system produce from the upper sand and gravel aquifers. The wells range in depth from about 35 to 85 feet. Reported well yields range from 10 to 16 gpm with static water levels from 10 to 20 feet below the surface.

This system is generally not very susceptible to surface contamination because intertill sand and gravel units are overlain by thick till deposits. Wells producing from shallow aquifers are moderately to highly susceptible to contamination.

## Dearborn Upland / New Castle Till Aquifer Subsystem

The Dearborn Upland / New Castle Till Aquifer Subsystem is mapped throughout much of Fayette County. This subsystem is capable of meeting the needs of some domestic users in the county. However, about 20 percent of wells started in this subsystem in Fayette County are completed in the underlying bedrock aquifer system.

Potential aquifer materials in the Dearborn Upland / New Castle Till Aquifer Subsystem include relatively thin, discontinuous intertill sand and gravel deposits ranging from 2 to 15 feet thick with overlying clay layers ranging from 10 to 45 feet thick. The wells producing from this subsystem are completed at depths ranging from 35 to 70 feet. Domestic well yields are generally 5 to 10 gpm and static water levels range up to 35 feet below the surface. There are no registered significant groundwater withdrawal facilities utilizing this subsystem.

A small part of the Dearborn Upland / New Castle Till Aquifer Subsystem overlies a deep buried bedrock valley in west-central Fayette County. The one reported well completed in this portion of the system produces from a lower sand and gravel aquifer that is 12 feet thick with 120 feet of overlying clay. The well was completed at a depth of 132 feet. The reported well yield is 13 gpm with a static water level of 31 feet below the surface.

This subsystem is generally not very susceptible to surface contamination because intertill sand and gravel units are overlain by thick till deposits. Wells producing from shallow aquifers are moderately to highly susceptible to contamination.

## Dearborn Upland / New Castle Complex Aquifer System

The Dearborn Upland / New Castle Complex Aquifer System is mapped in the northwest corner and in the central portion of Fayette County. This system is capable of meeting the needs of domestic users in the county. All reported wells started in this system in Fayette County are completed in the unconsolidated material of this aquifer system.

Potential aquifer materials in the Dearborn Upland / New Castle Complex Aquifer System include multiple discontinuous units of intertill sand and gravel deposits that range in thickness from 12 to 50 feet and are generally overlain by 4 to 12 feet of clay. The wells producing from this system are completed at depths ranging from 32 to 85 feet. Domestic well yields are generally 10 to 30 gpm and static water levels range from 15 to 60 feet below the surface. There are no registered significant groundwater withdrawal facilities utilizing this system.

A small part of the Dearborn Upland / New Castle Complex Aquifer System overlies a deep buried bedrock valley located in the northwest corner of Fayette County that may reach a maximum depth of 350 feet as reported in wells located in Rush County. The wells completed in this portion of the system produce from the upper sand and gravel aquifers. The wells range in depth from about 40 to 65 feet. Reported well yields range from 10 to 20 gpm with static water levels from 15 to 35 feet below the surface.

This system is generally not very susceptible to surface contamination because intertill sand and gravel units are overlain by thick till deposits. Wells producing from shallow aquifers are moderately to highly susceptible to contamination.

## Whitewater River Valley Outwash Aquifer System

The Whitewater River Valley Outwash Aquifer System is mapped along the Whitewater River from the north-central part to the central portion of Fayette County. The system includes thick glacial outwash sands and gravels, that are (in some areas) capped by a layer of clay and/or silt deposits.

The Whitewater River Valley Outwash Aquifer System is capable of meeting the needs of both domestic and high-capacity users in Fayette County. The wells utilizing this aquifer system are completed at depths from about 25 to over 110 feet with sand and gravel aquifer materials ranging from 8 to 58 feet thick. Domestic well yields are typically 10 to 40 gpm with static water levels ranging from flowing to 30 feet below the surface. There are 5 registered significant groundwater withdrawal facilities (13 wells) in the Whitewater River Valley Outwash Aquifer System. Reported production for these high-capacity wells range from 80 to 1,200 gpm.

This system is highly susceptible to surface contamination where sand and gravel deposits are near the surface and have little or no overlying clay deposits.

## Whitewater River Valley Outwash Aquifer Subsystem

The Whitewater River Valley Outwash Aquifer Subsystem is mapped along the Whitewater River from central Fayette County to the southern county boundary and along portions of North Branch Garrison Creek located in the south-central part of the county. This subsystem is mapped similar to the Whitewater River Valley Outwash Aquifer System; however, aquifer materials in the Whitewater River Valley Outwash Aquifer Subsystem are generally thinner and potential yields are less in the subsystem.

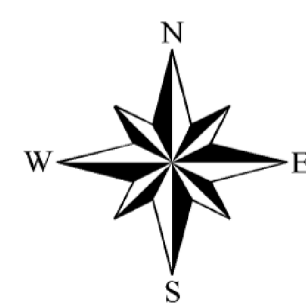
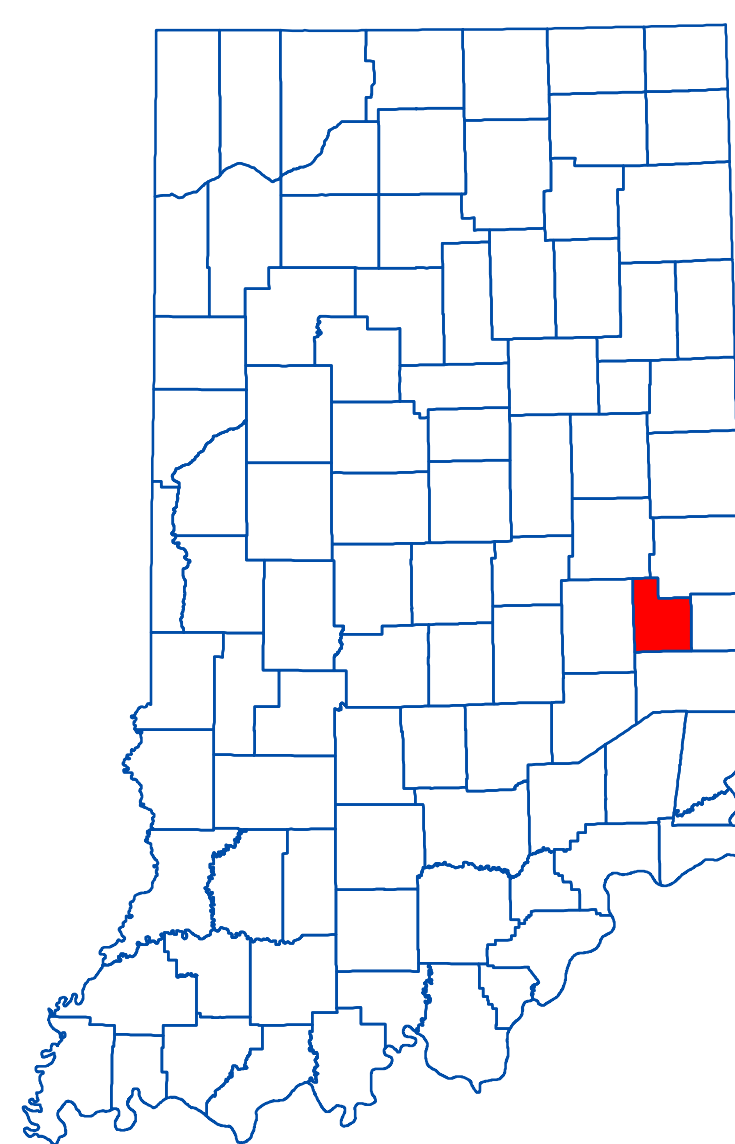
The Whitewater River Valley Outwash Aquifer Subsystem has the potential to meet the needs of domestic and some high-capacity users. The wells in this subsystem are completed at depths ranging from 30 to 60 feet. Aquifer materials include sand and gravel deposits commonly 20 to 42 feet thick with overlying clay ranging from 2 to 12 feet. Domestic well yields range from 10 to 30 gpm with static water levels ranging from flowing to 35 feet below the surface. There are no registered significant groundwater withdrawal facilities utilizing this subsystem.

Areas within the subsystem that have overlying clay deposits are moderately susceptible to surface contamination; however, areas lacking overlying clay deposits are highly susceptible to contamination.

## EXPLANATION

- Registered Significant Groundwater Withdrawal Facility
- Stream
- County Road
- State Road & US Highway
- Southern Limit of Wisconsin Glacial Deposits
- Municipal Boundary
- State Managed Property
- Lake & River

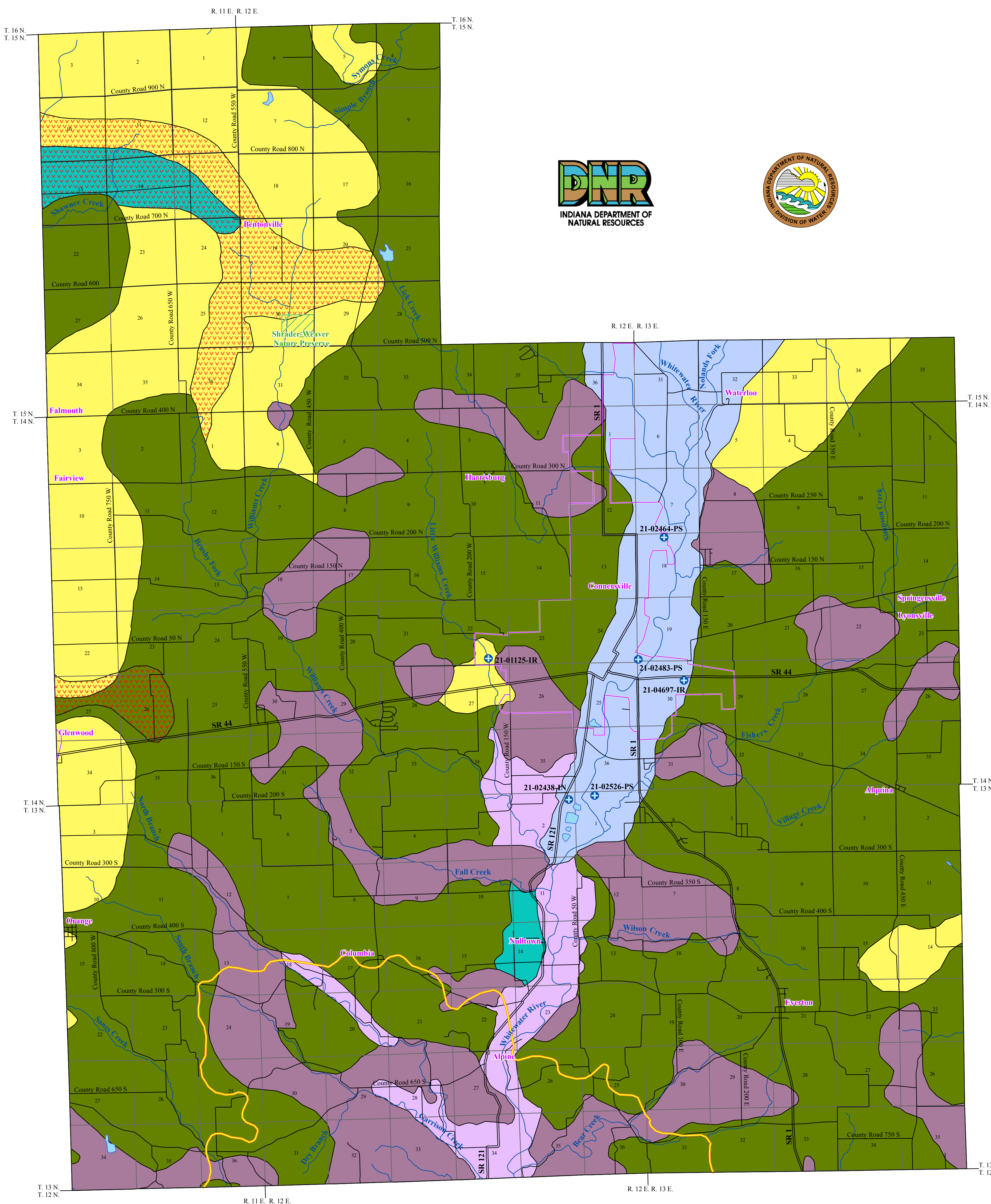
## Location Map



## Map Use and Disclaimer Statement

We request that the following agency be acknowledged in products derived from this map: Indiana Department of Natural Resources, Division of Water.

This map was compiled by staff of the Indiana Department of Natural Resources, Division of Water using data believed to be reasonably accurate. However, a degree of error is inherent in all maps. This product is distributed "as is" without warranties of any kind, either expressed or implied. This map is intended for use only at the published scale.



# Fayette County

