

Water Resources and Use in Decatur County

- | | |
|----------------------------|-----------------------|
| Withdrawal Location | River |
| WELL INTAKE | 7Q2 Flow (MGD) |
| ● Energy/Mining | — <10 MGD |
| ● Industry | — 10 - 50 MGD |
| ● Irrigation | — 50 - 100 MGD |
| ● Misc. | — 100 - 500 MGD |
| ● Public Supply | — > 500 MGD |
| ● Rural Use | |

Major Lakes (Blue square)

Interstate (Red line)

County (Dashed line)

City (Square with X)

INTERA
GEOSCIENCE & ENGINEERING SOLUTIONS

NORTH (North arrow)

Miles (Scale bar: 0, 1, 2, 4)

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

BEDROCK AQUIFER SYSTEMS OF DECATUR 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 Decatur County, rock types exposed at the bedrock surface are 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. 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 zone.

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.

Two bedrock aquifer systems are identified for Decatur County. They are, from west to east and younger to older: the Silurian and Devonian Carbonates and the Maquoketa Group of Ordovician age. Bedrock aquifers are not highly productive in this county. However, bedrock wells represent about 75% of all wells completed in the county.

The quality of water in bedrock aquifer systems in this county is generally acceptable for domestic use. 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.

Silurian and Devonian Carbonates Aquifer System

In Decatur 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 in much of the eastern half of the county and in several pre-glacial 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 in Decatur County ranges from 0 to about 125 feet.

Wells completed in the Silurian and Devonian Carbonates Aquifer System are generally capable of meeting the needs of domestic users and some high-capacity users in this county. Domestic wells utilizing this system in Decatur County have reported depths ranging from 19 to 265 feet, but are commonly 50 to 100 feet deep. The amount of rock penetrated in this system typically ranges from 12 to 45 feet, although many of the deeper wells also reach the upper portion of the underlying Maquoketa Group. Typical yields for domestic wells range from 4 to 20 gallons per minute (gpm) and static water levels are generally 1 to 35 feet below land surface. However, several dry holes have been reported.

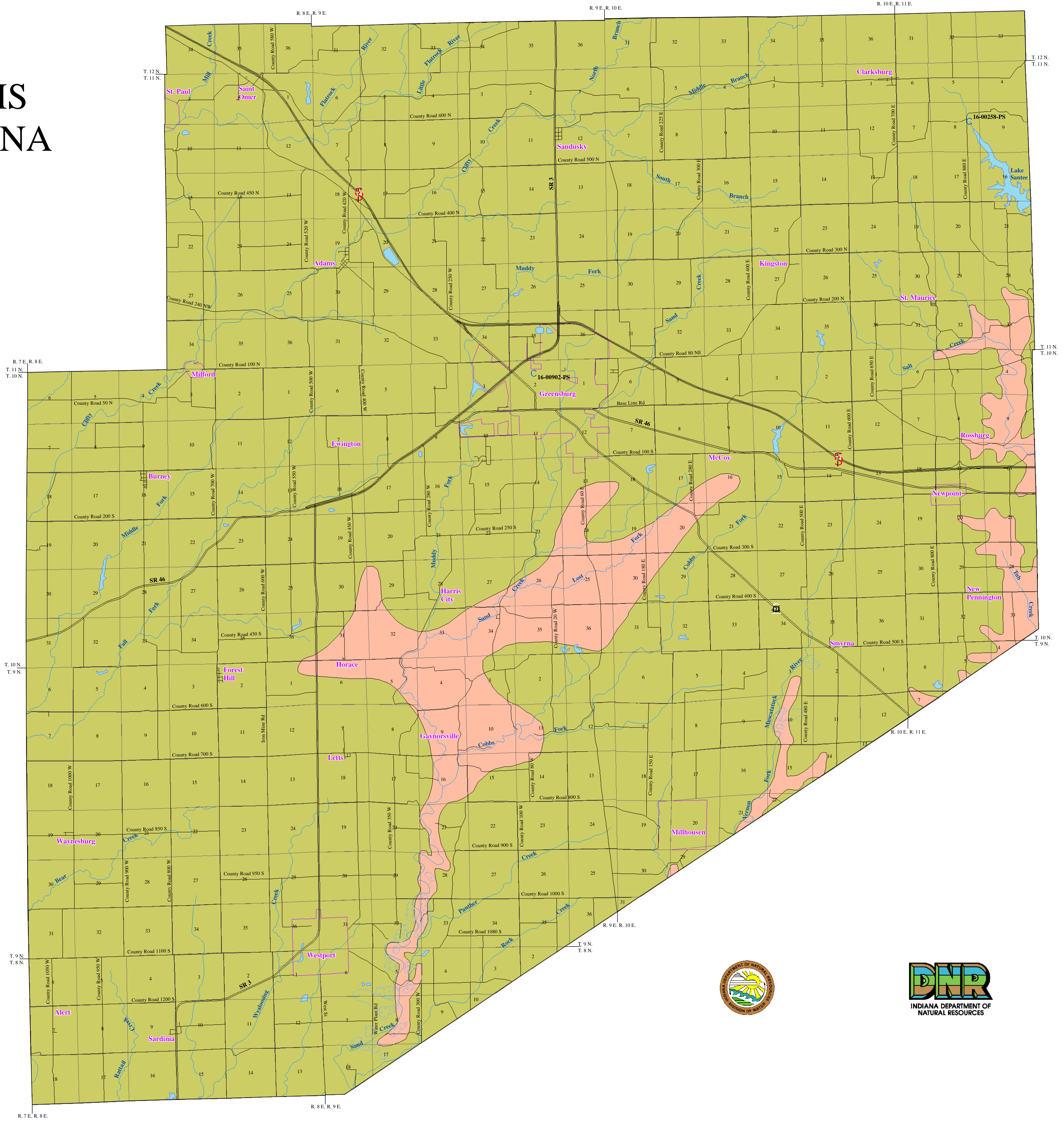
This aquifer system has a low susceptibility to surface contamination due to thick clay deposits over most of the county. However, the Silurian and Devonian Carbonates Aquifer System is moderately susceptible where overlying clay-rich till and residuum are thin or absent.

Ordovician -- Maquoketa Group Aquifer System

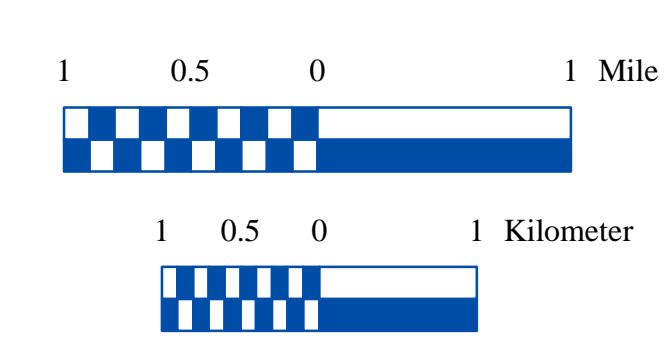
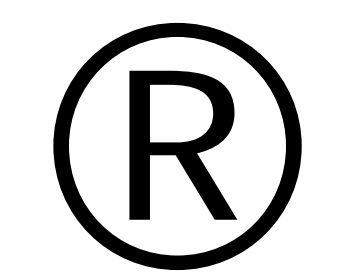
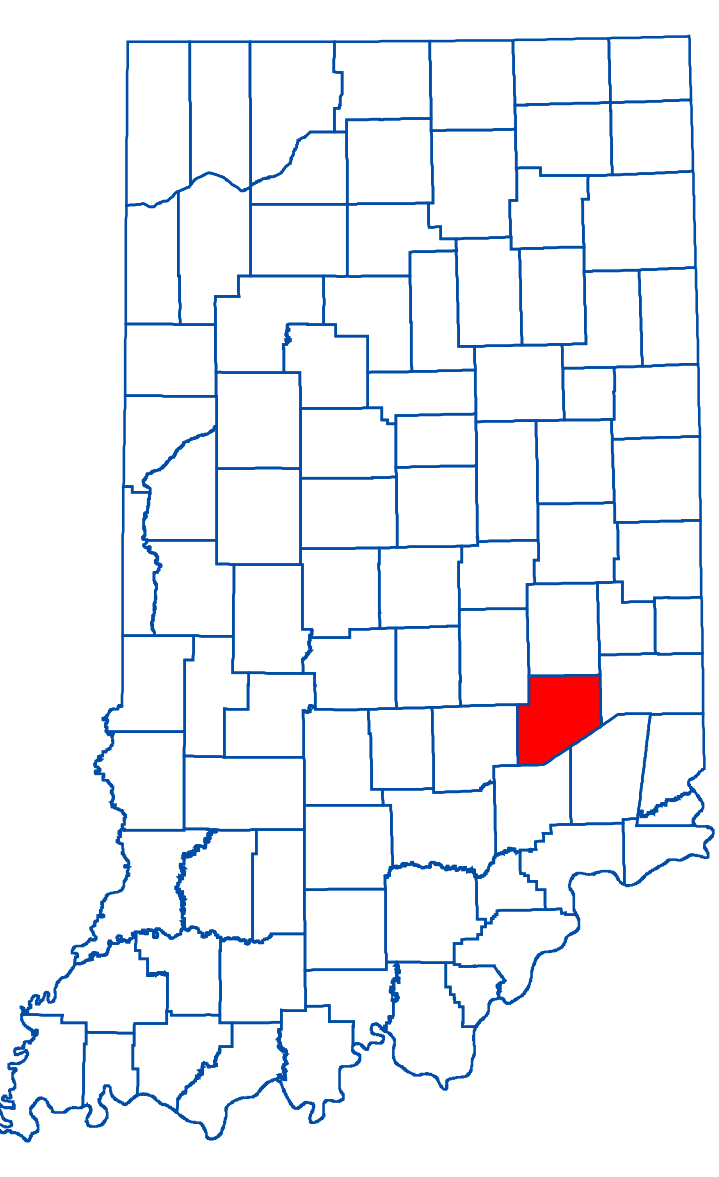
The outcrop/subcrop area of this aquifer system is limited to the deeply incised stream valleys (Sand Creek, Cobbs Fork, and Lost Fork) in south-central Decatur County and (Salt Creek, Tub Creek, and Vernon Fork Muscatatuck River) in the southeastern part of the county. The Maquoketa Group consists mostly of shales with interbedded limestone units. Although this system is approximately 700 to 850 feet thick in the county, typically little more than the top 100 feet is used for water production.

Wells completed in this system are generally capable of meeting the needs of domestic users in this county. Nearly 80% of the wells utilizing the Maquoketa Group Aquifer System penetrate the overlying thin-bedded Silurian and Devonian Carbonates. Some wells completed in the Maquoketa Group Aquifer System are open to and receive some water from the Silurian and Devonian Carbonates Aquifer System. Wells utilizing the Maquoketa Group Aquifer System in Decatur County have reported depths ranging from 28 to 265 feet, but are commonly 85 to 130 feet deep. The amount of rock penetrated in this system typically ranges from 55 to 95 feet. Typical yields for domestic wells range from 1.5 to 10 gpm and static water levels are commonly 12 to 40 feet below land surface. However, several dry holes have been reported.

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



Location Map



EXPLANATION

- Registered Significant Ground-Water Withdrawal Facility
- Stream
- County Road
- State Road & US Highway
- Interstate
- Lake & River
- Municipal Boundary
- Sinking-Stream Basin
- Sinkhole Area

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, 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 1:50,000 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) as 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.



Bedrock Aquifer Systems of Decatur County, Indiana

by
Gregory P. Schrader
Division of Water, Resource Assessment Section

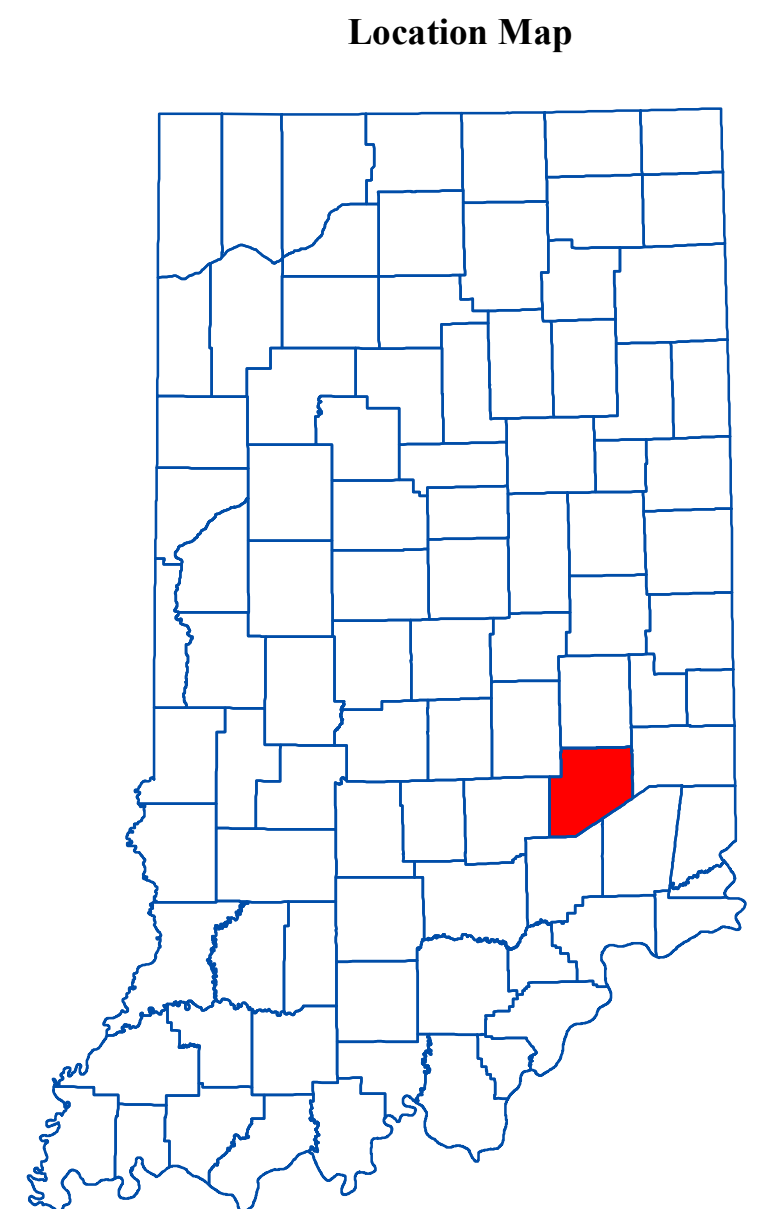
March 2006

UNCONSOLIDATED AQUIFER SYSTEMS OF DECATUR COUNTY, INDIANA

Three unconsolidated aquifer systems have been mapped in Decatur County: the Dissected Till and Residuum, the New Castle Till, and the Muscatatuck Plateau / New Castle Till Aquifer Subsystem. The first system includes deposits left by continental ice sheets as well as eroded residuum (a product of bedrock weathering). The next two systems comprise sediments deposited by, or resulting from, glaciers, glacial meltwaters, and post-glacial precipitation events. Boundaries of these aquifer systems are commonly gradational and individual aquifers may extend across aquifer system boundaries.

The thickness of unconsolidated deposits in the county is quite variable. In places where only residuum or thin drift is present, sediments overlying bedrock are less than 5 feet thick and bedrock is exposed along portions of Fall Fork near the western county line. However, the thickness of unconsolidated materials is as much as 160 feet where sequences of till and outwash have been stacked above the deepest parts of buried bedrock valleys in northwestern and western Decatur County.

Regional estimates of aquifer susceptibility to contamination from the surface can differ considerably from local reality. Variations within geologic environments can cause variation in susceptibility to surface contamination. 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 Aquifer System

This aquifer system, which covers about 73 percent of Decatur County, is the most limited groundwater resource of the unconsolidated aquifer systems in the county. Unconsolidated deposits of this aquifer system consist predominantly of fill with thin layers of stratified drift and of thin, eroded bedrock residuum. Also included in this aquifer system in many stream valleys are relatively thin deposits of alluvium and colluvium. Total thickness of the Dissected Till and Residuum Aquifer System generally ranges from about 20 to 45 feet, except in the northeastern part of the county where this system is typically 30 to 70 feet thick.

In Decatur County, potential aquifer units within this system include thin sand and/or gravel layers that are typically less than 2 feet thick and are generally separated by tills within the saturated zone. Large-diameter bored (bucket rig) wells are commonly used in this county to produce water from these thin seams of coarse-grained material. Typically constructed at depths of 30 to 45 feet with 30-inch diameter porous casing, these wells are built to maximize storage and are generally adequate for domestic use. These wells typically yield 0.5 to 6 gallons per minute (gpm) and static water levels are generally 14 to 30 feet below land surface. Because the near-surface materials generally have low permeability, this system is not very susceptible to contamination from surface sources.

New Castle Till Aquifer System

This system is mapped in the northwestern part of Decatur County. In much of this area, till and outwash were deposited in preexisting bedrock valleys. The New Castle Till Aquifer System is primarily composed of glacial till with discontinuous intratill sand and gravel layers. In Decatur County the New Castle Till Aquifer System typically ranges from 45 to 95 feet thick, but in places the thickness exceeds 160 feet. Potential aquifer materials include outwash sands and/or gravels that typically range from 5 to 20 feet thick and are generally overlain by 25 to 50 feet of till.

The New Castle Till Aquifer System is capable of meeting the needs of domestic and some high-capacity users. However, there are no registered significant ground water withdrawal facilities utilizing this system in Decatur County. Wells are commonly 40 to 30 feet deep. Domestic well capacities are typically 7 to 20 gallons per minute and static water levels are generally 10 to 30 feet below surface.

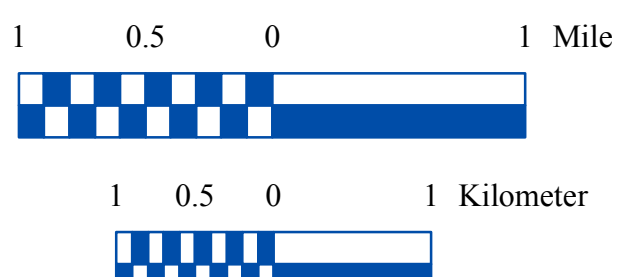
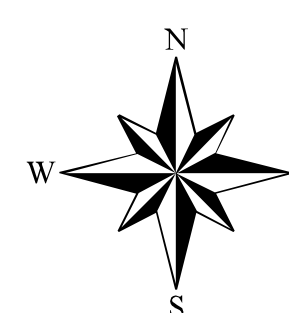
The New Castle Till Aquifer System has a low susceptibility to surface contamination because intratill sand and gravel units are generally separated from the surface by till layers within the system.

Muscatatuck Plateau / New Castle Till Aquifer Subsystem

The Muscatatuck Plateau / New Castle Till Aquifer Subsystem is mapped predominantly as a northeast-southwest trending band in central and western Decatur County. In this area till and outwash were deposited in preexisting bedrock valleys. Nearly all of the Muscatatuck Plateau / New Castle Till Aquifer Subsystem in this band that lies east of the town of Horace also includes a thick cap of till associated with the Wisconsin terminal moraine. In southern and eastern parts of the county, this aquifer system consists primarily of pre-Wisconsin glacial till with discontinuous intratill sand and gravel layers. In Decatur County the Muscatatuck Plateau / New Castle Till Aquifer Subsystem ranges from 18 to 160 feet in thickness, but is commonly 55 to 95 feet thick.

This aquifer system is generally capable of meeting the needs of domestic users. In Decatur County, nearly 40 percent of the reported wells penetrating this system were completed in unconsolidated materials rather than in the underlying bedrock. Wells in the Muscatatuck Plateau / New Castle Till Aquifer Subsystem are commonly completed at depths ranging from 45 to 95 feet. About 40 percent of these wells are large-diameter (bucket-rig) wells which are constructed using 30-inch diameter porous casing to allow for maximum storage. Potential aquifer materials within the glacial till include discontinuous intratill sand and gravel layers. Individual sand and gravel units are commonly 3 to 15 feet thick. Domestic wells typically yield from 4 to 20 gpm and static water levels are generally 18 to 45 feet below land surface.

The Muscatatuck Plateau / New Castle Till Aquifer Subsystem has a low susceptibility to surface contamination because intratill sand and gravel units are generally separated from the surface by till layers within the system.

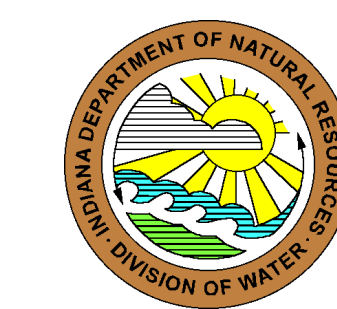
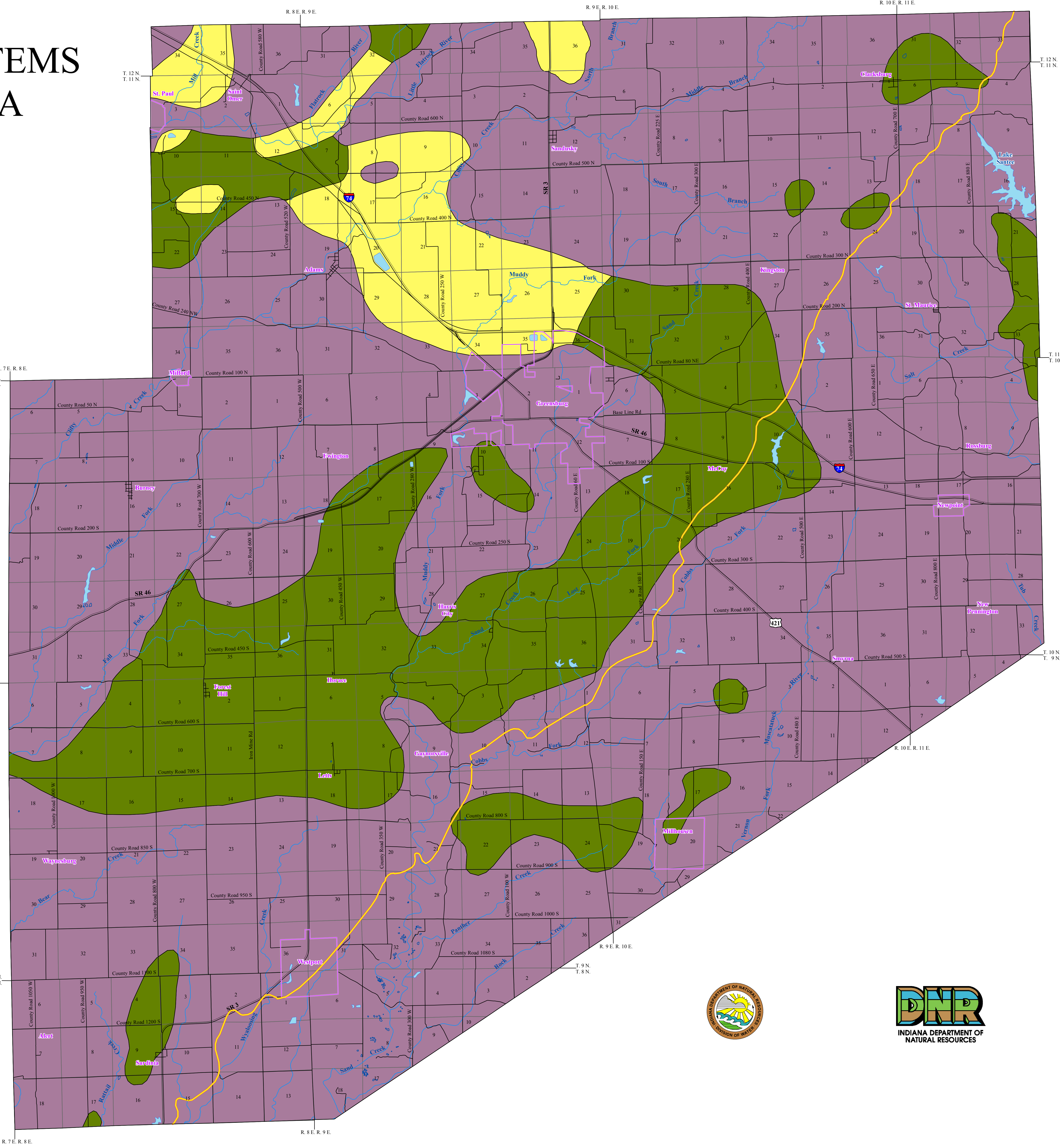


EXPLANATION

- Stream
- County Road
- State Road & US Highway
- Interstate
- Wisconsin Glacial Limit
- Municipal Boundary
- USGS Closed Contour (Mostly Karst Depressions)
- 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.



Unconsolidated Aquifer Systems of Decatur County, Indiana

by
Gregory P. Schrader
Division of Water, Resource Assessment Section

March 2006

Map generated by Jennifer K. McMillan, Joseph L. Phillips, and Adam B. Watts
DNR, Division of Water, Resource Assessment Section

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 from the Indiana Geological Survey and based on a 1:24,000 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. Large-Scale D1-G Hypsography data (line shapefile, various dates) was from the US Geological Survey and based on a 1:24,000 scale. Unconsolidated Aquifer Systems coverage (Schrader, 2006; modified 2011) was based on a 1:24,000 scale.

Decatur County

