

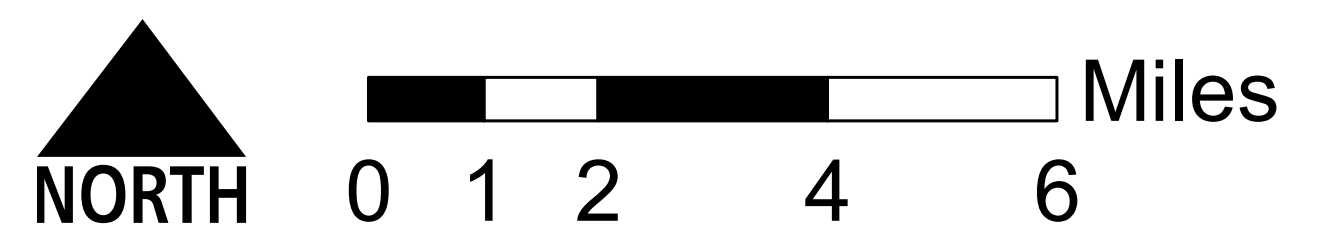
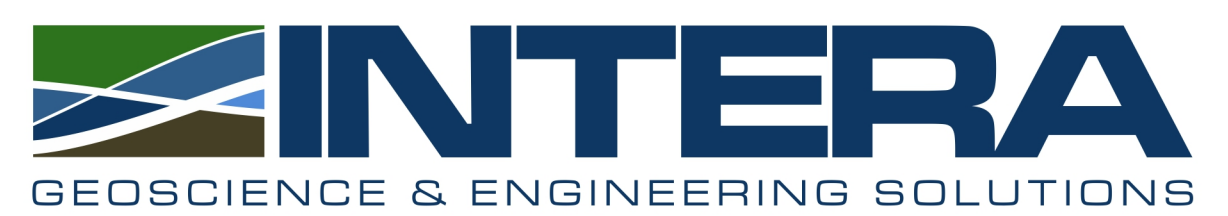
Water Resources and Use in Jasper County

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

- Withdrawal Location**
- | | | |
|---------------|------------|---------------|
| WELL | INTAKE | Energy/Mining |
| Industry | Irrigation | Misc. |
| Public Supply | Rural Use | |

- River**
- 7Q2 Flow (MGD)**
- | |
|---------------|
| <10 MGD |
| 10 - 50 MGD |
| 50 - 100 MGD |
| 100 - 500 MGD |
| > 500 MGD |

- | |
|-------------|
| Major Lakes |
| Interstate |
| County |
| City |



BEDROCK AQUIFER SYSTEMS OF JASPER 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 Jasper County thickness of unconsolidated deposits overlying bedrock ranges from less than 2 feet in the east-central and southern portions of the county where bedrock is shallow to as much as 174 feet in the southwest portion of the county where a buried bedrock valley is present.

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.

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.

Five bedrock aquifer systems are identified for Jasper County. They are the Pennsylvanian-Raccoon Creek Group Aquifer System, the Devonian and Mississippian-New Albany Shale Aquifer System, the Devonian and Mississippian-Coldwater, Elsworth, and Antrim Shales Aquifer System, the Silurian and Devonian Carbonates Aquifer System, and the Silurian and Devonian Carbonates Aquifer System.

Pennsylvanian -- Raccoon Creek Group Aquifer System

The Raccoon Creek Group Aquifer System outcrop/subcrop area occurs in a small area of southern Jasper County. Bedrock consists of mostly sandstone and shale with minor amounts of mudstone, coal, and limestone. The basal formation of the Raccoon Creek Group, the Mansfield Formation, rests unconformably on Mississippian rocks. The Raccoon Creek Group is generally considered a limited groundwater resource. However, the Mansfield Formation is considered a moderately dependable source of groundwater.

Few wells are available in the Raccoon Creek Group subcrop area. Depth to bedrock ranges from 2 to 24 feet. Wells completed in the Raccoon Creek Group are typically 55 to 107 feet deep with 27 to 142 feet of penetration into the bedrock. Domestic well capacities range from 11 to 30 gallons per minute (gpm) with static water levels of 7 to 65 feet below surface. Greater capacities have been reported in isolated areas. However, greater yields are commonly associated with significant to complete drawdown.

Clay materials that overlie bedrock generally range in thickness from 2 to 24 feet. In general the Raccoon Creek Group has a low susceptibility to surface contamination; however, shallow wells where unconsolidated deposits are thin are moderately to highly susceptible.

Mississippian -- Borden Group Aquifer System

The Borden Group Aquifer System outcrop/subcrop area is limited to a small area of southwestern Jasper County. This bedrock aquifer system is composed of siltstone and shale, but fine-grained sandstones are also common. Although carbonates are rare, discontinuous interbedded limestone lenses are present, mainly in the upper portion of the group.

Few wells are available in the Borden Group in Jasper County. Total well depths range from 40 to 285 feet with depths to bedrock generally 5 to 105 feet. Reported well yields range from 1 to 25 gpm with static water levels of 5 to 85 feet below surface.

The Borden Group is composed primarily of fine-grained materials and is overlain with thick clay materials. The Borden Group Aquifer System, susceptibility to contamination introduced at or near the surface is low.

Devonian and Mississippian--New Albany Shale Aquifer System

The New Albany Shale Aquifer System in Jasper County is an extremely limited groundwater resource. The subcrop area for the New Albany Shale is present in much of the southern third of Jasper County. This aquifer system consists mostly of brownish-black carbon-rich shale, greenish-gray shale, and minor amounts of dolomite and dolomitic quartz sandstone. Thickness of the New Albany Shale in Jasper County reportedly ranges from 2 to 198 feet.

Few wells are completed in the New Albany Shale Aquifer System. Approximately 63 percent of bedrock wells in the New Albany subcrop area bypass the shale in favor of the underlying Silurian Devonian Carbonates Aquifer System. This aquifer system is considered a poor groundwater resource and is generally described as an aquitard. However, a few domestic wells are completed in this system. Total well depths range from 30 to 146 feet with 2 to 113 feet of penetration into bedrock. Typical yields are 7 gpm or less with some dry holes reported. Capacities up to 20 gpm have been reported but are commonly associated with greater drawdown. Static water levels range from 3 to 39 feet below ground surface.

Because the permeability of shale materials is considered low and thick clay deposits generally overlie the New Albany Shale Aquifer System, susceptibility to contamination introduced at or near the surface is low.

Devonian and Mississippian--Coldwater, Elsworth, and Antrim Shales Aquifer System

In Jasper County only the Elsworth and Antrim Shales subcrop in the Coldwater, Elsworth and Antrim Shales Aquifer System. The Elsworth Shale overlies the Antrim Shale and is composed of alternating beds of gray-green to brownish black shale. The Elsworth Shale subcrop in a small area of the northeastern corner of Jasper County. The Antrim Shale is typically described as brownish-black shale and subcrop in northeastern and a portion of west-central Jasper County. Shale is commonly considered an aquitard and therefore, the system is an extremely limited groundwater resource. However, in some places the lower portion of the Antrim Shale may contain some limestone.

Depth to bedrock surface ranges from 35 to 153 feet with reported thickness of the shale in the subcrop areas ranging from 5 to 97 feet. Most wells bypass the shale in favor of the underlying Silurian and Devonian Carbonates Aquifer System or utilize the overlying unconsolidated resources. However, a few wells report capacities up to 15 gpm with static water levels up to 90 feet below surface.

Because the permeability of shale materials is considered low, susceptibility to contamination introduced at or near the surface is low. However, areas where outwash deposits directly overlie fractured bedrock are at moderate to high risk to contamination.

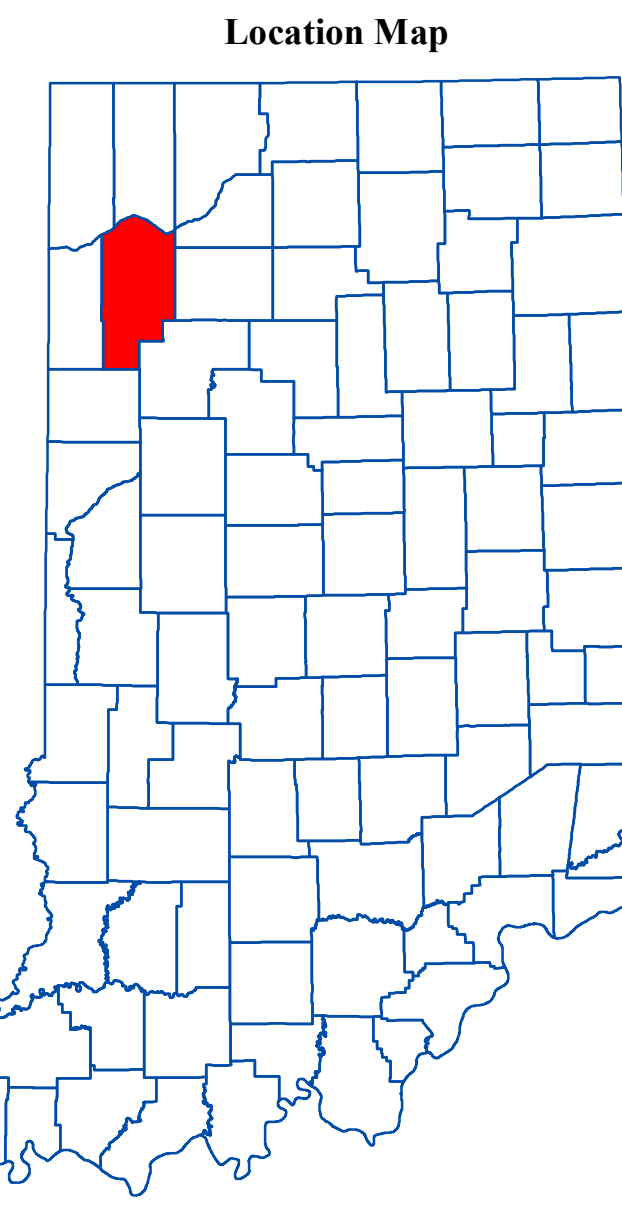
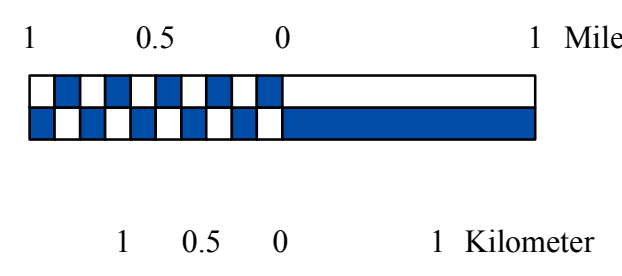
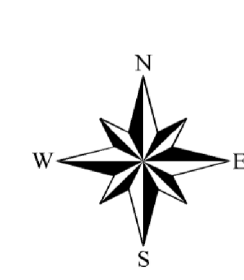
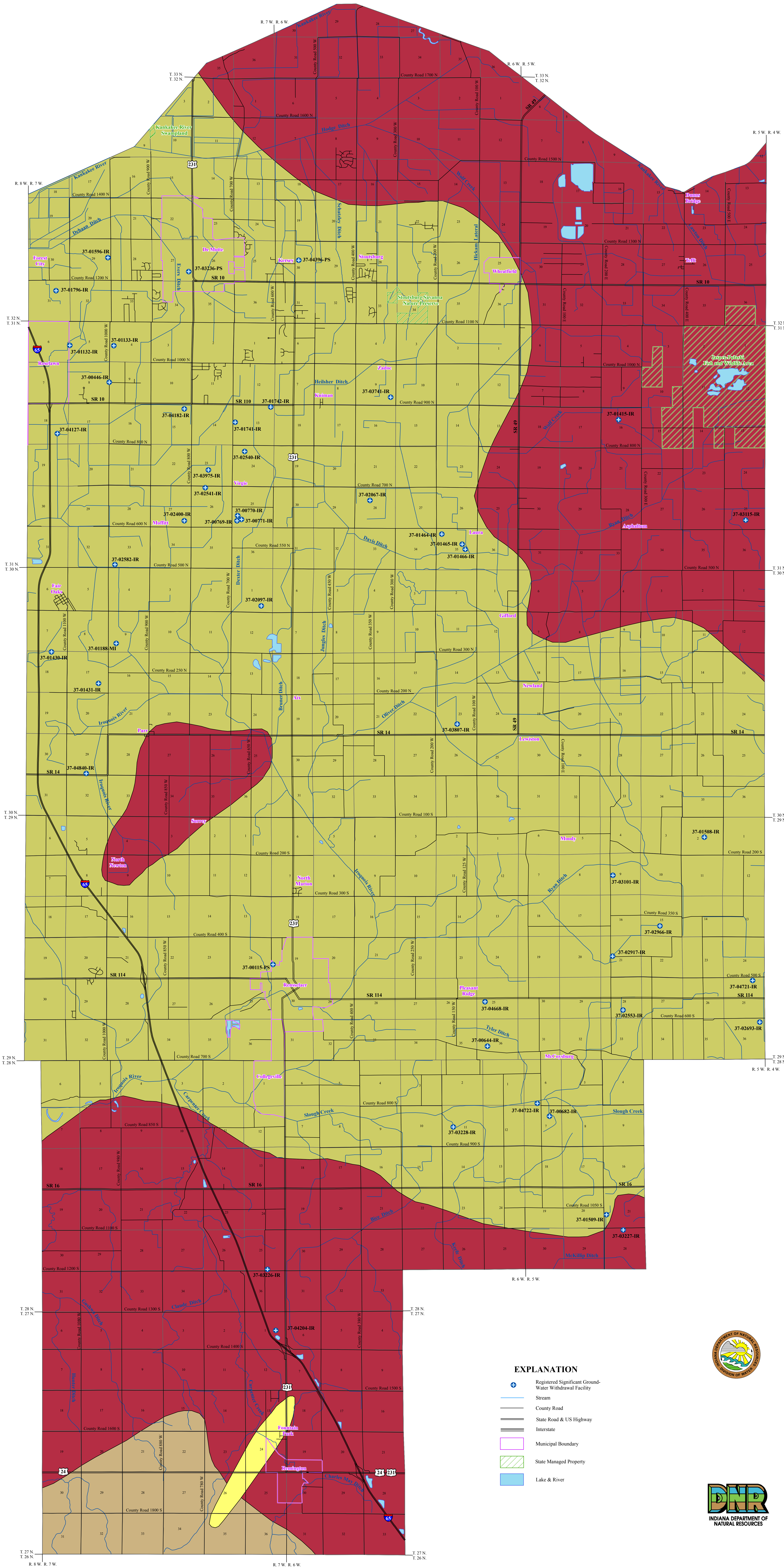
Silurian and Devonian Carbonates Aquifer System

The Silurian and Devonian Carbonates Aquifer System subcrop along much of the central and northwest areas of Jasper County. The system includes Silurian age carbonates of the Wabash Formation overlain by Devonian age carbonate units of the Muscatatuck Group. Total combined thickness of the Silurian and Devonian bedrock is up to 575 feet.

Depth to the bedrock surface ranges from less than 2 feet in the east-central part of the county to 174 feet in the west-central part of the county where a buried valley is present. Total well depths range from 10 to 864 feet but are commonly 20 feet to 150 feet below surface. Many wells that penetrate deep into the bedrock are associated with high capacity usage.

The Silurian and Devonian Carbonates Aquifer System is capable of meeting the needs of domestic and some high-capacity users. It should be noted that groundwater conflicts caused by high-capacity pumpage of the Silurian and Devonian Carbonates Aquifer System have occurred in Newton and Jasper counties. For details, see the 1990 DNR Pollution Water Resource Availability in the Kanawha River Basin, Indiana located on the Internet at www.in.gov/dnr/water. Domestic yields range from 10 to 65 gpm with static water levels ranging from 6 to 36 feet. There are 49 registered significant groundwater withdrawal facilities (81 wells) utilizing the Silurian and Devonian Carbonates Aquifer System with reported yields of individual wells ranging from 80 to 1800 gpm. Because of historic groundwater conflicts, additional proposed high-capacity well sites should be evaluated with regard to not only individual needs but also proper well spacing that would help prevent or minimize interference with nearby wells and reduce impacts to the source aquifer.

Most of the Silurian and Devonian Carbonates Aquifer System in Jasper County is overlain by sands and gravels with intermittent clay deposits. These areas are generally considered at moderate to high risk to contamination. However, most wells completed in this aquifer system are outside the subcrop area and penetrate through the overlying Elsworth and Antrim shales. These areas are at moderate to low risk to contamination.



EXPLANATION

- Registered Significant Groundwater Withdrawal Facility
- Stream
- County Road
- State Road & US Highway
- Interstate
- Municipal Boundary
- State Managed Property
- Lake & River



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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, 20020316), which was at a 1:500,000 scale. Draft road shapefiles, System 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.

Bedrock Aquifer Systems of Jasper County, Indiana

by
Randal D. Maier
Division of Water, Resource Assessment Section
December 2010

UNCONSOLIDATED AQUIFER SYSTEMS OF JASPER COUNTY, INDIANA

Six unconsolidated aquifer systems have been mapped in Jasper County: the Till Veneer, the Kankakee/Iroquois Till Subsystem, the Iroquois Moraine, the Iroquois Basin, the Iroquois Buried Valley Subsystem, and the Kankakee Aquifer System. Characteristics of the Iroquois Basin, Iroquois Moraine, Iroquois Buried Valley Subsystem and the Kankakee aquifer systems have been described and mapped as part of the previously published regional basin study report, Water Resource Availability in the Kankakee River Basin, Indiana, DNR, 1990. Although characteristics and descriptions of the basin study aquifer systems are generalized over large portions of northern Indiana, the descriptions of the aquifer systems have been modified here to accommodate the individuality of Jasper County. Boundaries of all aquifer systems described are commonly gradational, and individual aquifers may extend across aquifer system boundaries.

Thicknesses of unconsolidated sediments that overlie bedrock are quite variable in Jasper County. Total thicknesses range from less than 2 feet in the east-central and southern portions of the county where bedrock is shallow to as much as 174 feet in the southwest portion of the county where a buried bedrock valley is present.

Regional estimates of aquifer susceptibility to contamination from the surface can differ considerably due to 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.

Till Veneer Aquifer System

In Jasper County, the Till Veneer Aquifer System is mapped along the southeast corner of the county. This system is the most limited groundwater resource of the unconsolidated aquifer systems in the county. This system generally consists of thin till 30 to 30 feet thick that directly overlies an uneven bedrock surface. In places, intermittent and discontinuous intertidal or surface sand and gravel are present.

Nearly all wells started in the Till Veneer System are completed in the underlying bedrock aquifer system. However, one well is reportedly producing 20 gallons per minute (gpm) from a shallow sand and gravel. This well reports significant drawdown and it is likely that such production cannot be sustained for lengthy periods of time.

This aquifer system is generally not very susceptible to surface contamination because intertidal sand and gravel units are overlain by thick till deposits. However, some areas have surface sands and gravels or thin to no clay deposits above the aquifer resource. These areas are considered at moderate to high risk of contamination.

Kankakee / Iroquois Till Aquifer Subsystem

In Jasper County the Kankakee / Iroquois Till Aquifer Subsystem is mapped along a small portion of the east central edge of the county. Typical deposits include a thick glacial till with intermittent and thin sand and gravel deposits.

Few wells are available in the Kankakee / Iroquois Till Aquifer Subsystem with nearly all wells completed in the underlying bedrock. However, the subsystem has the potential of meeting the needs of some domestic users. Potential aquifer materials include sand and gravel deposits that range from 20 to 20 feet thick and are capped by 25 to 117 feet of fill. The few wells that utilize the available sand and gravel deposits report yields up to 30 gpm. However, significant drawdown is commonly associated with greater yields.

The subsystem is generally not very susceptible to surface contamination because intertidal sand and gravel units are overlain by thick till deposits.

Iroquois Moraine Aquifer System

The Iroquois Moraine Aquifer System is mapped in much of the central third of Jasper County. This system is characterized by isolated and discontinuous sand and gravel resources overlain by thick clay. In some isolated areas wind-blown sands with thin to no clay deposits overlie the aquifer resource.

Few wells utilize the Iroquois Moraine Aquifer System. Approximately 84 percent of located wells bypass the unconsolidated deposits and utilize the underlying bedrock aquifer system. However, the system has the potential of meeting the needs of some domestic and high-capacity users. Total well depths range from 13 to 180 feet below surface. Thickness of aquifer deposits are generally from 3 to 15 feet and are capped by clay with some intermittent sands and gravels that range from 20 to 100 feet in thickness.

Well yields for domestic wells range from 5 to 50 gpm. Static water levels range from 1 to 85 feet below surface. There are two registered high capacity facilities (6 wells) with reported yields that range from 15 to 50 gpm.

This aquifer system is generally not very susceptible to surface contamination where sand and gravel units are overlain by thick till deposits. However, areas where overlying clays are thin or absent are at moderate to high risk of contamination.

Iroquois Basin Aquifer System

The Iroquois Basin Aquifer System is mapped in most of the southern third of Jasper County. Characteristics of this system generally consist of thick clay deposits with thin intermittent sands and gravels that overlie shallow bedrock, or isolated surface sands with thin to no clay that directly overlie bedrock.

Nearly all wells completed in the mapped areas utilize the underlying bedrock aquifer system. However, approximately 15 percent of wells in this area are completed in unconsolidated deposits. Total well depths commonly range from 30 to 70 feet below surface with aquifer sands and gravels generally 3 to 25 feet thick. Overlying intermittent clay deposits are to 95 feet thick. In places the aquifer sands and gravels are unconfined and are up to 130 feet thick and directly overlie the bedrock surface.

Domestic well yields generally range from 2 to 50 gpm with static water levels from 5 to 35 feet below surface. There are 2 registered significant water withdrawal facilities (10 wells) with reported yields that range from 149 to 800 gpm.

This aquifer system is generally not very susceptible to surface contamination where sand and gravel units are overlain by thick till deposits. However, areas where overlying clays are thin or absent are at moderate to high risk of contamination.

Iroquois Buried Valley Aquifer Subsystem

The southwestern portion of Jasper County is marked by the presence of a buried bedrock valley. This subsystem is associated with deposits that underlie part of the Iroquois Basin Aquifer System and a small portion of the Iroquois Moraine Aquifer System. Unconsolidated deposits generally include thick, intermittent clay with multiple intermittent sands and gravels that overlie the deeper aquifer resource. Depth to bedrock is up to 174 feet.

Few wells are reported in the Iroquois Buried Valley Aquifer Subsystem. Well depths range from 34 to 128 feet with sand and gravel aquifer thicknesses ranging from 2 to 77 feet. Domestic well capacities range from 8 to 50 gpm with static water levels generally 7 to 40 feet below surface. There is one registered significant water withdrawal facility (2 wells) with reported yields of 250 and 510 gpm.

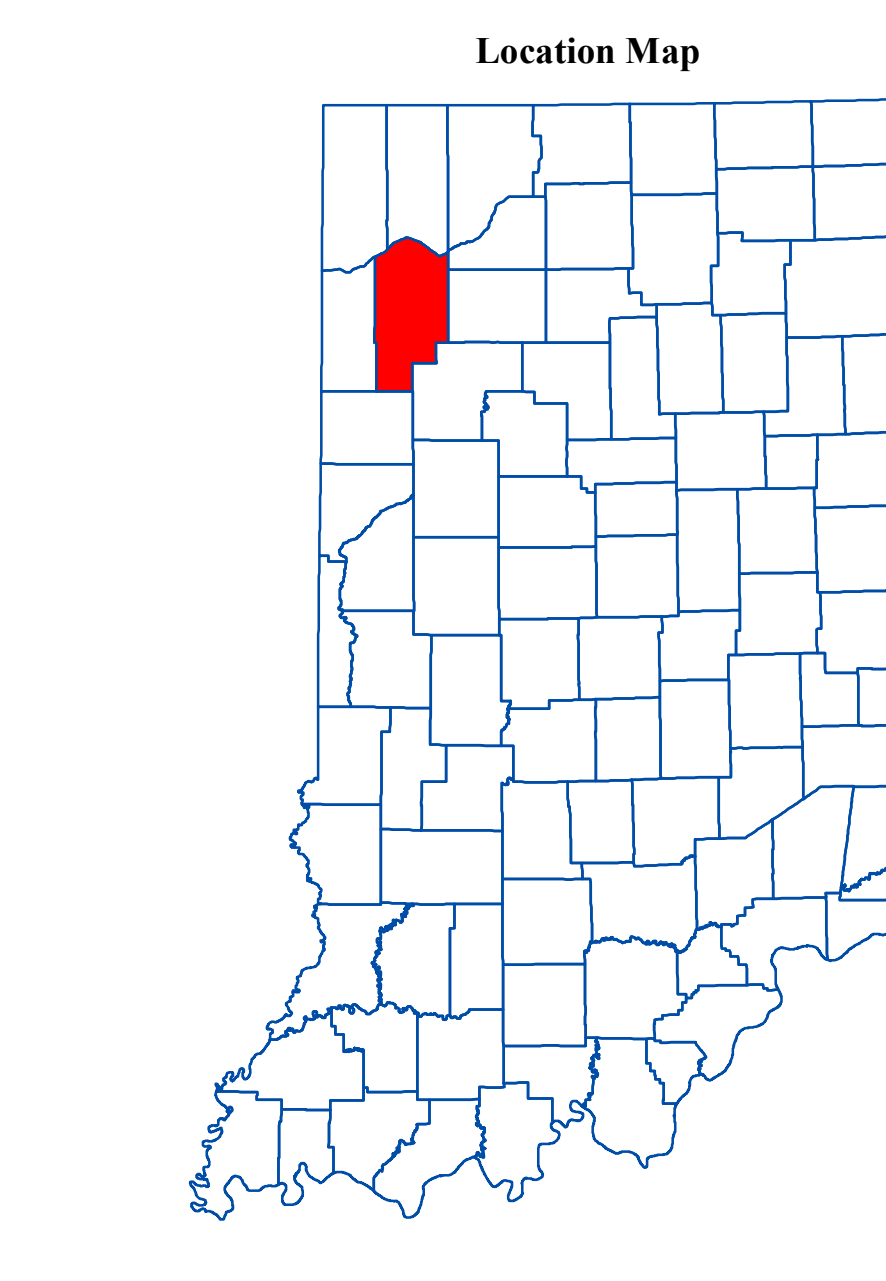
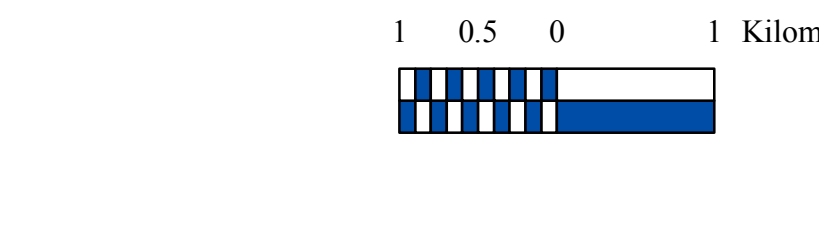
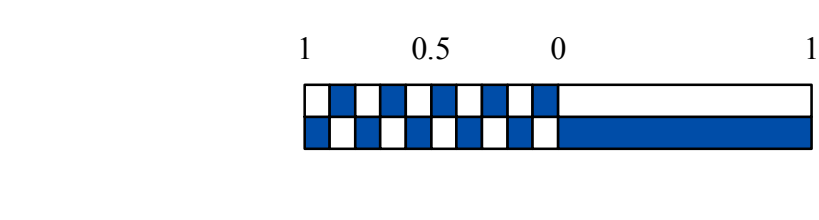
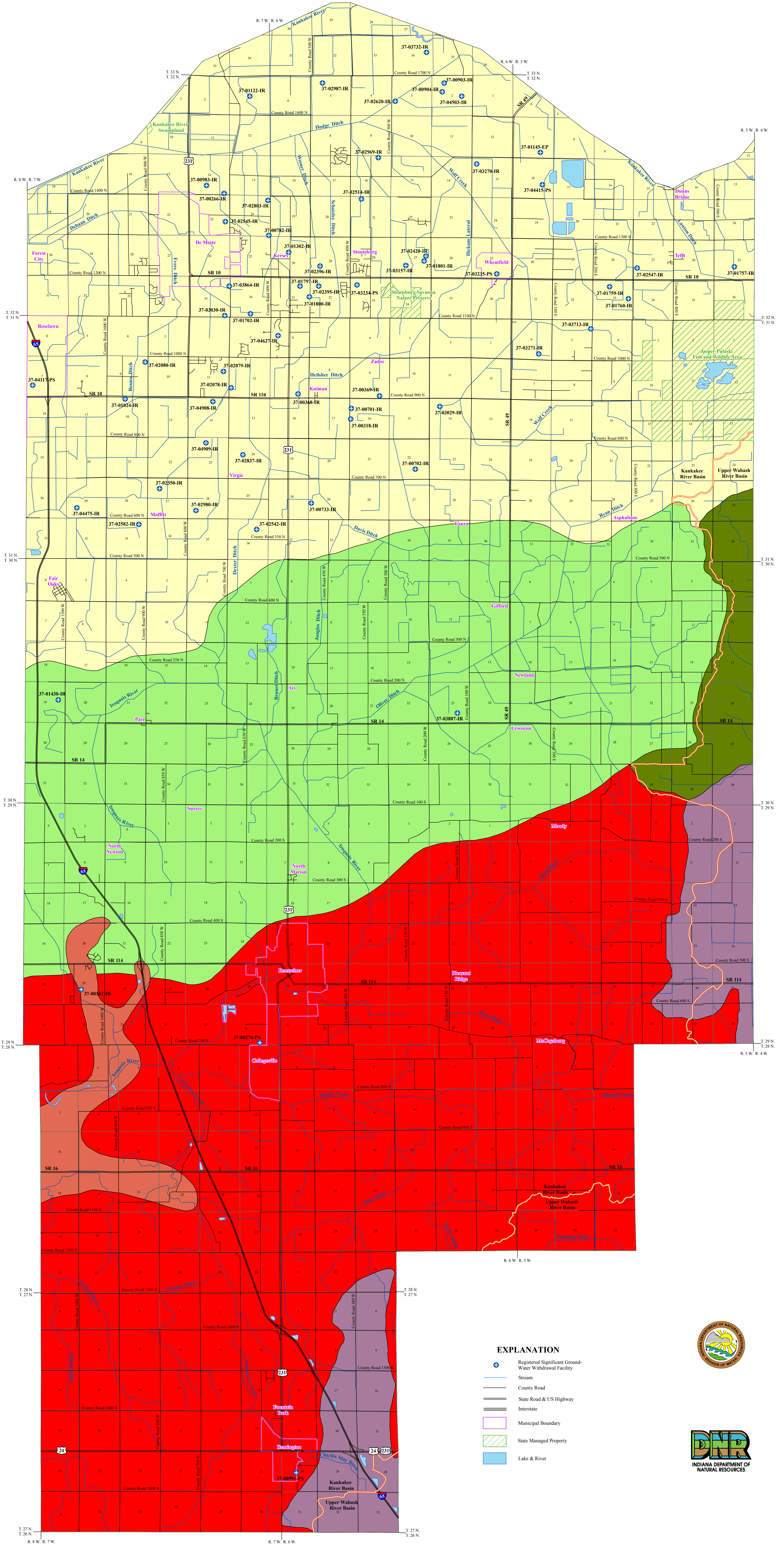
This aquifer system is generally not very susceptible to surface contamination because intertidal sand and gravel units are overlain by thick till deposits.

Kankakee Aquifer System

The Kankakee Aquifer System is mapped in the northern third of Jasper County. Characteristics of this system include unconfined, thick glacial outwash sands and gravels with, in places, discontinuous clay materials over bedrock. The clay deposits generally increase in thickness as the system grades into less prolific aquifer systems to the south.

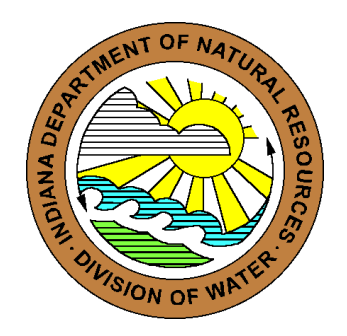
In Jasper County total well depths are typically 25 to 50 feet with saturated sands and gravels up to 42 feet in thickness. This system is capable of meeting the needs of domestic and some high-capacity users. Domestic well capacities are commonly 15 to 70 gpm with static water levels from 3 to 11 feet below surface. There are 57 registered significant groundwater withdrawal facilities (174 wells) with yields that range from 100 to 1100 gpm.

Most of the Kankakee Aquifer system includes unconfined outwash deposits. Therefore, this system is at high risk to contamination. However, in places clay deposits up to 25 feet thick overlie the aquifer resource. These areas are at moderate to high risk to contamination.



EXPLANATION

- Registered Significant Ground-Water Withdrawal Facility
- Stream
- County Road
- State Road & US Highway
- Interstate
- Municipal Boundary
- State Managed Property
- Lake & River



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Unconsolidated Aquifer Systems of Jasper County, Indiana

by
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Division of Water, Resource Assessment Section
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