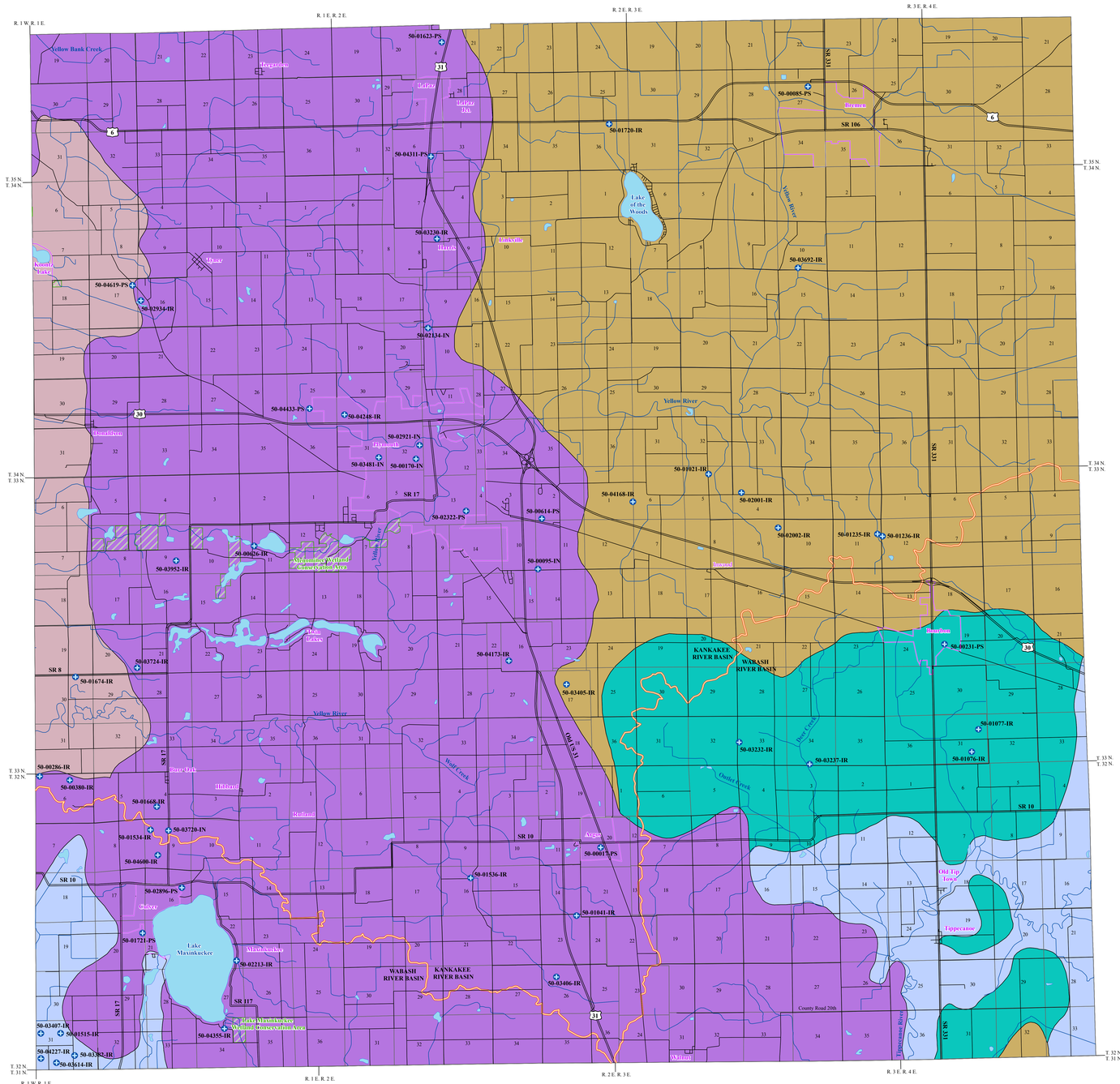
UNCONSOLIDATED AQUIFER SYSTEMS OF MARSHALL COUNTY, INDIANA



Five unconsolidated aquifer systems have been mapped in Marshall County: the Nappanee; the Eolian Sands; the Maxinkuckee Moraine; the Warsaw / Plymouth Complex; and the Wabash River and Tributaries Outwash System. Characteristics of the first three aquifer systems have been described and mapped as part of two previously published regional basin study reports; Water Resource Availability in the St. Joseph River Basin, Indiana, IDNR, 1987 and Water Resource Availability in the Kankakee River Basin, Indiana, IDNR, 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 Marshall County. Boundaries of all aquifer systems described are commonly gradational, and individual aquifers may extend across aquifer system boundaries.

Pre-Wisconsin and Wisconsin glacial sediments completely cover Marshall County. Thicknesses of unconsolidated sediments that overlie bedrock are quite variable ranging from approximately 100 feet, to as much as 370 feet.

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.

Nappanee Aquifer System

In Marshall County, the Nappanee Aquifer System is mapped along most of the northeastern part of the county and a small area to the southeast. This system typically consists of thick clay with intratill sands and gravels. The aquifer materials are typically overlain by 20 to 70 feet of continuous clay.

The Nappanee Aquifer System is capable of meeting the needs of domestic and some high-capacity users. Well depths range from 55 to 120 feet below surface. Aquifer sands and gravels are generally 5 to 10 feet thick. The intratill sand and gravel deposits range from 2 to 15 feet thick and appear to be more consistent in the northern part of the county.

Domestic well capacities commonly range from 10 to 30 gallons per minute (gpm) with static water levels from 9 to 30 feet below surface. There are 10 registered significant ground-water withdrawal facilities (18 wells) in the Nappanee Aquifer System in Marshall County. Reported yields range from 100 to 800 gpm.

This aquifer system is generally not very susceptible to surface contamination because intratill sand and gravel units are overlain by thick till deposits. However, some areas have surface sands and gravels with thinner underlying clay above the aquifer resource. These areas are considered moderately susceptible to contamination.

Eolian Sands Aquifer System

The Eolian Sands Aquifer System in Marshall County is mapped along part of the western edge of the county. In places, characteristics of this system generally involve windblown (eolian) sands at the surface with thick clay beneath that separates the surface deposits from the deeper aquifer resource. However, in some places the clays are not present. Clay thickness is typically 10 to 130 feet with the surface sand and gravels ranging from 10 to 60 feet thick. Wells completed in the Eolian Sands Aquifer System are generally 35 to 80 feet but wells as deep as 180 feet have been reported. Aquifer thickness ranges from 5 to 45 feet.

This system is capable of meeting the needs of domestic and some high-capacity users. Domestic well capacities are commonly 10 to 60 gpm. Static water levels range from 5 to 35 feet below surface. There are 2 registered significant ground-water withdrawal facilities (3 wells) utilizing this system with reported yields ranging from 90 to 500 gpm. However, large drawdowns are associated with the higher capacity wells.

This aquifer system is generally not very susceptible to surface contamination because intratill 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.

Maxinkuckee Moraine Aquifer System

The Maxinkuckee Moraine Aquifer System is mapped throughout most of the western half of Marshall County. Unconsolidated deposits are associated with a large morainal complex with varying characteristics that involve discontinuous and isolated surficial sands and gravels, thick till sequences with discontinuous intratill sands and gravels as well as deeper aquifer sands and gravels of varying thickness.

Most wells completed in the Maxinkuckee Moraine Aquifer System produce from the deeper sand and gravel deposits. However, a few wells are completed in the shallow sands and gravels. Well depths range from 25 to 275 feet but are commonly 55 to 120 feet. Typical aquifer thickness is from 6 to 30 feet; however, in places aquifer deposits may be significantly greater. The aquifer deposits are typically capped by 20 to 70 feet of clay with intratill sand and gravel layers that are 5 to 20 feet thick.

The Maxinkuckee Moraine Aquifer System is capable of meeting the needs of domestic and high-capacity users. Typical domestic yields range from 10 to 35 gpm with static water levels commonly 10 to 50 feet below surface. There are 31 registered significant ground-water withdrawal facilities (49 wells) with reported yields that range from 70 to 2278 gpm.

This aquifer system is generally not very susceptible to surface contamination because intratill sand and gravel units are overlain by thick till deposits. However, wells that utilize the shallow sands and gravels are at moderate to high risk to surface contamination

Warsaw / Plymouth Complex Aquifer System

The Warsaw / Plymouth Complex Aquifer System is mapped in portions of the southeast part of Marshall County. Several glacial advances resulted in a complex sequence of multiple, stacked, till and outwash units that are quite variable in position and thickness. Characteristics of this system include either surface sands and gravels (commonly not used as a aquifer resource) that overlie a thick till with intratill sands and gravels above a primary aquifer unit; or, a thick clay cap with intratill sands and gravels that is underlain by an aquifer unit.

Well depths are commonly 45 to 135 feet. In places the system exhibits multiple sand and gravel deposits above the primary aquifer resource that are also a potential source of ground-water. The sand and gravel deposits vary from thin to massive and are typically discontinuous and overlain by a thick till. Total accumulative unconsolidated thickness above the aquifer units are generally 20 to 105 feet. Individually, the discontinuous sands and gravels are typically 5 to 25 feet thick and the deeper, more productive aquifer deposits are 8 to 35 feet thick.

The Warsaw / Plymouth Complex Aquifer System is capable of meeting the needs of domestic and some high-capacity users. Typical domestic yields range from 10 to 45 gpm. Static water levels commonly range from 10 to 35 feet below surface with some flowing wells reported. There are 5 registered significant ground-water withdrawal facilities (7 wells) with reported yields that range from 250 to 900 gpm.

This aquifer system is not very susceptible to contamination where thick clay deposits overlie aquifer materials. However, in places clay deposits are thin or not present. These areas are at moderate to high risk to surface contamination.

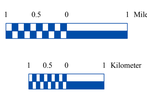
Wabash River and Tributaries Outwash Aquifer System

In Marshall County the Wabash River and Tributaries Outwash Aquifer System is mapped along the southeastern and southwestern edges of the county. The system is made up of thick, glacially derived outwash deposits along with recent alluvial deposits that cap the outwash deposits.

Few wells are completed in this system in Marshall County. Well depths range from 30 to 110 feet below surface with up to 100 feet of continuous sand and gravel. However, well depths are generally 50 to 80 feet. In places, aquifer materials are capped by silt or sandy clay ranging from less than 10 to 35 feet thick. In addition, aquifer sand and gravel deposits may include discontinuous clay, sandy clay or gravelly clay deposits 1 to 40 feet thick.

The Wabash River and Tributaries Outwash Aquifer System is capable of meeting the needs of domestic and some high-capacity users. Domestic wells are commonly 10 to 40 gpm. Static water levels are commonly 4 to 15 feet below surface with some flowing wells reported. There are 5 registered significant ground-water withdrawal facilities (5 wells) in the outwash system in Marshall County. Well yields range from 350 to 800 gpm.

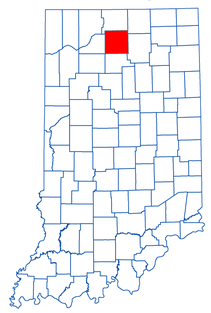
Areas that lack overlying clay or silt deposits are highly susceptible to contamination. However, where overlying clay or silt deposits are present the system is moderately susceptible to surface contamination.



EXPLANATION

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

Location Map



INDIANA DEPARTMENT OF NATURAL RESOURCES

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, 20020621), were all f rom 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 (pol ygon 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 shape file, various dates) was from IDNR. Unconsolidated aquifer systems coverage (Maier, 2008) was based on a 1:24,000 scale.

Unconsolidated Aquifer Systems of Marshall County, Indiana

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