

# UNCONSOLIDATED AQUIFER SYSTEMS OF CLAY COUNTY, INDIANA

The unconsolidated aquifer systems of Clay County are composed of sediments deposited by, or resulting from, a complex sequence of glacial, glacial meltwaters, and post-glacial precipitation events. Five unconsolidated aquifer systems have been mapped in Clay County: the Dissected Till and Residuum, the Alluvial, Lacustrine, and Backwater Deposits, the Martinsville Hills / Wabash Lowland Till Subsystem, the White River and Tributaries Outwash Subsystem, and the Coal Mine Spoil. 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 10 percent of all wells in this county are completed in unconsolidated deposits.

The thickness of unconsolidated deposits in Clay County is quite variable, due to the deposition of glacial material over an uneven bedrock surface. Unconsolidated deposits in the county range from less than 2 feet thick in the northern portion of the county to 215 feet thick in the southeastern portion of the county.

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, unpluged or improperly abandoned wells, and open excavations can provide contaminant pathways that bypass the naturally protective clays.

**Dissected Till and Residuum Aquifer System**

In Clay County, the Dissected Till and Residuum Aquifer System occurs in areas where pre-Wisconsinan till is thin and dissected due to deep down-cutting by streams. This system is generally less than 50 feet thick and has been mapped throughout Clay County.

The Dissected Till and Residuum Aquifer System has the most limited groundwater resources of the unconsolidated aquifer systems. Approximately 98 percent of the wells started in this system in Clay County are completed in the underlying bedrock; however, some wells do utilize this aquifer system. Potential aquifers within this system include thin isolated sand and/or gravel layers, and surficial sand and gravel outwash or alluvium. Wells are completed at depths ranging from 25 to 40 feet with sand and gravel aquifer materials commonly 2 to 6 feet thick. Most of the wells in this system have reported capacities of 5 gallons per minute (gpm) or less with some wells being reported as "dry". Static water levels range between 8 and 16 feet below the surface. There are no registered significant groundwater withdrawal facilities utilizing this system.

This system is generally not very susceptible to contamination from surface sources because of the low permeability of the near-surface materials. However, areas where protective clay layers are thin or absent are very susceptible to contamination.

**Alluvial, Lacustrine, and Backwater Deposits Aquifer System**

The Alluvial, Lacustrine, and Backwater Deposits Aquifer System in Clay County is mapped within a valley along a portion of Coy's Creek and a portion of Billy Creek. This system consists of deposits resulting from glacial meltwater drainage, fine-grained glaciolacustrine deposits formed in relatively static water, and colluvium from the surrounding upland areas.

This system is an extremely limited resource and the Division has no records of wells that produce from these deposits in Clay County. However, large-diameter bucket wells may be adequate to meet the needs of some domestic users. Typical materials overlying bedrock include fine sand, silt, and clay deposits that are generally greater than 25 feet thick. Aquifer materials commonly include thin sand seams that are typically less than a few feet thick. In some isolated areas, however, these deposits are thicker. Yields are generally expected to be less than a few gpm.

Thick deposits of clay that have a low susceptibility to surface contamination commonly characterize this aquifer system. However, the susceptibility is greater in areas where the surficial clay deposits are thin and directly overlie sand deposits.

**Martinsville Hills / Wabash Lowland Till Aquifer Subsystem**

The Martinsville Hills / Wabash Lowland Till Aquifer Subsystem is mapped throughout much of northern Clay County. This system typically consists of thick clay with discontinuous intertill sands and gravels. Portions of this system include fine-grained lacustrine, silt, and clay deposits. The discontinuous sands and gravels, where present, are commonly less than 10 feet thick with some noted as "dry".

In Clay County approximately 80 percent of the wells drilled in areas mapped as till subsystem are completed in the underlying bedrock aquifer system. However, the Martinsville Hills / Wabash Lowland Till Aquifer Subsystem has the potential of meeting the needs of some domestic users. Reported well depths range from 50 to 90 feet. Where present, potential aquifer materials include sand and gravel deposits that generally range from 2 to 22 feet thick and are capped by 18 to 80 feet of till.

The few wells that utilize the available sand and gravel deposits have yields that range from 4 to 8 gpm with static water levels of 16 to 40 feet below the surface.

A portion of this system overlies part of a major buried bedrock valley that includes mixtures of lacustrine sand, silt, and clay deposits along with isolated sand and gravels up to 132 feet in thickness. This area is capable of meeting the needs of domestic users; however, few unconsolidated wells are completed in this area. Those wells reported are up to 125 feet in depth with aquifer deposits generally ranging from 20 to 85 feet and are capped by 15 to 60 feet of overlying clay. Reported well capacities range from 10 to 20 gpm with static water levels from 22 to 52 feet below surface.

This aquifer subsystem is generally not very susceptible to surface contamination because intertill 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 to contamination.

**White River and Tributaries Outwash Aquifer Subsystem**

The White River and Tributaries Outwash Aquifer Subsystem is mapped in a wide floodplain of the Red River, along Jordan Creek, and a portion of White Oak Creek. This system includes glacial outwash sands and gravels that are generally capped by a layer of clay and silt deposits.

The White River and Tributaries 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 commonly ranging from 40 to 70 feet. Aquifer materials include sand and gravel deposits that are typically 10 to 35 feet thick and may be capped by alluvial silt and/or clay materials that generally range from 14 to 38 feet thick. Domestic well capacities range from 15 to 30 gpm with static water levels ranging from 10 to 16 feet below the surface. There are two registered significant groundwater withdrawal facilities (5 wells) using this system. The reported yields for the wells range from 300 to 500 gpm.

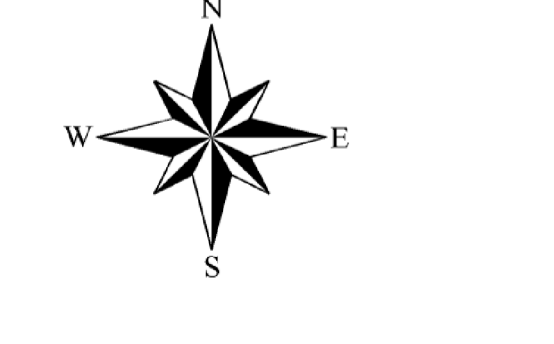
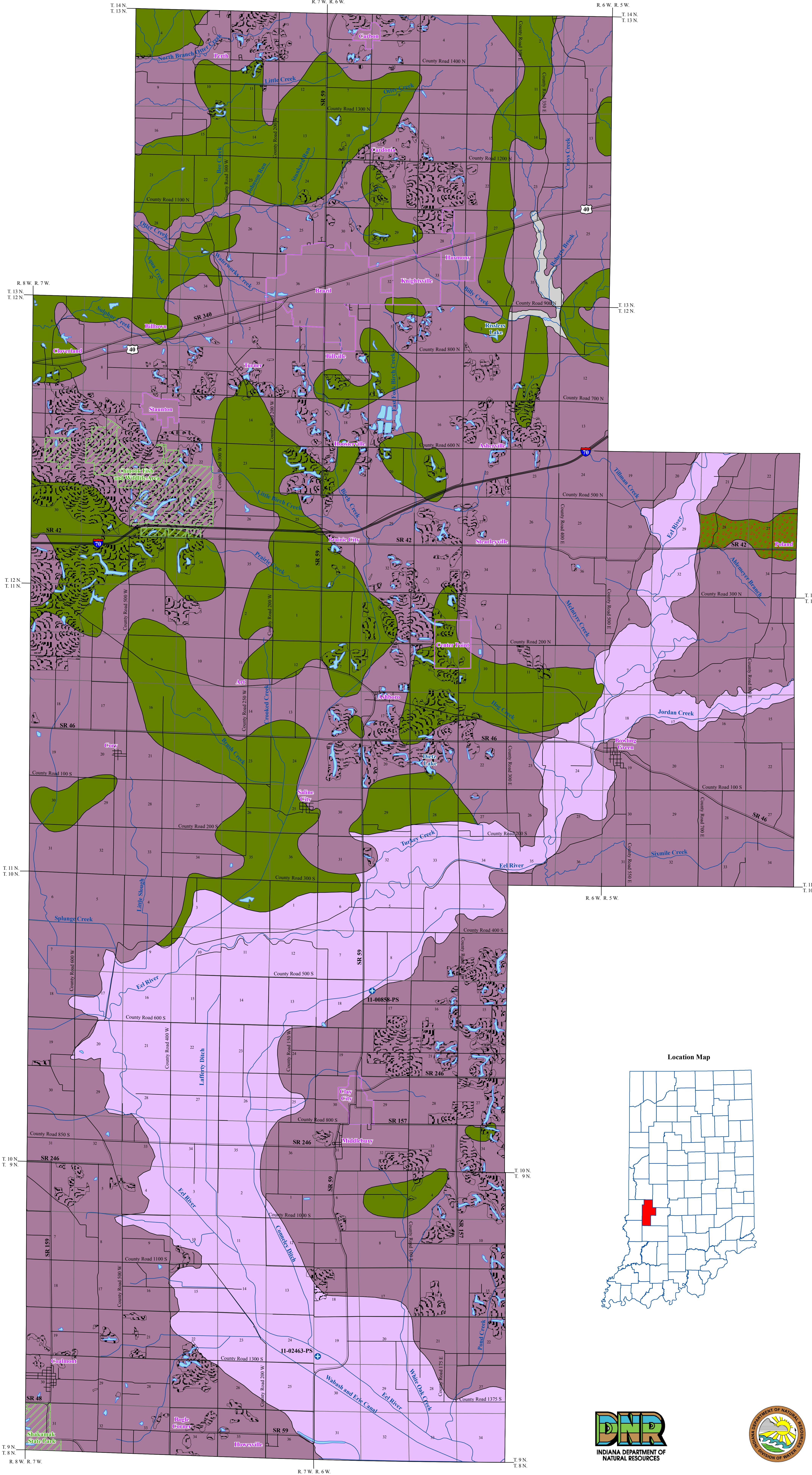
Areas that lack overlying clay deposits are highly susceptible to contamination. However, where overlying clay deposits are present the system is moderately susceptible to surface contamination.

**Coal Mine Spoil Aquifer System**

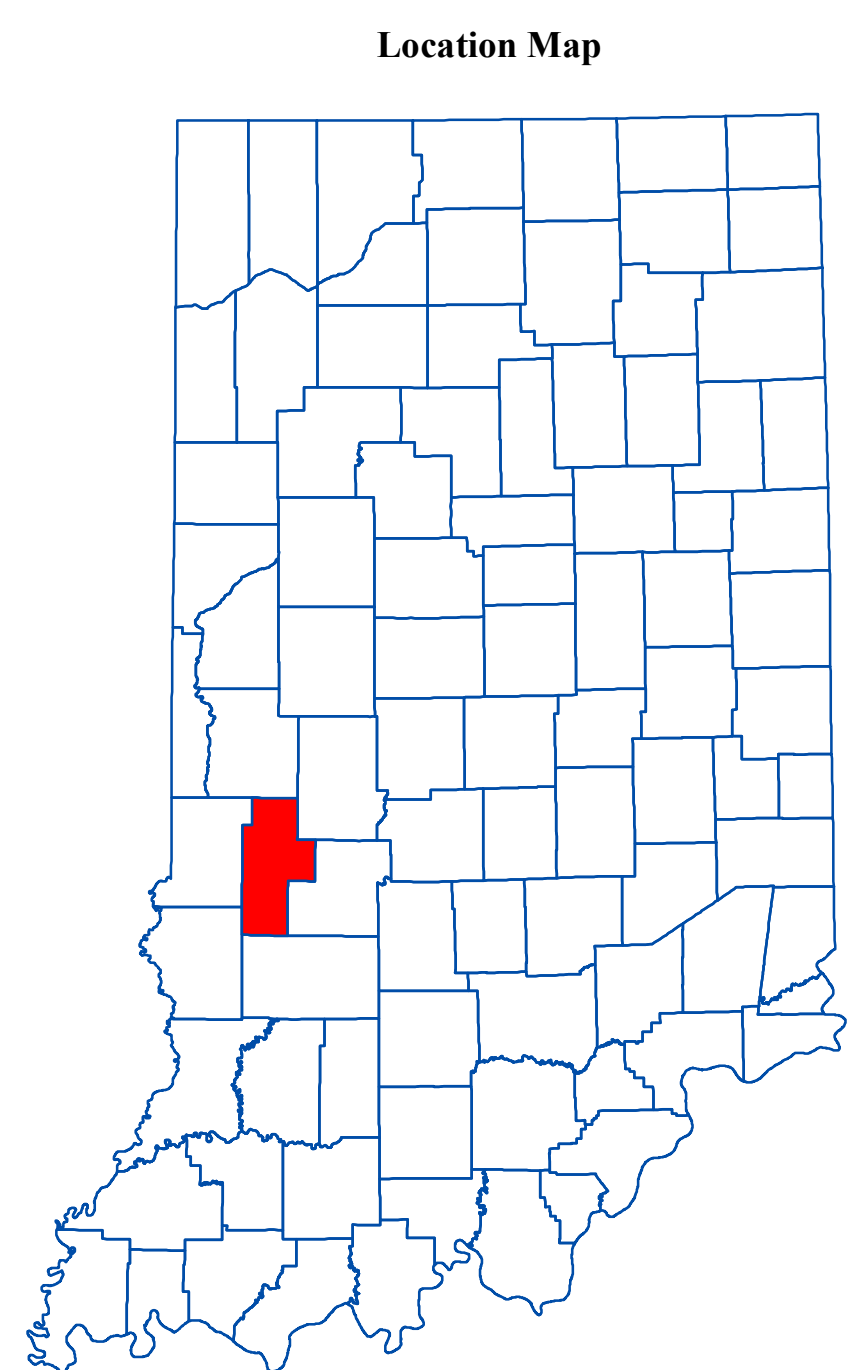
The Coal Mine Spoil Aquifer System covers about ten percent of Clay County. This aquifer system was formed during the process of mining coal by surface-mining methods. The overburden was typically broken up by blasting and moved aside to uncover the desired coal seam. The overburden, most of which was originally solid rock, became a heterogeneous mixture of particles ranging in size from clay, silt, and sand up to gravel, slabs, and boulders. Where extensive these spoil areas contain considerable amounts of groundwater. Although data are sorely lacking on permeability of these spoil materials, it is generally accepted that the spoil permeability is greater than that for most of the original rock layers above the coal seam mined.

The quality of groundwater in this system is generally much poorer than that in the overburden before mining took place. Typically a significant increase in total dissolved solids, especially calcium, magnesium, bicarbonate, and sulfate, occurs. High iron, and sometimes low pH, can also severely limit potential uses of groundwater from this system.

There are no well records reported in this aquifer system in Clay County. Very generally, it is expected that aquifers in old spoil areas that were not graded and capped with compacted soil are highly susceptible to surface contamination, whereas new spoil areas benefiting from modern reclamation methods are likely to be only moderately susceptible.



- 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, 20020318), which was at a 1:500,000 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. Managed Areas 96 (polygon shapefile, various dates) was from IDNR. Unconsolidated Aquifer Systems coverage (Scott, 2010) was based on a 1:24,000 scale.

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