

# UNCONSOLIDATED AQUIFER SYSTEMS OF MADISON COUNTY, INDIANA

The unconsolidated aquifer systems of Madison 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 Madison County: the Till Veneer, the Bluffton / New Castle / Tipton Till, the Bluffton / New Castle / Tipton Till Subsystem, the Bluffton / New Castle / Tipton Complex, the White River and Tributaries Outwash, and the White River and Tributaries 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 system boundaries. Approximately 51 percent of all wells in this county are completed in unconsolidated deposits.

The thickness of unconsolidated deposits in Madison County is quite variable, due to the deposition of glacial material over an uneven bedrock surface. Unconsolidated deposits in the county range from no cover at the falls of Fall Creek at Pendleton to over 350 feet thick in a buried bedrock valley located south of Chesterfield.

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

## Till Veneer Aquifer System

In Madison County, the Till Veneer Aquifer System occurs in areas where the unconsolidated material is predominantly thin till overlying bedrock. This system is chiefly the product of the deposition of glacial till over an uneven, eroded bedrock surface, and is generally less than 50 feet thick. Portions of northern and southwestern Madison County are mapped as Till Veneer.

The Till Veneer Aquifer System has the most limited groundwater resources of the unconsolidated aquifer systems. Approximately 99 percent of the wells in this system are completed in the underlying bedrock; however, some wells do utilize this aquifer system. Potential aquifers within this system include thin isolated sand and gravel layers, and surficial sand and gravel outwash or alluvium. Wells are completed at depths ranging from 24 to 45 feet with sand and gravel aquifer materials commonly 4 to 10 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 16 and 32 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.

## Bluffton / New Castle / Tipton Till Aquifer System

The Bluffton / New Castle / Tipton Till Aquifer System is mapped throughout portions of Madison County. This aquifer system is up to about 170 feet in thickness, and consists primarily of glacial till with interill sand and gravel layers. However, the sand and gravel aquifers in this system tend to be relatively thin and discontinuous.

This aquifer system is capable of meeting the needs of most domestic and some high-capacity users in Madison County. The wells utilizing this aquifer system are completed at depths ranging from 50 to 105 feet with sand and gravel aquifer materials commonly 4 to 24 feet thick. Domestic well yields are typically 10 to 40 gpm and static water levels range from flowing to 32 feet below the land surface. There are 5 registered significant groundwater withdrawal facilities (11 wells) using the Bluffton / New Castle / Tipton Till Aquifer System. The reported yields for the high-capacity wells range from 250 to 1,000 gpm.

The Bluffton / New Castle / Tipton Till Aquifer System typically has a low susceptibility to surface contamination because interill sand and gravel units are commonly overlain by thick glacial till. Shallow wells completed in this system are moderately susceptible to contamination.

## Bluffton / New Castle / Tipton Till Aquifer Subsystem

The Bluffton / New Castle / Tipton Till Aquifer Subsystem is mapped in several areas throughout Madison County. The subsystem is mapped similar to the Bluffton / New Castle / Tipton Till Aquifer System; however, potential aquifer materials are generally thinner and potential yields are less in the subsystem.

About 81 percent of wells started in this subsystem in Madison County are completed in the underlying bedrock aquifer system. However, the Bluffton / New Castle / Tipton Till Aquifer Subsystem is capable of meeting the needs of some domestic users in the county. Potential aquifer materials include relatively thin, discontinuous interill sand and gravel deposits. These interill sand and gravel aquifer materials are commonly less than 10 feet thick. The wells producing from this subsystem are typically completed at depths ranging from about 45 to 85 feet. Domestic well yields are generally 5 to 10 gpm and static water levels range from 10 to 30 feet below the surface. There are no registered significant groundwater withdrawal facilities using the Bluffton / New Castle / Tipton Till Aquifer Subsystem.

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

## Bluffton / New Castle / Tipton Complex Aquifer System

The Bluffton / New Castle / Tipton Complex Aquifer System is mapped throughout the central and southern areas of Madison County. Multiple glacial advances resulted in sequences of interill sand and gravel layers, typically overlain by thick clay, resulting in aquifers that are highly variable in depth, thickness, and lateral extent. The total combined thickness of the unconsolidated deposits is up to 240 feet.

The deeper more prolific aquifers of this system are capable of meeting the needs of domestic and some high-capacity users in Madison County. Saturated aquifer materials in the Bluffton / New Castle / Tipton Complex Aquifer System range from about 5 to 25 feet thick, and wells in this system are generally completed at depths from about 70 feet to 125 feet. Domestic well yields range up to 50 gpm and static water levels are about 15 to 40 feet below the surface. There are 14 registered significant groundwater withdrawal facilities (34 wells) using this system. The reported yields for the high-capacity wells range from 75 to 2,947 gpm.

The New Castle Complex Aquifer System overlies a buried bedrock valley located in the east-central portion of the county. The total unconsolidated thickness is up to 350 feet in this area. Only a few reported wells utilize the deeper aquifer within the buried bedrock valley. The aquifer utilized by these wells is up to 22 feet thick, and the reported yields range from 10 to 30 gpm. There is 1 registered significant groundwater withdrawal facility (1 well) using this system. The reported yield for the high-capacity well is 400 gpm.

The Bluffton / New Castle / Tipton Complex Aquifer System is not very susceptible to contamination where overlain by thick clay deposits. However, in some areas where surficial clay deposits are relatively thin, the shallow aquifer, if present, is at moderate to high risk.

## White River and Tributaries Outwash Aquifer System

The White River and Tributaries Outwash Aquifer System is mapped in the central portion of Madison County along the White River. The system includes thick glacial outwash sands and gravels that are generally capped by a layer of clay and silt deposits.

The White River and Tributaries Outwash Aquifer System is capable of meeting the needs of both domestic and high-capacity users in Madison County. The wells utilizing this aquifer system are completed at depths ranging from 15 to 165 feet with sand and gravel aquifer materials commonly 4 to 22 feet thick. Domestic well yields are typically 10 to 50 gpm with static water levels ranging from 12 to 36 feet below the surface. In the White River and Tributaries Outwash Aquifer System there are 2 registered significant groundwater withdrawal facilities (3 wells). Reported production for these high-capacity wells range from 512 to 1,319 gpm.

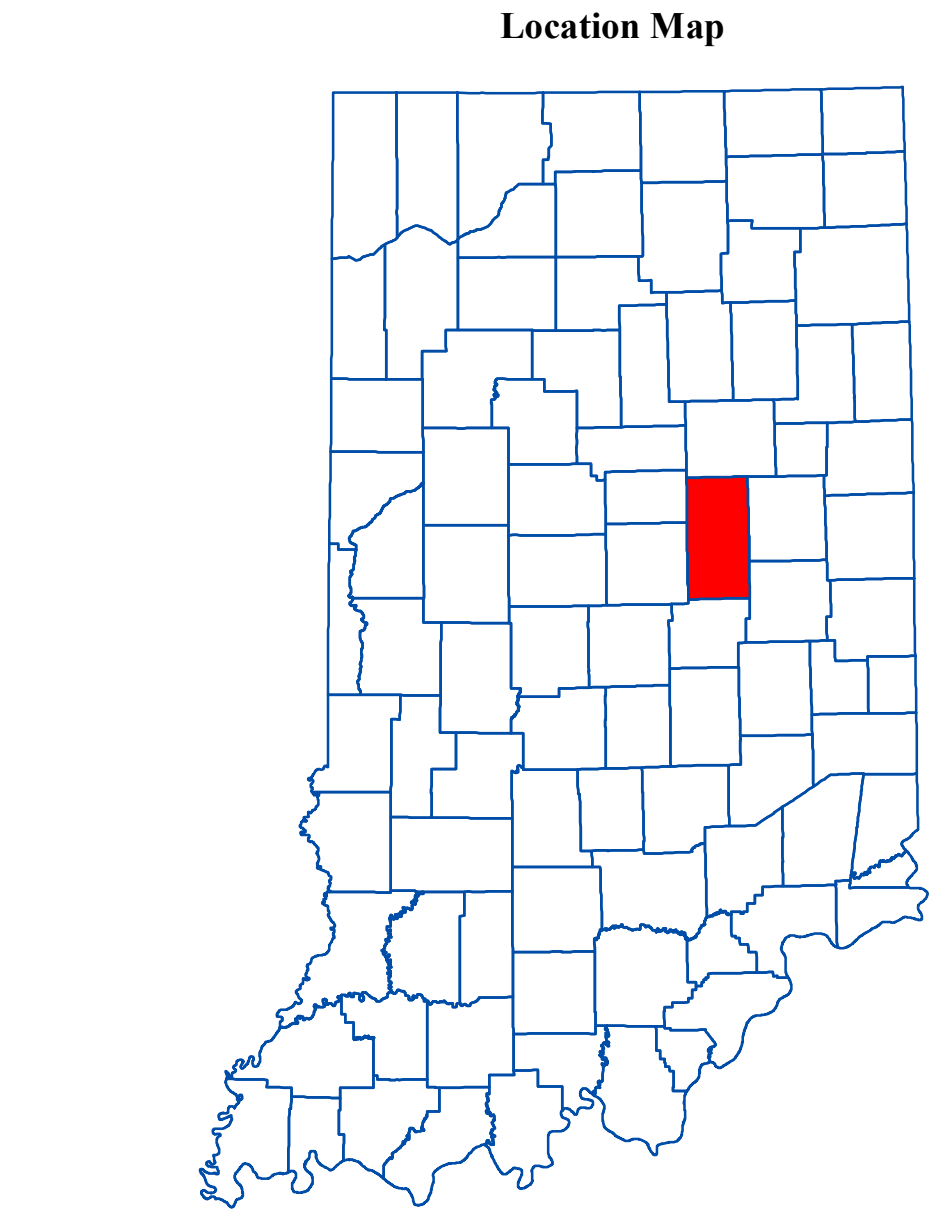
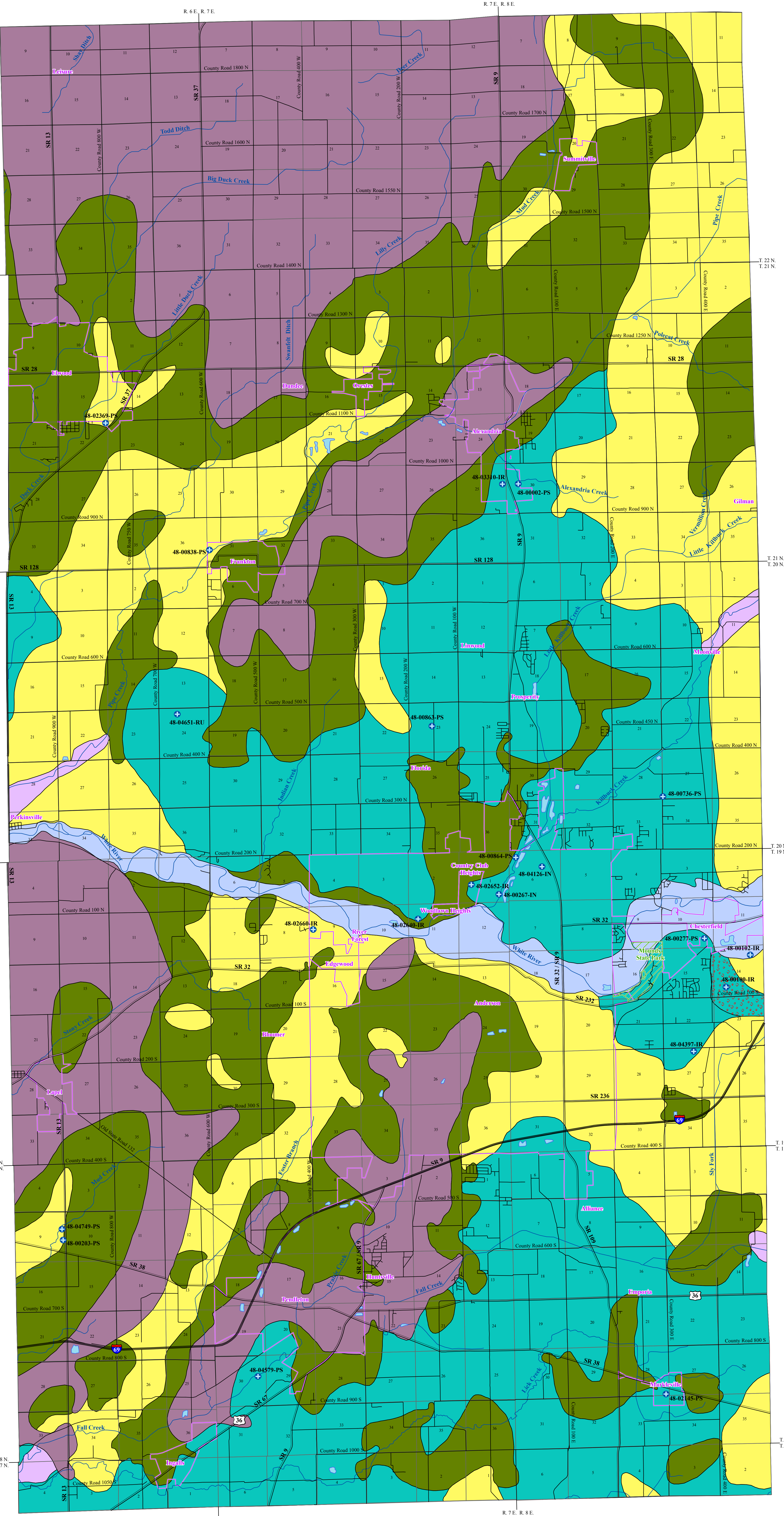
The White River and Tributaries Outwash Aquifer System is highly susceptible to surface contamination where sand and gravel deposits are near the surface and have little or no clay deposits. However, areas with relatively thick clays overlying the sand and gravel deposits are moderately susceptible to contamination.

## White River and Tributaries Outwash Aquifer Subsystem

The White River and Tributaries Outwash Aquifer Subsystem is mapped in several areas of Madison County along portions of Fall Creek, Pipe Creek, and Killbuck Creek. This subsystem is mapped similar to the White River and Tributaries Outwash Aquifer System; however, aquifer materials in the White River and Tributaries Outwash Aquifer Subsystem are generally thinner, overlying silt and clay materials are thicker, and potential yields are less in the subsystem.

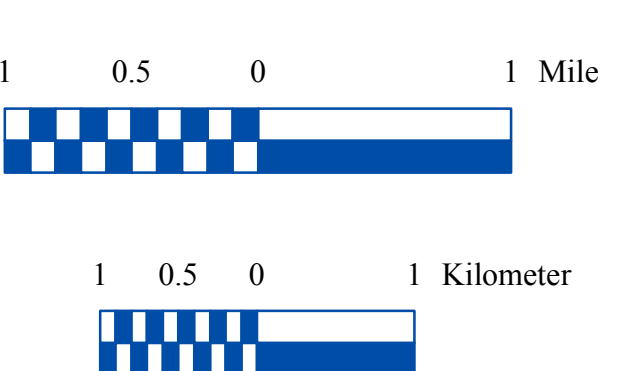
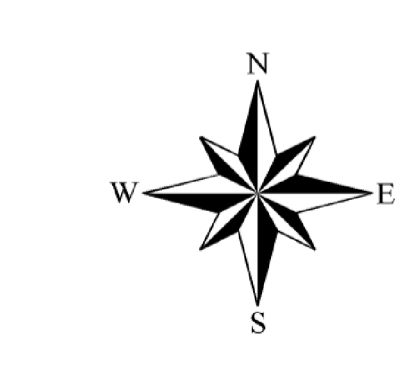
The White River and Tributaries Outwash Aquifer Subsystem has the potential to meet the needs of domestic and some high-capacity users. The wells in this subsystem are completed at depths commonly ranging from 50 to 90 feet. Saturated aquifer materials include sand and gravel deposits that are typically 1.5 to 50 feet thick. Domestic well yields are generally 10 gpm with static water levels ranging from 8 to 28 feet below the surface. There are no registered significant groundwater withdrawal facilities in the White River and Tributaries Outwash Aquifer Subsystem.

Areas within the White River and Tributaries Outwash Aquifer 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
- Interstate
- Municipal Boundary
- State Managed Property
- Lake & River



### Map Use and Disclaimer Statement

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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 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. Stream27 (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.

### Unconsolidated Aquifer Systems of Madison County, Indiana

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