Mitchell E. Daniels, Jr., Governor
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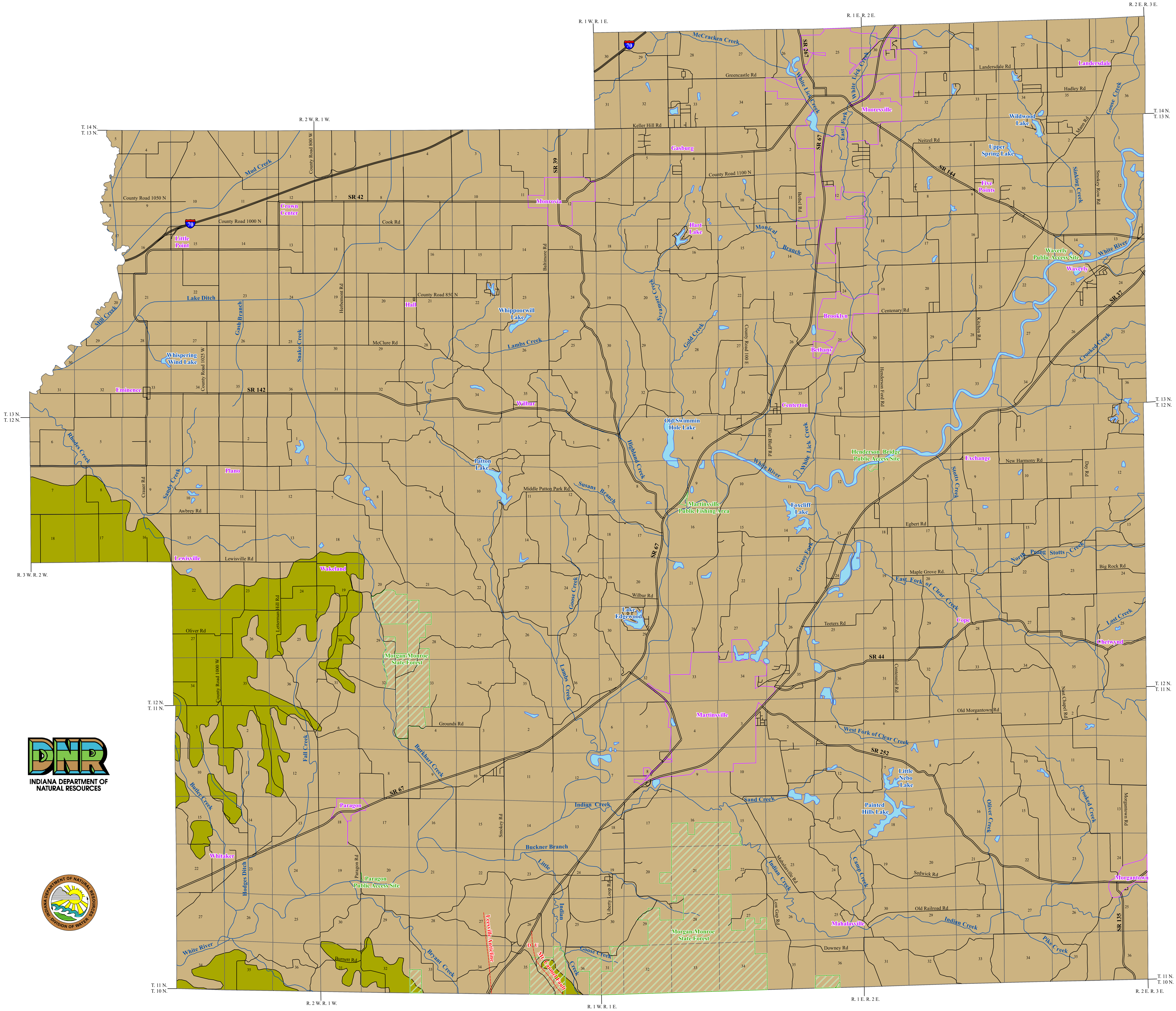
BEDROCK AQUIFER SYSTEMS OF MORGAN COUNTY, INDIANA



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.

Unconsolidated deposits of varying thickness overlie bedrock aquifer systems in Morgan County. Total thickness ranges from less than one foot where bedrock is near the surface or outcrops along portions of the White River, to an estimated 250 feet where glacial lacustrine and outwash sediments have filled bedrock valleys. 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 formation.

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.

Approximately 69 percent of all wells in Morgan County are completed in bedrock. Two bedrock aquifer systems are identified for Morgan County. They are the Mississippian Blue River and Sanders Groups; and the Mississippian Borden Group.

Mississippian -- Blue River and Sanders Groups Aquifer System

The Blue River and Sanders Groups Aquifer System is limited to portions of western and southwestern Morgan County. The Sanders Group includes primarily limestone with some shale and dolomitic limestone content. The overlying Blue River Group is absent in Morgan County. Thickness of the Sanders Group is estimated at 75 feet or less.

The Blue River and Sanders Groups Aquifer System is not regarded as a major groundwater resource in Morgan County. Very few wells are available with many that are drilled in the subcrop area penetrating through to the underlying Borden Group. However, the few wells that do utilize the Blue River and Sanders Groups Aquifer System in Morgan County generally range from 50 to 80 feet in depth. Depth to bedrock ranges from 12 to 29 feet below land surface with 36 to 68 feet of penetration into bedrock. Domestic well capacities are generally less than 5 gallons per minute (gpm) with reported static water levels that range from 23 feet to 40 feet below surface. Greater capacities have been reported in isolated areas. However, higher yields are commonly associated with significant to complete drawdown.

In areas where overlying clay materials are present, the Blue River and Sanders Group Aquifer System is at low risk to contamination. However, in some areas the clay deposits are thinner. These areas are at moderate to high risk from surface contamination.

Mississippian -- Borden Group Aquifer System

The Borden Group Aquifer System outcrop/subcrop area includes nearly all of Morgan 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. Thickness of the Borden Group in Morgan County is estimated up to 600 feet.

Well depths in Morgan County are typically 70 to 150 feet with penetration commonly 2 to 12 feet into bedrock. Domestic well capacities are typically 2 to 10 gpm with reported static water levels that range from 12 feet to 40 feet below surface. Greater capacities have been reported in isolated areas. However, higher yields are commonly associated with significant to complete drawdown.

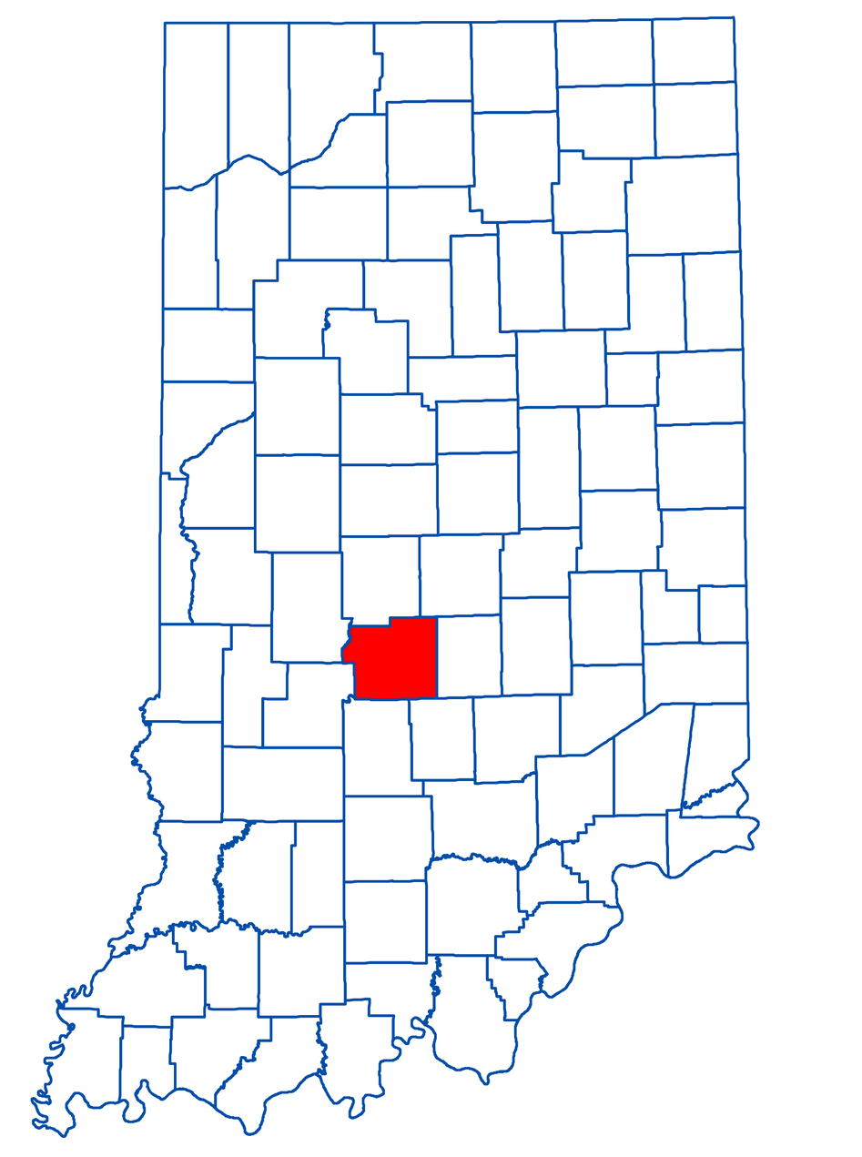
The Borden Group is composed primarily of fine-grained materials that limit the movement of groundwater and is overlain with thick clay materials. The Borden Group Aquifer System, therefore, is at low risk to contamination from the surface or near surface. However, areas where outwash deposits are near or at the surface and bedrock is shallow and may be fractured are at moderate to high risk from surface contamination.

N W E S

1 0.5 0 1 Mile

1 0.5 0 1 Kilometer

Location Map



EXPLANATION

- Stream
- County Road
- State Road & US Highway
- Interstate
- Leesville Anticline and Mt. Carmel Fault
- Municipal Boundary
- State Managed Property
- Lake & River

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 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. Structural Features of Indiana (line shapefile, 20020718) was from the Indiana Geological Survey and based on various scales. Managed Areas 96 (polygon shapefile, various dates) was from IDNR.

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