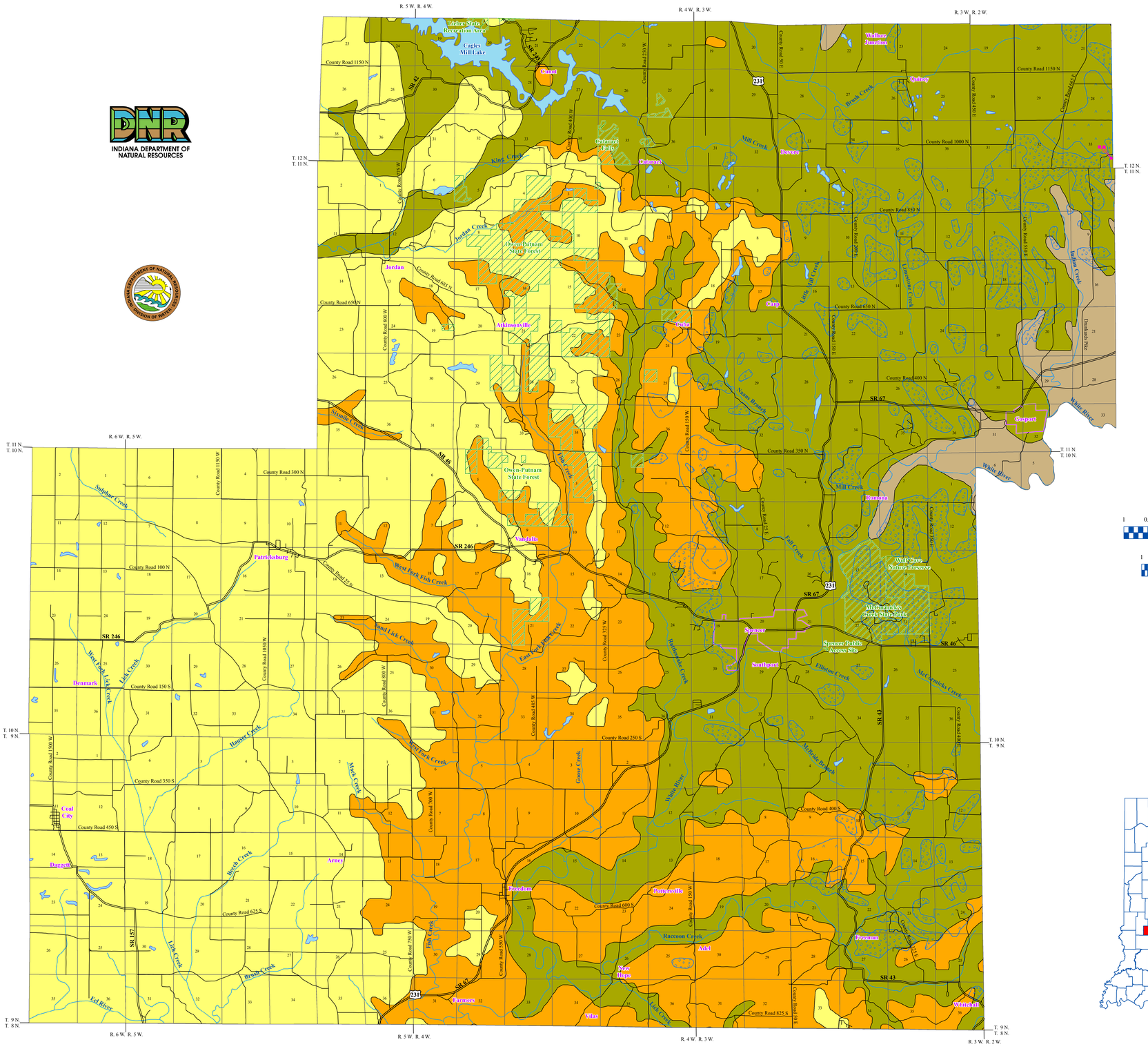
BEDROCK AQUIFER SYSTEMS OF OWEN COUNTY, INDIANA



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 Owen County. Total thickness ranges from less than one foot where bedrock is shallow or outcrops along portions of the White River and its tributaries, to an estimated 216 feet in the northwestern portion of the county. 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.

Four bedrock aquifer systems are identified for Owen County. They are the Pennsylvanian Raccoon Creek Group; the Mississippian Buffalo Wallow, Stephensport, and West Baden Groups; the Mississippian Blue River and Sanders Groups; and the Mississippian Borden Group.

Pennsylvanian -- Raccoon Creek Group Aquifer System

The Raccoon Creek Group Aquifer System outcrop/subcrop area occurs throughout portions of the western third of Owen 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. Depth to bedrock ranges from 10 to 30 feet. Wells completed in the Raccoon Creek Group are typically 100 to 240 feet deep with 7 to 45 feet of penetration into the bedrock. Domestic well capacities range from 2 to 15 gallons per minute (gpm) with static water levels of 30 to 120 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 are generally thick. These areas are considered at low risk to contamination. However, in some areas outwash, alluvial, and lacustrine sands directly overlie the bedrock surface. These areas are at moderate to high risk from surface contamination.

Mississippian -- Buffalo Wallow, Stephensport, and West Baden Groups Aquifer System

This Upper Mississippian bedrock aquifer system is present in central and southeastern Owen County. This aquifer system consists of three groups, from oldest to youngest: West Baden, Stephensport, and Buffalo Wallow. However, no Buffalo Wallow strata are present in the county. The West Baden and Stephensport Groups are composed primarily of shale, limestone, and sandstone.

The depth to the bedrock surface is commonly from 9 to 35 feet. Depths of wells range from 115 to 250 feet with 7 to 50 feet of typical penetration into bedrock. The Buffalo Wallow, Stephensport, and West Baden Groups Aquifer System is not regarded as a major groundwater resource. However, most attempts to drill a domestic well are successful. Domestic well yields are generally 4 to 15 gpm and reported static water levels range from 45 to 160 feet below land surface.

In some areas of the Buffalow Wallow, Stephensport and West Baden Groups Aquifer System bedrock is shallow and some karst has developed in the limestone beds. These conditions warrant considering the aquifer system as a whole to be somewhat susceptible to contaminants introduced at and near land surface.

Mississippian -- Blue River and Sanders Groups Aquifer System

The Blue River and Sanders Groups Aquifer System is present over portions of the eastern third of Owen County. The Sanders Group includes primarily limestone with some dolomitic limestone content. The overlying Blue River Group includes mostly limestones containing significant amounts of gypsum, anhydrite, shale, chert, and calcareous sandstone.

The Blue River and Sanders Groups Aquifer System is not regarded as a major groundwater resource in the county. Well depths in Owen County range from 90 to 200 feet. Depth to bedrock is generally between 10 and 70 feet below land surface. Domestic well capacities range from 3 to 20 gpm with reported static water levels that range from 25 feet to 90 feet below surface. Greater capacities have been reported in isolated areas. However, higher yields are commonly associated with low static water levels and 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 karst has developed in the limestone beds and outwash, alluvial, and lacustrine sands directly overlie the bedrock surface. These areas are at moderate to high risk from surface contamination.

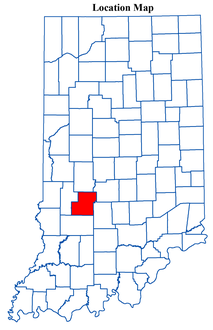
Mississippian -- Borden Group Aquifer System

The Borden Group Aquifer System outcrop/subcrop area is limited to a small portion of northeastern Owen 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 Owen County. The total well depths range from 24 to 270 feet with depths to bedrock generally 5 to 99 feet. Reported well yields range from 1 to 10 gpm with static water levels of 5 to 60 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, therefore, is at low risk to contamination from the surface or near surface. However, some portions of the bedrock surface are overlain by outwash sands and gravels. Therefore, these areas are at moderate to high risk from surface contamination.

Location Map



EXPLANATION

- Dye Test Input Point
- Dye Test Detection Point
- Karst Dye Trace
- Stream
- County Road
- State Road & US Highway
- Municipal Boundary
- Sinkhole Area
- Sinking-Stream Basin
- State Managed Land
- Lake & River

Map generated by Scott H. Dean
IDNR, Division of Water, Resource Assessment Section

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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), County Boundaries of Indiana (polygon shapefile, 20050621). Selected Subsurface Dye Traces in Parts of Southern Indiana (fine shapefile, 20000225), and Input and Detection Points for Selected Subsurface Dye Traces in Parts of Southern Indiana (point shapefile, 20001124) were all from the Indiana Geological Survey and based on a 1:24,000 scale, except the Bedrock Geology of Southwestern Indiana (polygon shapefile, 20001124), which was at a 1:500,000 scale. System 1 and System 2 were from the Indiana Department of Transportation (line shapefile, 2003) and based on a 1:24,000 scale. Managed Areas 96 (polygon shapefile, various dates) was from IDNR. City Areas in Southwestern Indiana (polygon shapefile, 1999) was from ESRI and based on a 1:100,000 scale. Streams 27 (line shapefile, 20000420) was from the Center for Advanced Applications in GIS at Purdue University. Sinkhole Areas and Sinking-Stream Basins in Part of Southern Indiana (polygon shapefile, 20001124) were also from the Indiana Geological Survey, but based on a 1:126,720 scale.

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by

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