Mitchell E. Daniels, Jr., Governor
Department of Natural Resources
Kyle J. Hupfer, Director

BEDROCK AQUIFER SYSTEMS OF PERRY COUNTY, INDIANA

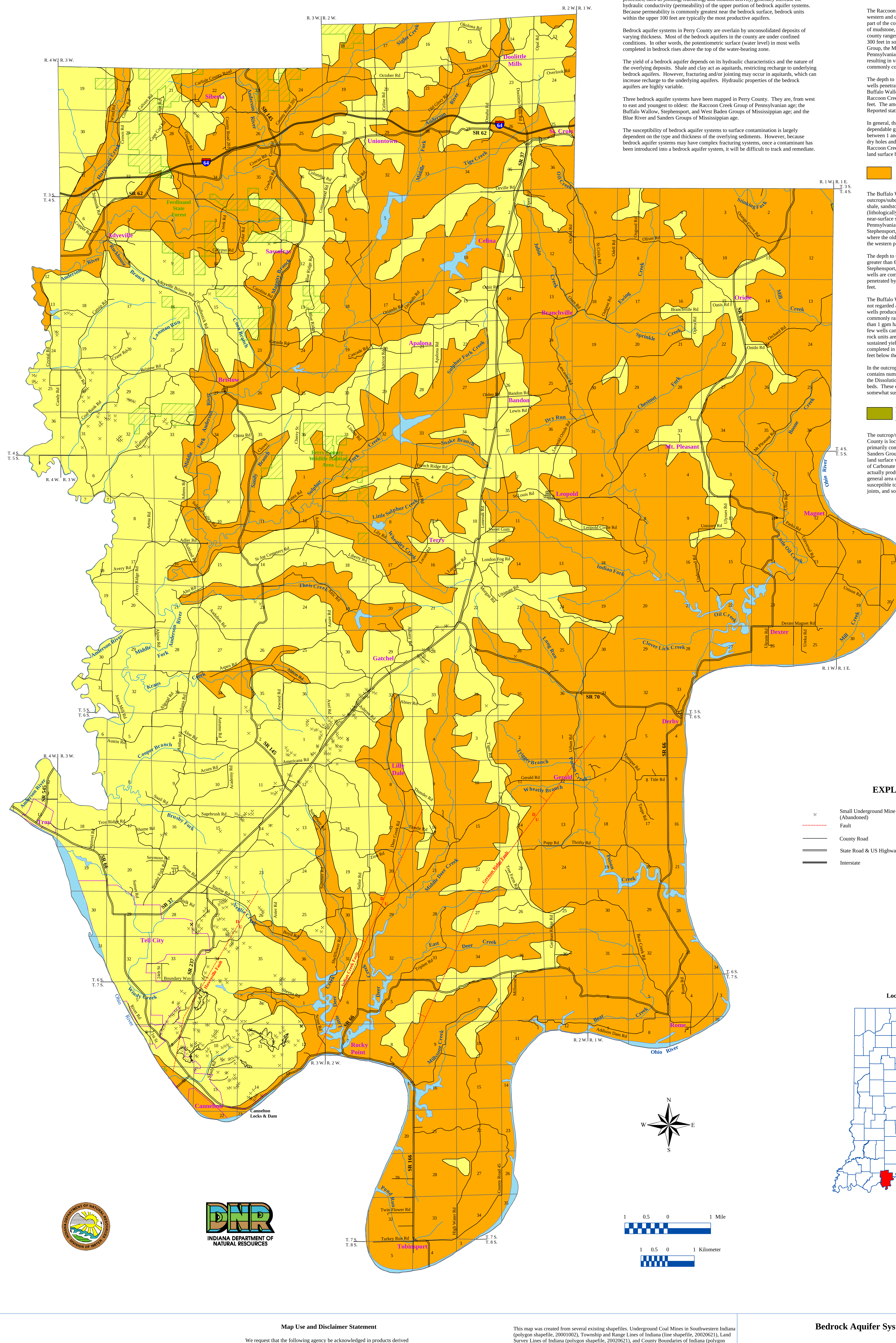
The occurrence of bedrock aquifers depends on the original composition of the rocks and subsequent changes which influence the hydraulic properties. Post-depositional processes, such as jointing, fracturing, and solution activity, generally increase the hydraulic conductivity (permeability) of the upper portion of bedrock aquifer systems. Because permeability is commonly greatest near the bedrock surface, bedrock units within the upper 100 feet are typically the most productive aquifers.

Bedrock aquifer systems in Perry County are overlain by unconsolidated deposits of varying thickness. 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 zone.

The yield of a bedrock aquifer depends on its hydraulic characteristics and the nature of the overlying deposits. Shale and clay 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.

Three bedrock aquifer systems have been mapped in Perry County. They are, from west to east and youngest to oldest: the Raccoon Creek Group of Pennsylvanian age; the Buffalo Wallow, Stephensport, and West Baden Groups of Mississippian age; and the Blue River and Sanders Groups of Mississippian age.

The susceptibility of bedrock aquifer systems to surface contamination is largely dependent on the type and thickness of the overlying sediments. However, because bedrock aquifer systems may have complex fracturing systems, once a contaminant has been introduced into a bedrock aquifer system, it will be difficult to track and remediate.



Pennsylvanian -- Raccoon Creek Group Aquifer System

The Raccoon Creek Group Aquifer System outcrops/subcrops primarily in portions of western and central Perry County, and also along a few ridges and hilltops in the eastern part of the county. The group consists of mostly sandstone and shale with minor amounts of mudstone, coal, and limestone. Total thickness of the Raccoon Creek Group in the county ranges from less than 1 foot where the Mississippian rocks are exposed to about 300 feet in southwestern Perry County. The basal formation of the Raccoon Creek Group, the Mansfield Formation, rests unconformably on the Mississippian rocks. The Pennsylvanian-Mississippian erosional contact surface is quite irregular in elevation, resulting in variable thickness of Mansfield rocks. The lowermost part of the Mansfield commonly contains a large percentage of sandstone.

The depth to the bedrock surface is typically less than 30 feet. Several of the deeper wells penetrate through the Raccoon Creek Group Aquifer System into the underlying Buffalo Wallow, Stephensport, and West Baden Groups Aquifer System. Wells in the Raccoon Creek Group Aquifer System are commonly completed at depths of 70 to 175 feet. The amount of rock penetrated by wells typically ranges from 25 to 160 feet. Reported static water levels are commonly 20 to 65 feet below the surface.

In general, the Raccoon Creek Group Aquifer System is considered a moderately dependable ground-water source in Perry County. Domestic wells typically produce between 1 and 10 gallons per minute (gpm) with localized yields of up to 20 gpm. A few dry holes and several wells with yields of less than 1 gpm have been reported. The Raccoon Creek Group Aquifer System is not very susceptible to contamination from the land surface because of low-permeability strata above water-bearing zones.

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

The Buffalo Wallow, Stephensport, and West Baden Groups Aquifer System outcrops/subcrops in much of central and eastern Perry County and consists primarily of shale, sandstone, and limestone. Many of the individual rock units are laterally (lithologically) discontinuous. In addition, the vertical and horizontal continuity of the near-surface system was altered because of erosion during the Mississippian-Pennsylvanian unconformity. The combined thickness of the Buffalo Wallow, Stephensport, and West Baden Groups in Perry County ranges from less than one foot where the older Blue River Group rocks are exposed to a maximum of about 550 feet in the western part of the county near the Ohio River.

The depth to the bedrock surface is typically less than 20 feet on the uplands, but is greater than 60 feet in the larger valley bottoms. Well depths in the Buffalo Wallow, Stephensport, and West Baden Groups Aquifer System range from 33 to 487 feet, but wells are commonly completed at depths of 60 to 140 feet. The amount of rock penetrated by a well typically ranges from about 35 to 115 feet, with a maximum of 482 feet.

The Buffalo Wallow, Stephensport, and West Baden Groups Aquifer System is generally not regarded as a major ground-water resource. However, in Perry County over 100 wells produce from the system. The yield of domestic wells completed in the system commonly range from 1 to 7 gpm. A few dry holes and several wells with yields of less than 1 gpm have been reported. One well was tested as high as 50 gpm. However, very few wells can sustain a pumping rate over 10 gpm. Where the more porous or jointed rock units are overlain by sand and gravel, such as in a river valley, somewhat higher sustained yields may be possible. Static water levels are highly variable in the wells completed in this aquifer system. Reported static water levels range from 0 feet to 245 feet below the land surface, but are generally between 15 and 60 feet.

In the outcrop/subcrop area of this aquifer system the rock is predominantly shallow and contains numerous, irregular joints. In limited areas, some karst (see Karst Features and the Dissolution of Carbonate Rocks in Perry County) 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 the land surface.

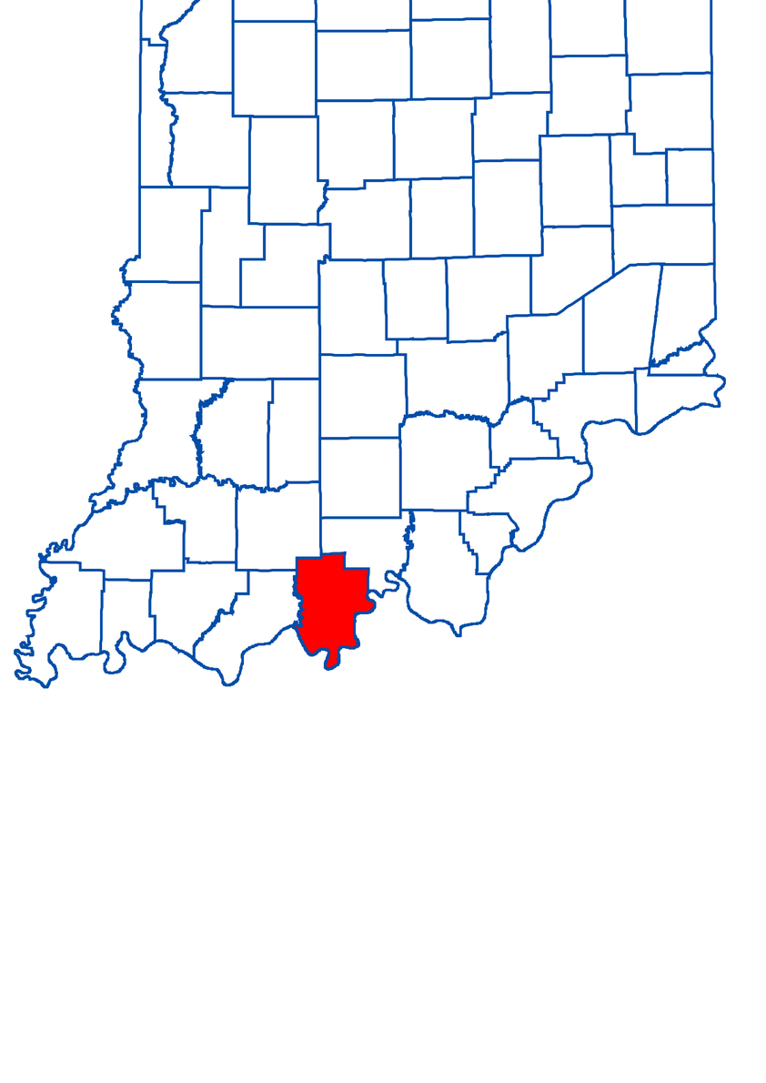
Mississippian -- Blue River and Sanders Groups Aquifer System

The outcrop/subcrop area of the Blue River and Sanders Groups Aquifer System in Perry County is located in the northeastern corner of the county. The rocks of this system primarily consist of limestone and dolomite. Limestones within the Blue River and Sanders Groups are especially noted for development of karst (solution) features on the land surface where the bedrock is quite shallow (see Karst Features and the Dissolution of Carbonate Rocks in Perry County). In Perry County, there are no known wells actually producing from the Blue River and Sanders Groups Aquifer System. In the general area of the outcrop/subcrop of the group, the aquifer system is considered very susceptible to contamination from the land surface because of the shallow rock, open joints, and solution channels.

EXPLANATION

Small Underground Mine (Abandoned)
Fault
County Road
State Road & US Highway
Interstate
Underground Coal
Municipal Boundary
State Managed Property
Lake & River

Location Map



N
W E
S

1 0.5 0 1 Mile

1 0.5 0 1 Kilometer

INDIANA DEPARTMENT OF NATURAL RESOURCES

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Map generated by Jennifer K. Mc Millan and Joseph L. Phillips
IDNR, Division of Water, Resource Assessment Section

This map was created from several existing shapefiles. Underground Coal Mines in Southwestern Indiana (polygon shapefile, 20001002), Township and Range Lines of Indiana (line shapefile, 20020621), Land Survey Lines of Indiana (polygon shapefile, 20020621), and County Boundaries of Indiana (polygon shapefile, 20050621) 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. City Areas in Southwestern Indiana (polygon shapefile, 1999) was from ESRI and based on a 1:100,000 scale. Streams27 (line shapefile, 20000420) was from the Center for Advanced Applications in GIS at Purdue University.

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by
Gerald A. Unterreiner
Division of Water, Resource Assessment Section
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