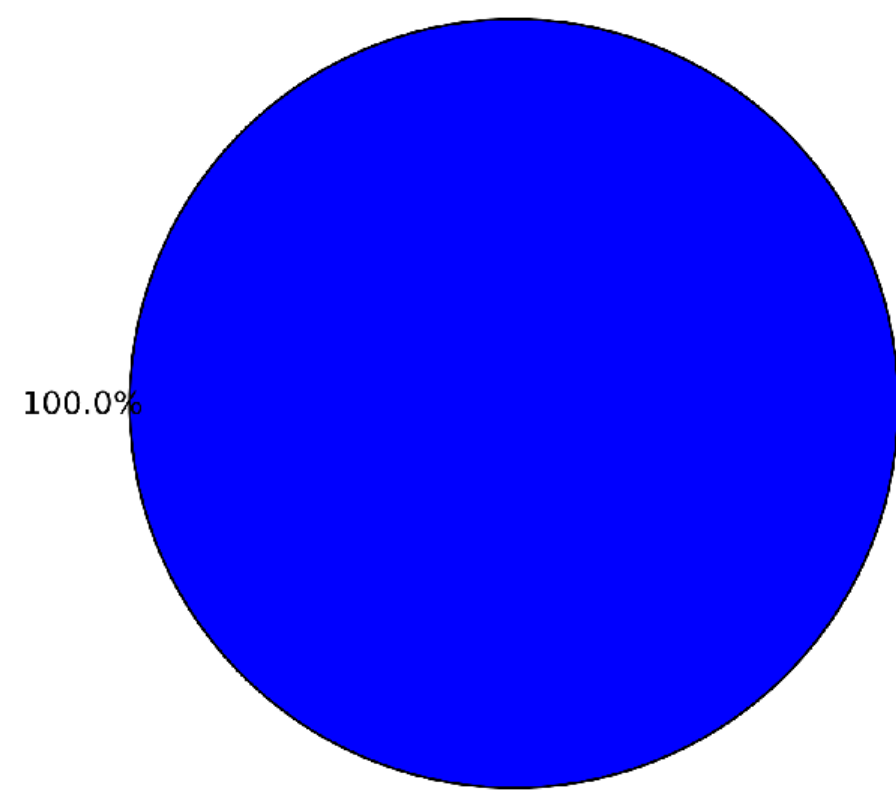
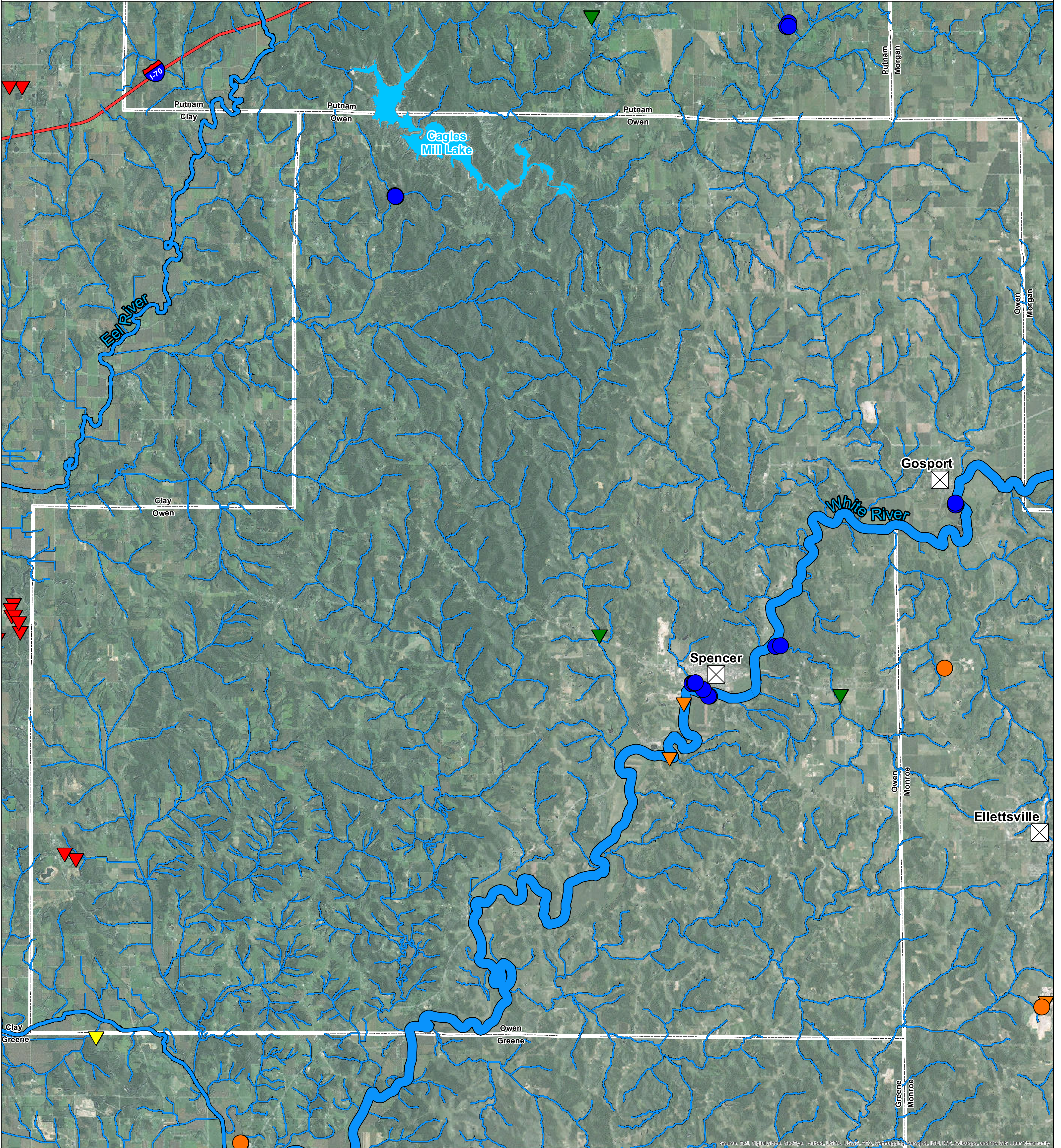
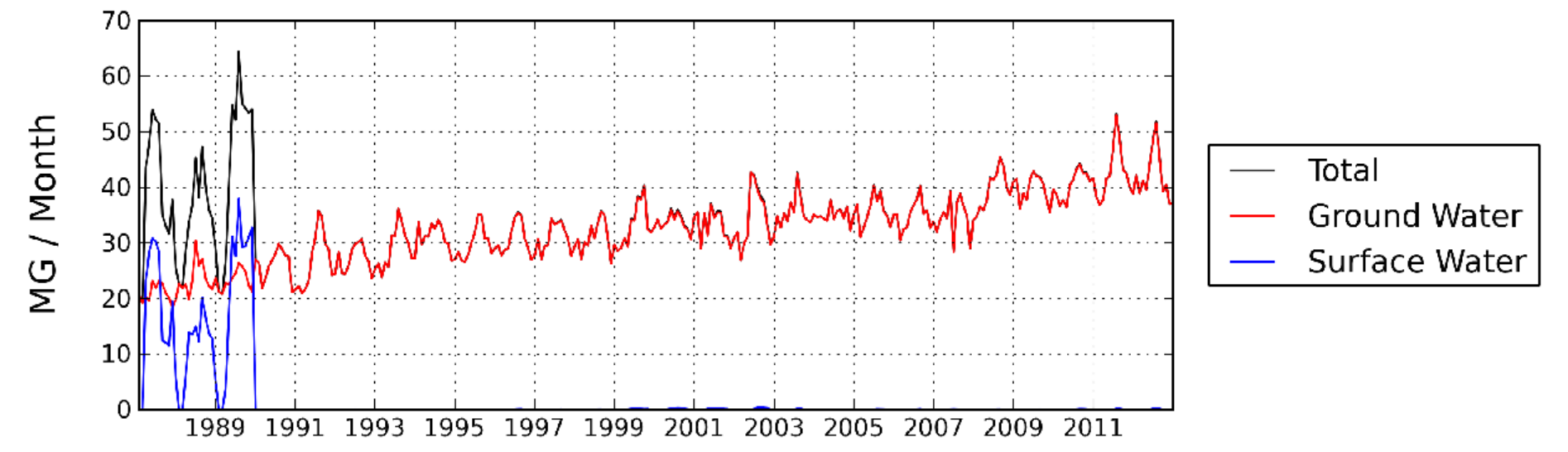
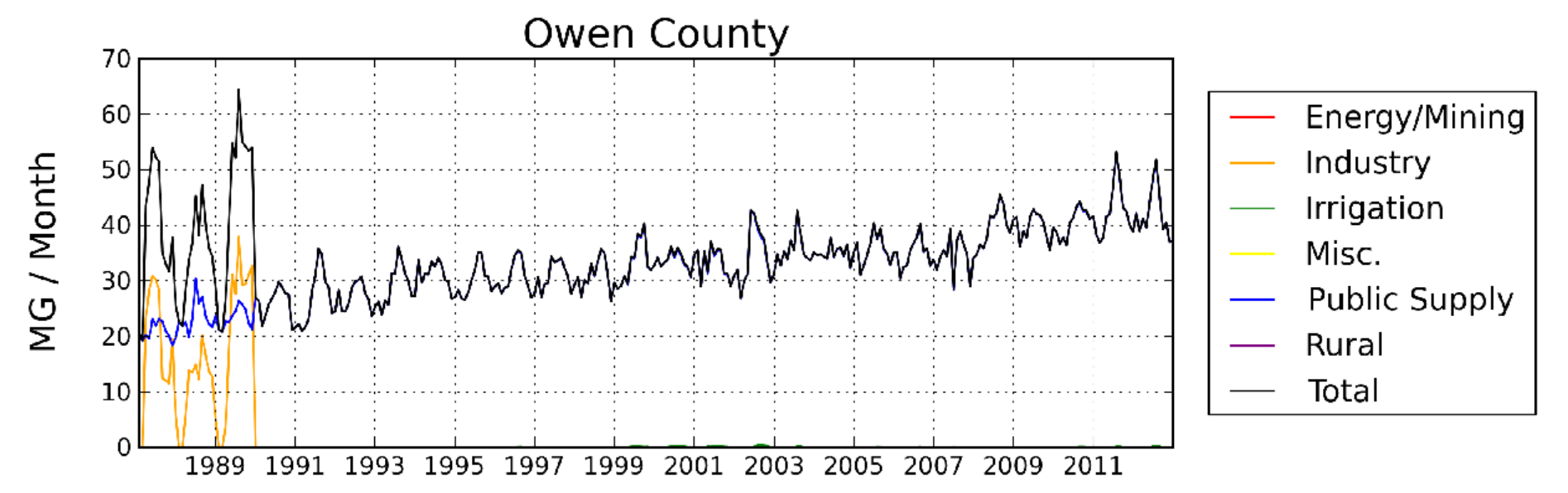




2012 Water Use



Average Daily Use: 1.4 MGD



# Water Resources and Use in Owen County

Data Sources: U.S. Geological Survey and Indiana Department of Natural Resources

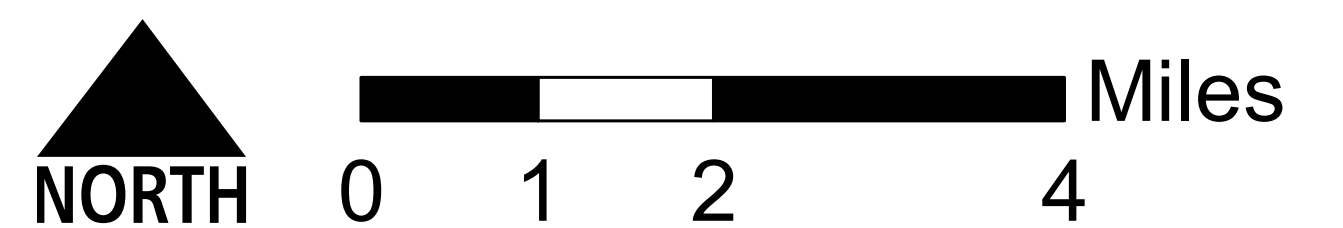
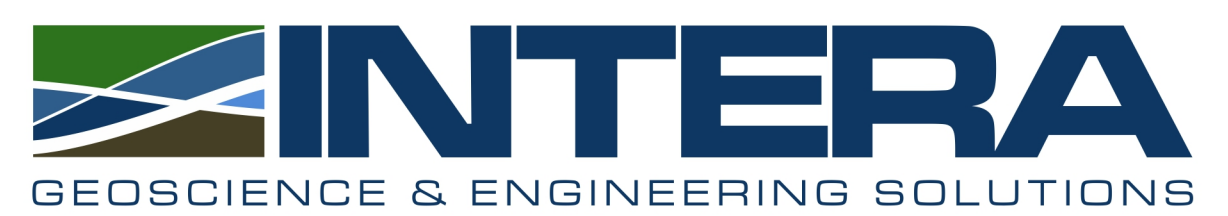
### Withdrawal Location

- |             |   |               |
|-------------|---|---------------|
| WELL INTAKE | ▼ | Energy/Mining |
| ●           | ▼ | Industry      |
| ●           | ▼ | Irrigation    |
| ●           | ▼ | Misc.         |
| ●           | ▼ | Public Supply |
| ●           | ▼ | Rural Use     |

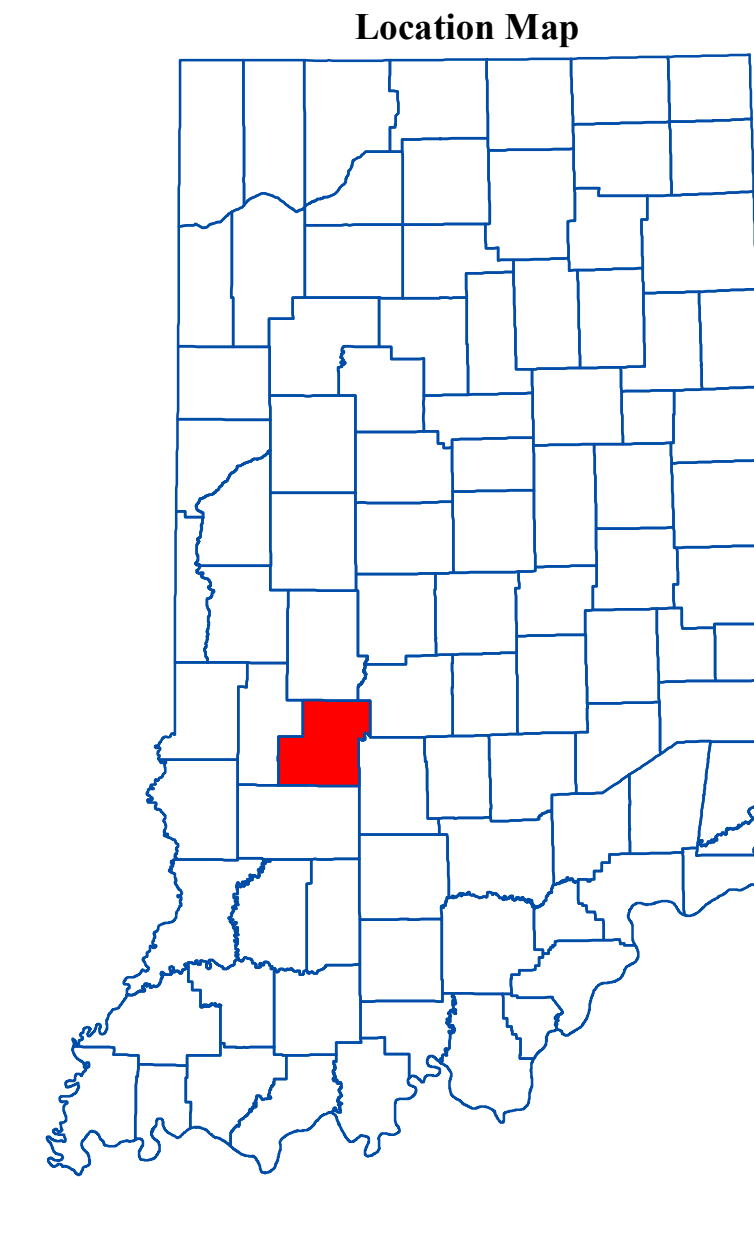
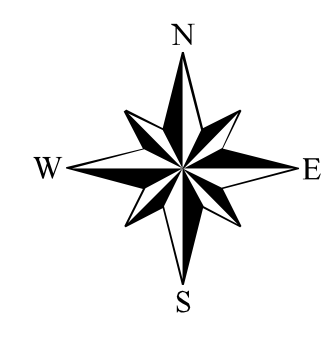
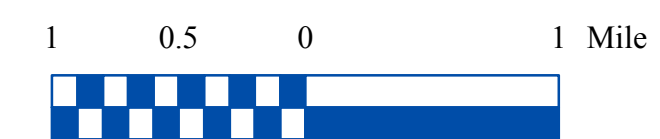
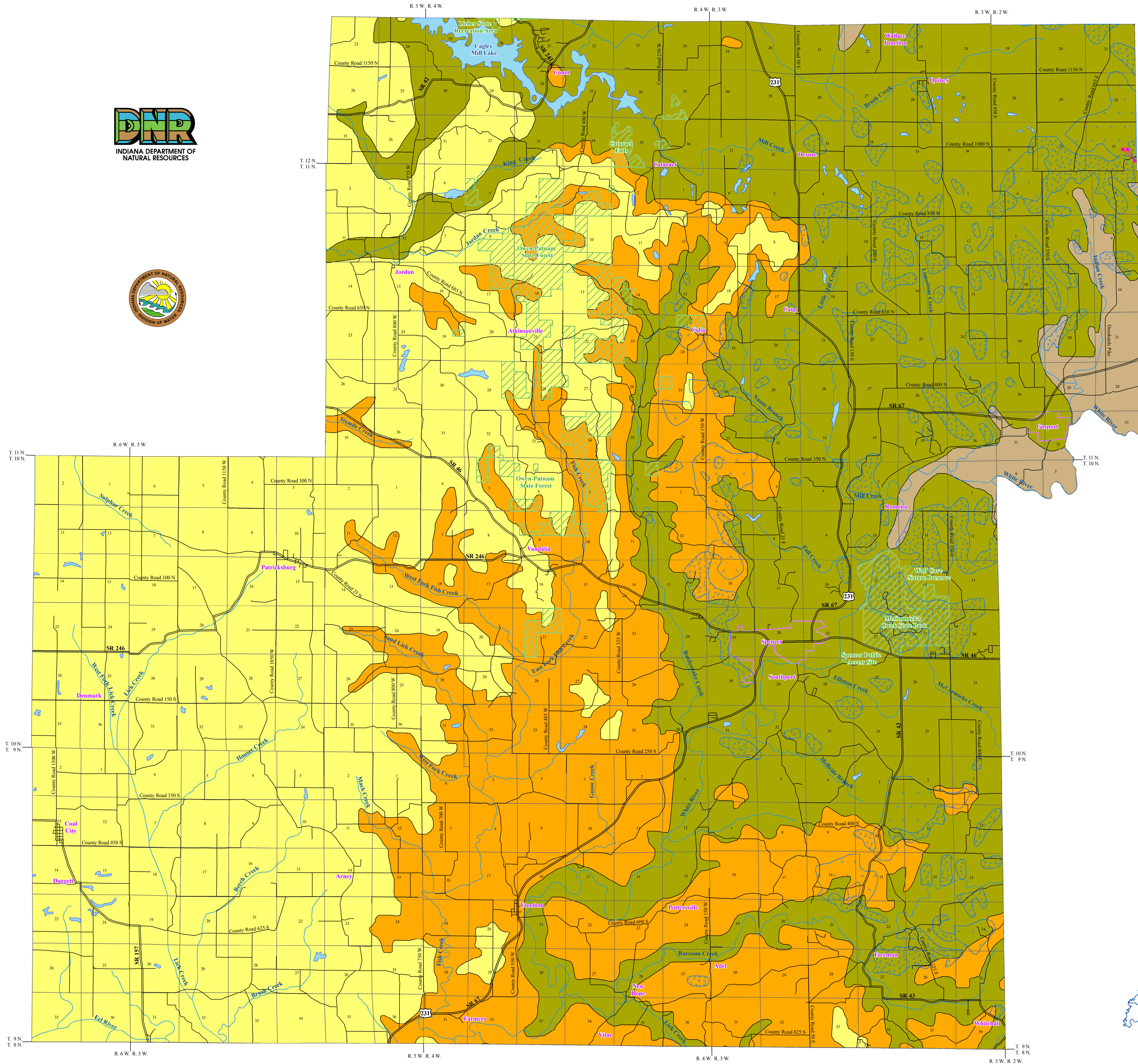
### River

- |                |   |               |
|----------------|---|---------------|
| 7Q2 Flow (MGD) | — | <10 MGD       |
|                | — | 10 - 50 MGD   |
|                | — | 50 - 100 MGD  |
|                | — | 100 - 500 MGD |
|                | — | > 500 MGD     |

- |   |             |
|---|-------------|
| ■ | Major Lakes |
| — | Interstate  |
| □ | County      |
| ⊠ | City        |



# 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 aquicluds, restricting recharge to underlying bedrock aquifers. However, fracturing and/or jointing may occur in aquicluds, 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 Buffalo 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.

### 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 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), County Boundaries of Indiana (polygon shapefile, 20050621), Selected Subsurface Dye Traces in Parts of Southern Indiana (line shapefile, 20000225), and Input and Detection Points for Selected Subsurface Dye Traces in Parts of Southern Indiana (point shapefile, 200001124) 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.

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

### Bedrock Aquifer Systems of Owen County, Indiana

by  
Randal D. Maier  
Division of Water, Resource Assessment Section

August 2010

# UNCONSOLIDATED AQUIFER SYSTEMS OF OWEN COUNTY, INDIANA

Five unconsolidated aquifer systems have been mapped in Owen County: the Dissected Till and Residuum / Unglaciated Southern Hills and Lowlands; the Alluvial, Lacustrine, and Backwater Deposits; the Martinsville Hills / Crawford Upland / Mitchell Plateau Till; the White River and Tributaries Outwash; and the White River and the Tributaries Outwash Subsystem. Boundaries of all aquifer systems described are commonly gradational, and individual aquifers may extend across aquifer system boundaries.

Thicknesses of unconsolidated sediments that overlie bedrock are quite variable in Owen County. Total thickness ranges from less than one foot where bedrock is shallow or outcrops along sections of tributaries to the White River, to an estimated 200 feet in the northwest part of the county where a major bedrock valley is present. Approximately 10 percent of all wells completed in the county are completed in unconsolidated deposits.

Regional estimates of aquifer susceptibility to contamination from the surface may differ considerably from local reality. Variations within geologic environments can cause variation in susceptibility to surface contamination. In addition, man-made structures such as poorly constructed water wells, unplugged or improperly abandoned wells, and open excavations provide contaminant pathways that bypass the naturally protective clays.

### Dissected Till and Residuum / Unglaciated Southern Hills and Lowlands Aquifer System

The Dissected Till and Residuum / Unglaciated Southern Hills and Lowlands Aquifer System is mapped throughout Owen County and is mapped as one system because they are similar in composition and aquifer characteristics. The Dissected Till and Residuum Aquifer System is mapped throughout most of Owen County where glacial deposits are thin and, in some areas, may include weathered materials. The Dissected Till and Residuum Southern Hills and Lowlands System areal extent is limited to the southeastern corner of Owen County where glacial deposits are absent.

Typical deposits for both systems include primarily clay that directly overlies bedrock. Thin (1 to 2 feet) fine-grained sands or gravels, although rare, may be present. Along some of the major streams this system may include thin alluvium and fine-grained surficial sands and gravels that directly overlie the bedrock surface.

There is little potential for groundwater production in this system in Owen County. Nearly all wells drilled in areas mapped as Dissected Till and Residuum / Unglaciated Southern Hills and Lowlands bypass the unconsolidated deposits in favor of the underlying bedrock aquifer system. However, a few wells in Owen County reportedly produce from this system. Reported yields generally range from 1 to 8 gallons per minute (gpm) and show significant to complete drawdown.

This aquifer system is generally not very susceptible to surface contamination because inter-till sand and gravel units are overlain by 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.

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

The Alluvial, Lacustrine, and Backwater Deposits Aquifer System in Owen County is mapped within several wide valleys along small tributaries of the White River. 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 Owen 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 / Crawford Upland / Mitchell Plateau Till Aquifer Subsystem

The Martinsville Hills / Crawford Upland / Mitchell Plateau Till Aquifer Subsystem is mapped throughout portions of northern and eastern Owen County. This system typically consists of thick clay with discontinuous inter-till sands and gravels. The discontinuous sands and gravels, where present, are generally less than 10 feet thick with some noted as "dry". Portions of this system include fine-grained lacustrine sand, silt and clay deposits.

In Owen County approximately 86 percent of the wells drilled in areas mapped as till subsystem are completed in the underlying bedrock aquifer system. However, the subsystem has the potential of meeting the needs of some domestic users. Well depths generally range from 20 to 156 feet. Where present, potential aquifer materials include sand and gravel deposits that generally range from 2 to 11 feet thick and are capped by 15 to 90 feet of till. In some isolated areas, greater thicknesses of sands and gravels have been reported.

The few wells that utilize the available sand and gravel deposits have yields that range from 5 to 30 gpm with static water levels of 10 to 180 feet below the surface. However, reported yields greater than 10 gpm are typically associated with significant to complete drawdown.

A portion of this system overlies part of a major buried bedrock valley that includes mixtures of lacustrine sand, silt, and clay. Unconsolidated deposits overlying bedrock are up to 215 feet with isolated thicknesses of sands and gravels up to 105 feet. Few unconsolidated wells are completed in these areas; however, those reported are up to 200 feet in depth. Thickness of aquifer deposits are generally less than 10 feet and are capped by thick clay. This area is capable of meeting the needs of domestic users. Reported well capacities range from 2 to 40 gpm with static water levels from 9 to 135 feet below surface.

This aquifer subsystem is generally not very susceptible to surface contamination because inter-till 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 System

The White River and Tributaries Outwash Aquifer System includes thick glacial outwash sands and gravels capped by recent alluvial deposits. The system is mapped primarily in the southeast part of Owen County along the White River.

Total depth of wells completed in the White River and Tributaries Outwash Aquifer System range from 29 to 120 feet. In places, aquifer materials are up to 120 feet of continuous sand and gravel and may be capped by alluvial silt and/or clay materials that generally range from 3 to 26 feet thick.

The White River and Tributaries Outwash Aquifer System is capable of meeting the needs of domestic and high-capacity users. Domestic well capacities range from 10 to 60 gpm with static water levels from 10 to 34 feet below the ground surface. There are 2 registered significant groundwater withdrawal facilities (10 wells) with capacities that range from 160 to 1000 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.

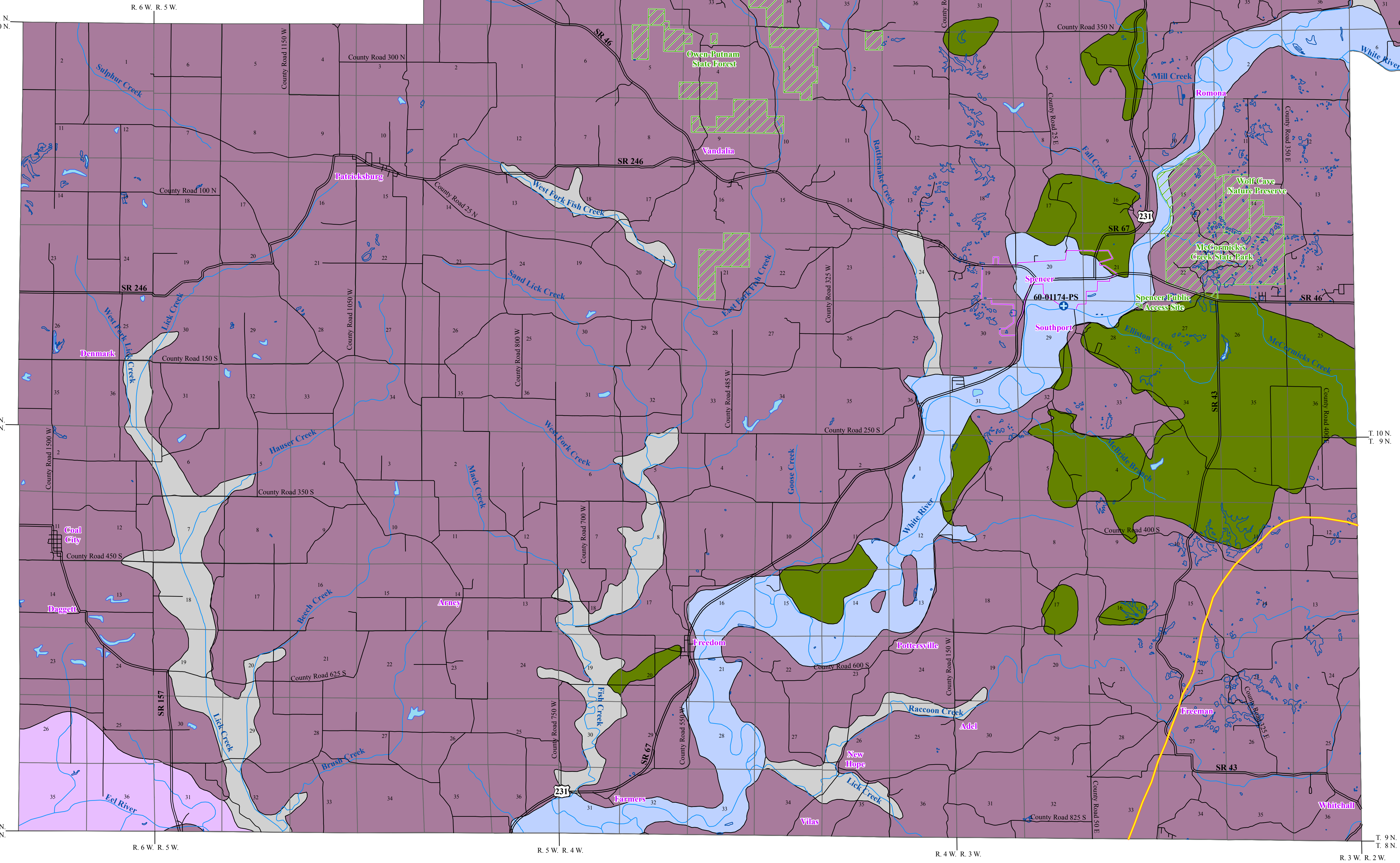
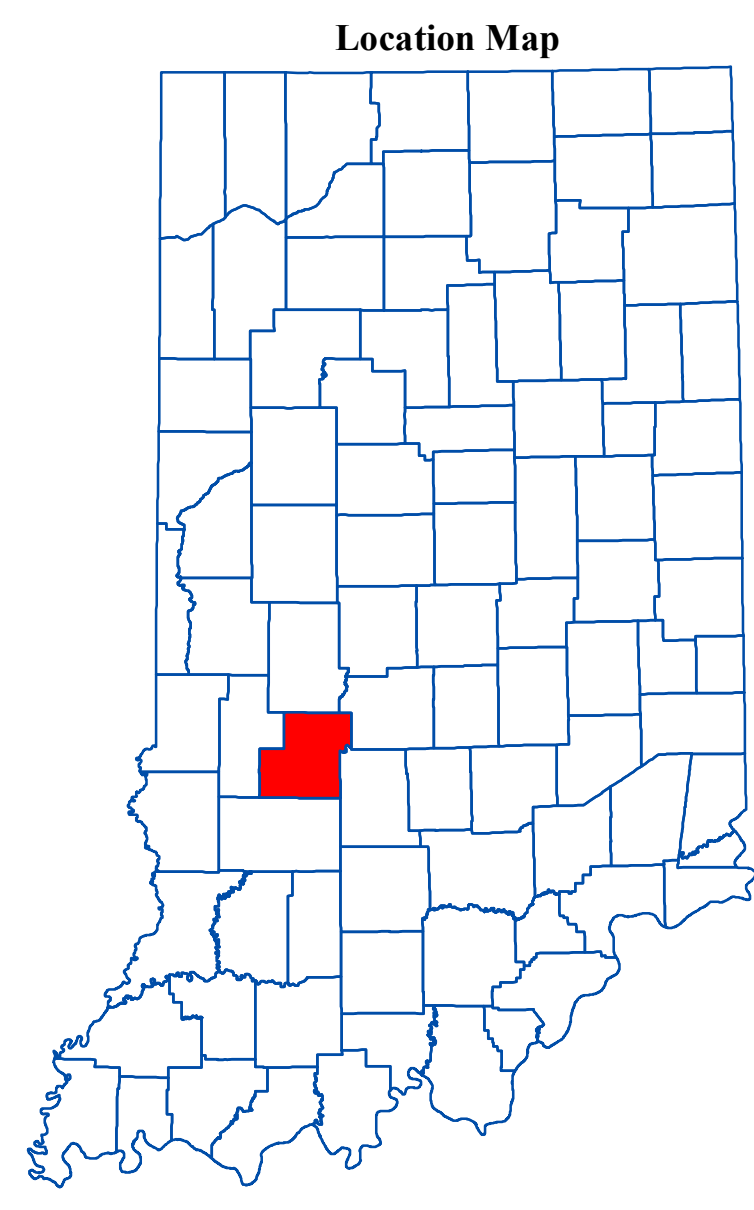
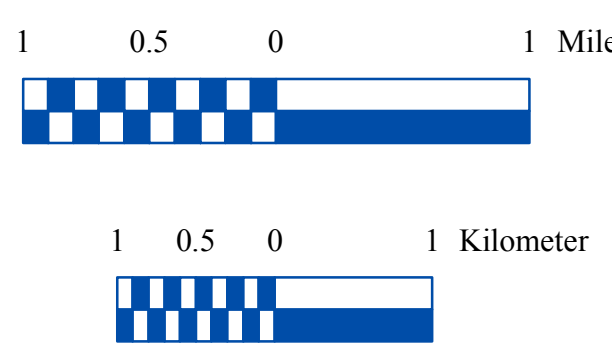
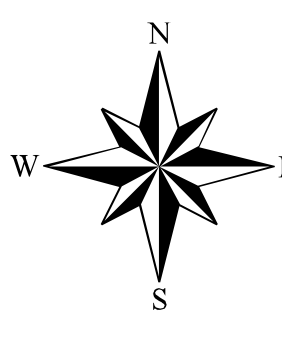
### White River and Tributaries Outwash Aquifer Subsystem

The White River and Tributaries Outwash Aquifer Subsystem is mapped to the southwest along the Eel River, to the northwest along North Fork Jordan Creek, and an area to the northeast of Gosport along the confluence of the White River and Indian Creek. The subsystem is mapped similar to the White River and Tributaries Outwash Aquifer System. However, potential aquifer materials are thicker, overlying silt or clay materials are generally thicker and potential yield is less in the subsystem than in the system.

Few wells are reported in the White River and Tributaries Outwash Aquifer Subsystem. However, the few that are available report well depths ranging from 60 to 118 feet. In places, aquifer materials are up to 65 feet of continuous sand and gravel and may be capped by alluvial silt and/or clay materials that generally range from 2 to 80 feet thick. The subsystem is capable of meeting the needs of domestic and some high-capacity users. Domestic well capacities range from 5 to 60 gpm with static water levels of 10 to 35 feet below ground surface.

A small portion of this system overlies part of a major buried bedrock valley that includes mixtures of lacustrine sand, silt, and clay. There is little information reported in this area; however, there is one registered significant water withdrawal facility (two wells) with reported capacities of 300 gpm each. Total reported depth of these wells is 124 and 128 feet with static water levels at 67 and 74 feet, respectively.

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.



### EXPLANATION

- Registered Significant Groundwater Withdrawal Facility
- Dye Test Input Point
- Dye Test Detection Point
- Karst Dye Trace
- Stream
- County Road
- State Road & US Highway
- Approximate Southern Limit of Older Glacial Deposits
- Municipal Boundary
- USGS Closed Contours (Mostly Karst Depressions)
- State Managed Land
- Lake & River

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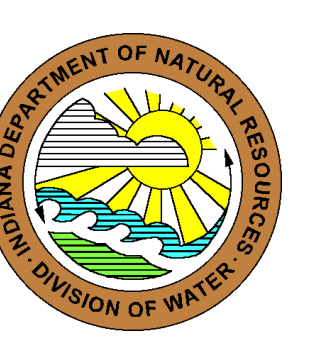
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### Unconsolidated Aquifer Systems of Owen County, Indiana

by  
Randall D. Maier  
Division of Water, Resource Assessment Section

August 2010

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



# Owen County

