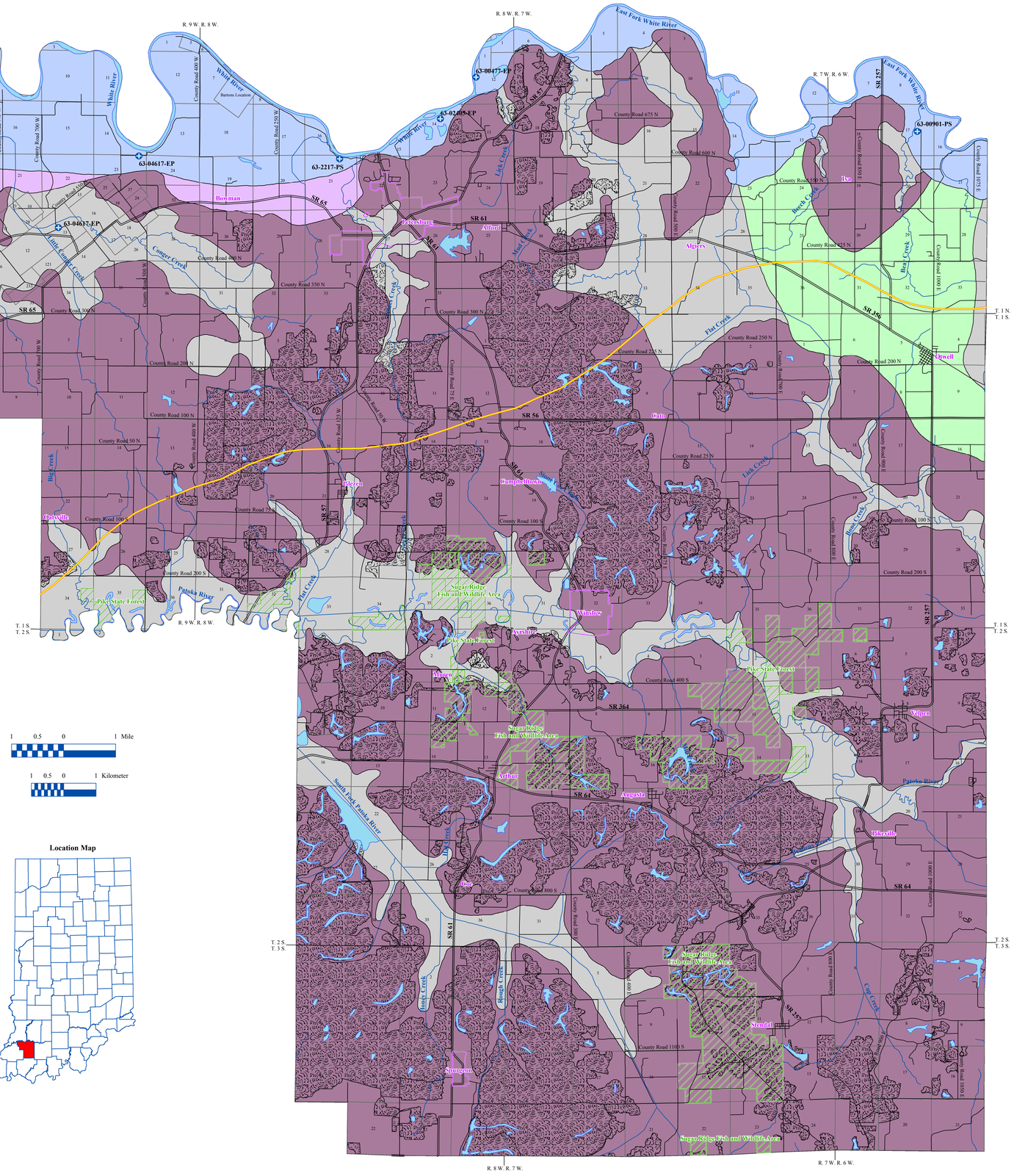
UNCONSOLIDATED AQUIFER SYSTEMS OF PIKE COUNTY, INDIANA



1 0.5 0 1 Mile

1 0.5 0 1 Kilometer

Location Map

Six unconsolidated aquifer systems are mapped in Pike County. Boundaries are commonly gradational, and individual aquifers may extend across aquifer boundaries. The Coal Mine Spoil Aquifer System is man-made and most boundaries are well defined. Except in the northern part of the county, where the thickness of unconsolidated material may exceed 200 feet, the amount of unconsolidated material overlying the bedrock is commonly less than 20 feet. In places, sand and gravel aquifers are located immediately above the bedrock surface. Sand and gravel aquifers occur in the main valley of the White River, East Fork White River, in a deeply buried bedrock valley in northeastern Pike County, and in some smaller buried bedrock valleys that may coincide with present-day valleys.

Regional estimates of aquifer susceptibility to surface contamination can differ considerably from local reality. Variations within geologic environments can cause large variations in susceptibility. Also, man-made structures such as poorly constructed water wells, unplugged or improperly abandoned wells, and open excavations, can provide containment pathways that bypass 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 that covers most of Pike County south of the floodplain of the White and East Fork White Rivers has the most limited groundwater resources of the unconsolidated aquifer systems in the county. Unconsolidated materials of this aquifer system consist of thin, eroded bedrock residuum in most of the county. The residuum has a high clay content and is typically less than 15 feet thick. However, in the northern third of the county the system includes some pre-Wisconsin till, lacustrine silt and clay, and Wisconsin loess. In places, a thin sand layer, commonly less than 5 feet thick, is encountered. Total thickness of the system in Pike County typically ranges from about 5 to 50 feet.

There appears to be little potential for water production in the Dissected Till and Residuum / Unglaciated Southern Hills and Lowlands Aquifer System in Pike County. Nearly all wells penetrating this unconsolidated aquifer system in the county are developed in the underlying bedrock. However, in places large-diameter bored (bucket-rig) wells may produce water from thin sands within the predominantly clay and silt materials of this aquifer system. The Dissected Till and Residuum / Unglaciated Southern Hills and Lowlands Aquifer System is transected by the Alluvial, Lacustrine, and Backwater Deposits Aquifer System and the Buried Valley Aquifer System. The boundaries between these systems are transitional in many areas of the county. Clay is abundant in both the till and residuum, thus this aquifer system has a low susceptibility to surface contamination.

White River and Tributaries Outwash Aquifer System

The White River and Tributaries Outwash Aquifer system is comprised primarily of large volumes of sand and gravel that occupy the valleys of the White River and its major tributaries. However, in Pike County this aquifer is limited to the main valleys of the White River and East Fork White River. Sand and gravel deposits in this system range from less than 25 to more than 90 feet thick, but not all are saturated with water. Actual saturated aquifer thickness is about 25 to 75 feet thick. In some areas the water-bearing units are overlain by fine-grained clay, silt, or muddy sand; therefore the aquifer may be confined or unconfined.

The White River and Tributaries Outwash Aquifer system is by far the most productive aquifer system in the county and has the potential to consistently meet the needs of high-capacity water users. Well yields of 200 to 1000 gpm can be expected throughout most of the system. Currently there are 5 registered significant groundwater withdrawal facilities using this system in Pike County. This aquifer system is highly susceptible to contamination in areas that lack overlying clay layers. Areas within the system that are overlain by thick layers of clay or silt are moderately susceptible to surface contamination.

White River and Tributaries Outwash Aquifer Subsystem

This aquifer system (subsystem) is generally located adjacent to and parallel to the White River and Tributaries Outwash Aquifer System. It typically occupies a higher topographic position and has considerably thinner sand and gravel units than the main outwash aquifer system. Commonly the sand and gravel is covered by a layer of clay, till, lacustrine, or loess deposits. In places, the upper portions may be unsaturated.

There are no domestic wells or registered significant groundwater withdrawal facilities using this aquifer system in Pike County, therefore no reliable estimates of aquifer thickness or potential yield may be made. In general, this system is highly susceptible to surface contamination. Although the overlying clay or till may provide some protection to the confined portions of the subsystem, in many places surficial valley train deposits coalesce with the deeper outwash deposits making them more vulnerable.

Alluvial, Lacustrine, and Backwater Deposits Aquifer System

The Alluvial, Lacustrine, and Backwater Deposits Aquifer System is composed of unconsolidated deposits in tributary valleys to White River, East Fork White River, and Wabash River. These include deposits in the main valley of Patoka River and South Fork Patoka River. Also included are deposits over two broad areas of Northern Pike County. The unconsolidated deposits have two sources: alluvium deposited by a stream along with colluvium eroded from valley walls and uplands, and glaciolacustrine deposits formed in bodies of relatively stagnant lake water.

There are areas in this system where the thickness of unconsolidated material exceeds 100 feet, such as, in the area adjacent to the Buried Valley Aquifer System and in the valleys of Conger Creek and Little Conger Creek. Although not readily identifiable in well records, deposits of till are present in these areas. Similar areas in other counties may be mapped as a till aquifer system, indicating higher yield potential due to the presence of intratill sand and gravel deposits. Very little data are available, but it is expected that wells drilled in these areas may yield sufficient water for domestic needs. Because the Patoka River carried little outwash from melting glaciers, it is doubtful that its main valley has potential for much more than domestic wells.

Sand and gravel lenses, where present in this aquifer system, are commonly less than 5 feet thick and are either confined within the glaciolacustrine deposits, or directly overly bedrock. Yields for domestic wells range from 0 (a dry hole) to 30 gpm. Overall, prospects of completing high-capacity wells in this aquifer system are poor. However, there is one registered significant groundwater withdrawal facility (3 wells) using this system in Pike County. The reported capacity for all three wells is 30 gpm. This aquifer system is marked by thick deposits of soft silt and clay that have low susceptibility to surface contamination.

Buried Valley Aquifer System

The Buried Valley Aquifer System consists of aquifer materials deposited in pre-glacial bedrock valleys. There is only one main buried bedrock valley located in Pike County. It cuts as deeply as 155 feet into Pennsylvanian (Raccoon Creek Group) bedrock. It enters the county at the eastern county line about one mile southeast of Otwell and trends northwest toward the East Fork White River valley (about 1.5 miles northeast of Algiers). A buried tributary valley trending toward the south-southwest intersects this main trunk about 2 miles west and 1 mile north of Otwell. Although there are additional buried bedrock valleys in Pike County, only the larger buried valleys that contain significant water-bearing sediments have been included as mapped units of the Buried Valley Aquifer System.

Domestic wells typically yield from 10 to 40 gpm. A major limitation of this aquifer system is the fine-grained, commonly dirty nature of the water-bearing units.

The Buried Valley Aquifer system has a low susceptibility to surface contamination because tills and lacustrine silts and clays generally overlie outwash sediments occurring within the bedrock valleys. Although lenses of outwash sand and gravel may occur within the tills, the predominance of fine-grained sediments above the bedrock valleys limits the migration of contaminants from surface sources to the deep aquifers.

Coal Mine Spoil Aquifer System

The Coal Mine Spoil Aquifer System covers a large percentage (about 24 percent) of Pike County, mostly in the central and southern regions. This aquifer system was formed during the surface-mining process. The overburden, most of which was originally solid rock, was typically broken up by blasting and moved aside to uncover the desired coal seam, thus creating a heterogeneous mixture of particles ranging in size from clay, silt, and sand up to gravel, slabs, and boulders. Where extensive, these spoil areas contain considerable amounts of groundwater. Although data are lacking on permeability of these spoil materials, it is generally accepted that the spoil permeability is greater than that for most of the original rock layers above the mined coal seam.

The quality of groundwater in this system is generally much poorer than that in the overburden before mining took place. Typically a significant increase occurs in total dissolved solids, especially calcium, magnesium, bicarbonate, and sulfate. High iron, and in places low pH, can also severely limit potential uses of ground water from this system. The Division of Water has only 1 record of a water supply well completed in this aquifer system in Pike County. This domestic well yields 20 gpm. A water quality analysis is not available. Very generally, it is expected that aquifers in old spoil that was not graded and capped with compacted soil are highly susceptible to surface contamination whereas new spoil areas benefiting from modern reclamation methods are likely to be only moderately susceptible.

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EXPLANATION

- Registered Significant Groundwater Withdrawal Facility
- Small Surface Mine (Abandoned)
- Stream
- County Road
- State Road & US Highway
- Approximate Southern Limit of Older Glacial Deposits
- Municipal Boundary
- DNR Managed Lands
- Lake & River

INDIANA DEPARTMENT OF NATURAL RESOURCES

Map generated by Jennifer Mc Millan
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This map was created from several existing shapefiles. Surface Coal Mines in Southwestern Indiana (polygon shapefile, 20001207), 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. 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. Unconsolidated Aquifer Systems coverage (Schrader, 2003, Modified, 2010) was based on a 1:24,000 scale.

Unconsolidated Aquifer Systems of Pike County, Indiana

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