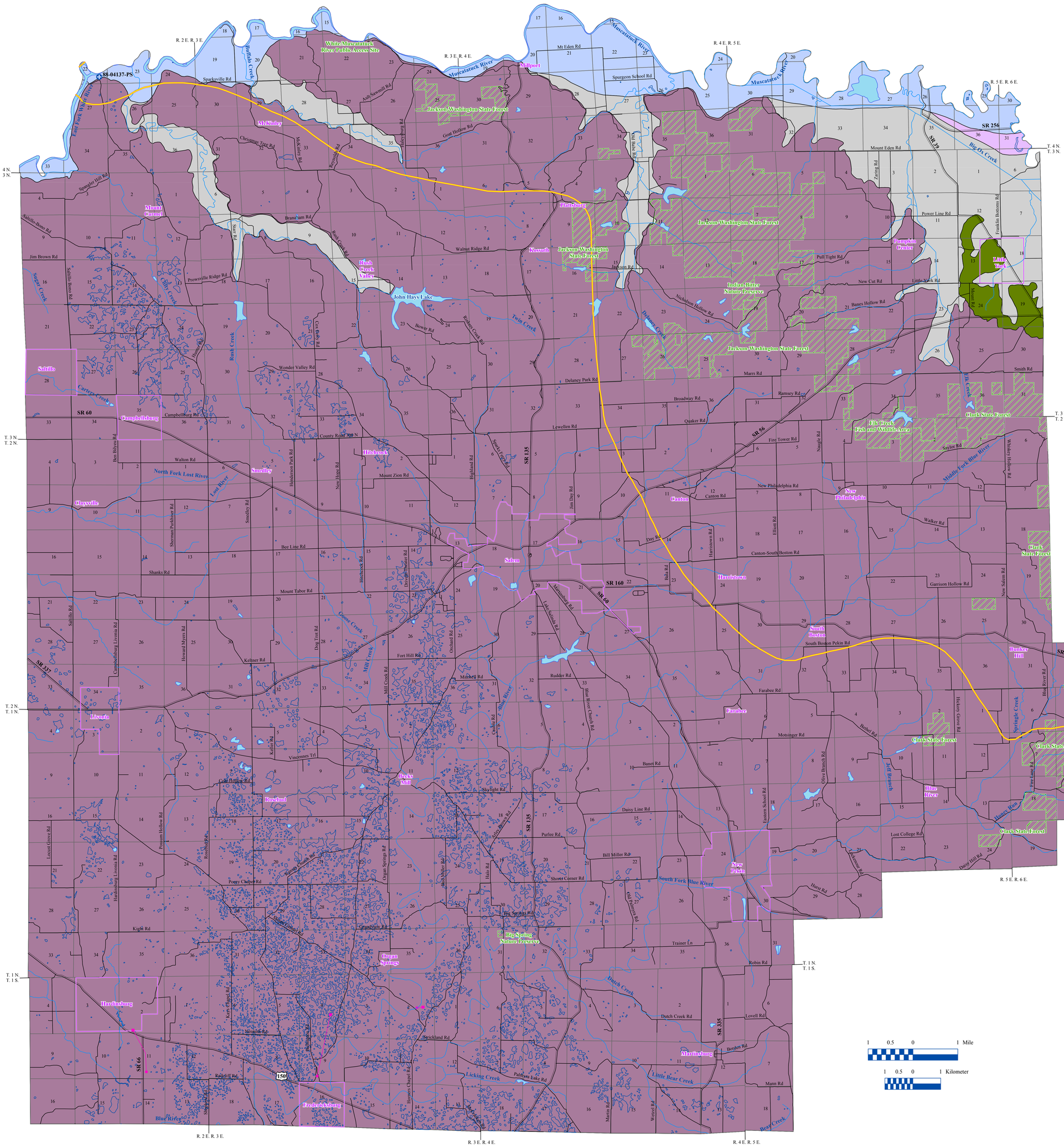
UNCONSOLIDATED AQUIFER SYSTEMS OF WASHINGTON COUNTY, INDIANA



Five unconsolidated aquifer systems have been mapped in Washington County: the Dissected Till and Residuum / Unglaciated Southern Hills and Lowlands; the Alluvial, Lacustrine, and Backwater Deposits; the Scottsburg Lowland Till Subsystem; the White River and Tributaries Outwash; and the White River and Tributaries Outwash Subsystem. The first system includes relatively thin deposits left by continental ice sheets as well as eroded residuum (a product of bedrock weathering). The next four systems comprise sediments deposited by, or resulting from, glaciers, glacial meltwaters, and post-glacial precipitation events. Boundaries of these aquifer systems are commonly gradational and individual aquifers may extend across aquifer system boundaries.

The thickness of unconsolidated sediments in Washington County is quite variable. In much of the county the unconsolidated materials overlying bedrock are less than 30 feet thick. However, along the northern and northeastern county boundary, particularly in the floodplains of the Muscatatuck and East Fork White Rivers, the thickness of unconsolidated deposits commonly ranges from 40 to 75 feet. A thickness of over 90 feet is present in glaciated upland areas around the town of Little York, where sequences of glacial outwash, till, and lacustrine deposits have been stacked above a deep part of a buried bedrock valley. Sand and gravel aquifers exist within thicker unconsolidated materials in the main valley of the East Fork White River and are expected to be present at the base of the thicker unconsolidated materials in the main valley of the Muscatatuck River.

Regional estimates of aquifer susceptibility to contamination from the surface can 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, can 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, which covers about 93 percent of Washington County, has the most limited groundwater resources of the unconsolidated aquifer systems in the county. Unconsolidated materials of this aquifer system predominantly consist of thin, eroded bedrock residuum and (in the glaciated northeastern part of the county) pre-Wisconsin tills and thin outwash terraces. On the uplands of the central portion of the county the residuum and broken limestone are generally between 25 and 50 feet thick, but near Campbellsburg and Smedley the residuum is over 80 feet thick in places. On long steep slopes the residuum is commonly less than 10 feet thick. Also included in this aquifer system, in many of the stream bottoms, are relatively thin deposits of alluvium, colluvium, and lacustrine materials. Thin dune sands of Wisconsin age are also present in this system east of Buffalo Creek.

Total thickness of this system in Washington County typically ranges from about 10 to 50 feet. Because the unconsolidated materials covering the bedrock are so thin in most places, the aquifer elevations closely match the elevation of the bedrock surface. The bedrock surface varies in elevation from about 530 feet above mean sea level (m.s.l.) near the East Fork White River at the northwestern corner of the county to as much as 1000 feet m.s.l. west of the town of New Philadelphia.

There is little potential for water production in the Dissected Till and Residuum / Unglaciated Southern Hills and Lowlands Aquifer System in Washington County and several dry holes have been reported. 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. Because of the generally low permeability of the near-surface materials, this system is not very susceptible to contamination from surface sources.

Alluvial, Lacustrine, and Backwater Deposits Aquifer System

In Washington County the Alluvial, Lacustrine, and Backwater Deposits Aquifer System is made up of deposits in the valleys of larger tributaries to the East Fork White and Muscatatuck Rivers. A portion of the main Muscatatuck River valley is also included in this system.

The unconsolidated deposits in this aquifer system come from two sources. The first source is alluvium, and perhaps some old outwash, deposited by the streams along with colluvium eroded from the valley walls and upland areas. The second source is glaciolacustrine deposits that were formed in bodies of relatively stagnant lake water, and are marked by soft silt and clay. These lake deposits were formed when the valley of the East Fork White River was choked with coarser material carried by glacial meltwater. Thick deposits of this material effectively dammed tributary streams, creating lakes. Thick deposits of silt, sometimes called "slackwater clay," mark the former locations of these glacial lakes. These lacustrine deposits are often noted on Quaternary geology maps and soil maps.

The three forks of the Blue River (West Fork, Middle Fork, and South Fork) all carried pre-Wisconsin outwash. However, the valley filling was not significant or has been mostly eroded over time. In many locations these streams run on bedrock, and bedrock outcrops along their banks. The South Fork Blue River has small isolated terraces of thin sand and gravel, mixed with clay. However, these deposits are too thin to be included in the Alluvial, Lacustrine, and Backwater Deposits Aquifer System.

The total thickness of unconsolidated deposits (mostly clay and silt) in this aquifer system varies considerably, from about 25 feet to more than 50 feet. The thickness of permeable sand or gravel zones is typically less than 5 feet, but in a few isolated places may exceed 10 feet. Most of the permeable zones are fine-grained sand. The overall scarcity of productive zones of sand and gravel in this aquifer system is apparent from the number of water wells completed in the underlying bedrock aquifers. Very few data are available. However, it is expected that many wells drilled in this system (especially bucket-rig wells) may yield sufficient water for domestic needs.

This aquifer system is marked by thick deposits of soft silt and clay that have low susceptibility to surface contamination.

Scottsburg Lowland Till Aquifer Subsystem

The Scottsburg Lowland Till Aquifer Subsystem is present in one small area in northeastern Washington County. The unconsolidated deposits overlying bedrock consist of dominantly pre-Wisconsin glacial materials that range in thickness from 30 to more than 95 feet. Very few data points are available for this aquifer system in the county, thus boundaries with other aquifer systems are transitional and largely based on surface topography. In places, this system is also covered by younger lacustrine deposits of Wisconsin age.

In Washington County this aquifer system is expected to be a better resource than the Dissected Till and Residuum Aquifer System. Potential aquifer materials within the glacial till include discontinuous intratill sand and gravel units. The Division of Water has only one water well record for this system, and the well driller described a seam of gravel 8 feet thick. Typical well yields would be expected to be sufficient for domestic uses.

The Scottsburg Lowland Till Aquifer Subsystem has a low susceptibility to surface contamination because intratill sand and gravel aquifers in this system are generally overlain by fine-grained material (till), loess, and/or lacustrine deposits.

White River and Tributaries Outwash Aquifer System

The White River and Tributaries Outwash Aquifer System occupies the valley of the East Fork White River and portions of the Muscatatuck River valley in Washington County. This system contains large volumes of sand and gravel that filled the main river valleys. As the glaciers melted (far upstream), the sediment contained within them was delivered to these valleys in quantities too large for the streams to transport. As a result, the increased sediment load was stored in the valleys as vertical and lateral accretionary deposits. As long as the retreating glaciers continued to provide sediment in quantities too large for the streams to transport, the main valleys continued to be filled. This valley-filling process formed the most prolific aquifer system in the county.

Based on only two water well records and limited seismic data, the unconsolidated deposits (mostly sand and gravel) of this system in the East Fork White River valley are known to be up to 85 feet thick. West of the confluence of the Muscatatuck River, little or no clay is present above the sand and gravel. It is likely most of the sand and gravel is saturated, because the ground water level is expected to be 5 to 15 feet below the land surface. The two wells completed in this system are for the town of Campbellsburg. The wells are 61 and 65 feet deep and penetrate 49 to 53 feet of saturated aquifer materials and wells yield about 350 gallons per minute (gpm).

The Muscatatuck River valley was blocked by valley-train outwash deposits of the East Fork White River during Wisconsin glacial events. This resulted in a thick accumulation of fine-grained sediments (silt, clay, and fine-grained sand) over the pre-Wisconsin sediments in the Muscatatuck valley. Because few water well records are available, the boundaries of this portion of the system are somewhat subjective. The system is limited to the deepest part of the bedrock valley. Seismic data indicate the unconsolidated material exceeds 100 feet in thickness in Jackson County; however, it is generally less than 75 feet thick in Washington County. Below as much as 40 or 50 feet of silt and clay, in the deepest part of the bedrock valley, are likely relatively thick sand and gravel outwash deposits of pre-Wisconsin age.

The elevation of the modern Muscatatuck River floodplain is approximately 525 feet m.s.l. upstream where the river enters Washington County and approximately 515 feet m.s.l downstream at its confluence with the East Fork White River. The elevation of the floodplain where the East Fork White River leaves the county is approximately 505 feet m.s.l. The elevation of the bottom of the aquifer system, in the deepest parts of the bedrock valley, may range from 430 to 415 feet m.s.l.

The White River and Tributaries Outwash Aquifer System is by far the most productive in Washington County and has the potential to consistently meet the needs of high-capacity water users. Large-diameter well yields of 300 to 1500 gpm have been obtained in this system in other counties. The system could support considerably more development than is utilized by the existing facilities. The only registered significant groundwater facility in the county currently using this aquifer system is the town of Campbellsburg.

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. The boundaries of this portion of the system are very subjective. Because of a lack of water well data, the system boundaries are based primarily on limited seismic data. This system occupies a very small portion of the northeastern corner of Washington County.

This system is not expected to be as productive as the White River and Tributaries Outwash Aquifer System. Based on well data from nearby counties, well yields in this subsystem would be expected to be sufficient for most domestic uses. Larger diameter wells in the thickest sand and gravel may yield 70 to 300 gpm.

In Washington County the subsystem is not very susceptible to surface contamination because of moderately thick units of clay and silt overlying the water-bearing sand and gravel.

EXPLANATION

- Registered Significant Ground-water Withdrawal Well
- Dye Trace Input Point
- Dye Trace Detection Point
- Karst Dye Trace
- Stream
- County Road
- State Road & US Highway
- Approximate Southern Limit of Older Glacial Deposits
- USGS Closed Contour (Mostly Karst Depressions)
- Municipal Boundary
- State Managed Property
- Lake & River

Location Map

Map generated by Jennifer Mc Millan
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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), Selected Subsurface Dye Traces in Parts of Southern Indiana (line shapefile, 20000225), Input and Detection Points for Selected Subsurface Dye Traces in Parts of Southern Indiana (point shapefile, 20001124) 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. 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. Large-Scale DLG Hypsography data (line shapefile, various dates) was from the US Geological Survey and based on a 1:24,000 scale. Managed Areas 96 (polygon shapefile, various dates) was from IDNR. Unconsolidated Aquifer Systems coverage (Grove, 2004; modified by Schmidt, 2010) was based on a 1:24,000 scale.

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by

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