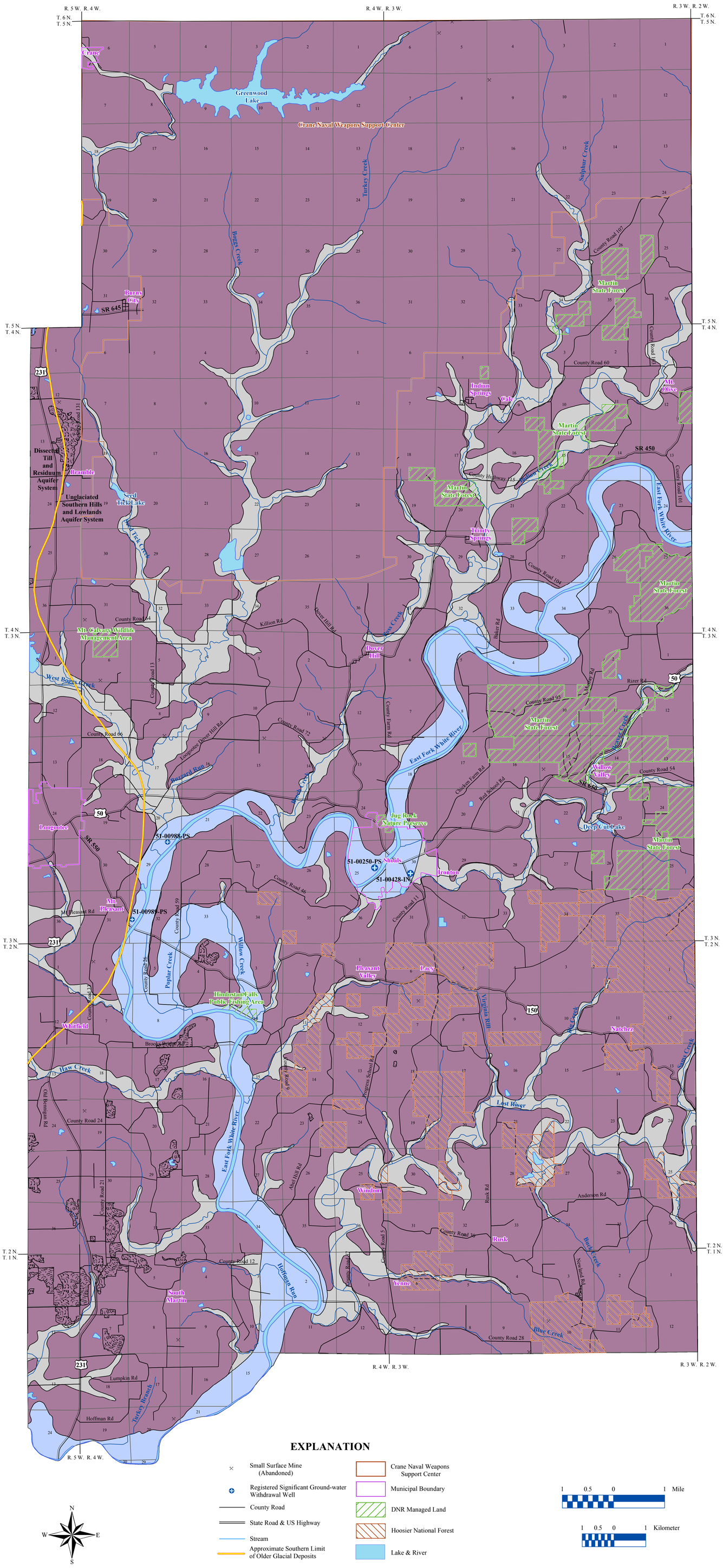
UNCONSOLIDATED AQUIFER SYSTEMS OF MARTIN COUNTY, INDIANA



Four unconsolidated aquifer systems have been mapped in Martin County: the Dissected Till and Residuum / Unglaciated Southern Hills and Lowlands; the Alluvial, Lacustrine, and Backwater Deposits; the White River and Tributaries Outwash; and the Coal Mine Spoil. The first three aquifer systems comprise sediments that were deposited by glaciers and their meltwaters, or are thin, eroded residuum (a product of bedrock weathering). Boundaries of these aquifer systems are often gradational and individual aquifers may extend across aquifer system boundaries. The Coal Mine Spoil Aquifer System is man-made and the larger area boundaries are well defined.

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 most of Martin County, has the most limited ground-water resources of the unconsolidated aquifer systems in the county. Unconsolidated materials of the Dissected Till and Residuum / Unglaciated Southern Hills and Lowlands Aquifer System consist of thin, eroded residuum, and (along the western edge of the county) predominantly pre-Wisconsin tills. A few small areas of eolian (wind-blown) silt and sand, primarily along the East Fork of the White River, are also included in this system. Clay, often mixed with some silt and sand, is the predominant material in the Dissected Till and Residuum / Unglaciated Southern Hills and Lowlands Aquifer system. However, the area around Loogootee is covered by a sandy, silty till in which a few small lenses (typically less than 5 feet thick) of sand and gravel may be present.

Aquifer elevations are typically between 450 and 800 feet mean sea level (m.s.l.). Because the materials covering the bedrock are so thin in most places, the aquifer elevations closely match the elevation of the bedrock surface. Because this aquifer system is so thin, nearly all wells in the area are completed in bedrock. The highest aquifer elevations are in the northern and eastern parts of the county, and the lowest aquifer elevations are in the southwestern corner of the county.

The Division has no records of drilled or bored (bucket-rig) wells in this aquifer system. Although a few such wells may exist, yields would likely be very low. The overwhelming majority of the area of this aquifer system exhibits little or no potential for successful wells. Some old dug wells probably still exist, but yields would also be quite low.

The White River and Tributaries Outwash Aquifer System transects the Dissected Till and Residuum / Unglaciated Southern Hills and Lowlands Aquifer System. The boundary between these two systems is sharply defined by geologic materials, aquifer elevation, and water availability.

Because of the low permeability of the surface materials, this system is not very susceptible to contamination from surface sources.

Alluvial, Lacustrine, and Backwater Deposits Aquifer System

The Alluvial, Lacustrine, and Backwater Deposits Aquifer System is made up of deposits in the valleys of tributaries to the East Fork White River. The unconsolidated deposits in this aquifer system come from two sources. The first source is alluvium deposited by the stream 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 major valleys of the Wabash River and the White River were 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 up to an elevation of 520 or 530 feet m.s.l. in the county.

There are not many productive areas in this aquifer system due to the limited amount of sand and gravel. Only a few known wells, located in the west-central part of the county, have been completed in it. (All other wells that have been drilled in the area of this aquifer system have been completed in the underlying bedrock.) Well depths in this aquifer system typically are 40 to 80 feet. Static water levels are typically 10 to 20 feet below land surface. Reported test rates on these wells range from 2 to 40 gallons per minute (gpm).

The portions of this aquifer system having the greatest potential are adjacent to the main valley of the East Fork White River. In addition, the valleys of Boggs Creek (especially West Boggs Creek) appear to have greater potential than the other alluvial tributaries in the county.

The total thickness of unconsolidated deposits (mostly clay and silt) in this aquifer system varies considerably, from less than 20 feet up to 140 feet. However, the thickness of permeable sand or gravel zones is typically less than 15 feet. The lowest elevation of these deposits, in the southwestern part of the county, is approximately 350 feet m.s.l. The highest floodplain elevation of the aquifer system is approximately 600 feet m.s.l. (in northwestern Martin County).

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

White River and Tributaries Outwash Aquifer System

In Indiana, the White River and Tributaries Outwash Aquifer System occupies the valleys of the White River and its major tributaries. The system has a very wide main trunk with long, narrow, north-south to northeast-southwest trending tributaries that transect other unconsolidated aquifers. However, in Martin County this aquifer system is limited to the main valley of the East Fork White River.

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

The unconsolidated deposits (mostly sand and gravel) of the White River and Tributaries Outwash Aquifer System in Martin County are known to be up to 125 feet thick. In many places a clay layer, 20 to 30 feet thick, lies above the sand and gravel. In at least one location, however, the sand and gravel is only a few feet below the land surface. Most of the sand and gravel is saturated, because the ground water level is typically 15 to 30 feet below the land surface. Available well records show that wells are typically 40 to 100 feet deep and the aquifer is typically 30 to 80 feet thick.

The elevation of the modern East Fork White River floodplain is approximately 475 feet m.s.l. upstream where the river enters Martin County and approximately 445 feet m.s.l. downstream where it leaves the county. Accurate elevations of the top and bottom of the aquifer itself are hard to determine because there are no records of wells completed in the floodplain along the far upstream and downstream reaches of the East Fork White River in the county. There are records of a number of high-capacity wells completed in the center part of the floodplain from Shoals downstream to approximately two miles southeast of Loogootee. At the upstream end of this part, near Shoals, the floodplain elevation is approximately 465 feet m.s.l., with the aquifer bottom elevation at approximately 365 feet m.s.l. At the downstream end near the old Loogootee well field (Township 3 North, Range 4 West, Section 32), the floodplain elevation is approximately 455 feet m.s.l., and the aquifer bottom elevation is approximately 350 feet m.s.l.

This aquifer system is by far the most productive in Martin County. High-capacity wells in this aquifer system have been tested at rates ranging from 300 to 1000 gpm.

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.

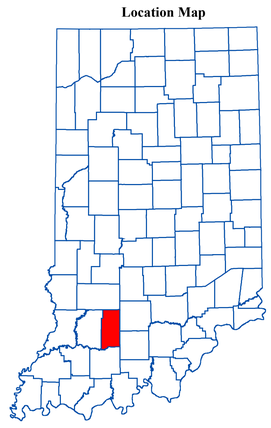
Coal Mine Spoil Aquifer System

The Coal Mine Spoil Aquifer System covers a small percentage of Martin County, primarily because the coal seams (within the Raccoon Creek Group of Pennsylvanian age) in the county are too thin and sporadic to have been commercially mined on a very large scale. This aquifer system was formed during the process of mining coal by surface-mining methods. The overburden was typically broken up by blasting and moved aside to uncover the desired coal seam. The overburden, most of which was originally solid rock, became 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 ground water. However, in Martin County the coal mine spoil areas are relatively small and are generally situated so that much of the ground water accumulating in them quickly drains out. This results in an aquifer having limited potential for high well yields.

Information from surface coal mine areas in other counties indicate that the quality of ground water in this system is probably much poorer than that in the overburden before mining took place. Typically a significant increase in total dissolved solids, especially calcium, magnesium, bicarbonate, and sulfate, occurs. High iron, and in places low pH, can severely limit potential uses of ground water from this system. The Division of Water has no records of any water supply wells completed in this aquifer system in Martin County.

Very generally, it is expected that aquifers in old coal mine spoil that was not graded and capped with compacted soil are highly susceptible to contaminants introduced at the surface. However, spoil aquifers in areas benefiting from modern reclamation methods are likely to be only moderately susceptible.

Location Map



EXPLANATION

- Small Surface Mine (Abandoned)
- Registered Significant Ground-water Withdrawal Well
- County Road
- State Road & US Highway
- Stream
- Approximate Southern Limit of Older Glacial Deposits
- Crane Naval Weapons Support Center
- Municipal Boundary
- DNR Managed Land
- Hoosier National Forest
- Lake & River

1 0.5 0 1 Mile

1 0.5 0 1 Kilometer

N W E S

INDIANA DEPARTMENT OF NATURAL RESOURCES

Map generated by Jennifer K. McMillan
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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, except the Bedrock Geology of Southwestern Indiana (polygon shapefile, 20001124), 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 scales. City Areas in Southwestern Indiana (polygon shapefile, 1999) was from ESRI and based on a 1:100,000 scale. Managed Areas 96 (polygon shapefile, various dates) was from IDNR. Streams27 (line shapefile, 20000420) was from the Center for Advanced Applications in GIS at Purdue University.

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