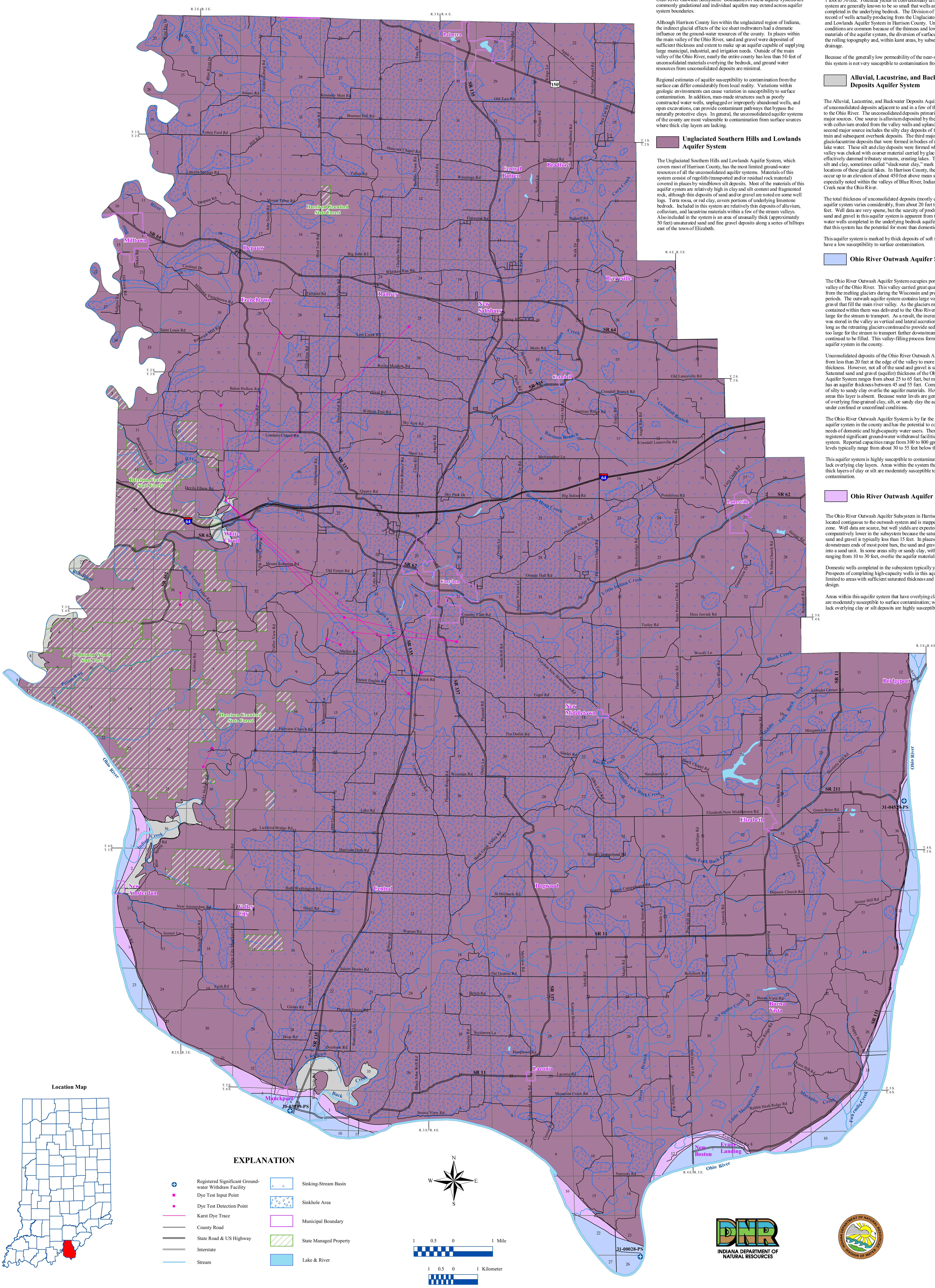
UNCONSOLIDATED AQUIFER SYSTEMS OF HARRISON COUNTY, INDIANA



Four unconsolidated aquifer systems have been mapped in Harrison County: the Unglaciated Southern Hills and Lowlands; the Alluvial, Lacustrine, and Backwater Deposits; the Ohio River Outwash; and the Ohio River Outwash Subsystem. Boundaries of these aquifer systems are commonly gradational and individual aquifers may extend across aquifer system boundaries.

Although Harrison County lies within the unglaciated region of Indiana, the indirect glacial effects of the ice sheet meltwaters had a dramatic influence on the ground-water resources of the county. In places within the main valley of the Ohio River, sand and gravel were deposited of sufficient thickness and extent to make up an aquifer capable of supplying large municipal, industrial, and irrigation needs. Outside of the main valley of the Ohio River, nearly the entire county has less than 50 feet of unconsolidated materials overlying the bedrock, and ground water resources from unconsolidated deposits are minimal.

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. In general, the unconsolidated aquifer systems of the county are most vulnerable to contamination from surface sources where thick clay layers are lacking.

Unglaciated Southern Hills and Lowlands Aquifer System

The Unglaciated Southern Hills and Lowlands Aquifer System, which covers most of Harrison County, has the most limited ground-water resources of all the unconsolidated aquifer systems. Materials of this system consist of regolith (transported and/or residual rock material) covered in places by windblown silt deposits. Most of the materials of this aquifer system are relatively high in clay and silt content and fragmented rock, although thin deposits of sand and/or gravel are noted on some well logs. Terra rossa, or red clay, covers portions of underlying limestone bedrock. Included in this system are relatively thin deposits of alluvium, colluvium, and lacustrine materials within a few of the stream valleys. Also included in the system is an area of unusually thick (approximately 50 feet) unsaturated sand and fine gravel deposits along a series of hilltops east of the town of Elizabeth.

Collectively, over 80 percent of the well logs for the 650 field-located wells within the Unglaciated Southern Hills and Lowlands Aquifer System show that the total thickness of the system typically ranges from less than 1 foot to 50 feet. Potential yields of conventionally drilled wells in this system are generally known to be so small that wells are commonly completed in the underlying bedrock. The Division of Water has no record of wells actually producing from the Unglaciated Southern Hills and Lowlands Aquifer System in Harrison County. Unsaturated conditions are common because of the thinness and low permeable materials of the aquifer system, the diversion of surface water runoff by the rolling topography and, within karst areas, by subsequent subterranean drainage.

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

The Alluvial, Lacustrine, and Backwater Deposits Aquifer System consists of unconsolidated deposits adjacent to and in a few of the valleys tributary to the Ohio River. The unconsolidated deposits primarily come from three major sources. One source is alluvium deposited by the streams along with colluvium eroded from the valley walls and upland areas. The second major source includes the silty clay deposits of the waning valley train and subsequent overbank deposits. The third major source is glaciolacustrine deposits that were formed in bodies of relatively stagnant lake water. These silt and clay deposits were formed when the Ohio River valley was choked with coarser material carried by glacial meltwater that effectively dammed tributary streams, creating lakes. Thick deposits of silt and clay, sometimes called "slackwater clay," mark the former locations of these glacial lakes. In Harrison County, these deposits can occur up to an elevation of about 450 feet above mean sea level. They are especially noted within the valleys of Blue River, Indian Creek, and Buck Creek near the Ohio River.

The total thickness of unconsolidated deposits (mostly clay and silt) in this aquifer system varies considerably, from about 20 feet to more than 90 feet. Well data are very sparse, but the 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 aquifer. It is doubtful that this system has the potential for more than domestic wells.

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

Ohio River Outwash Aquifer System

The Ohio River Outwash Aquifer System occupies portions of the main valley of the Ohio River. This valley carried great quantities of outwash from the melting glaciers during the Wisconsin and pre-Wisconsin glacial periods. The outwash aquifer system contains large volumes of sand and gravel that fill the main river valley. As the glaciers melted, the sediment contained within them was delivered to the Ohio 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 farther downstream, the valley continued to be filled. This valley-filling process formed the most prolific aquifer system in the county.

Unconsolidated deposits of the Ohio River Outwash Aquifer System range from less than 20 feet at the edge of the valley to more than 130 feet in thickness. However, not all of the sand and gravel is saturated with water. Saturated sand and gravel (aquifer) thickness of the Ohio River Outwash Aquifer System ranges from about 25 to 65 feet, but most of the system has an aquifer thickness between 45 and 55 feet. Commonly, 20 to 35 feet of silty to sandy clay overlie the aquifer materials. However, in some areas this layer is absent. Because water levels are generally near the base of overlying fine-grained clay, silt, or sandy clay the aquifer could be under confined or unconfined conditions.

The Ohio River Outwash Aquifer System is by far the most productive aquifer system in the county and has the potential to consistently meet the needs of domestic and high-capacity water users. There are three registered significant ground-water withdrawal facilities (10 wells) in this system. Reported capacities range from 300 to 800 gpm. Static water levels typically range from about 30 to 55 feet below the land surface.

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.

Ohio River Outwash Aquifer Subsystem

The Ohio River Outwash Aquifer Subsystem in Harrison County is located contiguous to the outwash system and is mapped as a transitional zone. Well data are scarce, but well yields are expected to be comparatively lower in the subsystem because the saturated thickness of sand and gravel is typically less than 15 feet. In places, especially on the downstream ends of most point bars, the sand and gravel deposits grade into a sand unit. In some areas silty or sandy clay, with a typical thickness ranging from 10 to 30 feet, overlie the aquifer materials.

Domestic wells completed in the subsystem typically yield 5 to 20 gpm. Prospects of completing high-capacity wells in this aquifer system are limited to areas with sufficient saturated thickness and optimal well-field design.

Areas within this aquifer system that have overlying clay or silt deposits are moderately susceptible to surface contamination; whereas, areas that lack overlying clay or silt deposits are highly susceptible to contamination.

Location Map

EXPLANATION

- Registered Significant Ground-water Withdraw Facility
- Dye Test Input Point
- Dye Test Detection Point
- Karst Dye Trace
- County Road
- State Road & US Highway
- Interstate
- Stream
- Sinking-Stream Basin
- Sinkhole Area
- Municipal Boundary
- State Managed Property
- Lake & River

N / W / E / S

1 0.5 0 1 Mile

1 0.5 0 1 Kilometer

INDIANA DEPARTMENT OF NATURAL RESOURCES

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

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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, 20001124), 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. 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. Managed Areas 96 (polygon shapefile, various dates) was from IDNR. Sinkhole Areas and Sinking -Stream Basins in Part of Southern Indiana (polygon shapefile, 20001124) was also from the Indiana Geological Survey, but based on a 1:126,720 scale. Unconsolidated aquifer systems coverage (Unterreiner, 2005) was based on a 1:24,000 scale.

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