

Bedrock Aquifer Systems

The susceptibility of bedrock aquifer systems to surface contamination is dependant on the nature of the overlying sediments, because the bedrock throughout the basin is overlain by unconsolidated deposits. Just as recharge for bedrock aquifers cannot exceed that of overlying unconsolidated deposits, susceptibility to surface contamination will not exceed that of overlying deposits. However, because the bedrock aquifer systems have complex fracturing systems, once a contaminant has been introduced into a basin bedrock aquifer system, it will be difficult to track.

Ordovician -- Maquoketa group

The Ordovician/Maquoketa Group Aquifer system consists of interbedded shales and limestones. Limestone, which constitutes about 20 percent of the group, is most abundant in the upper part. In general, because of the high shale content, the Maquoketa Group is considered as an aquifer having poor yield potential. However, in the West Fork White River basin higher yields are reported than in other parts of the state because there is higher limestone content in the upper part of the group. The moderate yield potential in the basin is related to joints and solution cavities that formed in the limestone units. Yields for domestic wells typically range from 5 to 15 gpm.

Silurian and Devonian Carbonates

The carbonate aquifer system is composed of limestone and dolomite with some interbedded shale units. This is the principal bedrock aquifer in the basin and the only bedrock aquifer capable of supporting high-capacity pumpage. Yields of large-diameter wells generally range from 50 to 350 gpm, but higher-yielding wells may be possible where several feet of sand and gravel directly overlie the bedrock surface. In areas where the Silurian and Devonian Carbonates are overlain directly by unconfined sand and gravel outwash, the bedrock is highly susceptible to surface contamination.

Devonian and Mississippian -- New Albany Shale

This aquifer system is predominately brownish-black shale. Although several dozen wells are producing water from the New Albany Shale, the formation is not considered as a significant aquifer. Dry holes are common. Yields for domestic wells typically range from 0 to 5 gpm.

Mississippian -- Borden Group

This aquifer system is composed primarily of siltstone and shale. Fine-grained sandstones are common. Yields for domestic wells typically range from 1 to 5 gpm. High-capacity production from these rocks is not likely.

Mississippian -- Blue River and Sanders Groups

This aquifer system encompasses two groups; the lowermost Sanders Group includes the Harrodsburg and Salem limestone formations. These are primarily limestone with some dolomitic limestone content. The Blue River Group includes the St. Louis, St. Genevieve, and the Paoli limestone formations. These are primarily limestones containing significant amounts of gypsum, anhydrite, shale, chert, and calcareous sandstone. Yields for domestic wells typically range from 2 to 25 gpm. The outcrop/subcrop area of the Blue River and Sanders Groups is well known for significant karst development. Because of the shallow rock, open joints, and solution channels the aquifer system is quite susceptible to contaminants introduced at and near land surface.

Mississippian -- Buffalo Wallow, Stephensport, and West Baden Groups

This aquifer system is laterally discontinuous and has been truncated northward as a result of pre-Pennsylvanian erosion. It is composed primarily of shale, limestone, and sandstone, and consists of three groups. The three groups comprising this bedrock aquifer system differ in their percentages of shale, limestone, and sandstone. Yields for domestic wells typically range from 3 to 16 gpm. In the outcrop/subcrop area of the Buffalo Wallow, Stephensport, and West Baden Groups the rock is predominantly shallow and contains numerous, irregular joints. In limited areas 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.

Pennsylvanian -- Racoon Creek Group

This aquifer system consists, in ascending order of the Mansfield, Brazil, and Staunton Formations. Shale and sandstone compose approximately 95 percent of the group and clay, coal, and limestone make up nearly all the rest. Shale is more common than sandstone. The sandstone is mostly fine grained. In general, the Racoon Creek Group Aquifer system is considered a minor ground-water source, with most wells producing from the basal sandstone of the Mansfield Formation. Potentially higher yielding wells may be obtained in the thicker sandstone members of the Mansfield Formation along the eastern fringes of the outcrop area in Clay, Greene, and Daviess Counties. Yields for domestic wells typically range from 2 to 10 gpm.

Pennsylvanian -- Carbondale Group

This aquifer system consists in ascending order of the Linton, Petersburg, and Dugger Formations. Most of the thickness of this group consists of variable shales and sandstones with some coal and limestone. In general, the Carbondale Group is considered a minor ground-water source with most wells producing from the thicker sandstone and coal units. Yields for domestic wells typically range from 1 to 12 gpm.

Pennsylvanian -- McLeansboro Group

This aquifer system consists in ascending order of the Shelburn, Patoka, and Bond Formations in the basin. It consists primarily of shale (50 to 60 percent) and sandstone (40 to 45 percent) with minor amounts of coal, clay, and limestone. In general, the McLeansboro Group is considered a minor ground-water source with most wells producing from the Busseron and Ingelfield Sandstone Members. Yields for domestic wells typically range from 1 to 9 gpm.

Unconsolidated Aquifer Systems

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

Tipton Till Plain Aquifer System

The Tipton Till Plain Aquifer system contains intratill sand and gravel lenses that are highly variable in depth and lateral extent and are confined by variably thick clay or till sequences. Individual aquifers within this system are usually not extensive, and commonly range from 12 to 14 feet in thickness. Large diameter, high-capacity wells commonly yield from 70 to 300 gpm. This aquifer system is generally considered to have low susceptibility to surface contamination.

Tipton Till Plain Aquifer Subsystem

The Tipton Till Plain Aquifer subsystem is composed primarily of glacial tills that contain intratill sand and gravel of limited thickness and extent. Sand and gravel zones within this aquifer system are typically 5 to 12 feet thick. Large diameter, high-capacity wells commonly yield 70 to 100 gpm. This aquifer system is similar to the Tipton Till Plain Aquifer system but is generally considered moderately vulnerable to surface contamination. This system is located in many areas where the bedrock is shallow and till cover overlying the sand and gravel is thin.

Buried Valley Aquifer System

The Buried Valley Aquifer system consists of aquifer materials deposited in pre-glacial bedrock valleys. Large-diameter, high-capacity wells are expected to yield 70 to 500 gpm. The Buried Valley Aquifer system has a low susceptibility to surface contamination because outwash sediments within the bedrock valleys are generally overlain by tills. 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.

Dissected Till and Residuum Aquifer System

The Dissected Till and Residuum Aquifer system, consisting of thin, eroded residuum and predominantly pre-Wisconsin till overlying bedrock dominates the southern portions of the basin. Common aquifer thickness in this system is 0 to 5 feet. Yields for domestic wells typically range from 0 to 5 gpm. Because of the low permeability of the surface materials, this system is not very susceptible to contamination from surface sources.

White River and Tributaries Outwash Aquifer System

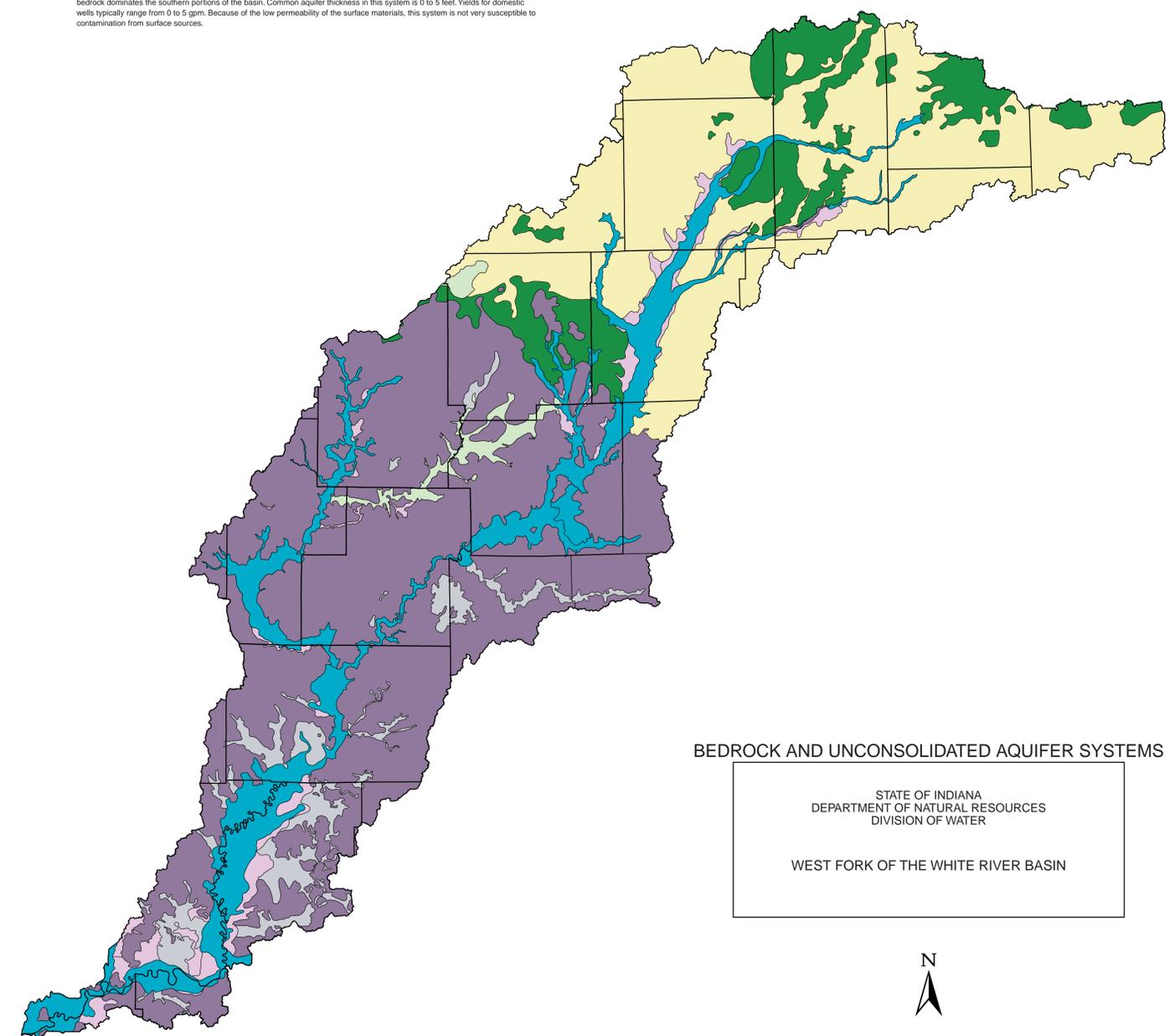
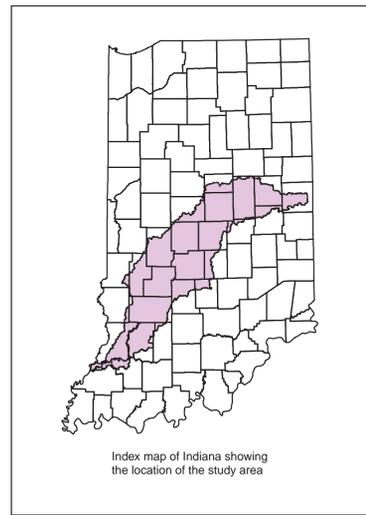
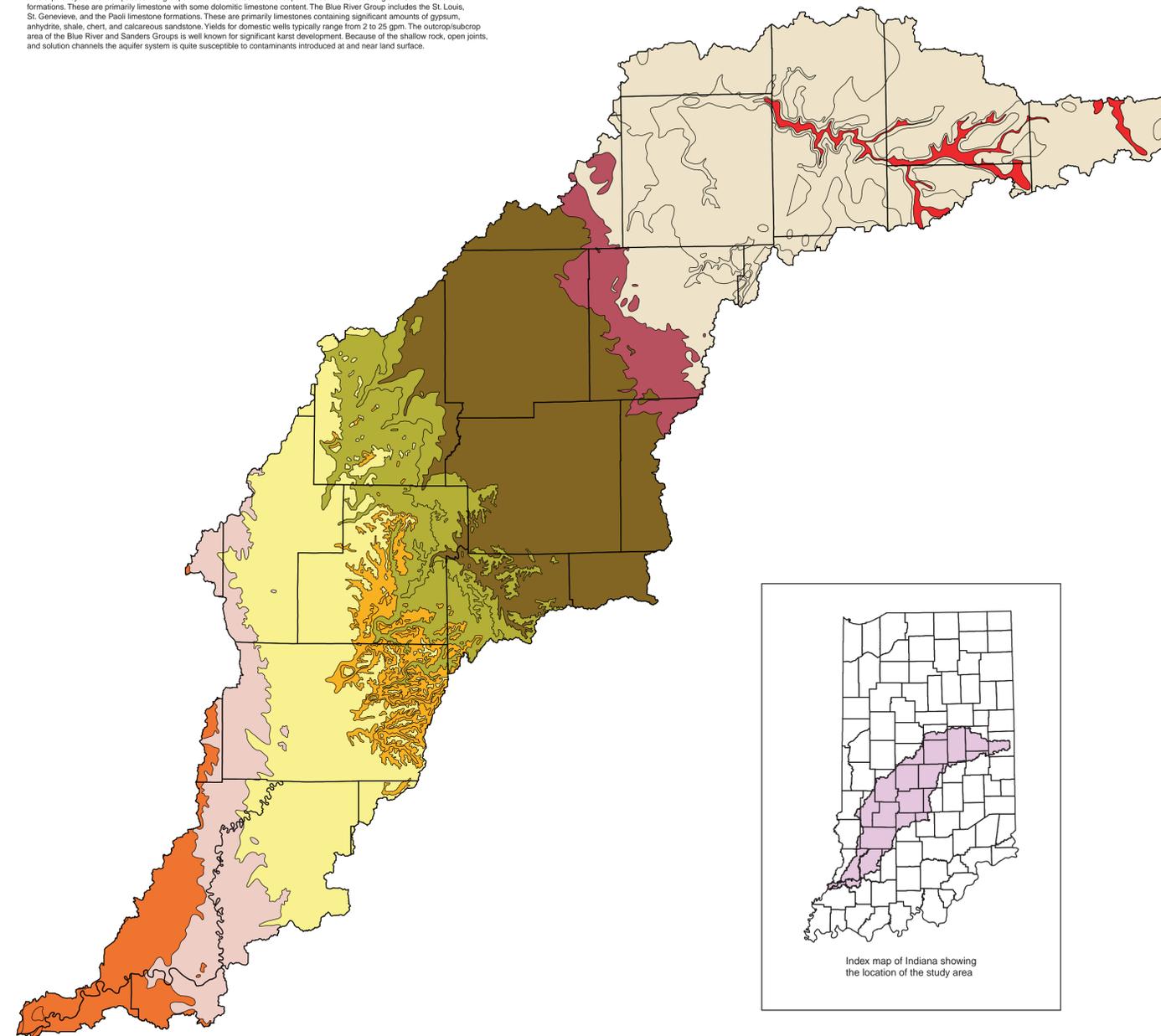
The White River and Tributaries Outwash Aquifer system is comprised primarily of surficial valley train sand and gravel and occupies the valleys of the White River and its major tributaries. Sand and gravel aquifers in this system are commonly 50 to 100 feet thick. Large-diameter, high-capacity wells commonly yield 500 to 2,000 gpm. The water-bearing units of the White River and Tributaries Outwash Aquifer system are unconfined, usually fairly shallow, and are characterized by thick sequences of sand and gravel with little clay. This aquifer system is highly susceptible to contamination due to its lack of clay layers and shallow water levels.

White River and Tributaries Outwash Aquifer Subsystem

The White River and Tributaries Outwash Aquifer subsystem, adjacent to the White River and Tributaries Outwash Aquifer system, consists of thick zones of sand and gravel that have been covered by a layer of clay or till. Common aquifer thickness is 20 to 40 feet. Large-diameter, high-capacity wells commonly yield 70 to 1,000 gpm. 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 White River and Tributaries Outwash Aquifer subsystem, in many places surficial valley train deposits coalesce with the deeper outwash deposits making them more vulnerable. Two small areas of this system in Gibson and Knox Counties have thick layers of clay overlying the sand and gravel making them moderately susceptible to surface contamination.

Lacustrine and Backwater Deposits Aquifer System

The Lacustrine and Backwater Deposits Aquifer system is made up of discontinuous bodies of deposits extending along areas of outwash close to the West Fork White River Valley Aquifers within this system are generally less than 5 feet thick. Yields for domestic wells typically are 0 to 35 gpm. These bodies are marked by thick deposits of soft silt and clay that have low susceptibility to surface contamination.



BEDROCK AND UNCONSOLIDATED AQUIFER SYSTEMS

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER

WEST FORK OF THE WHITE RIVER BASIN

