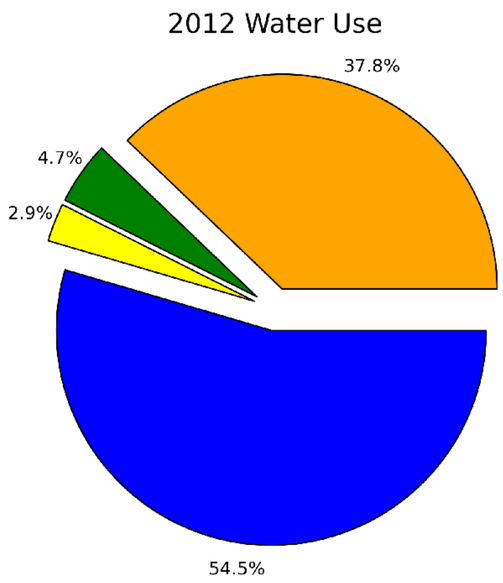
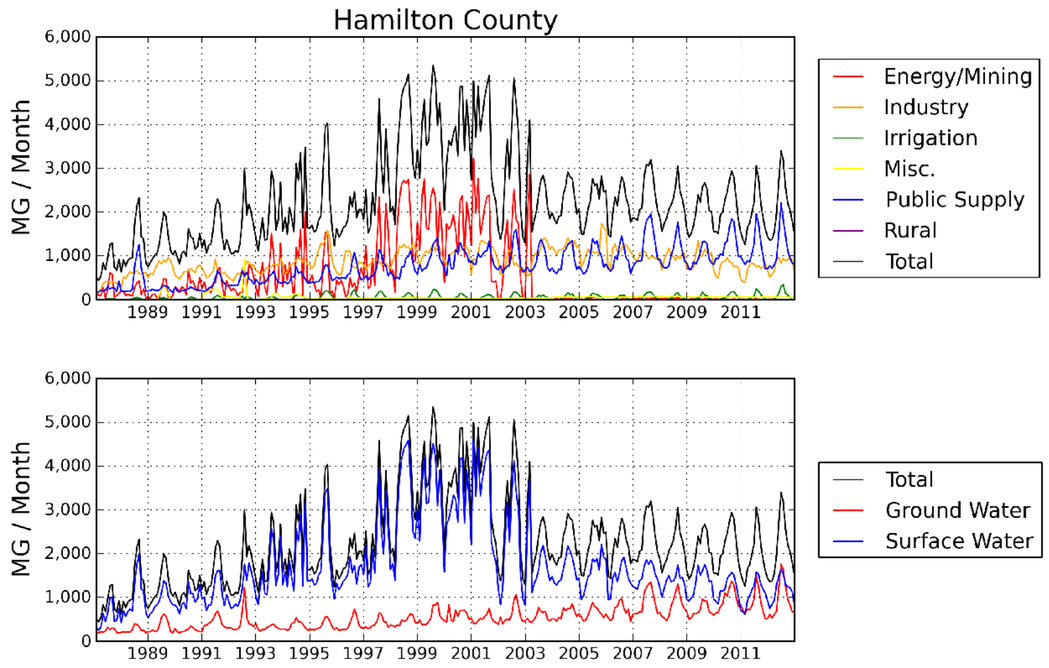
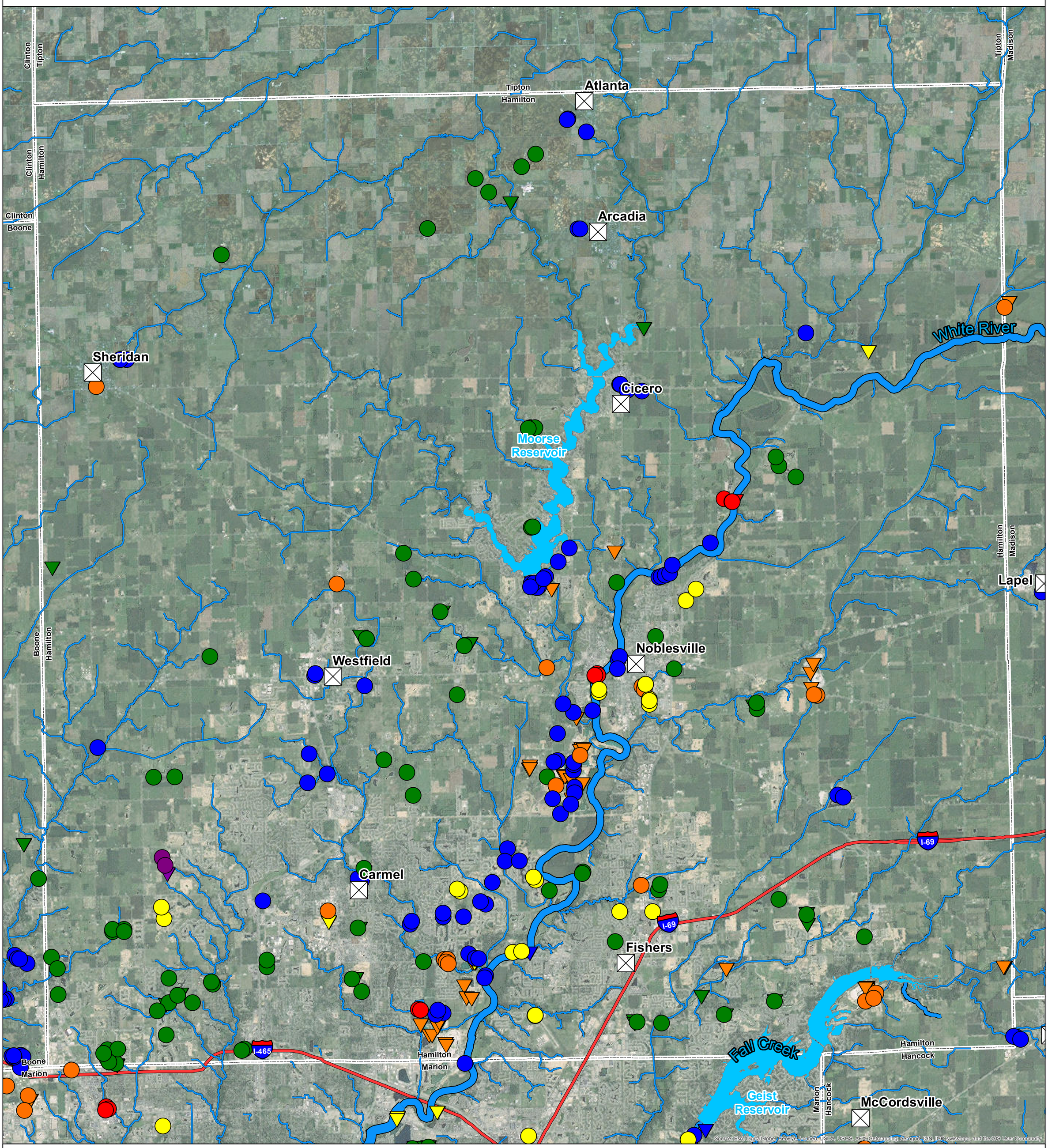



Average Daily Use: 70.4 MGD




# Water Resources and Use in Hamilton County

Data Sources: U.S. Geological Survey and Indiana Department of Natural Resources

**Withdrawal Location**

WELL INTAKE

- Energy/Mining
- Industry
- Irrigation
- Misc.
- Public Supply
- Rural Use

**River**

**7Q2 Flow (MGD)**

- <10 MGD
- 10 - 50 MGD
- 50 - 100 MGD
- 100 - 500 MGD
- > 500 MGD

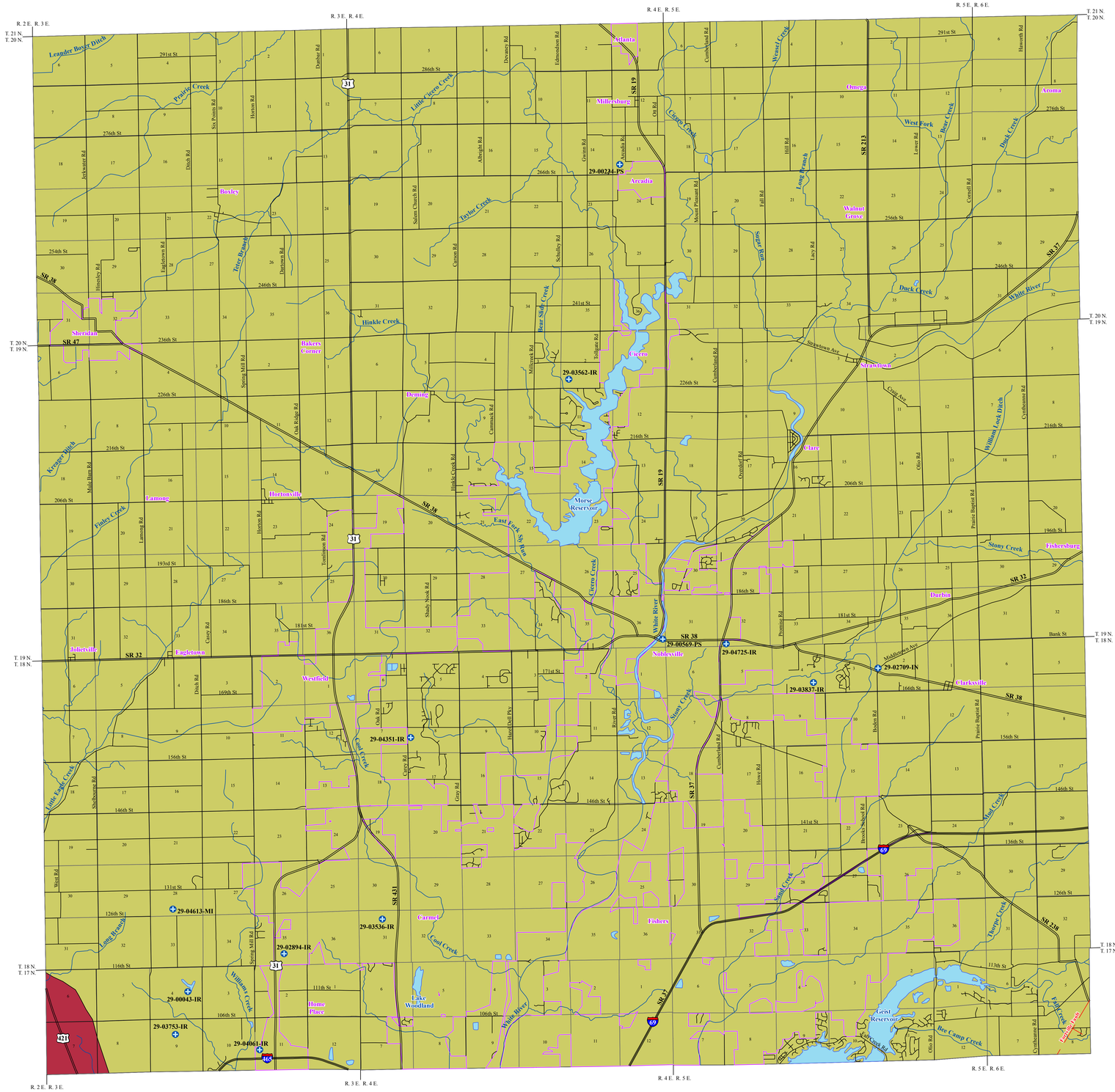
- Major Lakes
- Interstate
- County
- City

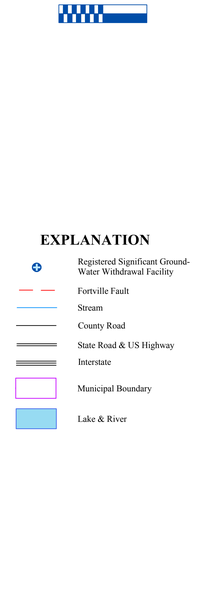
INTERA
GEOSCIENCE & ENGINEERING SOLUTIONS

NORTH

Miles
0 1 2

# BEDROCK AQUIFER SYSTEMS OF HAMILTON COUNTY, INDIANA




## EXPLANATION

- Registered Significant Ground-Water Withdrawal Facility
- Fortville Fault
- Stream
- County Road
- State Road & US Highway
- Interstate
- Municipal Boundary
- Lake & River

The occurrence of bedrock aquifers depends on the original composition of the geologic material and subsequent changes which influence the hydraulic properties. Post-depositional processes, which promote jointing, fracturing and solution activity of exposed bedrock, generally increase the hydraulic conductivity (permeability) of the upper portion of bedrock aquifer systems. Because permeability in many places is greatest near the bedrock surface, bedrock units within the upper 100 feet are commonly the most productive aquifers.

Bedrock aquifer systems in Hamilton County are overlain by unconsolidated deposits of varying thickness ranging from about 5 feet to over 300 feet. Bedrock, in places, is at or near the surface along many streams in the county.

The yield of a bedrock aquifer depends on its hydraulic characteristics and the nature of the overlying deposits. Shale and glacial till act as aquitards, restricting recharge to underlying bedrock aquifers. However, fracturing and/or jointing may occur in aquitards, which can increase recharge to the underlying aquifers. Hydraulic properties of bedrock aquifers are highly variable.

Most bedrock aquifers in the county are under confined conditions, mainly a result of low vertical hydraulic conductivity clay-rich materials, such as glacial till, overlying the bedrock. Therefore, the potentiometric surface (water level) in most wells completed in bedrock rises above the top of the water-bearing zone.

Two bedrock aquifer systems are identified for Hamilton County. They are, from younger to older; the New Albany Shale of Devonian and Mississippian age, and the Silurian and Devonian Carbonates. Bedrock aquifers are fairly productive in this county. Bedrock wells represent approximately 25 percent of all wells completed in Hamilton County.

The susceptibility of bedrock aquifer systems to surface contamination is largely dependent on the type and thickness of the overlying sediments. Because the bedrock aquifer systems have complex fracturing systems, once a contaminant has been introduced into a bedrock aquifer system, it will be difficult to track and remediate.

### Devonian and Mississippian -- New Albany Shale Aquifer System

The New Albany Shale consists mostly of brownish-black carbon-rich shale, greenish-gray shale, and minor amounts of dolomite and dolomitic quartz sandstone. The New Albany Shale subcrops in a relatively small area in the southwestern corner of Hamilton County. There are no reported wells completed in the New Albany Shale in Hamilton County. Domestic wells either produce from the overlying unconsolidated deposits or penetrate through the shale in favor of the underlying Silurian and Devonian Carbonates.

Because the New Albany Shale is generally not very productive, it is typically used only where overlying deposits do not contain aquifer material. The New Albany Shale is often described as an aquitard, and yields of wells completed in it are typically quite limited. Most domestic wells from adjacent counties that were completed in the New Albany Shale Aquifer System have reported testing rates of less than 5 gallons per minute (gpm).

The permeability of shale materials is considered low. The New Albany Shale Aquifer System, therefore, has a low susceptibility to contamination introduced at or near the surface.

### Silurian and Devonian Carbonates Aquifer System

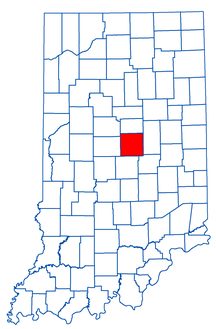
In Hamilton County, Silurian and Devonian Carbonates Aquifer System subcrops throughout nearly all of Hamilton County. The total thickness of this system in the county ranges up to 450 feet.

In Hamilton County, wells penetrating the Silurian and Devonian Carbonates Aquifer System have reported depths ranging from 25 to 300 feet, but are commonly 80 to 240 feet deep. The amount of rock penetrated in this system typically ranges from 20 to 145 feet.

Wells utilizing the Silurian and Devonian Carbonates Aquifer System are generally capable of meeting the needs of domestic users and some high-capacity users in this county. Domestic well yields commonly range from 10 to 30 gpm. Static water levels typically range from 10 to 45 feet below the land surface. A few flowing wells have been reported for this bedrock aquifer system in the county. There are 12 registered significant groundwater withdrawal facilities (20 wells) utilizing the Silurian and Devonian Carbonates Aquifer System in Hamilton County. High-capacity well depths range from approximately 65 to 550 feet below the land surface. Reported high-capacity well yields range from about 100 gpm to nearly 700 gpm.

This aquifer system is generally not very susceptible to surface contamination due to thick clay deposits over most of the county. However, solution features (caves) are described in a few well records suggesting minor karst development and there are localized areas, especially near the White River, where the bedrock surface is shallow. These areas, therefore, are at moderate to high risk to contamination.

**Location Map**



Map generated by Scott H. Dean
IDNR, Division of Water, Resource Assessment Section

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**Bedrock Aquifer Systems of Hamilton County, Indiana**

by
Robert A. Scott
Division of Water, Resource Assessment Section

June 2010

# POTENTIOMETRIC SURFACE MAP OF THE BEDROCK AQUIFERS OF HAMILTON COUNTY, INDIANA

Hamilton County, Indiana is located in the central portion of the state. The entire county is situated within the White and West Fork White River Basin. The Potentiometric Surface Map (PSM) of the Bedrock aquifers of Hamilton County was mapped by contouring the elevations of over 1400 static water-levels reported on well records received primarily over a 50 year period. These wells are completed in unconsolidated aquifers at various depths, and typically, under confined conditions (bounded by impermeable layers above and below the water bearing formation). However, some wells were completed under unconfined (not bounded by impermeable layers) settings. The potentiometric surface is a measure of the pressure on water in a water bearing formation. Water in an unconfined aquifer is at atmospheric pressure and will not rise in a well above the top of the water bearing formation, in contrast to water in a confined aquifer which is under hydrostatic pressure and will rise in a well above the top of the water bearing formation.

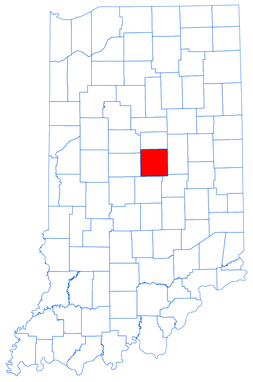
Static water-level measurements in individual wells used to construct county PSM's are indicative of the water-level at the time of well completion. The groundwater level within an aquifer constantly fluctuates in response to rainfall, evapotranspiration, groundwater movement, and pumpage. Therefore, current site specific conditions may differ due to local or seasonal variations in measured static water levels. Because fluctuations in groundwater are typically small, static water-levels can be used to construct a generalized PSM. Groundwater flow is naturally from areas of recharge toward areas of discharge. As a general rule, but certainly not always, groundwater flow approximates the overlying topography and intersects the land surface at major streams. The contour type was determined based on the amount of data and the degree of change in water levels between wells in each mapped area. Portions of the county are lacking in data and/or are covered by deposits that have limited to non-existent aquifer potential. Therefore, potentiometric surface elevations contours have not been extended through these areas.

Universal Transverse Mercator (UTM) coordinates for the water wells were either physically obtained in the field, determined through address geocoding, or reported on water well records; however, the location of the majority of the water well records used to make the PSM were address geocoded. Elevation data were either obtained from topographic maps or a digital elevation model. Quality control/quality assurance procedures were utilized to refine or remove data where errors were readily apparent.

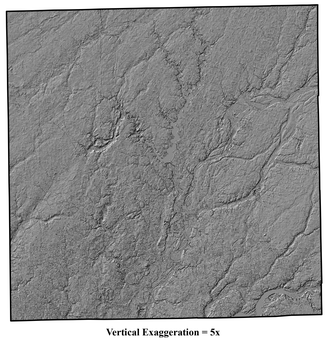
Bedrock potentiometric surface elevations in Hamilton County range from a high of 900 feet mean sea level (msl) in the northwest region of the county, to a low of 720 feet msl in the south-central portion. Groundwater flow direction within the White and West Fork White River Basin is generally towards the White River. In the far western portion of the county groundwater flows west towards Eagle Creek and Little Eagle Creek. Also, in the southeast corner groundwater flows towards Fall Creek.

The county PSM can be used to define the regional groundwater flow path and to identify significant areas of groundwater recharge and discharge. County PSM's represent overall regional characteristics and are not intended to be a substitute for site-specific studies.

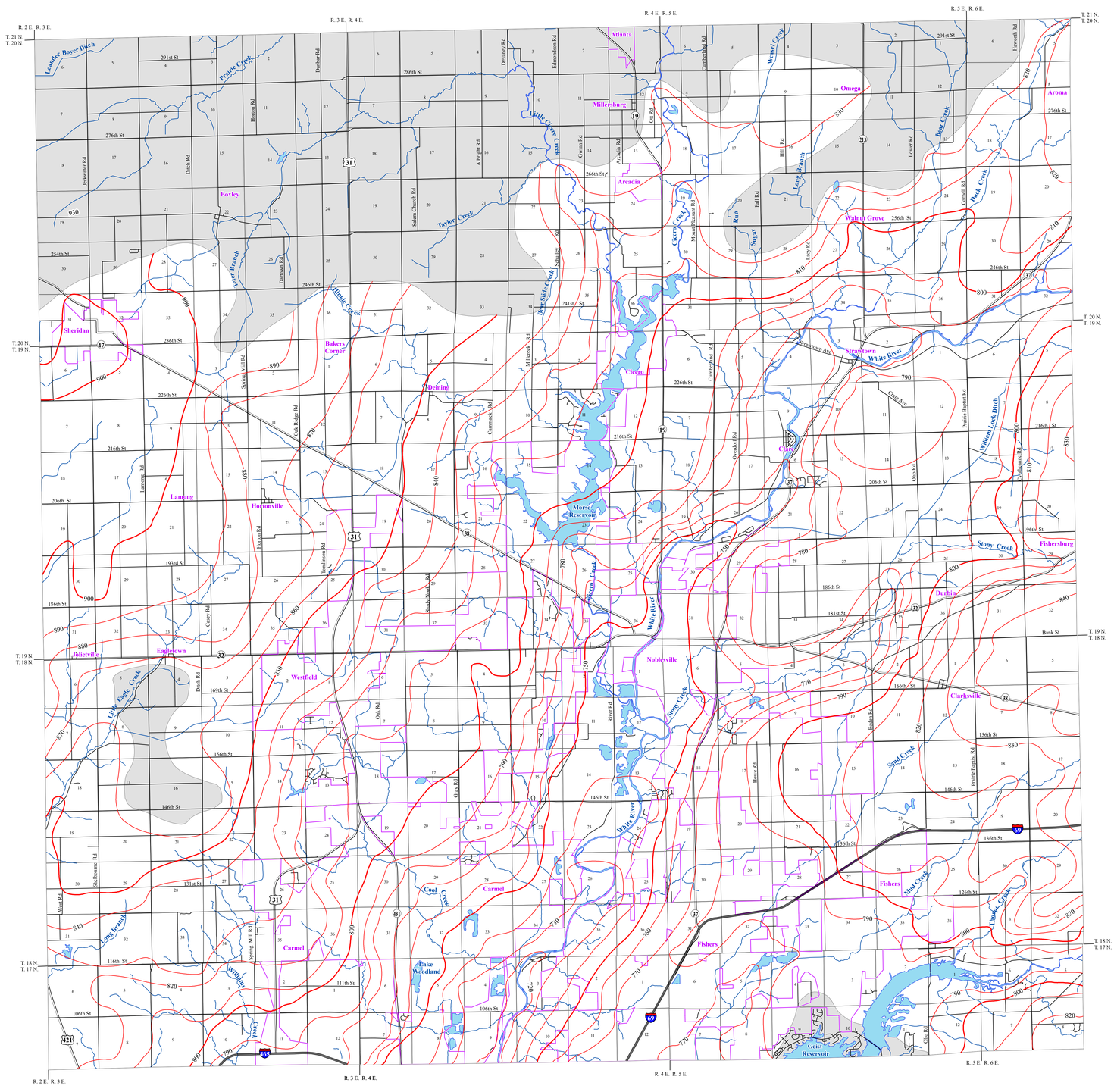
**Location Map**



**Hillshade Map of Hamilton County, Indiana**



**Vertical Exaggeration = 5x**




## EXPLANATION

- 800 — Line of equal elevation, in feet above mean sea level Potentiometric Contour interval 10 feet
- Stream
- County Road
- 19 — State Road
- 31 — US Highway
- 69 — Interstate
- Basin Boundary
- Municipal Boundary
- Lake & River
- No Aquifer Material or Limited Data

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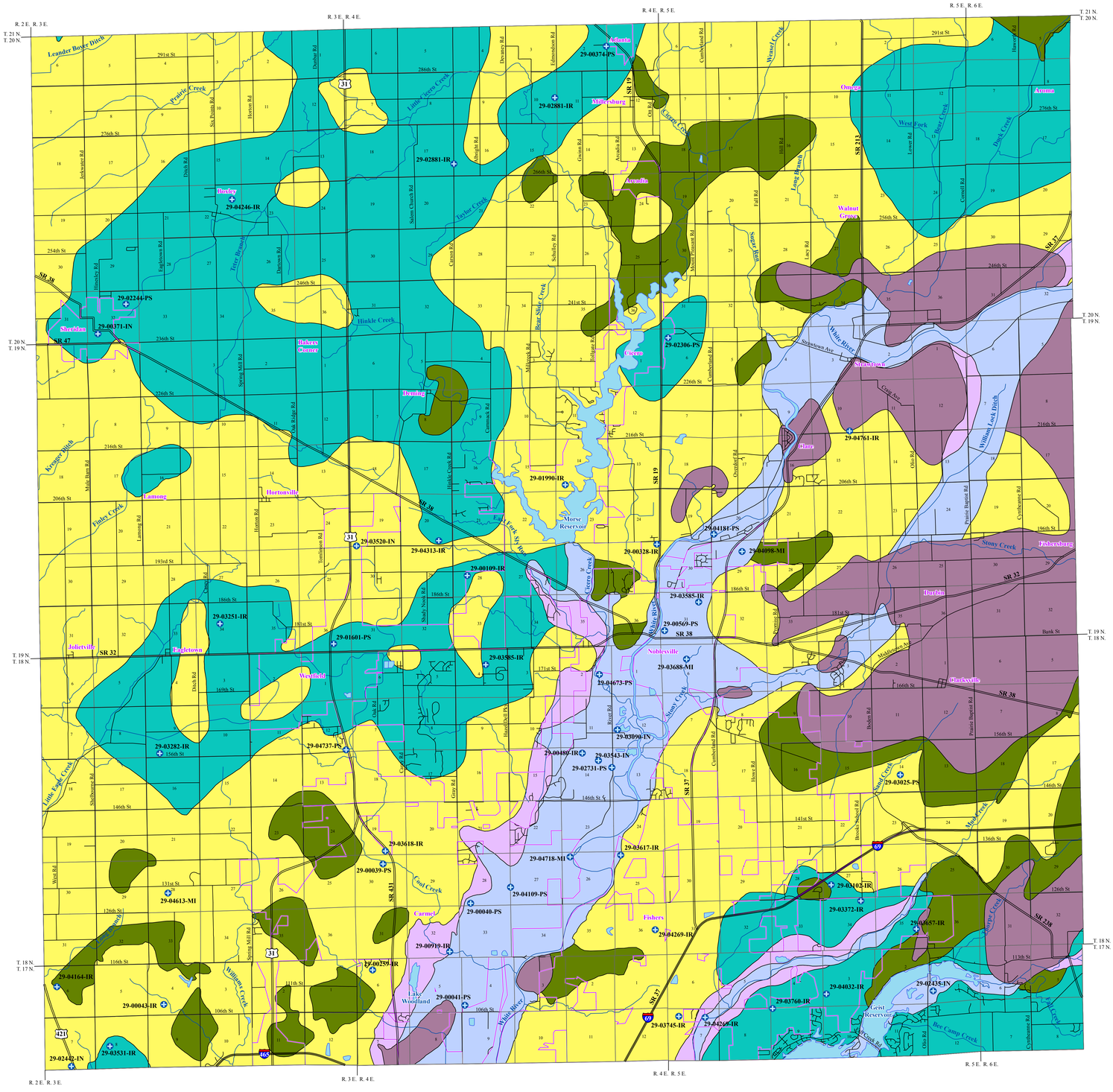
Map generated by Joel Sanderson
IDNR, Division of Water, Resource Assessment Section

**Potentiometric Surface Map of the Bedrock Aquifers of Hamilton County, Indiana**

by
Glenn E. Grove
Division of Water, Resource Assessment Section

December 2012

# UNCONSOLIDATED AQUIFER SYSTEMS OF HAMILTON COUNTY, INDIANA




The unconsolidated aquifer systems of Hamilton County are composed of sediments deposited by, or resulting from, a complex sequence of glaciers, glacial meltwaters, and post-glacial precipitation events. Six unconsolidated aquifer systems have been mapped in Hamilton County: the Till Veneer; the New Castle / Tipton Till; the New Castle / Tipton Till Subsystem; the New Castle / Tipton Complex; the White River and Tributaries Outwash; and the White River and Tributaries Outwash Subsystem. Because of the complicated glacial geology, boundaries of the aquifer systems in this county are commonly gradational and individual aquifers may extend across aquifer system boundaries. Approximately 75 percent of all wells in this county are completed in unconsolidated deposits.

The thickness of unconsolidated deposits in Hamilton County is quite variable, due to the deposition of glacial material over an uneven bedrock surface. Unconsolidated deposits in the county range from less than 5 feet to about 300 feet thick.

Regional estimates of aquifer susceptibility to contamination from the surface can differ considerably due to a wide range of variation within geologic environments. 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.

### Till Veneer Aquifer System

In Hamilton County, the Till Veneer Aquifer System occurs in areas where the unconsolidated material is predominantly thin till overlying bedrock. This system is chiefly the product of the deposition of glacial till over an uneven, eroded bedrock surface, and is generally less than 50 feet thick. Small areas of eastern and southeastern Hamilton County are mapped as Till Veneer.

The Till Veneer Aquifer System has the most limited groundwater resources of the unconsolidated aquifer systems. Potential aquifers within this system include thin isolated sand and/or gravel layers, and surficial sand and gravel outwash or alluvium. However, there is little potential for groundwater production in this system in Hamilton County with 96 percent of the wells being completed in the underlying bedrock. The wells utilizing this aquifer system are oompleted at depths ranging from 30 to 40 feet. Most of the wells in this system have reported capacities of 5 gallons per minute (gpm) or less with some wells being reported as "dry". Static water levels range between 8 and 20 feet below the surface. There are no registered significant groundwater withdrawal facilities utilizing this system.

This system is generally not very susceptible to contamination from surface sources because of the low permeability of the near-surface materials. However, areas where protective clay layers are thin or absent are very susceptible to contamination.

### New Castle / Tipton Till Aquifer System

The New Castle / Tipton Till Aquifer System is mapped throughout a large portion of Hamilton County. This aquifer system is up to about 170 feet in thickness, and consists primarily of glacial till with intertill sand and gravel layers. However, the sand and gravel aquifers in this system tend to be relatively thin and discontinuous.

This aquifer system is capable of meeting the needs of most domestic and some high - capacity users in Hamilton County. The wells utilizing this aquifer system are completed at depths ranging from 65 to 135 feet with saturated sand and gravel aquifer materials commonly 4 to 18 feet thick. Domestic well yields are typically 10 to 40 gpm and static water levels range from flowing to 44 feet below the land surface. There are 17 registered significant groundwater withdrawal facilities (32 wells) using the Tipton Till Aquifer System. The reported yields for the high-capacity wells range from 70 to 777 gpm.

The New Castle / Tipton Till Aquifer System typically has a low susceptibility to surface contamination because intertill sand and gravel units are commonly overlain by thick glacial till. Shallow wells completed in this system are moderately susceptible to contamination.

### New Castle / Tipton Till Aquifer Subsystem

The New Castle / Tipton Till Aquifer Subsystem is mapped in several isolated areas of Hamilton County. The subsystem is mapped similar to the New Castle / Tipton Till Aquifer System. However, potential aquifer materials are generally thinner and potential yields are less in the subsystem.

About 84 percent of wells started in this subsystem in Hamilton County are completed in the underlying bedrock aquifer system. However, the New Castle / Tipton Till Aquifer Subsystem is capable of meeting the needs of some domestic users in the county. Potential aquifer materials include relatively thin, discontinuous intertill sand and gravel deposits. These intertill sand and gravel aquifer materials are commonly less than 10 feet thick. The wells producing from th is subsystem are typically completed at depths ranging from about 50 to 110 feet. Domestic well yields are generally 5 to 10 gpm and static water levels range from 12 to 40 feet below the surface. There are no registered significant groundwater withdrawal facilities using the New Castle / Tipton Till Aqufer Subsystem.

This subsystem is generally not very susceptible to surface contamination because intertill sand and gravel units are overlain by thick till deposits. Wells producing from shallow aquifers are moderately to highly susceptible to contamination.

### New Castle / Tipton Complex Aquifer System

The New Castle / Tipton Complex Aquifer System is mapped throughout much of Hamilton County. Multiple glacial advances resulted in sequences of intertill sand and gravel layers, typically overlain by thick clay, resulting in aquifers that are highly variable in depth, thickness, and lateral extent. The total thickness of the combined unconsolidated deposits is up to about 300 feet.

The deeper more prolific aquifers of this system are capable of meeting the needs of domestic and some high-capacity users in Hamilton County. Saturated aquifer materials in the New Castle / Tipton Complex Aquifer System range from about 5 to 20 feet thick, and wells in this system are generally completed at depths from about 75 to 150 feet. Domestic well yields range up to 50 gpm and static water levels are about 15 to 50 feet below the surface. There are 18 registered significant groundwater withdrawal facilities (38 wells) using this system. The reported yields for the high-capacity wells range from 70 to 1500 gpm.

The New Castle / Tipton Complex Aquifer System is not very susceptible to contamination where overlain by thick clay deposits. However, in some areas where surficial clay deposits are relatively thin, the shallow aquifer, if present, is at moderate to high risk.

### White River and Tributaries Outwash Aquifer System

The White River and Tributaries Outwash Aquifer System is mapped in the southeastern and east-central portions of Hamilton County along the White River, Stony Creek, William Lock Ditch, Mud Creek, and Fall Creek. The system includes thick glacial outwash sands and gravels that are generally capped by a layer of clay and silt deposits.

The White River and Tributaries Outwash Aquifer System is capable of meeting the needs of both domestic and high-capacity users in Hamilton County. The wells utilizing this aquifer system are completed at depths ranging from 45 to 85 feet with saturated sand and gravel aquifer materials commonly 10 to 45 feet thick. Domestic well yields are typically 10 to 50 gpm with static water levels ranging from 12 to 30 feet below the surface. In the White River and Tributaries Outwash Aquifer System there are 20 registered significant groundwater withdrawal facilities (55 wells). Reported production for these high-capacity wells range from 75 to 2100 gpm.

The White River and Tributaries Outwash Aquifer System is highly susceptible to surface contamination where sand and gravel deposits are near the surface and have little or no clay deposits. However, areas having relatively thick clays overlying the sand and gravel deposits are moderately susceptible to contamination.

### White River and Tributaries Outwash Aquifer Subsystem

The White River and Tributaries Outwash Aquifer Subsystem is mapped in southeastern and east-central Hamilton County along portions of the White River, William Lock Ditch, Mud Creek, and Fall Creek. This subsystem is mapped similar to the White River and Tributaries Outwash Aquifer System; however, aquifer materials in the White River and Tributaries Outwash Aquifer Subsystem are generally thinner, overlying silt and/or clay materials are thicker, and potential yields are less in the subsystem.

The White River and Tributaries Outwash Aquifer Subsystem has the potential to meet the needs of domestic and some high-capacity users. The wells in this subsystem are completed at depths commonly ranging from 45 to 95 feet. Saturated aquifer materials include sand and gravel deposits that are commonly 5 to 30 feet thick. Domestic well yields are generally 10 gpm with static water levels ranging from 15 to 40 feet below the surface. There are no registered significant groundwater withdrawal facilities in the White River and Tributaries Outwash Aquifer Subsystem.

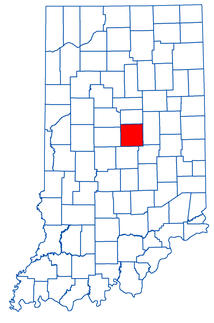
Areas within the White River and Tributaries Outwash Aquifer Subsystem that have overlying clay deposits are moderately susceptible to surface contamination; however, areas lacking overlying clay deposits are highly susceptible to contamination.

1 0.5 0 1 Mile

1 0.5 0 1 Kilometer

INDIANA DEPARTMENT OF NATURAL RESOURCES

### Location Map



### EXPLANATION

- Registered Significant Ground-Water Withdrawal Facility
- Stream
- County Road
- State Road & US Highway
- Interstate
- Municipal Boundary
- Lake & River

Map generated by Scott H. Dean
IDNR, Division of Water, Resource Assessment Section

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## Unconsolidated Aquifer Systems of Hamilton County, Indiana

by
Robert A. Scott
Division of Water, Resource Assessment Section

June 2010

# POTENTIOMETRIC SURFACE MAP OF THE UNCONSOLIDATED AQUIFERS OF HAMILTON COUNTY, INDIANA

Hamilton County, Indiana is located in the central portion of the state. The entire county is situated within the White and West Fork White River Basin. The Potentiometric Surface Map (PSM) of the unconsolidated aquifers of Hamilton County was mapped by contouring the elevations of over 1800 static water-levels reported on well records received primarily over a 50 year period. These wells are completed in unconsolidated aquifers at various depths, and typically, under confined conditions (bounded by impermeable layers above and below the water bearing formation). However, some wells were completed under unconfined (not bounded by impermeable layers) settings. The potentiometric surface is a measure of the pressure on water in a water bearing formation. Water in an unconfined aquifer is at atmospheric pressure and will not rise in a well above the top of the water bearing formation, in contrast to water in a confined aquifer which is under hydrostatic pressure and will rise in a well above the top of the water bearing formation.

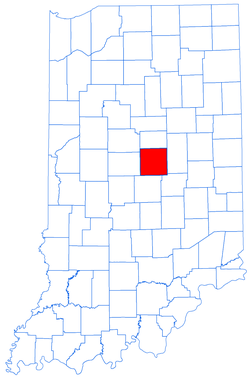
Static water-level measurements in individual wells used to construct county PSM's are indicative of the water-level at the time of well completion. The groundwater level within an aquifer constantly fluctuates in response to rainfall, evapotranspiration, groundwater movement, and pumpage. Therefore, current site specific conditions may differ due to local or seasonal variations in measured static water levels. Because fluctuations in groundwater are typically small, static water-levels can be used to construct a generalized PSM. Groundwater flow is naturally from areas of recharge toward areas of discharge. As a general rule, but certainly not always, groundwater flow approximates the overlying topography and intersects the land surface at major streams. The contour type was determined based on the amount of data and the degree of change in water levels between wells in each mapped area. In Hamilton County well depths 100 feet or less were a priority in mapping the potentiometric surface.

Universal Transverse Mercator (UTM) coordinates for the water wells were either physically obtained in the field, determined through address geocoding, or reported on water well records; however, the location of the majority of the water well records used to make the PSM were address geocoded. Elevation data were either obtained from topographic maps or a digital elevation model. Quality control/quality assurance procedures were utilized to refine or remove data where errors were readily apparent.

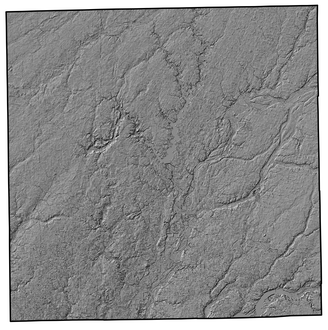
Unconsolidated potentiometric surface elevations in Hamilton County range from a high of 940 feet mean sea level (msl) in the northwest region of the county, to a low of 720 feet msl in the south-central portion. Groundwater flow direction within the White and West Fork White River Basin is generally towards the White River. In the far western portion of the county groundwater flows west towards Eagle Creek in Boone County. Also, in the southeast corner groundwater flows towards Fall Creek. Some of the shallower aquifers associated with other major tributaries to White River like Stone Creek, Mud Creek and Cicero Creek locally affect the regional drainage with groundwater flowing toward these streams in places. However, the local affect of Cicero Creek in and near Morse Reservoir is significantly reduced by the close proximity to the White River and its associated outwash aquifer. This is indicated by the many wells around the reservoir that are finished in the deeper aquifer with static water levels 10 to 15 feet below the Morse Reservoir normal pool elevation (810 feet msl).

The county PSM can be used to define the regional groundwater flow path and to identify significant areas of groundwater recharge and discharge. County PSM's represent overall regional characteristics and are not intended to be a substitute for site-specific studies.

**Location Map**



**Hillshade Map of Hamilton County, Indiana**

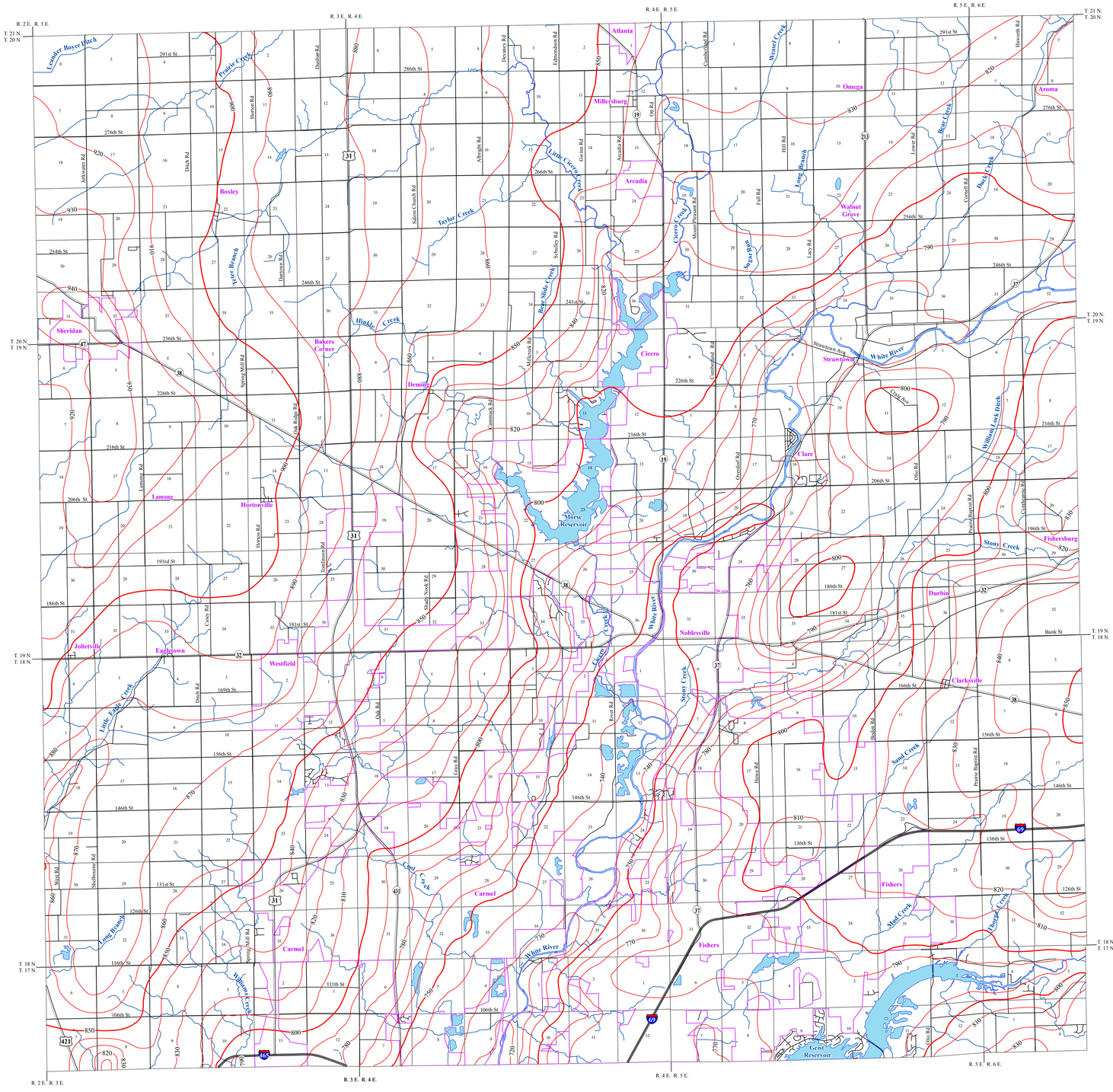


**Vertical Exaggeration = 5x**




## EXPLANATION

- 800 — Line of equal elevation, in feet above mean sea level Potentiometric Contour interval 10 feet
- Stream
- County Road
- 19 — State Road
- 31 — US Highway
- 69 — Interstate
- Basin Boundary
- Municipal Boundary
- Lake & River




Map generated by Joel Sanderson
IDNR, Division of Water, Resource Assessment Section

### Map Use and Disclaimer Statement

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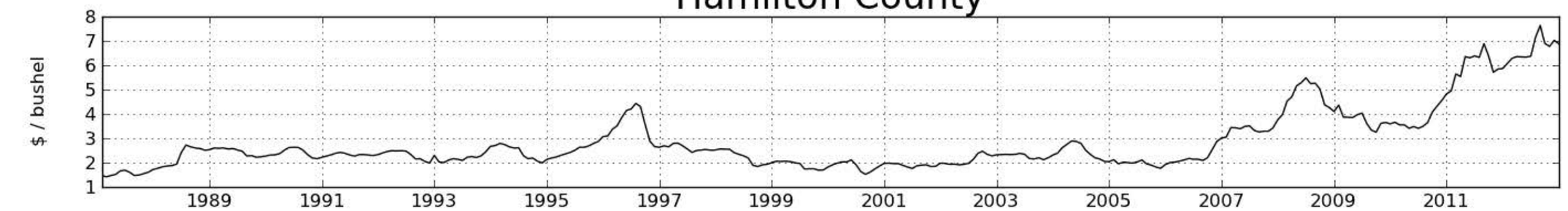
This map was created from several existing shapefiles. Township and Range Lines of Indiana (line shapefile, 20020621), Land Survey Lines of Indiana (polygon shapefile, 20020621), and County Boundaries of Indiana (polygon shapefile, 20020621), were all from the Indiana Geological Survey and based on a 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. Hydrography, Streams (NHD) (line shapefile, 20081218), Rivers (NHD) (polygon shapefile, 20081218), Lakes (NHD) (polygon shapefile, 20081218) was from the U.S. Geological Survey and the U.S. Environmental Protection Agency and based on a 1:24,000 scale. Managed Lands IDNR IN (polygon shapefile, 20100920) was from IDNR and based on a 1:24,000 scale. County Hillshade image was from the U.S. Geological Survey National Elevation Dataset (raster image, 20120720). Potentiometric Surface Map of the Unconsolidated Aquifers of Hamilton County, Indiana (line shapefiles, Grove, 2012) was based on a 1:24,000 scale.

**Potentiometric Surface Map of the Unconsolidated Aquifers of Hamilton County, Indiana**

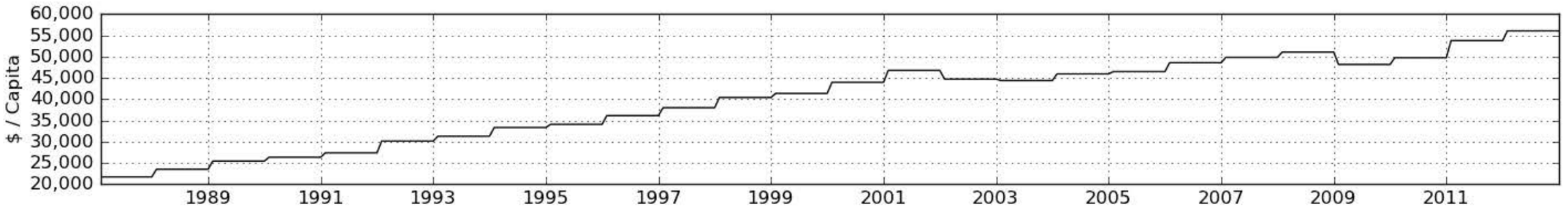
by
Glenn E. Grove
Division of Water, Resource Assessment Section

December 2012

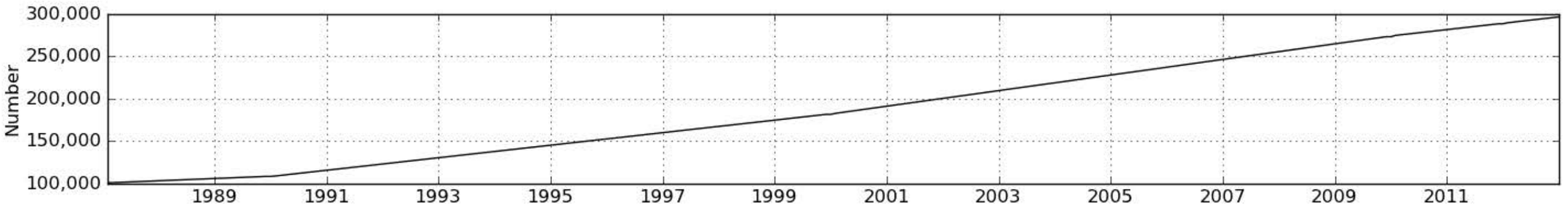
# Hamilton County



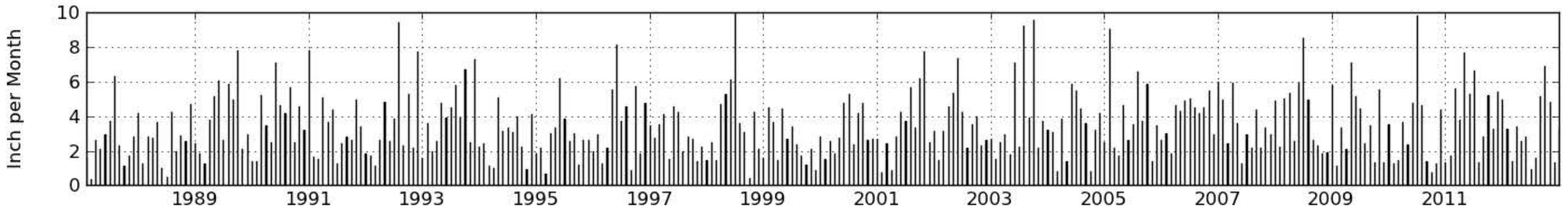

Corn Price



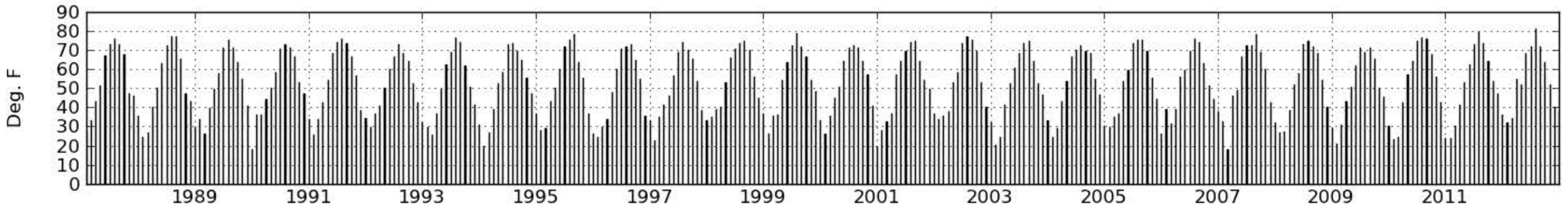

Income



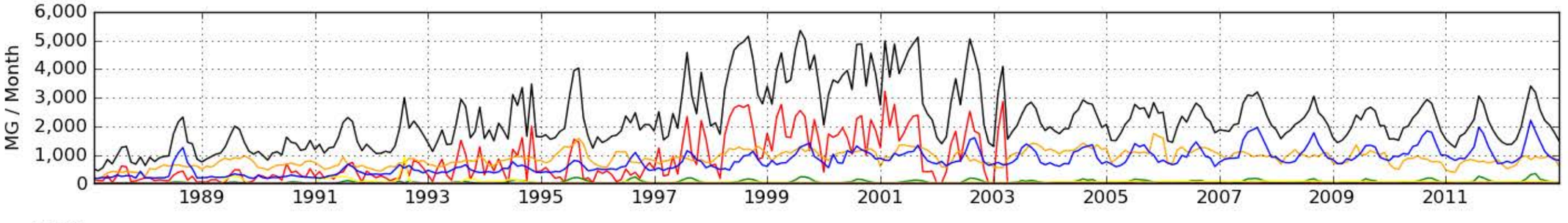

Population



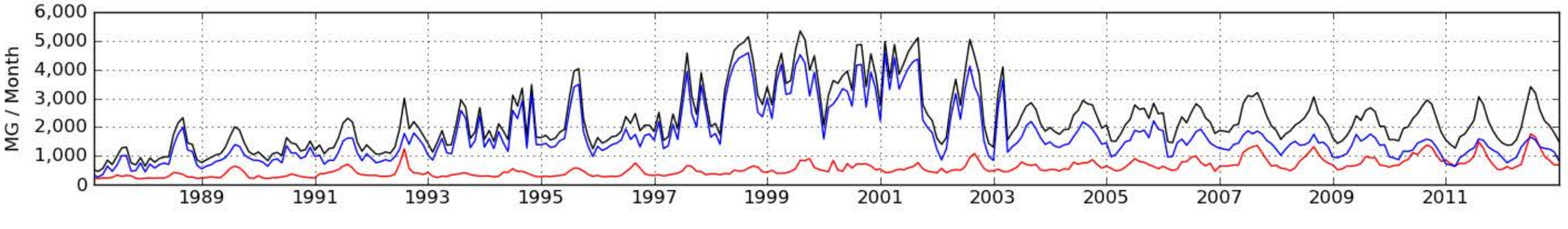

Precipitation




Temperature




Energy/Mining
Industry
Irrigation
Misc.
Public Supply
Rural
Total




Total
Ground Water
Surface Water