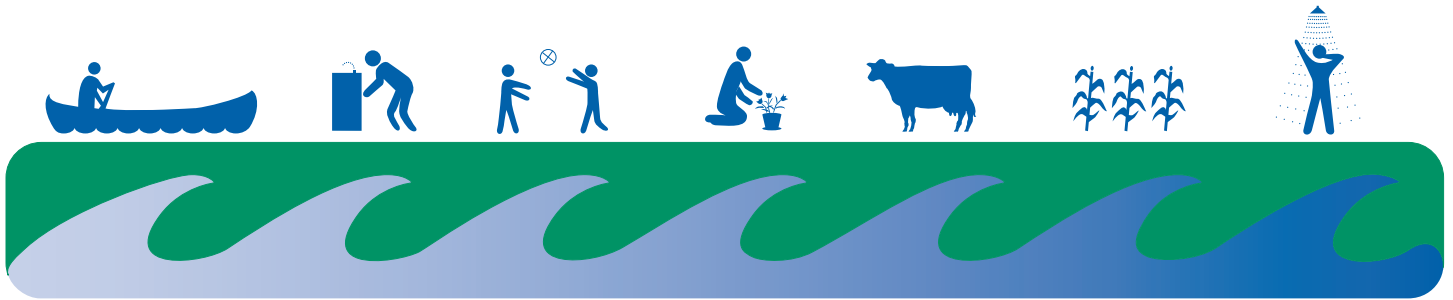


Watershed Connections



Water Resources of Warren County, Indiana

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Introduction

Water is a vital resource for all citizens of Warren County. Water is essential for agriculture and industry, as well as for recreation and drinking. A healthy environment and economy requires clean water and healthy watersheds. This publication gives basic information about surface and ground water resources of Warren County, and discusses human activities that may be affecting those water resources.

The population of Warren County was 8,419 in 2000. The county covers an area of 366 square miles or 234,413 acres. Elevation ranges from 480 feet to 830 feet. Warren County has an average monthly temperatures ranging from 24.7°F in January to 74.5°F in July.

Warren County Watersheds

A watershed is a region of land that drains into a lake, stream, or river. Watersheds are important because everything that is done on the land within a watershed can affect the lake or river into which it drains. The quantity and quality of our water is affected not only by what might be dumped into it, but by everything we do on the land in the watershed.

Watersheds vary in size, depending upon the water body you are looking at. A few acres of land that drain into a pond form a watershed. If that pond drains into a stream, those acres, along with many others, are part of the watershed for the stream. Small watersheds are part of larger watersheds, just as small streams flow into larger streams.

Warren County is in two major watersheds (Figure 2). Three-quarters of the county is in the Middle Wabash-Little Vermilion watershed that covers 2,267 square miles (in Indiana and Illinois). Opossum Run, Redwood Creek, Rock Creek, Big Pine Creek, Kickapoo Creek, and Little Pine Creek drain the Middle Wabash-Little Vermilion Watershed into the Wabash River. The northwestern corner of the county is in the Vermilion Watershed, which covers 1,439 square miles (in Indiana and Illinois). This watershed is drained by Jordan Creek, of which Leak Ditch and Little Creek are tributaries. Jordan Creek then flows to the Vermilion River, which later joins the Wabash River. The Wabash River, which forms the southeastern county line, flows into the Ohio River, which flows into the Mississippi and eventually to the Gulf of Mexico.

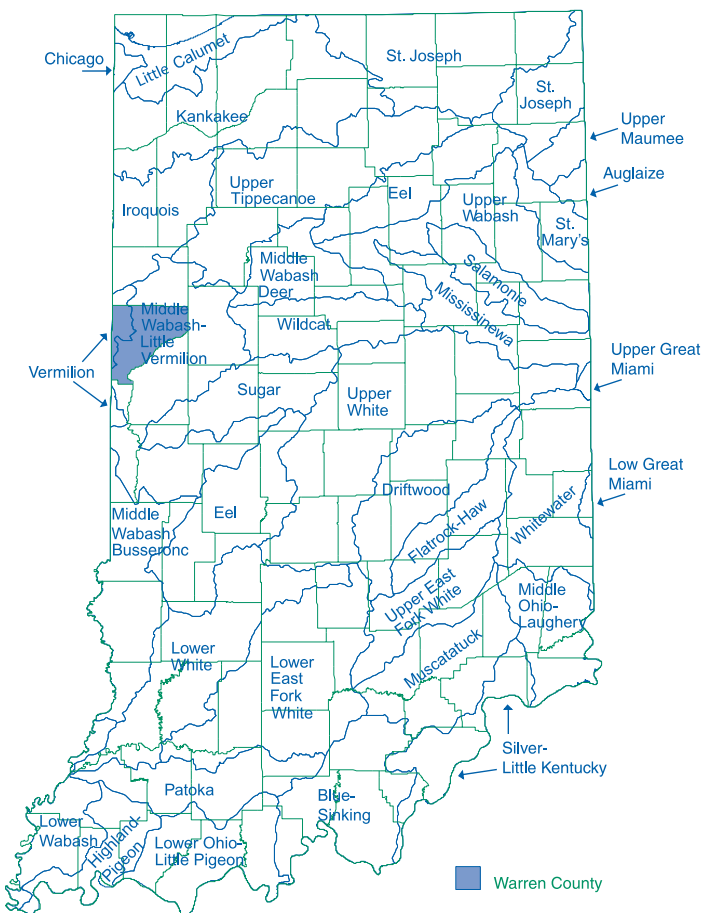


Figure 1. Major Watersheds of Indiana. Warren County is in the Middle Wabash-Little Vermilion and Vermilion Watersheds.

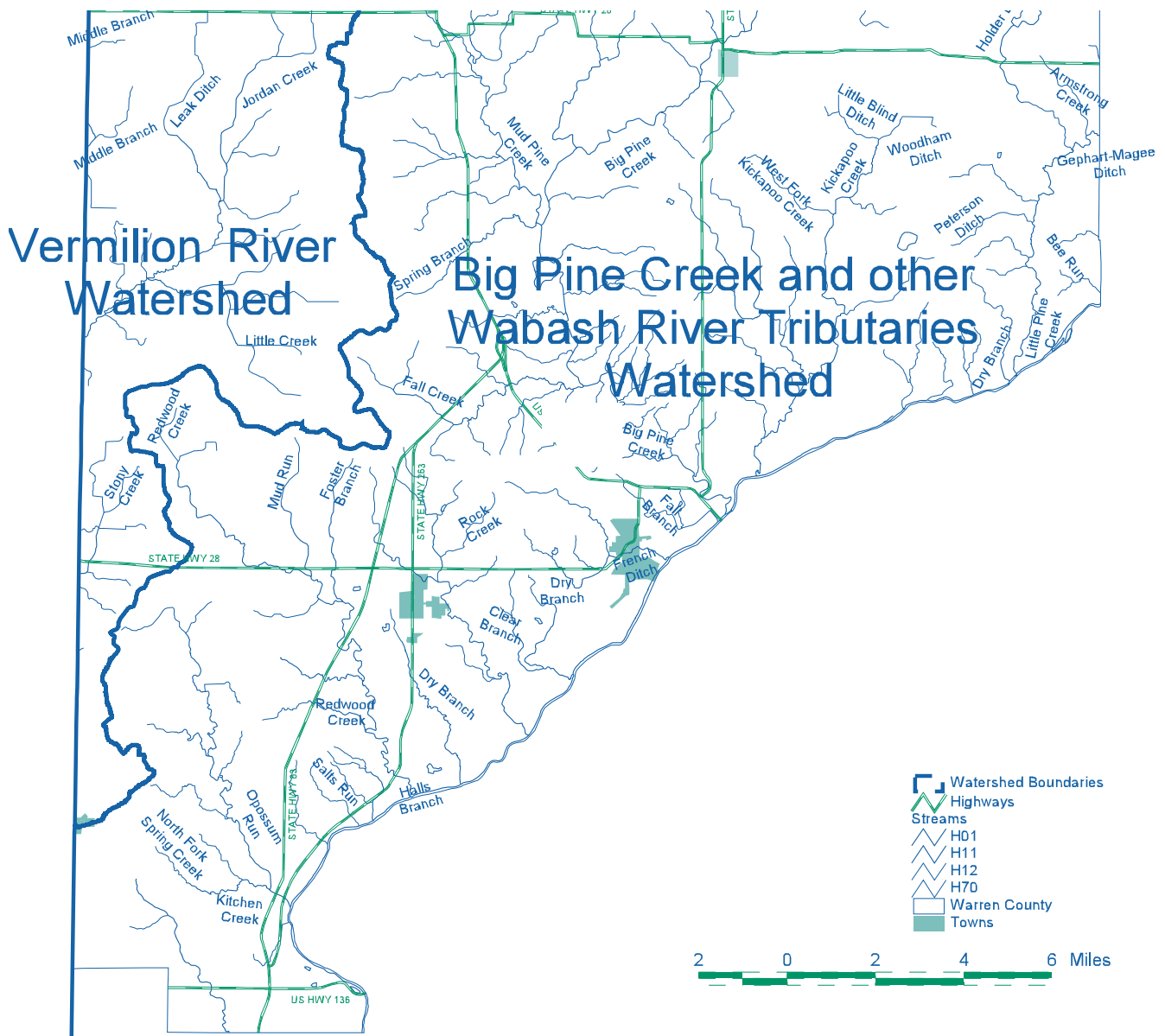


Figure 2: Stream and watersheds of Warren County.

A watershed assessment (Unified Watershed Assessment, for Indiana, was carried out for all watersheds in Indiana in 1998. The goal of this assessment was to use all available data to assess the present condition of the water in lakes, rivers and streams (surface waters) in Indiana. There was not enough data available to determine the condition of the Vermilion watershed. The Middle Wabash-Little Vermilion watershed was determined to be in need of restoration – the water does not meet the designated uses or other natural resource goals (25%, or more, of the waters assessed did not meet state water quality standards).

Warren County Streams

Discharge for a stream or river is the amount of water flowing per unit of time. A typical unit for measuring discharge is cubic feet per second (cfs). The U.S. Geological Survey in Warren County runs four gauging stations, where discharge

is measured continuously in a stream or river. These four stations are located in Little Pine Creek at Green Hill, Big Pine Creek near Williamsport, the Wabash River at Covington, and Big Pine Creek Tributary near Pine Village.

The monthly average discharge for the Wabash River and Little Pine Creek are shown in Figure 3. Highest flows generally occur during February to April while low flows usually occur in August through September, a pattern that is typical for most streams in Indiana. Little Pine Creek has only been monitored for a few years, so there is not enough data to smooth out the spikes in the graph.

The values shown in Figure 3 are monthly averages. Maximum daily flows during floods can be much higher, and low flows during droughts can be much lower, than the discharge shown in Figure 3.

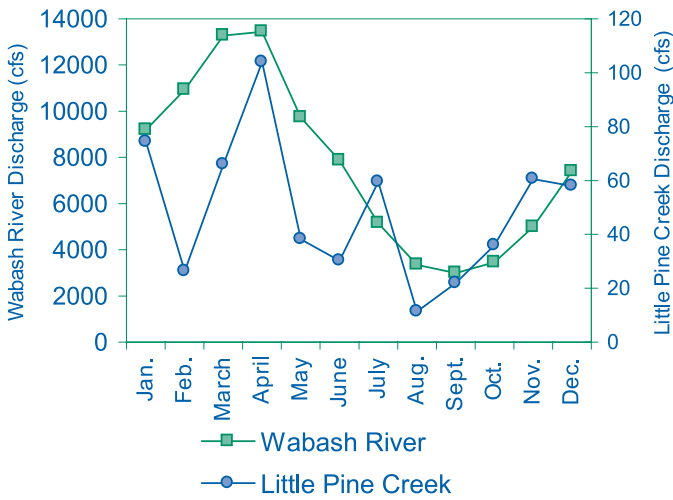


Figure 3. Average monthly discharge for Warren County Streams.

Floodplains are low areas adjacent to river or stream channels. Floodplains exist because river channels are rarely large enough to contain major floods. These areas have flooded in the past and will flood again in the future. The Federal Emergency Management Agency (FEMA) has delineated floodplains for Warren County. A very general map of floodplains is shown in Figure 4. The Warren County Zoning Office (762-6311) at the Courthouse has a floodplain map which should be viewed before planning any development that may coincide with a floodplain.

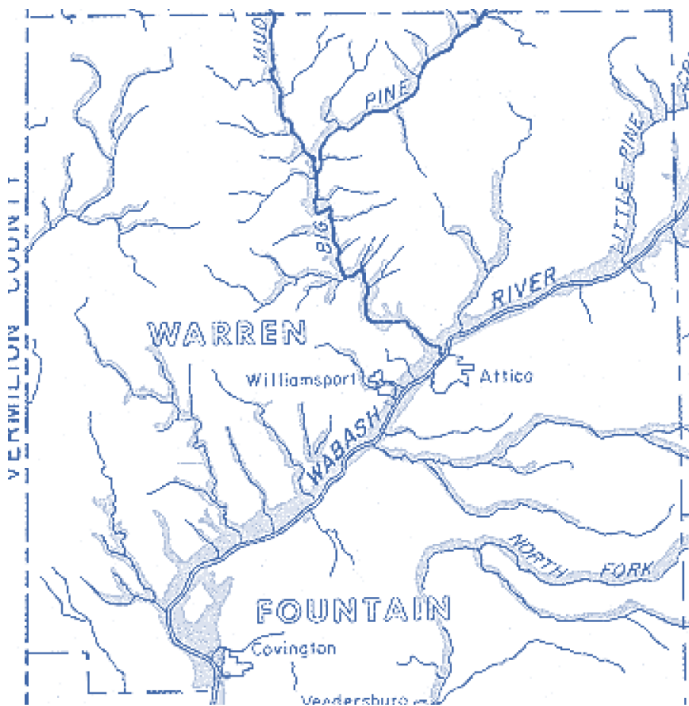


Figure 4: Floodplains in Warren County (and neighboring Fountain County).

Warren County Wetlands

Wetlands are transitional lands between terrestrial and deep-water habitat that is generally covered with water or the water table is at or near the surface. The area must support water-loving plants and have mostly undrained hydric (e.g. peat or muck) soil. Wetlands help maintain the quality of surface and ground water by removing potential pollutants such as sediment, nutrients, and pesticides from the water. Wetlands have many other benefits including providing habitat for wetland flora and fauna, providing services to humans such as aesthetics, hunting, fishing, and recreation, and reducing peak flood flows. Approximately 85 percent of Indiana wetlands have been lost since the 1700s.

In Warren County there are 5,439 acres of wetlands, according to the National Wetlands Inventory from the 1980s. This is equal to about 2.5 percent of the total area in the county. Two well known Warren County wetlands are Kate's Pond (about 2 acres, near 200 N) and Cranberry Marsh (about 77 acres, near 500N).

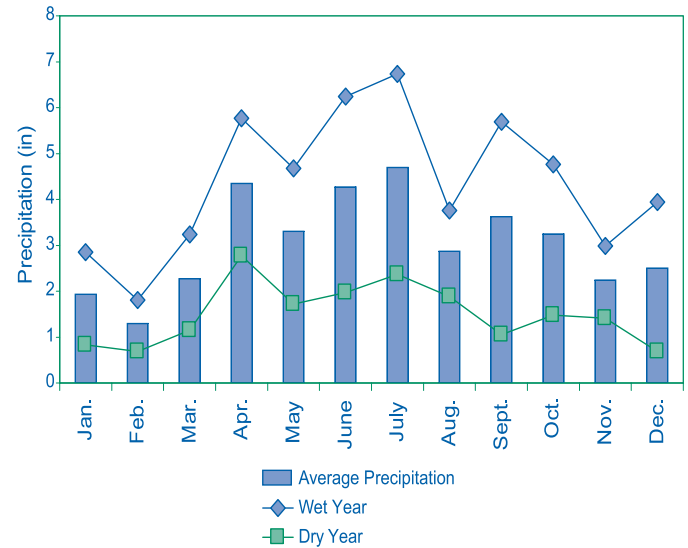


Figure 5. Warren County Precipitation

Precipitation

The average yearly precipitation in Warren County (rain, snow, sleet, and hail) is approximately 37 inches a year. Precipitation varies from about 1.5 inches to 5 inches per month, as shown in Figure 5. Average monthly precipitation is about 3 inches, but monthly highs and lows can vary considerably. The bars show average monthly precipitation, while the lines show the wettest year and driest year expected once in 5 years.

The amount of precipitation in a single storm can be an important factor in causing flooding. Precipitation records over many years have been analyzed to assess the probability of various storms occurring. Precipitation probability for a single storm is generally expressed in terms of a return period. The return period is the expected number of years between

storms of a given size. A “5-year storm” has a 20% chance of occurring in any one year, so it is likely to occur about every 5 years on the average. Probability doesn’t tell how often a storm will occur, however. It is possible for a 5-year storm to occur many years in a row or even several times in a single year. A 100-year storm has a 1% chance of occurring in any year. The 100-year storm is particularly important, because the area that is expected to be flooded by the 100-year storm is generally considered to be the “floodplain” shown in Figure 4. Permission from the Indiana Department of Natural Resources (IDNR) is required before constructing any building in the area that will be flooded by a 100-year storm. Figure 6 shows the expected 24-hour rainfall for Warren County for various return periods.

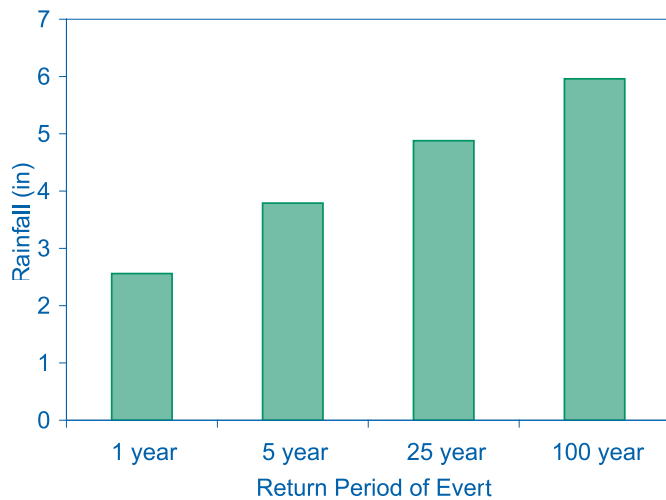


Figure 6. Rainfall expected in 24 hours for low-probability storm events.

Warren County Ground Water

Ground water availability is good throughout most of Warren County. The entire population in Warren County relies on ground water for drinking, washing, and other needs. Parts of Warren County, especially the areas just north of the Wabash River, need deep wells to reach water. If wells are too shallow they may dry up when there is insufficient rainfall (as happened in 1999). Ground water in the county tends to move toward the Wabash River.

Warren County Water Use

Warren County citizens and industry use water for a variety of purposes. Most people (66%) have their own wells that they use for drinking, washing, flushing toilets, gardening, washing cars, etc. The citizens of the towns of Williamsport and West Lebanon get their water for home use from public water suppliers. Businesses and industry use water for a variety of purposes (depending on their needs). Table 1 shows the largest water users in Warren County, compiled by the IDNR in 1999.

Table 1. Major Water Users in Warren County

Owner	Water Use*
Interstate Sand	333.9
City of Covington	109.2
Town of Williamsport	77.1
RE Billings	76.5
Town of West Lebanon	36.7
Hubner Farms	10.8
Wabash Gravel	1.14
United Methodist Church	0.4
Total	645.8

* Water Used is in millions of gallons per year

Warren County Drinking Water

In Indiana, 60% of citizens use ground water for drinking, while 40% use surface water. In Warren County, the entire population uses ground water for the source of their water (there is no surface water used within the county). Most of the water comes from wells, but some residents use water from springs (water that flows naturally to the ground surface so no pumping is required) or artesian wells (water that is under pressure and does not need pumping). Springs have a high risk for contamination because the water is close to the surface.

According to the 1990 census, 34% of Warren County households use water supplied by one of two public water systems: Williamsport Water Utility (serving 2,140 people) or West Lebanon Water Works (serving 674 people).

These two community systems, like all water suppliers using ground water in Indiana, are required to develop a Wellhead Protection Plan to protect water quality. Each system must identify the area that provides recharge to the wells (the wellhead protection area), identify potential sources of contamination within this area, and develop a management plan to minimize risks of contaminating drinking water. Some examples of potential contamination sources include storage tanks, areas where chemicals are applied to the land, septic systems, landfills, and industrial chemicals. A contingency plan must also be developed to cope with possible emergencies. Community involvement is an important component of this plan. Contact your public water supplier, IDEM, or Purdue Extension for more information (see “Sources of Information”).

The Safe Drinking Water Act requires that all public water supplies test at least once a year for the following:

- volatile organic compounds such as gasoline or solvents
- pesticides and other synthetic organic compounds
- lead, nitrate, and other inorganic substances
- microbial contaminants such as bacteria

Information on contaminant levels in public supplies is available from your water supplier, or from the Bi-County Health Department (Fountain & Warren).

Citizens using private water supplies (66% of Warren County residents) must monitor their own well for water quality, since no testing on private wells is required or carried out by government agencies. Purdue Extension publications, *Water Testing Laboratories* (WQ 1), *How to take a Water Sample* (WQ 3), *Why Test Your Water* (WQ 4), and *Interpreting Water Test Results, Part One* (WQ 5) provide information about testing your water.

Warren County Water Quality

Surface Water Quality

Surface water quality in the United States has greatly improved since enactment of the Clean Water Act in 1972. Sewage treatment plants and industries, which previously discharged minimally treated pollution into streams, are now required to have permits for all discharges. Although much remains to be done, many rivers that once barely supported fish are now fully supportive of a variety of aquatic life.

The Indiana Department of Environmental Management monitors rivers and streams around Indiana and reports the results every two years. In 1998, Big Pine Creek near Pine Village was fully supportive of aquatic life but not supportive of recreational uses, such as swimming, because of contamination by *E. coli* bacteria. Rock Creek near West Lebanon and Little Pine Creek near Green Hill are both fully supportive of aquatic life. These streams are monitored for nonpoint source pollution. Big Pine Creek is monitored for *E. coli* and nonpoint source pollution.

The Indiana State Department of Health (ISDH) issued a fish consumption advisory in 1999 for Big Pine Creek. Consumption advisories were issued for the following fish: Black Redhorse, Channel Catfish, and Smallmouth Bass. Black Redhorse were found to be contaminated with mercury, so the larger ones should be consumed no more than once a month. Channel Catfish and Smallmouth Bass were contaminated with PCB's; some of the larger ones should only be consumed once a month, while the smaller fish can be consumed once a week. Carp anywhere in Indiana can be contaminated with both PCB's and mercury and should be consumed rarely. These recommendations are particularly important for women who are pregnant or breastfeeding, women who plan to have children, and children under the age of 15. For more information, consult the most recent Indiana Fish Consumption Advisory, (see "Sources of Information").

Ground Water Quality

Information about ground water quality in Warren County is limited. The most common pollutants in ground water in Indiana are volatile organic compounds (gasoline and other petroleum products) and nitrate. Private wells can be contaminated by bacteria, often from nearby septic systems.

Abandoned wells and poorly constructed wells also pose a special risk to drinking water because they can act as a conduit for contaminants to travel to the ground water source. In the

same way that wells can pull water from an aquifer they also are an opening for unintended contaminants to enter the water source.

One of the few sources of information on ground water in Warren County is a voluntary private well testing program carried out in 1994 by the Farm Bureau, Purdue Extension, and other agencies. Nitrate, which has adverse effects on infants, was not found at levels above the drinking water standard in any of the 16 wells tested. People whose well test indicates levels of nitrates higher than the drinking water standard should treat their water with reverse osmosis or distillation or use bottled water, particularly if an infant is present or expected in the household. Screening was also done for two herbicide groups: None of wells tested had levels of concern for any of these herbicides.

The sample size (16 of 2,115 wells in the county) used in the 1994 study is too small to make any estimates of what the drinking water quality is for private wells in Warren County. Testing of all private wells should be completed every few years to be sure that drinking water remains safe. Call the Bi-County Health Department for information on how you can have your water tested for bacteria, nitrates, and other potential contaminants. Water samples can also be tested for a small fee at Consumers Illinois Water Company in Danville, IL. You will need to pick up a sample bottle at the lab and return it to the lab shortly after you collect the sample. Ask for instruction in taking your sample or see *How to take a Water Sample* (WQ 3). Call (217) 442-3063 for more information.

Potential Sources of Pollution in Warren County

Pollutants can be separated into two categories, point source and nonpoint source. *Point source* pollution refers to contaminants that enter the water directly, usually through a pipe. Examples are sewage treatment plants and industrial facilities, which have permits to discharge prescribed quantities of potential contaminants into a specific stream. *Nonpoint source* pollution, by contrast, originates across the watershed and enters the water at locations that cannot be easily identified. Examples of nonpoint source pollution include sediments, nutrients, pesticides, oil, and other chemicals. Point and nonpoint source pollution are illustrated in Figure 8. Nonpoint source pollution, which is not regulated, is currently the primary cause of water quality degradation in the U.S.

Potential Point Source Pollution

Because point source discharges require permits, excellent information is available about potential point sources discharging in Warren County. Five facilities (municipal sewage treatment plants, factories, schools, packing plants, etc.) were permitted to discharge wastes into Warren County's water in 1996. Some of the dischargers in Warren County are the Williamsport Municipal Sewage Treatment Plant, the West Lebanon Public Works Department, and Seeger Memorial High School.

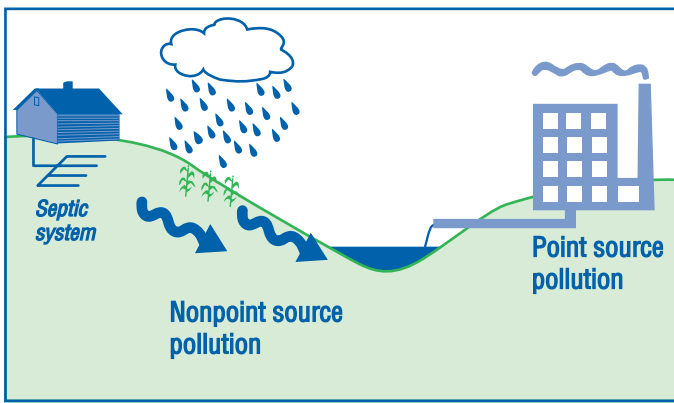


Figure 7. Point source and nonpoint source pollution

Potential Nonpoint Source Pollution

Potential nonpoint source pollution exists everywhere in a watershed. Nutrients, such as phosphorus or nitrogen, are potential pollutants in either ground or surface water. Nutrients can come from urban or rural areas and result from normal home and farm operations as well as accidents or spills. Major sources of nutrients include septic systems, fertilizers, and livestock manure.



Urban and Residential Nonpoint Sources

Septic systems have the potential of leaching nutrients into the ground water and can contaminate surface water if the system is not functioning properly. According to the 1990 census, of the 3,275 households in Warren County, 72% use a septic system for waste disposal, while the other 28% of the housing units are connected to the public sewer system (which treats the waste and then discharges into a river or lake as a point source). Limited information is available on how well the septic systems are performing. Septic systems can function well if they are installed correctly and maintained properly. However, 95% of the soils in Warren County have severe limitations for conventional septic systems. Some older systems are connected to underground tile drains or discharge directly to drainage ditches. Both situations are illegal in Indiana. In order to ensure a properly functioning septic system, homeowners are advised to have a soil assessment completed first, hire a reputable contractor, and use a licensed hauler to empty their septic tank every three to five years. More septic system information is available at www.ces.purdue.edu/onsite/.

Salt, oil, fertilizers for lawns, antifreeze, and pet feces are other examples of urban pollutants that can be washed off by rain and enter the water system as pollutants. No figures are available on urban lawn chemicals and runoff, which may be significant sources of pollution from residential areas.

Agricultural Nonpoint Sources

Agriculture can also contribute to nonpoint source pollution. Sediment, nutrients, and pesticides can be transported by water from cropped fields and land where manure is applied. Roughly 165, 213 acres or 71% of Warren County is used for planting crops, mainly corn and soybeans.

Information on fertilizer sales from the Office of the Indiana State Chemist shows that 18,296 tons of fertilizer was sold in Warren County in 1996. Manure from livestock may also contribute nutrients to ground and surface water. Livestock in 1994 included more than 6,500 cattle and 11,700 hogs. The Indiana Department of Environmental Management requires a permit for large livestock facilities.

No statistics are available for pesticide use or runoff in Warren County. Indiana Agricultural Statistics tracks pesticide use statewide and this information could be assumed to represent Warren County. In Indiana in 1999, the most widely used pesticides were the herbicides Atrazine, Metolachlor, and Acetochlor for corn and Glyphosate, Chlorimuron-ethyl and Imazethapyr for soybeans. Large-scale studies carried out in Indiana and elsewhere have shown that typically about 1% of applied pesticides end up in lakes or rivers.

Many farmers are changing their practices to protect water resources. Using conservation tillage can often reduce erosion and chemical runoff from fields. No-till is a form of conservation tillage that leaves the most plant residue on the field. In 1994 (most recent data available) 20% of the corn and 39% of the soybeans planted in Warren County used no-till conservation tillage. All methods of conservation tillage (no-till, ridge-till, mulch-till) were used on 36% of the corn and 87% of soybeans planted in the county. Many farmers test their soils to ensure that crops only receive the amount of fertilizer that is needed, and some have installed grass waterways and buffer strips to protect water quality and provide habitat for wildlife.

Protecting the Water

There are many things you can do to protect surface and ground water quality.

1. Be Informed

This publication gives you a start in becoming familiar with water issues that affect Warren County. You can obtain further information from the Water Quality series of publications available from the Purdue Extension office in Warren County (762-3231). The USDA Service Center can provide information and technical assistance to any Warren County resident (764-4100). Web sites listed in the “Sources of Information” section can provide additional information.

2. Be Responsible

You can take actions in your own home and yard to protect water quality. For example, keep litter, pet waste, leaves, and grass clippings out of gutters and storm drains. Never dispose of any household, automotive, or gardening wastes

in a storm drain or on the ground. Keep your septic system in good working order. Always follow directions on labels for use and disposal of household chemicals. Contact the Warren County Solid Waste District (762-1433) to find out how to dispose of motor oil, paints, and other hazardous household wastes. Some of these items can be disposed of at collection sites while others are collected at one-day special events. Small businesses should also call the Solid Waste District for information on how to dispose of hazardous materials. Internet users can check the Warren County Solid Waste District web site for proper disposal and alternative product suggestions: www.tctc.com/~warrency

Do not apply fertilizer in your yard unless you are sure additional nutrients are needed. If you own or manage land

through which a stream flows, protect the stream banks by planting buffer strips of native vegetation. Buffer strips are narrow strips of land that are not cultivated along streams and rivers to reduce runoff of soil and pesticides into water bodies.

3. Be Involved

As a citizen, one of the most important things you can do is find out how your community protects water quality, and speak out if you see problems. Warren County's water resources are plentiful, of generally good quality, and are critical for health and prosperity. Everyone's help is needed to protect these vital water resources.

THANKS to the following Warren County citizens for their assistance and review of this publication:

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Sources of Information

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- *Elevation:* Soil Survey of Warren County, U.S. Department of Agriculture, Soil Conservation Service, 1990.
- *Population:* Warren county summary report from the U.S. Census at <http://govinfo.kerr.orst.edu/usaco-stateis.htm>
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- *Gauging stations and discharge:* Water Resources Data - Indiana, Water Year 1994. U.S. Geological Survey Water - Data Report IN-94-1. <http://www.epa.gov/enviro/index.java.html>
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- General Soils Maps and Interpretation Tables for the Counties of Indiana. Purdue University Extension Publication AY-50.

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Warren County Drinking Water

- U.S. Geological Survey Water web page at: <http://water.usgs.gov/public/watuse>
- IDEM Office of Water Management, Drinking Water Branch

Warren County Water Quality

- Indiana 305(b) Report, Indiana Department of Environmental Management, Office of Water Management, 1994-1995.
- Indiana Fish Consumption Advisory. Indiana State Department of Health, Environmental Epidemiology Section. Obtain a copy at (317) 233-7808 or at <http://www.state.in.us/doh/html/fish/fishtoc.html>.
- Nitrate and Pesticides in Private Wells of Indiana. The Water Quality Laboratory, Heidelberg College and Indiana Farm Bureau Inc., 1994.

Potential Sources of Pollution in Warren County

- Point Source Pollution: "Envirofacts" Permit Compliance System of the U.S. Environmental Protection Agency at: http://www.epa.gov/enviro/pcs/pcs_query.html and toxic release information at: http://www.epa.gov/enviro/html/tris/tris_query.java.html
- Septic Systems: The U.S. Housing Census at site <http://sasquatch.kerr.orst.edu/stateis.html>
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- Livestock: Agricultural Census at <http://govinfo.kerr.orst.edu/ag-stateis.html>
- Indiana Agricultural Statistics
- Septic Systems <http://www.ces.purdue.edu/onsite/>

Well Testing

- WQ 1 Water Testing Laboratories
- WQ 3 How to take a Water Sample
- WQ 4 Why Test Your Water
- WQ 5 Interpreting Water Test Results, Part One

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