Watershed Connections

Water Resources of Allen County, Indiana

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Introduction

Water is a vital resource for all citizens of Allen 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. Allen County, with an area of 671 square miles or 429,440 acres, is the largest county in Indiana. Its population is approximately 332,000.

This publication gives basic information about surface and ground water resources of Allen County and discusses human activities that may be affecting those water resources. Many sources of information were used in preparing this publication. All sources, along with dates for the statistics and numbers presented, are listed on page 12, under "Sources of Information." Refer to these sources for further information.

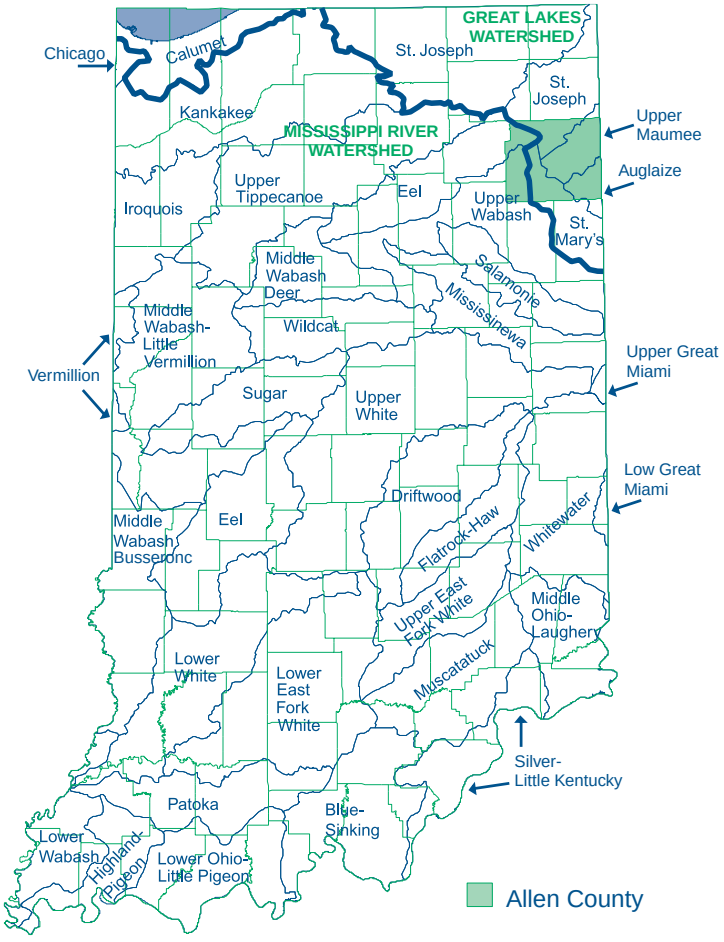

Figure 1: Major watersheds of Indiana.

Allen County Streams and 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 quality of our water is affected not only by what might be dumped in the lake or river, but by everything we do on the land in the watershed.

Allen County lies in two major watersheds of North America. The western part of the county is in the Mississippi River watershed, which flows west and south to the Gulf of Mexico. The rest of the county is in the Great Lakes watershed, which flows east to the Atlantic Ocean. The division between these two watersheds, shown in bold in Figure 1, can be considered a "Continental Divide," separating water headed for the Atlantic Ocean from water that will flow to the Gulf of Mexico.

Those large watersheds are divided into Allen County's six watersheds, which are shown in Figure 2 on the next page.

- The **Eel River**, which drains the northwestern part of the county, flows west and drains into the Wabash River at Logansport. The Wabash River, the largest river in Indiana, flows west and south to the Ohio before flowing into the Mississippi River.
- The **Upper Wabash Watershed** is drained in Allen County by the Little River, which flows into the Wabash River near Huntington.
- The **St. Joseph River** flows south from Michigan and Ohio, through Steuben and DeKalb counties, before flowing into the Maumee River at Fort Wayne.
- The **St. Mary's River** originates in Ohio and flows northwest through Adams and Allen Counties before joining the St. Joseph River to form the Maumee River. In major flood events, Junk Ditch (normally a tributary of the St. Mary's River) has historically flowed into the Wabash.

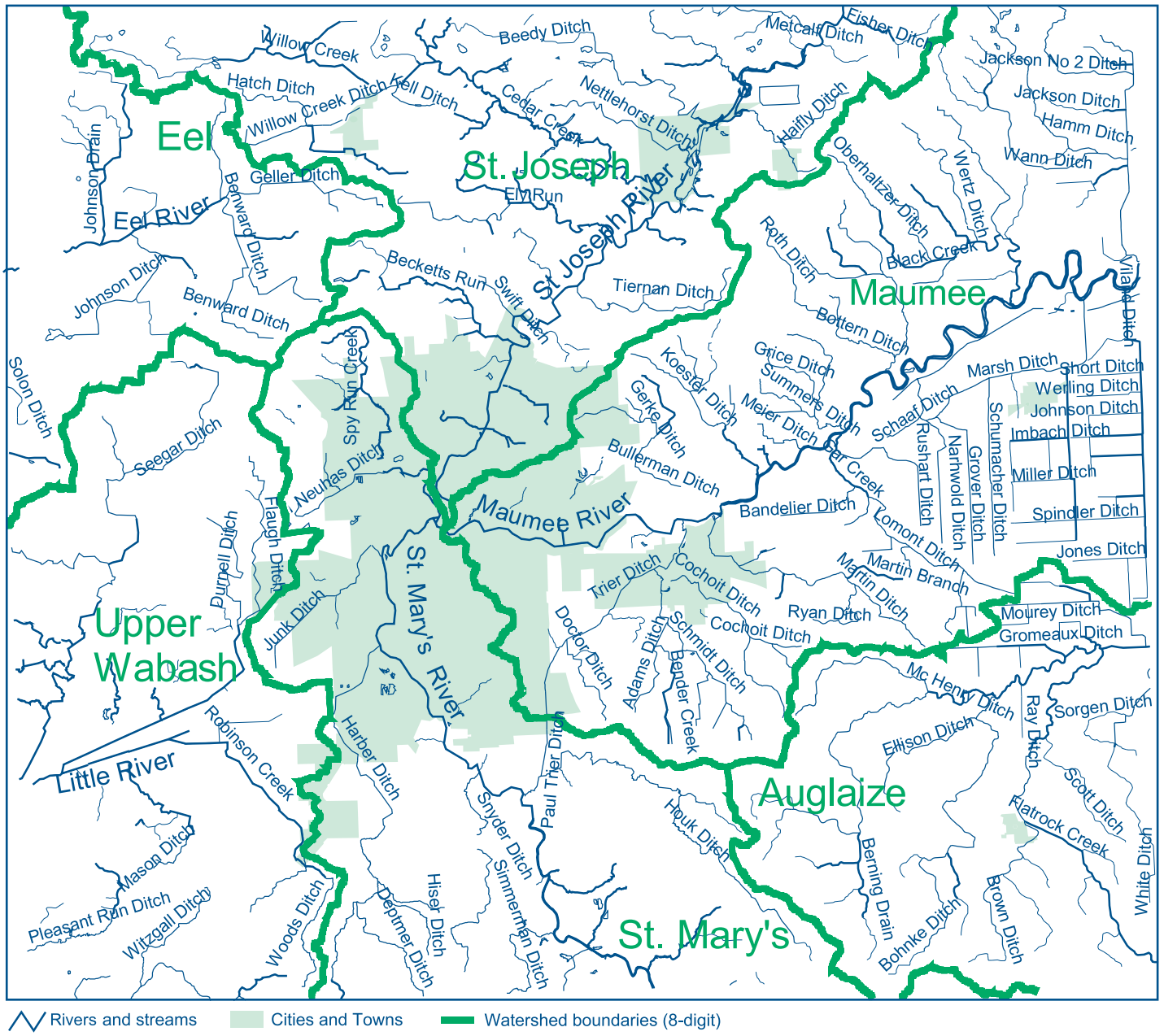

Figure 2: Major watersheds of Allen County.

- The Auglaize River watershed is drained by Flatrock Creek and its tributaries in Allen County and flows east into Ohio.
- The Maumee River is formed where the St. Joseph and St. Mary's Rivers join in Fort Wayne. The Maumee River flows east into Ohio and eventually into Lake Erie.

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). Five *gauging stations*, where discharge is measured continuously in a stream or river, are run by the U.S. Geological Survey in Allen County. These stations are located in the St. Joseph River at Fort Wayne, in the Maumee River at New Haven, in Cedar Creek at Cedarville, and in the St. Mary's River and Spy Run Creek near Fort Wayne. These gauges are a component of a system used to notify the public of floods. The monthly average discharge for two of these streams is shown in Figure 3. Highest flows generally occur in February through April while low flows usually occur in August through October, a pattern that is typical for most streams in Indiana.

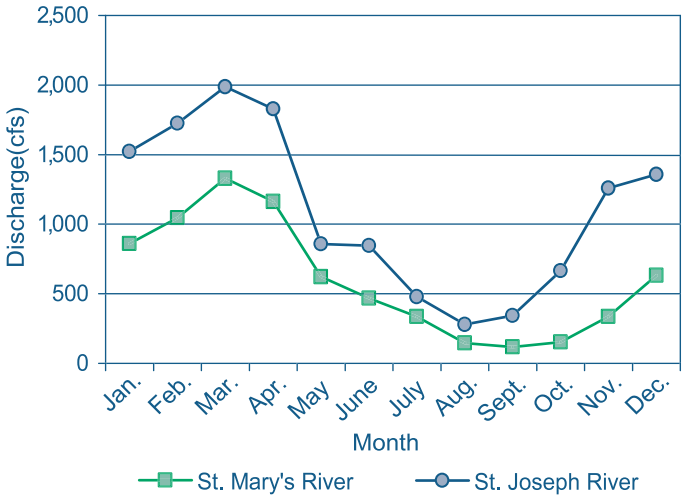

Figure 3: Average monthly discharge for two Allen County rivers.

Maximum daily flows during floods can be much higher, and low flows during droughts can be much lower than these monthly averages. Peak flows, which are instantaneous measures, can be much higher than maximum daily flows. For example, the peak flow on record for St. Mary's River at Fort Wayne was 13,600 cubic feet per second in 1959, while the peak flow on record for the St. Joseph River near Fort Wayne was 16,500 cubic feet per second in 1913.

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 special flood hazard area is the area flooded by the 100-year storm, or a storm that has a 1% chance of occurring in any year. Figure 4 shows the floodway and floodway fringe components of a special flood hazard area.

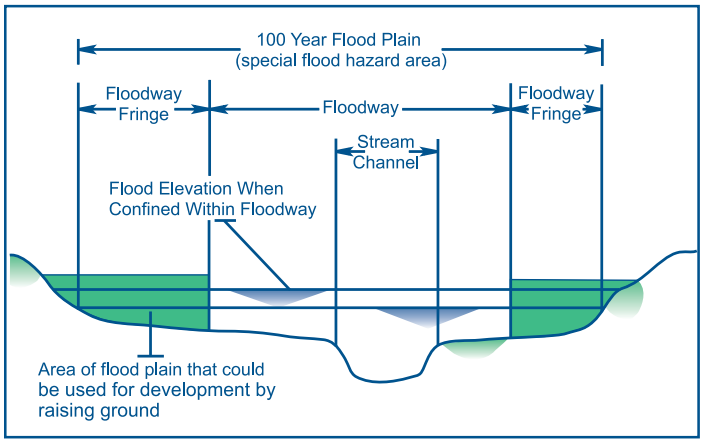

Figure 4: Diagram of a floodplain (Source: Indiana Department of Natural Resources).

Flood plains have been delineated for Allen County by the Federal Emergency Management Agency. A very general map of floodplains is shown in Figure 5. Check with the Department of Planning Services for maps that show detailed boundaries of floodplains, which should be viewed before purchasing land or planning any development that may coincide with a floodplain. The Allen County Surveyor's Office also has the maps, and the Maumee River Basin Commission distributes the maps to the public free of charge.

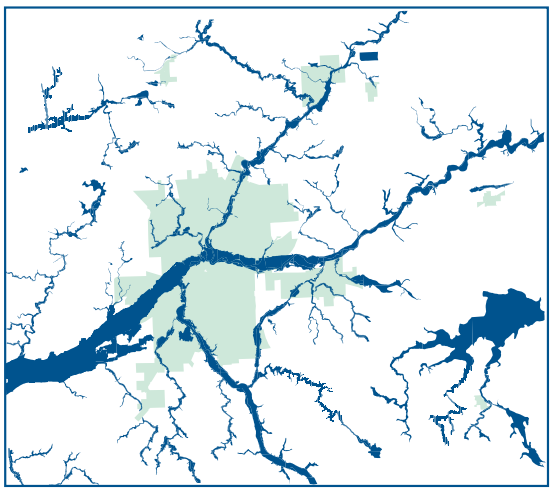

Figure 5: Floodplains of Allen County.

Allen County Lakes and Wetlands

There are two major reservoirs in Allen County: Cedarville Reservoir and Hurshtown Reservoir. Both store water from the St. Joseph River and provide water supply for the city of Fort Wayne. The western part of the county is dotted with a few small lakes. Many of the lakes and ponds in Allen County were originally built as detention ponds to contain runoff from development activities.

Allen County has about 12,262 acres of wetlands, which is about 2.9 percent of the total area in the county. Approximately 85 percent of Indiana wetlands have been lost since the 1700s, including many in Allen County. The conversion of those wetlands has facilitated the growth and development of Allen County communities. The remaining 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 opportunities, and reducing peak flood flows.

Allen County Precipitation

The average yearly precipitation (rain, snow, sleet, and hail) in Allen County is approximately 35 inches. Figure 6 shows average monthly precipitation, which is relatively constant throughout the year. The bars show the average, while the lines show the wettest year and driest year expected once in 5 years.

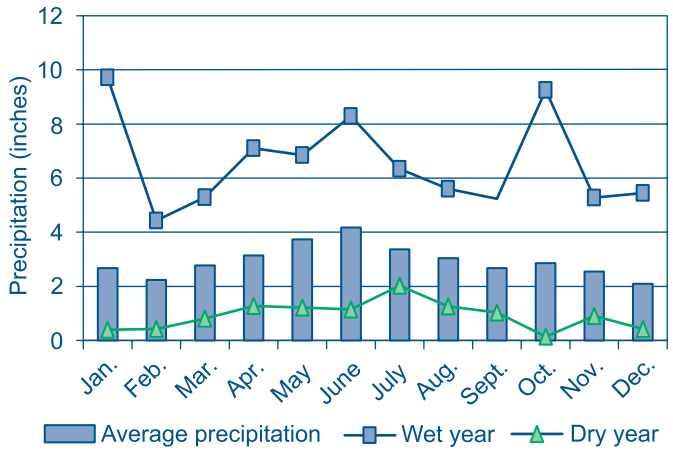

Figure 6: Average monthly precipitation in Allen County.

Individual storms can cause flooding, so precipitation records over many years have been analyzed to assess the probability of storms of a certain size occurring. Precipitation probability for a single storm is generally expressed in terms of a return period, which means 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. 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 the special flood hazard area mapped in Figure 5.) Expected 24 hour precipitation for Allen County for various return periods is shown in Figure 7.

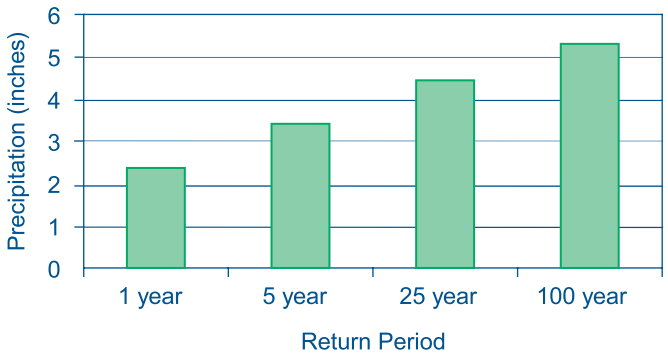

Figure 7: Precipitation expected in 24 hours for various storm events.

Allen County Ground Water

Ground water includes all water below the surface of the earth. In Allen County, economically significant amounts of this resource are produced from aquifers that consist of limestone bedrock and various sand and gravel bodies in the glacial deposits. Nearly all of these aquifers are confined by a variable thickness of clay that acts to retard recharge and slow the movement of potential contaminants into these water sources. Aquifers are commonly interconnected with one another and, at places, with surface water, to form aquifer systems. According to a recent study (*The Hydrogeology of Allen County*, by A. Fleming) there are three principal aquifer systems in Allen County, including the bedrock aquifer system in the southern and central parts of the county, the Aboite aquifer system in southwest Allen County, and the Huntertown aquifer system in the northwest. The Huntertown aquifer system appears to be the most productive ground water resource in the county, and is further distinguished by a hummocky, internally-drained landscape in the northwestern townships that locally causes increased recharge and a heightened potential for contamination. According to stream-gauging data, some 14 million gallons of water per day are discharged into a 10-mile reach of the St. Joseph River above the City of Fort Wayne's water intake. Therefore ground water is an unseen, though extremely important contributor to the city's surface water supply.

Fleming further divided the county into 11 distinct hydrogeologic regions based on ground water availability, potential for contamination, relationship between surface water and ground water, and other factors. Five regions are overall the most sensitive to contamination based on hydrogeologic factors. These include the Huntertown interlobate region, the Eel River Valley, Cedar Creek Canyon, the St. Joseph River Valley, and the Wabash-Erie Channel, which are shown in Figure 8.

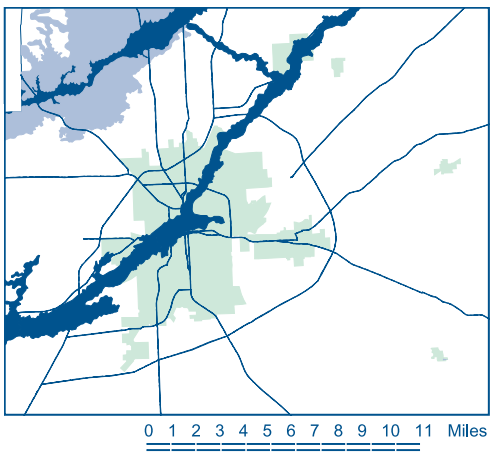

Figure 8: Ground water regions containing the largest number of sensitive areas in Allen County.

Although the highlighted blue regions have the highest number of sensitive areas, smaller areas with a high potential for contamination can be located in any part of the county. Refer to *The Hydrogeology of Allen County, Indiana. A Geologic and Ground Water Atlas* for a detailed description of the geology and ground water resources of Allen County. It is available at the Department of Planning Services or the public library, or can be purchased from the Indiana Geological Survey (see "Sources of Information").

Allen County Water Use

Allen County citizens and industry use water for many purposes. The largest water use in Allen County is for domestic purposes, which include water in homes for drinking, washing, flushing toilets, and watering gardens. Industry is the second largest water user. Water use in Allen County is shown in Figure 9.

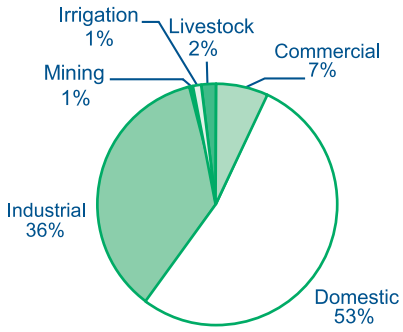

Figure 9: Water use in Allen County.

Allen County Drinking Water

In Allen County, 76% of the population uses surface water (from streams, rivers, and reservoirs) for drinking and other household uses. The surface water used in the county is drawn from the St. Joseph River and the Cedarville and Hurshtown Reservoirs by the City of Fort Wayne Utilities. In Indiana as a whole, only 40% of the population uses surface water, meaning that Allen County relies on clean water from its rivers and reservoirs more than other Indiana counties.

About 85% of Allen County households use water supplied by one of the 19 public water systems. The other 15% have their own wells. People using private wells are responsible for monitoring their own well water quality, since no regular testing on private wells is required, or carried out, by government agencies.

All community public water suppliers using ground water (16 systems in Allen County) are required to develop a **Wellhead Protection Plan** to protect water quality. Each system must identify the area overlying ground water that can travel to the well in 5 years or less (the wellhead protection area), identify potential sources of contamination within this area, and develop a management plan to minimize risk from these sources. Some examples of potential sources of contamination include fuel storage tanks, fertilizers and pesticides, 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 system, the Indiana Department of Environmental Management, or Purdue Extension for more information (see "Sources of Information").

Public water systems test drinking water annually, or more often, for a number of contaminants including:

- 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 found in your tap water is available from your water supply system. Starting in 1999, all systems are required to send out an annual report on the quality of tap water they supply. This report provides all citizens the opportunity to know what is in the water they drink. Be sure to read yours, and contact your water system if you have any questions. The City of Fort Wayne provides information on current water quality conditions including turbidity, taste, atrazine, and cryptosporidium at their Web site (see "Sources of Information").

Allen 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, some rivers that once barely supported fish are now fully supportive of a variety of aquatic life.

The **St. Joseph Watershed Initiative** has monitored many sites in the St. Joseph River and its tributaries in Steuben, DeKalb, Noble, and Allen Counties in Indiana, Williams County in Ohio, and Hillsdale County in Michigan. Figure 10 shows the results of monitoring for atrazine, the most commonly detected pesticide. The level, or concentration, of atrazine from each site for each date when monitoring takes place (between April and October each year) is shown. The drinking water standard for atrazine (3 parts per billion or ppb) is also shown. When levels in the St. Joseph River are above the drinking water standard, the City of Fort Wayne Three Rivers Filtration Plant treats the water to lower the atrazine level. High levels only occur for a short period in May, June, and July, shortly after atrazine is applied to farm fields. The St. Joseph Watershed Initiative and other agencies are working with farmers to adopt practices such as buffer strips that can reduce atrazine loss from fields.

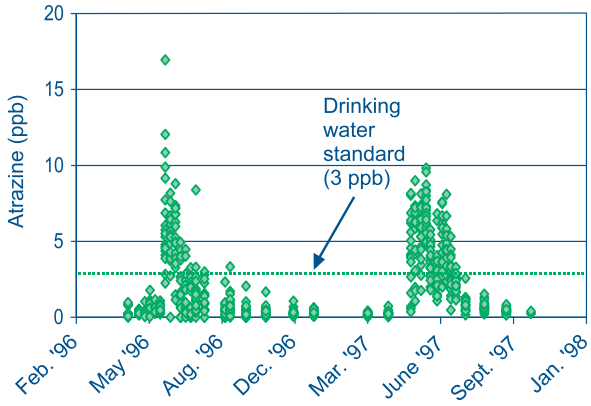

Figure 10: Atrazine concentration in the St. Joseph River.

E. coli bacteria are another common contaminant in the St. Joseph River, its tributaries, and most other streams in Allen County. *E. coli* are bacteria that are usually harmless but serve as an indicator of other potentially harmful organisms resulting from fecal contamination (Certain strains of *E. coli* are also a human health concern). The unit of measure for *E. coli* is the number of colony forming units (CFU) found in 100 ml (about 1/2 cup) of water. The health standard for *E. coli* in streams and rivers is 235 CFU per 100 ml. Figure 11 shows that the levels of *E. coli* measured are often 10 or even 100 times greater than the standard.

High *E. coli* levels can be found at any time of year, both during high flow and low flow in the river. *E. coli* comes from the intestines of any warm-blooded animal, including humans. Sources responsible for the high numbers probably include failing septic systems, livestock manure runoff from fields or leaking lagoons, and wildlife. It is very difficult to distinguish the sources of *E. coli* measured, although researchers are currently developing methods to do so. The Allen County Health Department monitors many smaller streams for *E. coli*, and has found similar results.

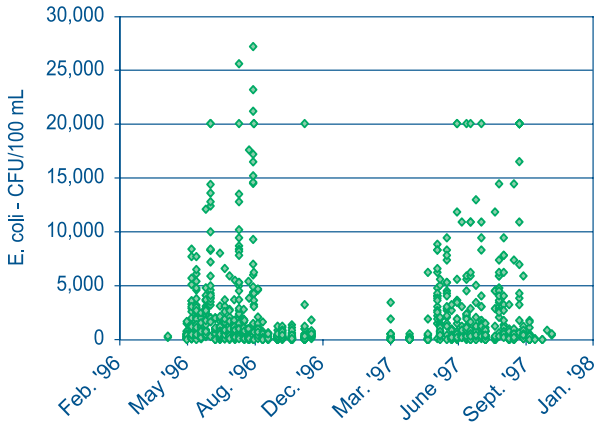

Figure 11: *E. coli* in the St. Joseph River.

The **U.S. Geological Survey** is monitoring the Maumee River in Allen County, just downstream of the confluence of the St. Mary's and St. Joseph Rivers at New Haven, Indiana. They sample for nutrients, 44 pesticides and three pesticide metabolites, *E. coli*, major ions, suspended sediment, and dissolved and suspended organic carbon. Results so far suggest that the most heavily applied row crop herbicides, metolachlor and atrazine, are the most widely found contaminants in the stream. Twenty-one pesticides were detected at least once in the Maumee River at New Haven. Aquatic-life standards, which are set to protect aquatic life, were exceeded 19 times for either atrazine or cyanazine. For more information, contact the USGS office in Columbus, Ohio (see "Sources of Information").

Fish in the St. Joseph River, the St. Mary's River, and the Maumee River are contaminated by PCBs or mercury, according to the 2001 Fish Consumption Advisory provided by the Indiana State Department of Health. Fish in those rivers should be consumed rarely, and channel catfish more than 25 inches in length should not be consumed at all. Carp anywhere in Indiana can be contaminated with both PCBs 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

In Indiana, ground water contamination has occurred, often by volatile organic compounds (gasoline and other petroleum products) in industrial areas. Many private wells are contaminated by bacteria or nitrate, often from nearby septic systems. Allen County wells have indicated little contamination, although data is limited.

One of the few sources of information on ground water in Allen County is a voluntary, private well testing program carried out in 1994 and 1999 by the Farm Bureau, Purdue Cooperative Extension Service, and other agencies. Nitrate, which has adverse effects on infants, was below the drinking water standard in all of 406 well tests. If households do find levels above the standard, the water should be treated with reverse osmosis, distillation, or bottled water should be used, particularly if an infant is present or expected in the household. Screening was also done for pesticides including atrazine (Aatrex), cyanazine (Bladex), simazine (Princep), alachlor (Lasso), metolachlor (Dual), and the breakdown products of these herbicides. Only very low levels were detected in a few wells, and none of the wells tested exceeded the drinking water standard for any of these herbicides.

The vast majority of wells in Allen County can therefore be assumed to provide safe, clean water for drinking. Testing of all private wells should continue every few years, however, to be sure that water remains safe. Call the Allen County Health Department for information on how you can have your water tested for bacteria. A current list of certified laboratories that can test for other contaminants can be found in the Purdue Extension publication "Water Testing Laboratories" (see "Sources of Information").

Potential Sources of Pollution in Allen County

Pollutants can be separated into two categories, *point source* and *nonpoint source*, depending on how they get into the water. *Point source pollution* refers to contaminants that enter the water directly, usually through a pipe. Examples are sewage treatment plants and industrial facilities, that 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 12. Nonpoint source pollution, which is not regulated, is currently the primary cause of water quality degradation in the U.S.

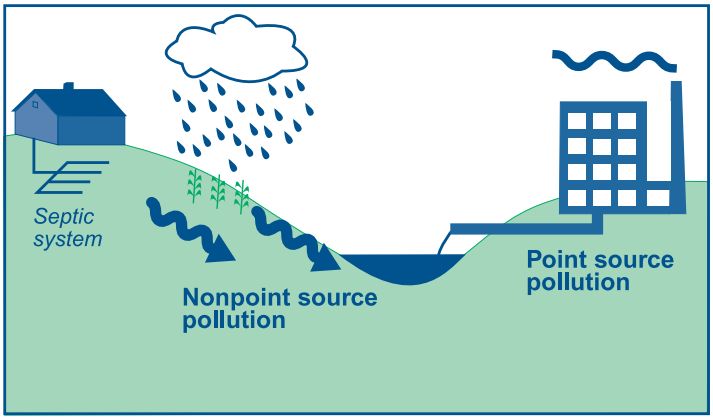

Figure 12: Point source and nonpoint source pollution.

Potential Point Source Pollution

Because point source discharges require permits, excellent information is available about potential point sources discharging in Allen County. There are currently 78 facilities (municipal sewage treatment plants, factories, schools, packing plants, etc.) permitted to discharge wastes into Allen County's water. Combined sewer overflows are a major source of pollution, and the city has initiated a major effort to clean them up.

One closed hazardous waste landfill, two operating municipal landfills, and numerous abandoned dumps are located in the county. More information is available from the Allen County Health Department.

Potential Nonpoint Source Pollution

Potential nonpoint source pollution exists everywhere in the watershed and can come from urban or rural areas. Nonpoint source pollution can result from normal home and farm activities as well as accidents or spills.

Urban and Residential Nonpoint Sources

The Allen County Health Department estimates that approximately 20,000 homes in Allen County are not connected to public sewer systems. These homes are required to have a properly functioning on-site sewage system, commonly known as a septic system. Persistent pathogens found in water sampling programs suggest that many systems may be failing, or worse, were never properly constructed. Septic systems have the potential of leaching nutrients into the ground water and can contaminate the surface water if the system is not functioning properly. The soil in many parts of Allen County (up to 80%) is poorly-suited for septic systems, and on-site sewage systems have failed prematurely in these soils. Special soil testing procedures may be required in those areas. These procedures will help to ensure that new systems are not constructed in soils unable to support a properly functioning septic system.

Salt, oil, fertilizers, and pesticides for lawns, and antifreeze are other examples of urban pollutants that can be washed off from rain and enter the water system as pollutants. No figures are available on runoff of urban lawn chemicals, which may be significant sources of pollution from residential areas. Developers of planned residential subdivisions in Allen County must provide detention for stormwater. These detention areas hold water and slowly release it to the streams. This process allows for release of nitrogen into the atmosphere and removes some sediment before the water is discharged into the streams.

Agricultural Nonpoint Sources

Agriculture can also contribute to nonpoint source pollution. Sediment, nutrients, pathogens, and pesticides can be transported by water from cropped fields and land where manure is applied. Roughly 242,500 acres or 53% of Allen County is used for planting crops. Major crops are corn, soybeans, and small grains.

Information on fertilizer sales from the Office of the Indiana State Chemist shows that about 40,000 tons of fertilizer are sold annually in Allen County.

Manure from livestock may also contribute pathogens and nutrients to ground and surface water. Livestock include more than 18,000 cattle and 49,000 hogs, according to the most recent Census of Agriculture (1997). Large livestock facilities require a permit from the Indiana Department of Environmental Management.

No specific statistics are available for pesticide use or runoff in Allen County. Indiana Agricultural Statistics tracks pesticide use statewide and this information could be assumed to represent Allen County. In Indiana, the most widely used pesticides are the herbicides atrazine, alachlor, and metolachlor. Large-scale studies carried out in Indiana and elsewhere have shown that typically about 1% of applied pesticides end up in lakes or rivers. As described above, monitoring by the St. Joseph River Watershed Initiative has shown that some herbicides are often detected in the river after spring planting, before returning to low levels for most of the year.

Many farmers are changing their practices to protect water resources. Erosion and chemical runoff from fields can often be reduced by using conservation tillage. No-till was used on 11% of the corn acres and 64% of soybean acres in 2000. 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. Most of the agencies listed below have Web sites where you can learn more ("see Sources of Information").

1. Be Informed

This publication gives you a start in becoming familiar with water issues that affect Allen County. You can obtain further information such as the Water Quality series of publications from the Allen County Cooperative Extension Office at 260-481-6826. The Allen County Soil and Water Conservation District, Natural Resources Conservation Service, and Indiana Department of Natural Resources - Soil Conservation can provide information and technical assistance to any Allen County resident (260-426-4637, ext. 3). The Department of Planning Services (260-449-7607) can provide information on land use issues and concerns. Call the Maumee River Basin Commission (260-449-7226) for information on flood issues. Several agencies have formed the Maumee River Basin Partnership of Local Governments to cooperate on water quality issues. Many 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. Keep your septic system in good working order. Always follow directions on labels for use and disposal of household chemicals. Take used motor oil, paints, and other hazardous household materials to proper disposal sites such as approved service stations or designated landfills. In your yard, determine whether additional nutrients are needed before you apply fertilizers. If you own or manage land through which a stream flows, protect the stream banks by planting buffer strips of native vegetation.

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. Several groups are working locally in Allen County and in neighboring counties to protect and improve water quality.

- **The St. Joseph River Watershed Initiative** is a not-for-profit organization made up of community members, businesses, organizations, and agencies working to improve water quality in the St. Joseph River Watershed. The overall goal of the Initiative is to improve water quality by promoting land-use practices that are economically and environmentally compatible. The target water quality issues for the St. Joseph River Watershed are pesticides, nutrients, sedimentation, and bacteria that can cause illness. Call 260-426-4637, ext. 3 for more information or to get involved.
- The **Cedar Creek Wildlife Project** (1727 Chapman Road, Huntertown, IN 46748) focuses on wildlife preservation but also considers the condition and quality of the water in the Cedar Creek, a major tributary of the St. Joseph River, one of their issues.
- The **Little River Wetlands Project Inc.** (260-434-0728; e-mail: lriver3@juno.com; www.lrwp.org) is concerned with the preservation, maintenance, and enhancement of the wetlands at the headlands of the Little River which feeds into the Wabash. This area was the historical trade portage from the Great Lakes area to the East to the Wabash River and finally the Mississippi River area.

Allen 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.

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Rod Renkenberger, *Maumee River Basin Commission*
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Al Frisinger, *Allen County Surveyor*
Ted Rhinehart, *City of Fort Wayne*
Gary Chapple, *Allen County Health Department*
Jeff Frey, *U.S. Geological Survey, Indianapolis*
Rachel Arst, Anne Marie Smrchek, **Ibrahim Aly**, *Purdue University Agricultural and Biological Engineering Department*

Sources of Information

Web Sites for Water-Related Allen County Agencies and Organizations

- Purdue Extension, Allen County Office
  www.ces.purdue.edu/allen
- Allen County Department of Planning Services
  http://www.acdps.org/
- Allen County Health Department
  http://www.fw-ac-deptofhealth.com/
- Maumee River Basin Commission
  http://www.mrbc.org/
- St. Joseph River Watershed Initiative
  http://www.sjrwi.org/
- City of Fort Wayne Utilities (including drinking water information)
  http://www.cityoffortwayne.org/city_utilities/
- Allen County Soil and Water Conservation District
  http://allenswcd.org/about.htm

Introduction

- *Area*: Soil Survey of Allen County, U.S. Department of Agriculture, Soil Conservation Service, 1969
- *Population:* Population from 2000 census at http://www.census.gov

Allen County Streams and Watersheds

- *Gauging stations and discharge:* Water Resources Data - Indiana, Water Year 1994. U.S. Geological Survey Water -Data Report IN-94-1
- Peak flows from the USGS Water Data Retrieval Site at http://water.usgs.gov/in/nwis/. The St. Joseph River at Fort Wayne is 04180500, and the St. Mary's River is 04182000
- *Floodplains:* The Indiana Water Resource: Availability, Uses, and Needs. Governor's Water Resource Study Commission, State of Indiana, G.D. Clark, Editor, 1980
- Federal Emergency Management Agency floodplain data
  http://www.fema.gov

Allen County Lakes and Wetlands

- Indiana Lake Water Quality Update for 1989-1993. IDEM Clean Lakes Program, Indianapolis
- Indiana 305(b) Report, Indiana Department of Environmental Management, Office of Water Management, 1994-1995
- Wetlands estimates from National Wetlands Inventory, carried out in the 1980s by the U.S. Fish and Wildlife Service

Allen County Precipitation

- *Amount of Precipitation:* Soil Survey of Allen County
- *Storm Information*: Rainfall Frequency for Indiana. Department of Natural Resources, Division of Water., Sept. 1994

Allen County Ground Water

- Indiana Historical Bureau at:
  http://www.statelib.lib.in.us/WWW/ihb/physio.HTML
- Fleming, A.H., 1994. *The Hydrogeology of Allen County, Indiana. A Geologic and Ground-Water Atlas.* Indiana Geological Survey Special Report 57, Bloomington, IN. Available from the Indiana Geological Survey, 611 N. Walnut Grove Ave. Bloomington IN 47405. (812) 855-7636 or e-mail: IGSinfo@indiana.edu

Allen County Water Use

- Water Use from U.S. Geological Survey Water Web page at:
  http://water.usgs.gov/public /watuse

Allen County Drinking Water

- U.S. Geological Survey Water Use Web page;
  http://water.usgs.gov/public /watuse
- IDEM Office of Water Management, Drinking Water Branch
- City of Fort Wayne Utilities
  http://www.cityoffortwayne.org/city_utilities/

Allen County Water Quality

- *Indiana 305(b) Report*, Indiana Department of Environmental Management, Office of Water Management, 1994-1995.
- 2001 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/isdh (under "Data and Statistics")
- Nitrate and Pesticides in Private Wells of Indiana The Water Quality Laboratory, Heidelberg College and Indiana Farm Bureau Inc., 1994.
- St. Joseph Watershed Initiative monitoring contact: Bill Lambert, 260-426-4637, ext 3.
- U.S. Geological Survey information at
  http://oh.water.usgs.gov/nawqa/
- Water testing laboratories information: WQ-1, Water Testing Labs, available from the Allen County CES office or 1-888-EXT-INFO.

Potential Sources of Pollution in Allen County

- *Point Source Pollution:* "Envirofacts" Permit Compliance System of the U.S. Environmental Protection Agency at
  http://www.epa.gov/enviro
- *Crops and Tillage:* Crop Residue Management Survey results from Conservation Technology Information Center at
  http://www.ctic.purdue.edu/CRM/CRMoptions.html
- *Fertilizer:* Indiana Fertilizer Tonnage Report
  Office of Indiana State Chemist, Purdue University
- *Livestock*: 1997 Agricultural Census at
  http://govinfo.kerr.orst.edu/ag-stateis.html

Printing and publication made possible by:

Purdue Cooperative Extension
Allen County

MAUMEE RIVER BASIN COMMISSION

Additional printing and publishing funds provided by Home Builders Association of Fort Wayne Inc. and Colonial Homes, Fort Wayne, Indiana.

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