

# **GALENA RIVER WATERSHED**

## **Watershed Characteristics**

### **1.0 INTRODUCTION**

#### **1.1 Purpose and Scope**

Under a grant from the Indiana Department of Natural Resources (IDNR) Lake and River Enhancement Program (LARE), the LaPorte County Soil and Water Conservation District (SWCD) is completing a diagnostic study and watershed management plan for the Galena River Watershed in northeast LaPorte County and northwest St. Joseph Counties. The watershed is on the State's 303(d) list of impaired waters for elevated concentrations of *Escherichia coli* bacteria that exceed water quality standards. The goal of this Watershed Management Plan is to:

- To characterize watershed and stream quality, condition, and trends,
- To identify potential sources of water quality problems,
- To identify and prioritize watershed land treatment projects,
- To propose near-term and distant non-point source (NPS) control work directives,
- To develop success factors and benchmarks for water quality improvements, and
- To improve coordination between local residents and local and state agencies in an effort to protect and improve the watershed.

### **2.0 WATERSHED CHARACTERISTICS**

#### **2.1 General**

Information on the existing conditions is provided by several sources including previous studies by IDEM (2009), the Northwest Regional Planning Commission (2005), and Michigan Department of Environmental Quality (MDEQ) (2003).

The Galena River Watershed (HUC 0404000110) is located in LaPorte and St. Joseph Counties, in north-central Indiana (Figure 1). The watershed is part of the Little Calumet-Galien tri-state management area which spans coastal areas of Illinois, Indiana, and Michigan. The headwaters of the watershed begin in Springfield Township in LaPorte County, approximately five miles north of LaPorte, Indiana and flow northeast through the northwest corner of St. Joseph County, Indiana and into Berrien County, Michigan.

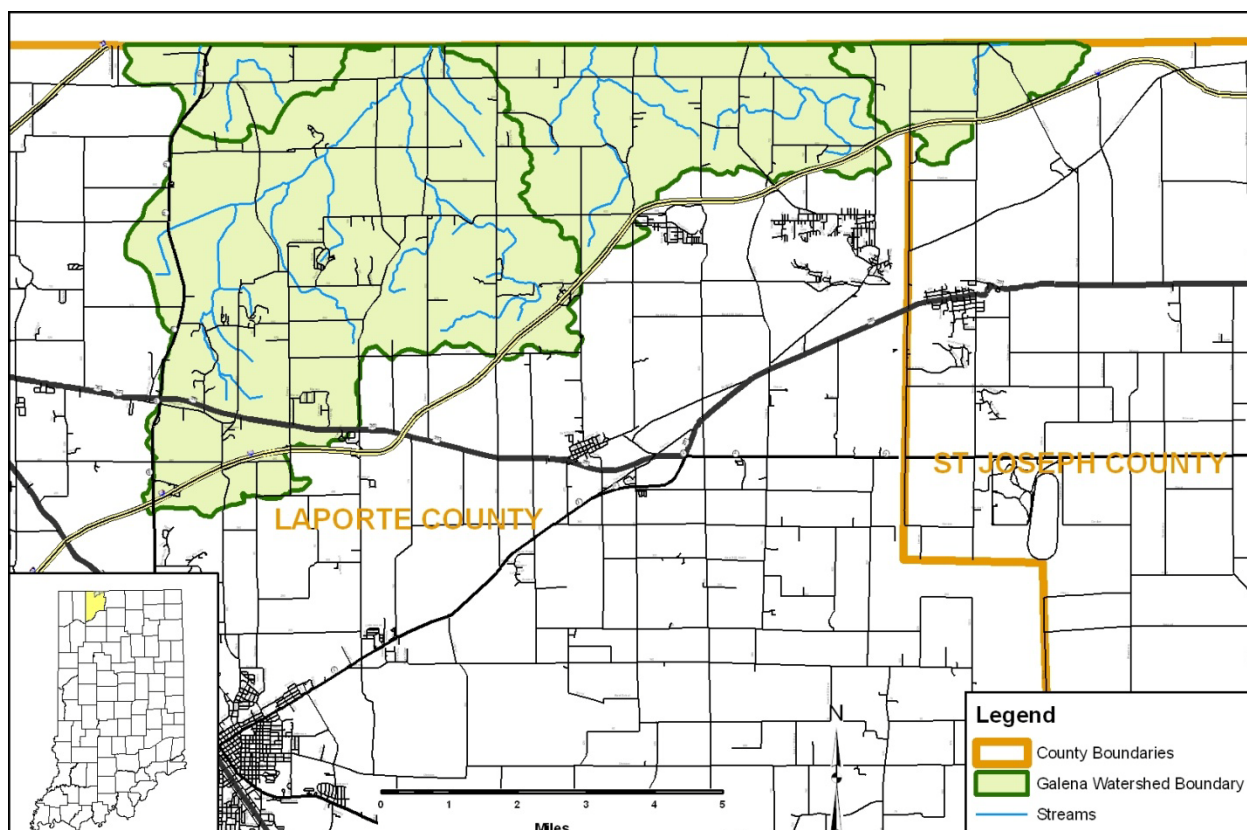


Figure 1. Galena River Watershed

The watershed is 112,222 acres; approximately one-quarter of the watershed, 29,630 acres, lies in Indiana; the remainder lies across the state line in Berrien County, Michigan. This Watershed Management Plan focuses only on the Indiana portion of the watershed. A Watershed Management Plan for the Galien River<sup>1</sup>, covering the river as it flows through Berrien County, Michigan, has been prepared by the MDEQ (MDEQ 2003).

In Indiana, the watershed remains relatively undeveloped; the two principal land uses are forest and agriculture. There are no large urbanized areas in the watershed. In comparison to other watersheds along the Lake Michigan coastal area, the Galena River has not been significantly impacted by human influence (IDNR 2005).

In 2002, the Galena River was included on IDEM's 303(d) list of impaired waters and has remained on this list through 2008 (IDEM 2008; Prast et. al 2009). *E. coli* bacteria were the identified causes of impairment. Waters that do not meet water quality standards require development of TMDLs (Total Maximum Daily Load). In 2008, IDEM completed an extensive water quality study of the Galena River and its tributaries to measure *E. coli*, general chemistry,

<sup>1</sup> In Indiana it is the Galena River; in Michigan it is the Galien River.

and nutrients to determine if conditions and the Galena River now supported its designated uses or a TMDL was needed (Prast et. al 2009). The results showed that *E. coli* exceeded the water quality standards at eight of nine sampling sites. In comparison, general chemical and nutrient parameters met water quality standards. As a result of this study, IDEM is currently in the process of developing a TMDL for *E. coli*.

## **2.2 Cultural Setting**

According to the 2000 U.S. Census, the population for LaPorte County was 110,106. The 2007 estimate, based on the 2005-2007 American Community Survey<sup>2</sup>, was 109,440. This is a 0.3% decline from the 2000 census. According to the Northwestern Indiana Regional Planning Commission (NIRPC), LaPorte County's population has hit a plateau being only slightly higher than it was in 1980. NIRPC also notes that the latest estimates showing a slight population loss (NIRPC 2008). For St. Joseph County, the population was 265,559 according to the 2000 U.S. Census and 265,507 based on the 2007 estimate. This represents a 0.2% decrease. It is important to note that these numbers do not reflect the actual population living in the Galena River watershed. For example, only a small portion of St. Joseph County lies within the Galena River watershed.

Figure 2 shows the change in population density in the watershed between 1990 and 2000. The lost in population is apparent with most of the watershed losing between 2 and 5 percent population. The southern tip of the watershed is the only area that experienced growth between 1990 and 2000.

Agriculture is a primary land use in both LaPorte and St. Joseph Counties. A variety crops and livestock are produced within the two counties. Figure 3 shows the areas of prime farmland. Table 1 provides 2007 acres of the major crops produced as provided by the USDA 2007 Agricultural Census by county (USDA 2009). Table 2 provides livestock numbers by county. Corn is the number one crop produced; corn and soybeans are the primary crops on the basis of acreage.

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<sup>2</sup> The American Community Survey is an ongoing survey prepared by the U.S. Census Bureau that is sent to a small sample of the population to gather information about the population.

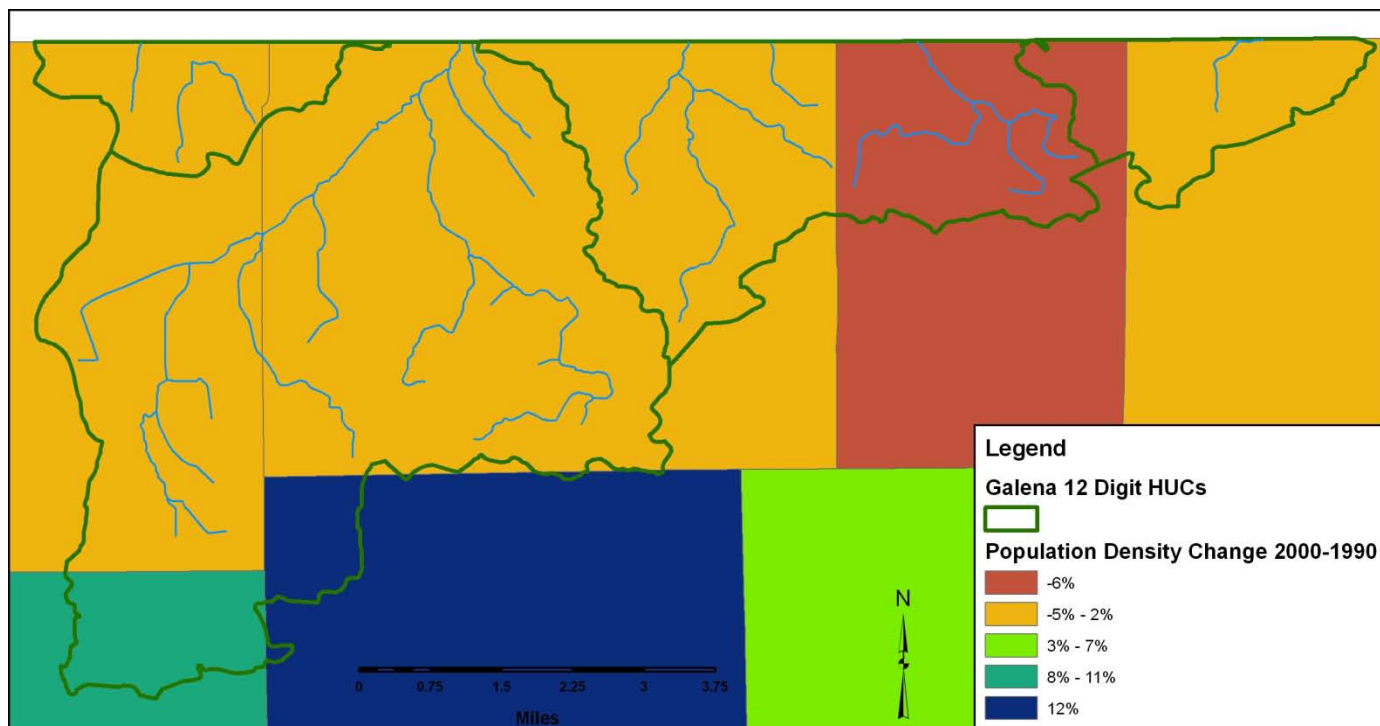


Figure 2. Changes in Population Density from 1990 to 2000.

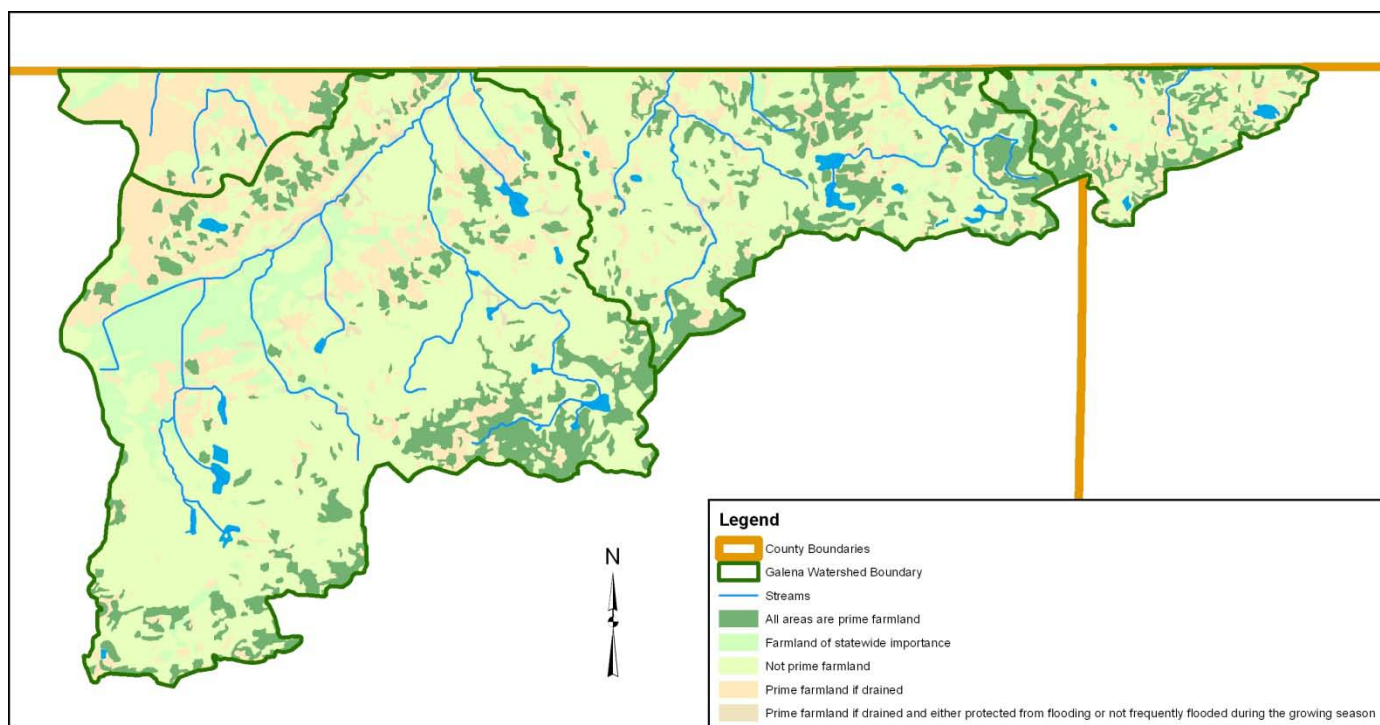


Figure 3. Locations of prime farmland within the Galena River Watershed.

**Table 1.**

**CROPS PRODUCED IN THE GALENA RIVER WATERSHED,  
LAPORTE AND ST. JOSEPH COUNTIES, INDIANA**

Source: U.S. Department of Agriculture, 2007 Census of Agriculture (USDA 2009)

	<b>2007 Crop Data</b>					
<b>County</b>	<b>Number of Farms</b>	<b>Land in Farms</b>	<b>Corn for Grain</b>	<b>Corn for silage or greenchop</b>	<b>Wheat for Grain</b>	<b>Soybeans for Beans</b>
		Acres	Acres	Acres	Acres	Acres
LaPorte	869	256,159	131,354	4,524	5,958	70,142
St. Joseph	712	178,674	96,963	1,632	3,221	51,157

**Table 2.**

**LIVESTOCK INVENTORY IN THE GALENA RIVER WATERSHED,  
LAPORTE AND ST. JOSEPH COUNTIES, INDIANA**

Source: U.S. Department of Agriculture, 2007 Census of Agriculture (USDA 2009)

	<b>2007 Livestock Inventory</b>			
<b>County</b>	<b>Hogs and Pigs</b>	<b>Cattle and Calves</b>	<b>Sheep and Lamb</b>	<b>Layers 20 Weeks and Older (Chicken)</b>
	# Individuals	# Individuals	# Individuals	# Individuals
LaPorte	67,514	19,675	528	851
St. Joseph	25,063	5,749	354	(D)

(D) – Withheld by USDA to avoid disclosing data for individual farms.

Confined feeding is the *raising of animals for food, fur or recreation in lots, pens, ponds, sheds or buildings, where they are confined, fed and maintained for at least 45 days during any year, and where there is no ground cover or vegetation present over at least half of the animals' confinement area* (IDEM [www.in.gov/idem/4565.htm](http://www.in.gov/idem/4565.htm)). According to Indiana law, an operation must have at least 300 cattle, 600 swine/sheep or 30,000 fowl to be considered a Confined Feeding Operation (CFO). There are no CFOs for livestock in the Galena River watershed.

## 2.3 Physiography and Climate

Within Indiana, the Galena River watershed is located within the physiographic unit known as the Valparaiso Morainal Area. The Valparaiso Moraine, located south of the Lacustrine Plain, is an arc-shaped moraine complex that parallels the southern shore of Lake Michigan. The elevation of the moraine is higher than other parts of the County. Because of this the moraine divides the county into northern and southern drainage areas. The area north drains into Lake Michigan; south of the moraine water drains to the Kankakee River. Elevations along the moraine range from about 800 feet (245 m) to 950 feet (290 m). Numerous kettle lakes sit on the moraine.

Lake Michigan has a large influence on the local climate in northwest Indiana. This influence is most pronounced just inland (within a mile or two) from the lake shore, although several lake *effect features can extend farther inland to central Indiana if driven by strong northwesterly winds*. It is well documented that Northwest Indiana experiences cooler springs, warmer autumns, and heavier winter precipitation than other areas of similar latitude (Indiana State Climate Office, [www.agry.purdue.edu/climate/index.asp](http://www.agry.purdue.edu/climate/index.asp)). Average annual rainfall in northern Indiana is 37 inches. Table 3 provides monthly means for temperature and precipitation.

**Table 3**

### **CLIMATE IN LAPORTE AND ST. JOSEPH COUNTIES (30 year normals)**

Month	County			
	Mean Temperature (°F)		Monthly Precipitation (in)	
	LaPorte Co.	St. Joseph Co.	LaPorte Co.	St. Joseph Co.
January	23	23	2.30	2.30
February	27	27	1.90	2.00
March	38	38	3.10	2.90
April	49	48	3.50	3.60
May	60	60	3.50	3.50
June	69	69	4.40	4.20
July	74	73	3.80	3.70
August	72	71	4.20	4.00
September	64	63	3.90	3.80
October	53	52	3.20	3.30
November	40	40	3.80	3.40
December	28	29	3.20	3.10

Data, 1970-2000, from Indiana State Climate Office, [www.agry.purdue.edu/climate/](http://www.agry.purdue.edu/climate/)

## **2.4 Hydrology and Hydrogeology**

Gently rolling hills and low depressional areas contribute to the numerous lakes, small drainages, and wetlands within the watershed. The Galena River originates from two wetland sources, the Galena Wetland Conservation Area and the Springfield Fen Nature Preserve, both located in the southwest corner of the watershed. These streams join to form the Galena River downstream of the wetlands. Several small tributaries flow into the Galena River before it reaches the Michigan line. These include Warwick Ditch, the Unnamed Tributary East to the Galena River, and several smaller, intermittent tributaries. Another tributary, the Spring Creek tributary, drains the northeastern catchment of the watershed then flows north into Michigan where it joins Spring Creek which then flows into the Galena River.

The watershed is subdivided into the following five subbasins represented by 14-digit HUC parcels (Figure 4):

- South Branch of Galena River (Blood Run) (HUC 04040001100080) – rises in Springfield Township in LaPorte County and flows north and east.
- Galena River headwaters (HUC 04040001100050) – rises in Galena Township in LaPorte County near Springville.
- Galena River (Hog Lake Tributary) (HUC 04040001100060) – rises in Galena Township in LaPorte County.
- Spring Creek (HUC 04040001100070) – rises in Hudson Township in the northeast corner of LaPorte County.
- Dowling Creek (HUC 04040001100010) – rises on the southern edge of Galien Township near the Indiana border where LaPorte and St. Joseph counties meet.



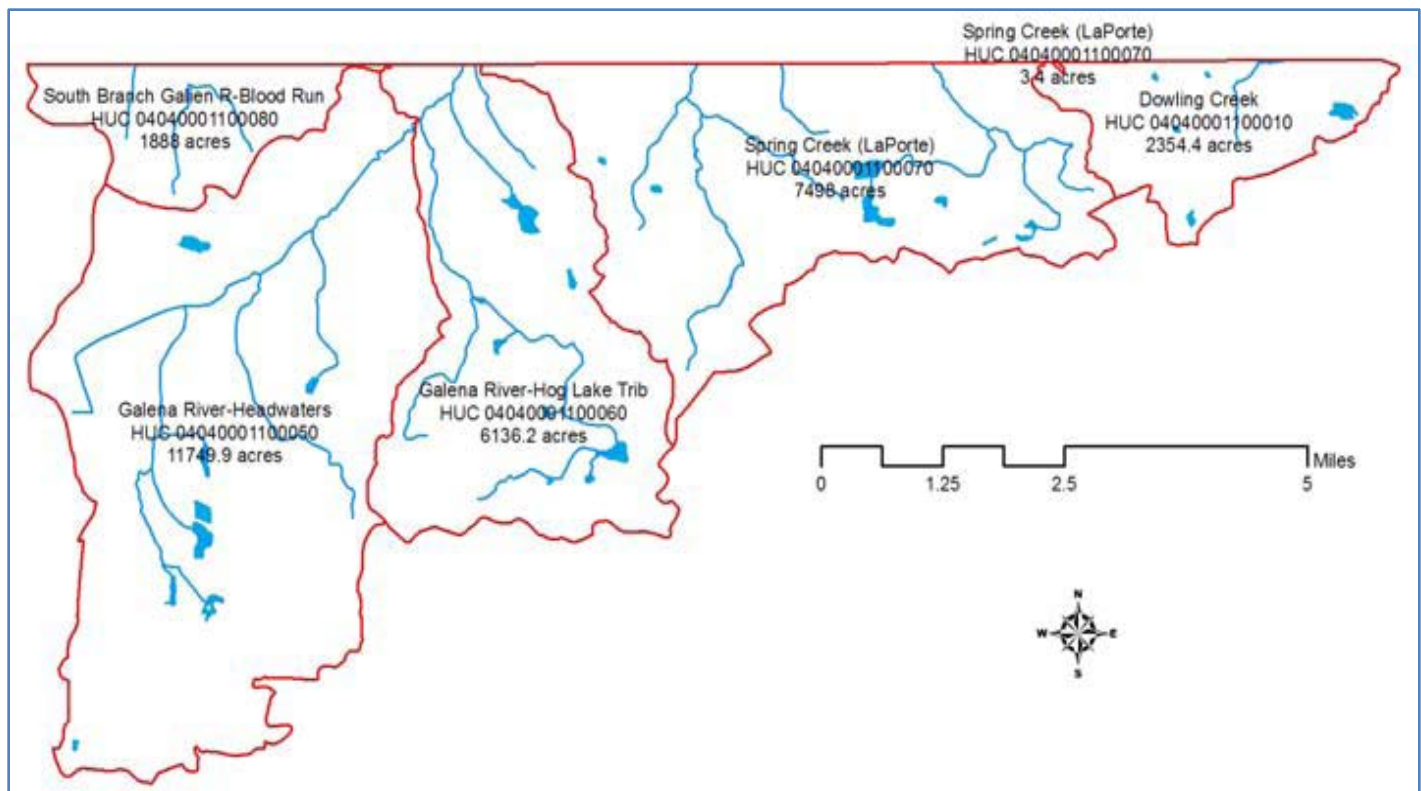


Figure 4. The 29,630-acre area of Indiana's portion of the Galena River watershed.

There are no major impoundments or reservoirs in the watershed.

According to the Indiana Water Pollution Control Board, the Galena River and its' tributaries in LaPorte County are designated as salmonid waters and shall be capable of supporting a salmonid fishery (327 IAC 2-1.5-5; 1997). This requires a more stringent set of water quality standards than those applied to general use in streams.

Groundwater provides drinking water for most of the residents within the watershed. Several major unconsolidated aquifer systems offer the area an abundant supply of groundwater for irrigation and drinking. Groundwater movement is constrained by the Valparaiso Moraine; groundwater north of the moraine flows north towards Lake Michigan. Groundwater south of the moraine flows south and west. In the Valparaiso Moraine groundwater recharges at a rate of 3 inches per year (Purdue University Extension, [cobweb.ecn.purdue.edu/~frankenb/watershed/index.html](http://cobweb.ecn.purdue.edu/~frankenb/watershed/index.html)). A 1994 study of the groundwater quality in LaPorte County found elevated levels of nitrate in 11% of all wells tested and elevated



levels of acetanilide products 9% of the wells. Based on this data the majority of wells provide clean, safe drinking water (Indiana Farm Bureau 1994).

## **2.5 Soils**

Common soils in the Galena River watershed include Blount, Adrian, Chelsea, Martisco, Maumee, Milford, Morocco, Selfridge, Tracy, and Riddles (USDA 1982, USDA 2004). Soils range from very poorly drained muck soils to well-drained loams and fine sands. The source of the Galena River is located in the Adrian-Houghton-Edwards association, which is described as ‘nearly level, very poorly drained soils that formed in organic material over sand and marl. This map unit consists of deposits of muck within large depressions. Within LaPorte County this map unit has largely been drained and farmed although ponding on agricultural land can often be a problem. Because of the wet conditions, this map unit is unsuitable for tree growth and for the development of sanitary facilities and building developments. Other general soil map units within the watershed include the following:

- Tracy-Chelsea: Nearly level to very steep, well drained and excessively drained soils that formed in loamy and sand outwash and eolian material. Slopes can range from 0 to 45%. Within the county most of this map unit has been cleared and converted to cropland. This map unit is suitable for tree growth but very poorly suited for sanitary facilities. Some soils within the map unit are poorly suited for building development. Limitations include slope, pollution of groundwater, droughty conditions, and erosion.
- Riddles: Nearly level to very steep, well drained soils that formed in loamy glacial till. The soils are nearly level or gently sloping on knolls and ridges and moderately sloping to steep soils on side slopes. Slopes range from 0 to 45%. This map unit is used primarily for woodland and pasture although the flatter areas have been cleared and converted to cropland. These soils are suited for sanitary facilities and building development. Slope and hazard of erosion are the main limitations with this map unit.
- Blount-Selfridge: Nearly level and gently sloping, somewhat poorly drained soils that formed in loamy glacial till and in sandy deposits over loamy material. This map unit is on till plains, lake plains, and moraines with gentle swales. Slopes range from 0 to 6%. The majority of this map unit has been cleared, drained, and converted to cropland. This map unit is suited to tree growth but unsuitable for sanitary facilities and building site development. Slow permeability, ponding, and wetness are the main limitations.

Figure 5 shows the location of hydric (wetland) soils within the watershed. While hydric soils are scattered throughout the watershed, not surprisingly, the largest concentrated area of hydric soils corresponds to the large wetlands that are the headwaters of the Galena River.

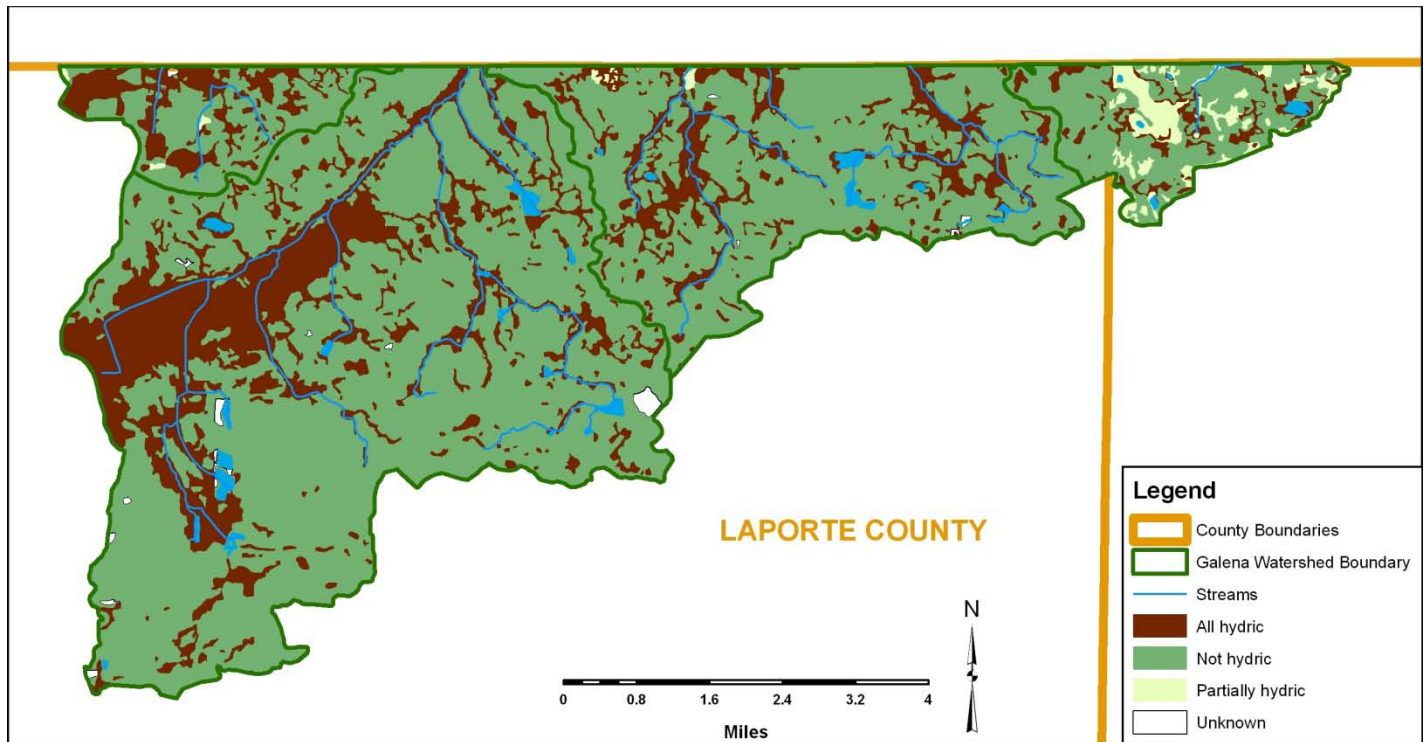


Figure 5. Hydric soils within the Galena River Watershed.

Cultivation has been made possible in some areas in the watershed by adequate drainage through open drainage ditches and subsurface drain tiles. Much of the watershed has been drained to allow for planting and harvesting of crops.

## 2.6 Natural History

The Galena River watershed is characterized by numerous lakes, small drainages, and marshes. Land is largely undeveloped with considerable areas of forest, wetlands, lakes, agricultural fields and livestock farms. Typical presettlement vegetation consisted of extensive forests, specifically oak-hickory forests in uplands, and beech or northern swamp forest in wetlands (USEPA 2002, Kurz 1979). Today untouched old growth forested areas are rare. Many of the forested areas have been cleared and converted to cropland or harvested for wood.

The Galena River originates from two adjacent sources, the Galena Wetland Conservation Area and the Springfield Fen Nature Preserve. The Galena Wetland Conservation Area is approximately 165 acres and is managed by the Indiana DNR as a wildlife management area. Public hunting is allowed there. Springfield Fen Nature Preserve is a prairie fen, approximately 45 acres that is located at the base of a high hill from which calcareous seepage has created a wetland.

The Forest Legacy Program (FLP) is a federal program administered by the USDA Forest Service, in partnership with states, to protect environmentally sensitive forestlands. One of six Legacy areas in Indiana is the Northwest Moraine Area, which encompasses northern LaPorte County (IDNR 2005). The forests in this area represent the rapidly disappearing northwest morainal forest and provide invaluable benefits as wildlife habitat, recreation, and open space.

## 2.7 Endangered Species

Table 4 provides a list of Federal threatened and endangered species for LaPorte and St. Joseph counties. Springfield Fen Nature Preserve provides possible habitat for listed species including the Federal Candidate species, Eastern Massasauga (Mierzwa 2005)

**Table 4**

### **FEDERAL LISTED THREATENED AND ENDANGERED SPECIES FOR LAPORTE AND ST. JOSEPH COUNTIES**

(Source: Indiana Department of Natural Resources,  
<http://www.in.gov/dnr/naturepreserve/4666.htm>)

<b>Scientific Name</b>	<b>Common Name</b>	<b>Federal Status</b>	<b>County</b>
<i>Neonympha mitchellii mitchellii</i>	Mitchell's Satyr	Endangered	LaPorte
<i>Sistrurus catenatus catenatus</i>	Eastern Massasauga	Candidate	LaPorte, St. Joseph
<i>Myotis sodalis</i>	Indiana Bat	Endangered	LaPorte, St. Joseph
<i>Platanthera leucophaea</i>	Prairie White-fringed Orchid	Threatened	LaPorte, St. Joseph
<i>Nerodia erythrogaster neglecta</i>	Copperbelly Water Snake	Threatened	St. Joseph

State-listed threatened and endangered species for LaPorte and St. Joseph counties are provided in Appendix A.

Figure 6 provides information from Indiana's Heritage Database on documented occurrences of federal- and state-listed endangered, threatened, and rare plant species, high quality natural communities, and significant natural areas for Indiana.

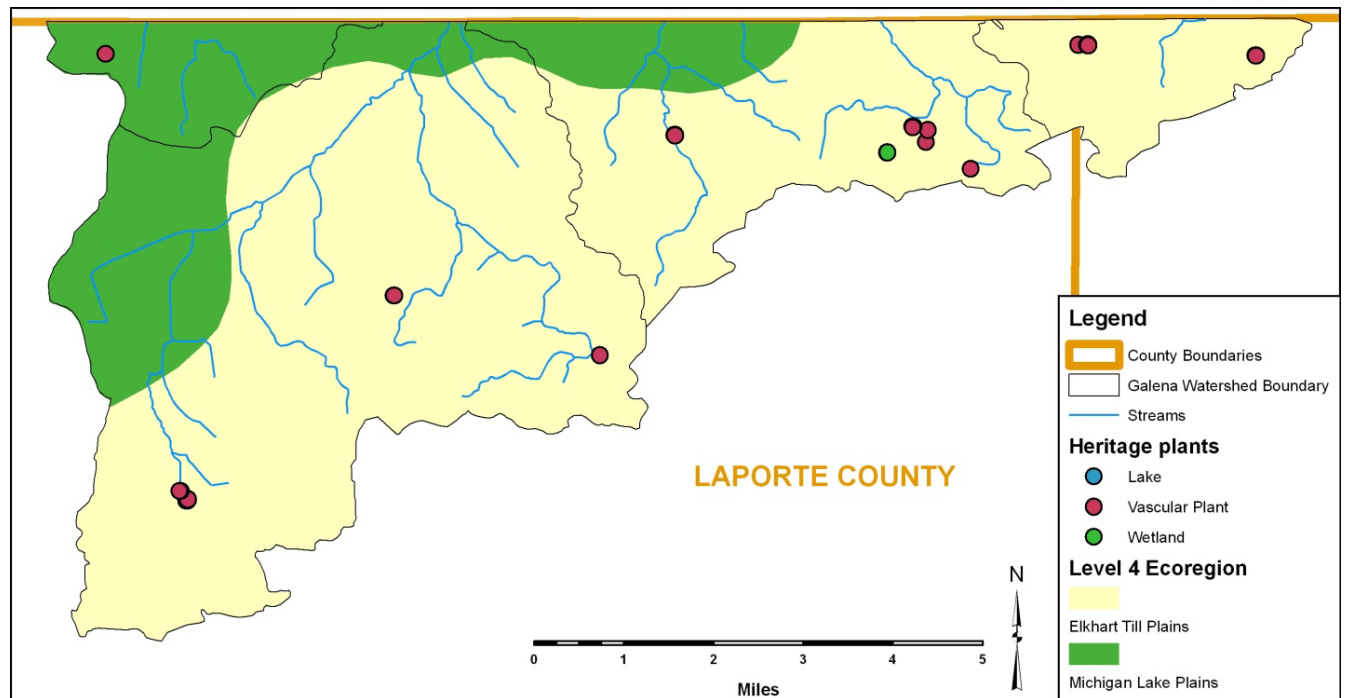


Figure 6. Locations of endangered, threatened, and rare vascular plant species and significant natural areas in LaPorte and St. Joseph Counties. Indiana Heritage Database.

## 2.8 Land Use and Cover

Land use data for the Galena River watershed were downloaded from the Indiana Geological Survey website (Indiana GAP 2000). Figure 7 shows the land use/land cover for the watershed. Table 5 lists the different land uses and acreages of each within the Galena River watershed. Land use in the watershed is principally forest and agriculture. The area is becoming more urbanized, however, given the excellent access to road and rail connections to the Chicago metropolitan area along the South Shore Railroad and interstates 94 and 80-90.

Figure 8 shows the imperviousness of the Galena River Watershed; imperviousness corresponds closely with the existing land use/land cover in the watershed. Right now within the watershed only a small portion is covered by impervious development. As highlighted by the thin, linear black lines in Figure 8, the dominant impervious layers are highways. One can also see in the figure some small developed areas that are present along the highways.

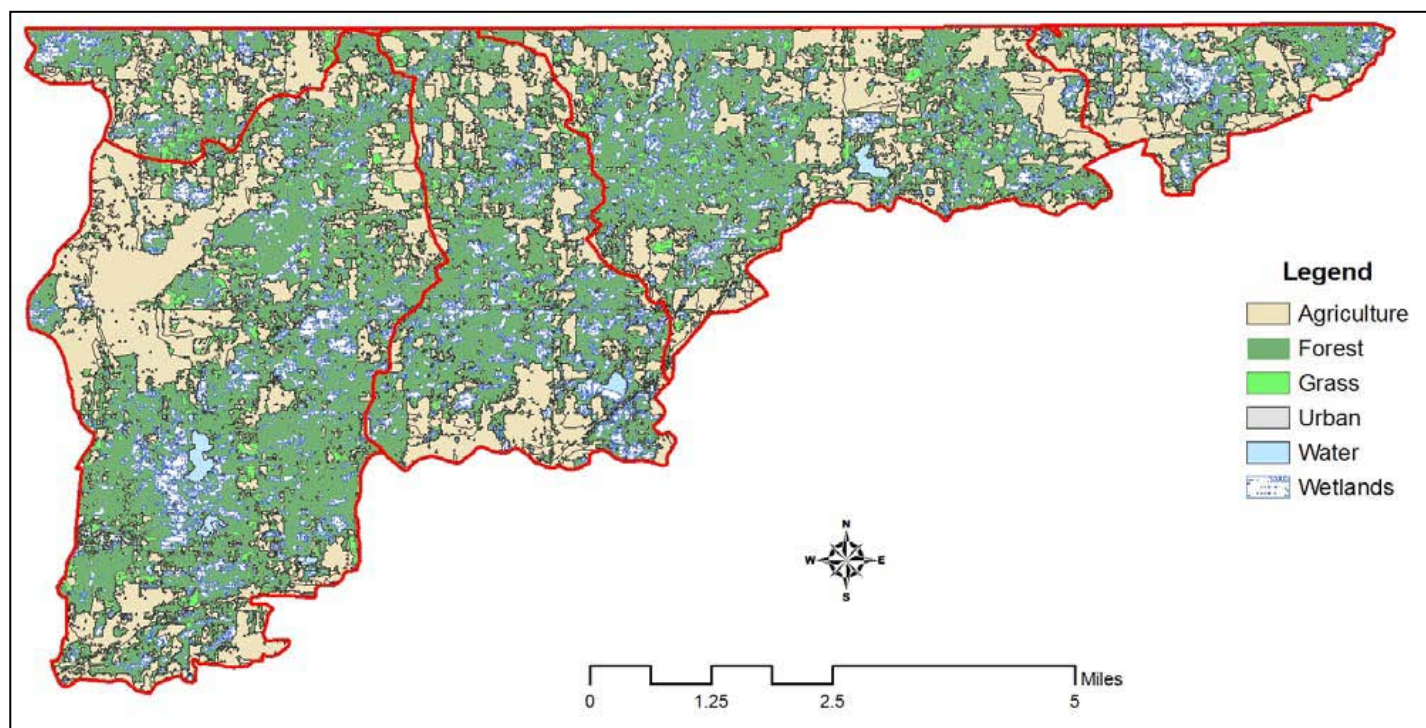


Figure 7. Land Use/Land Cover in the Galena River Watershed.

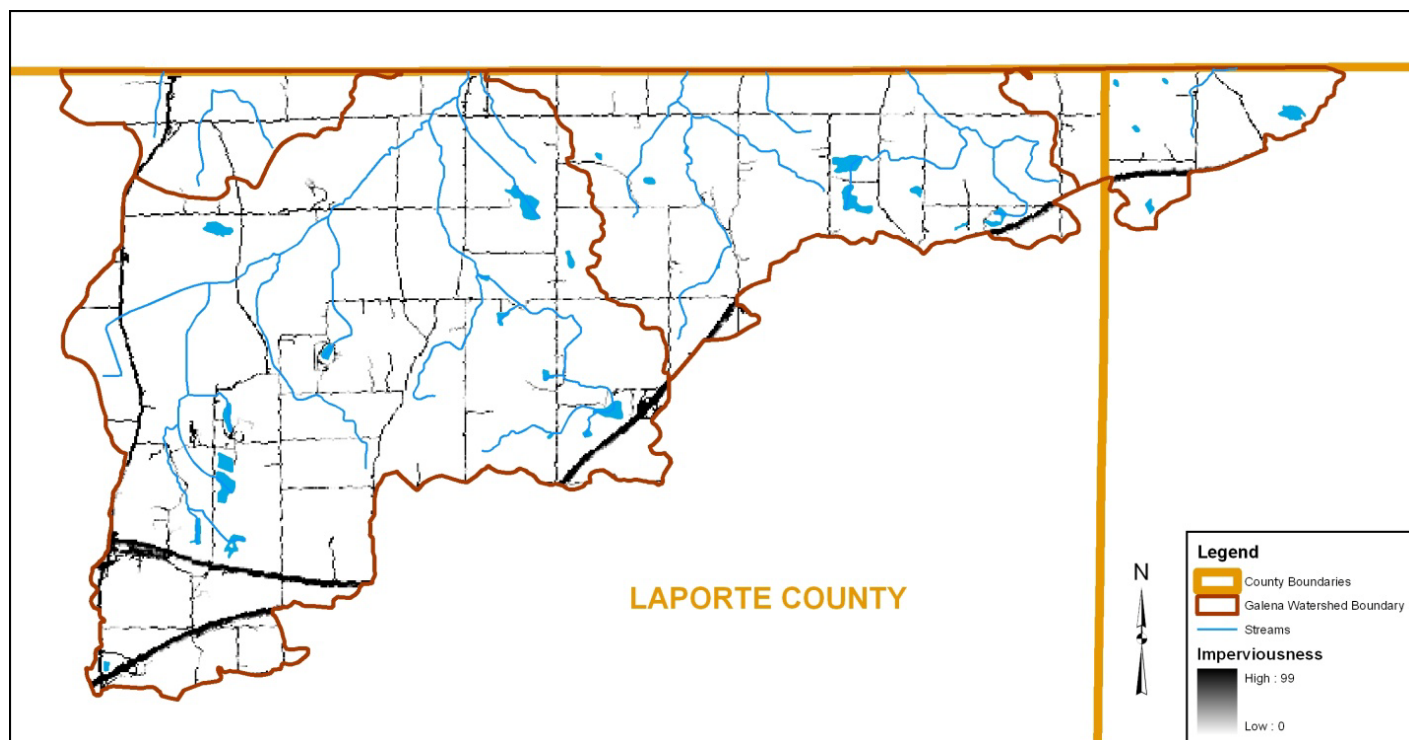


Figure 8. Imperviousness in the Galena River Watershed.

**Table 5**

**LAND USE/COVER IN THE GALENA RIVER WATERSHED**

<b>Land Use/Land Cover</b>	<b>Acres</b>
Commercial/Industrial/Transportation	21.86
Deciduous Forest	6263.42
Emergent Herbaceous Wetlands	1186.75
Evergreen Forest	4695.79
Grassland/Herbaceous	2045.53
High Intensity Residential	5.75
Low Intensity Residential	132.13
Mixed Forest	758.13
Open Water	392.68
Pasture/Hay	5144.86
Row Crops	6620.79
Small Grains	20.33
Urban/Recreational Grasses	122.43
Woody Wetland	2215.37
<b>Total</b>	<b>29,625.82</b>

## **2.9 Stormwater Management**

The watershed is forested and undeveloped and the population density is low with agriculture a primary land use. Given these characteristics, nonpoint sources are likely the primary causes of pollution entering the streams and drainages within the watershed.

Ditches and subsurface drain tiles carry stormwater off agricultural land and into nearby rivers and streams. Runoff from agricultural fields and livestock areas introduce fertilizers, pesticides, sediment, and fecal material into local drainages. Failing septic systems may also contribute nonpoint source pollution to area waterways.

Potential point sources include wastewater discharges, hazardous waste storage and management facilities, and underground storage tanks. Figure 9 shows the point sources in the watershed. There are no permitted landfills or Superfund sites in the watershed. As discussed earlier there are no CFOs in the watershed. There are, however, three active NPDES permitted facilities within the watershed (Table 6).



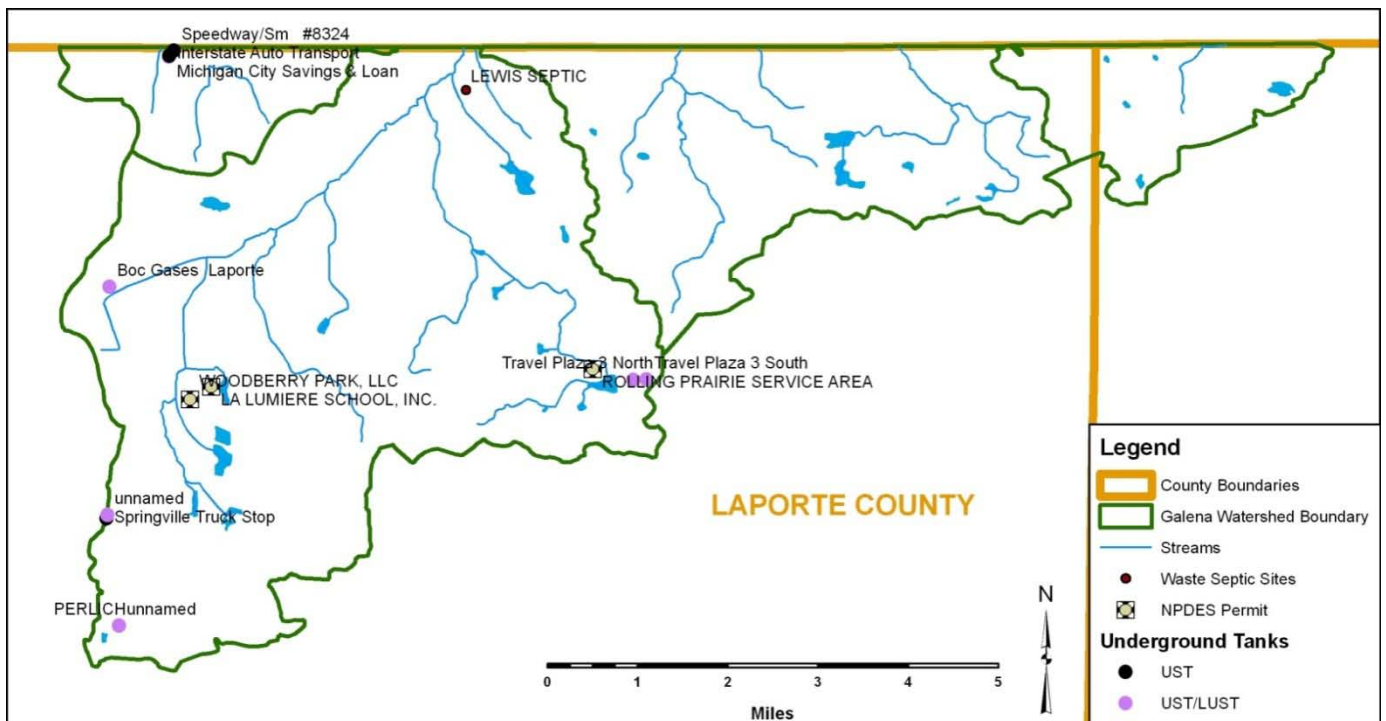


Figure 9. Point sources in the Galena River Watershed

**Table 6.**

**FACILITIES WITH NPDES PERMITS LOCATED WITHIN THE WATERSHED**

(Source: U.S. EPA Envirofacts Data Warehouse, [www.epa.gov/enviro/index.html](http://www.epa.gov/enviro/index.html))

<b>NPDES Permit #</b>	<b>Facility</b>	<b>SIC Description</b>	<b>Location</b>	<b>County</b>
IN0020931	Indiana DOT SA 3S WWTP Toll Rd. Milepost 56 (Rolling Prairie Service Area)	Regulation and administration of transportation programs	Rolling Prairie, IN	LaPorte
IN0036803	Lalumiere School	Elementary and secondary schools	LaPorte, IN	LaPorte
IN0039535	Woodberry Park, LLC	Operators of residential mobile home sites	LaPorte, IN	LaPorte



IDEM and USEPA provide the public with online access to underground storage tank (UST) information (<http://igs.indiana.edu/arcims/statewide/download.html>). Underground storage tanks generally present low risk to surface water bodies. Leakages however, do occur, and IDEM has records of leaking UST's (LUST) in a separate database. Figure 9 shows the underground storage tanks and leaking underground storage tanks in the study area. The LUST database does not contain a field indicating cleanup status, but most have likely been remediated.

### **3.0 WATER QUALITY DATA ANALYSIS**

An extensive water quality assessment for *E. coli* was completed on the Galena River and associated tributaries which showed elevated *E. coli* concentrations that exceeded water quality standards at eight of nine sampling sites (Prast et al. 2009). Sampling sites are shown in Figure 10. In addition to *E. coli* measurements, general chemistry, several nutrient parameters and field parameters (water temperature, pH, turbidity and specific conductance) were also measured. Stream flow data was collected at three sampling locations. Appendix B contains water chemistry results.

*E. coli* is listed as an impairment for many waterbody segments throughout northwest Indiana. High *E. coli* levels lead to the closure of Lake Michigan beaches every summer. Causes of elevated *E. coli* levels range from failing septic systems, direct discharge from septic systems, wastewater treatment plant discharges, leaking sewer lines, domestic pets, wildlife (particularly waterfowl), combined sewer overflows (CSOs), land application of sludge or manure, and runoff from livestock.

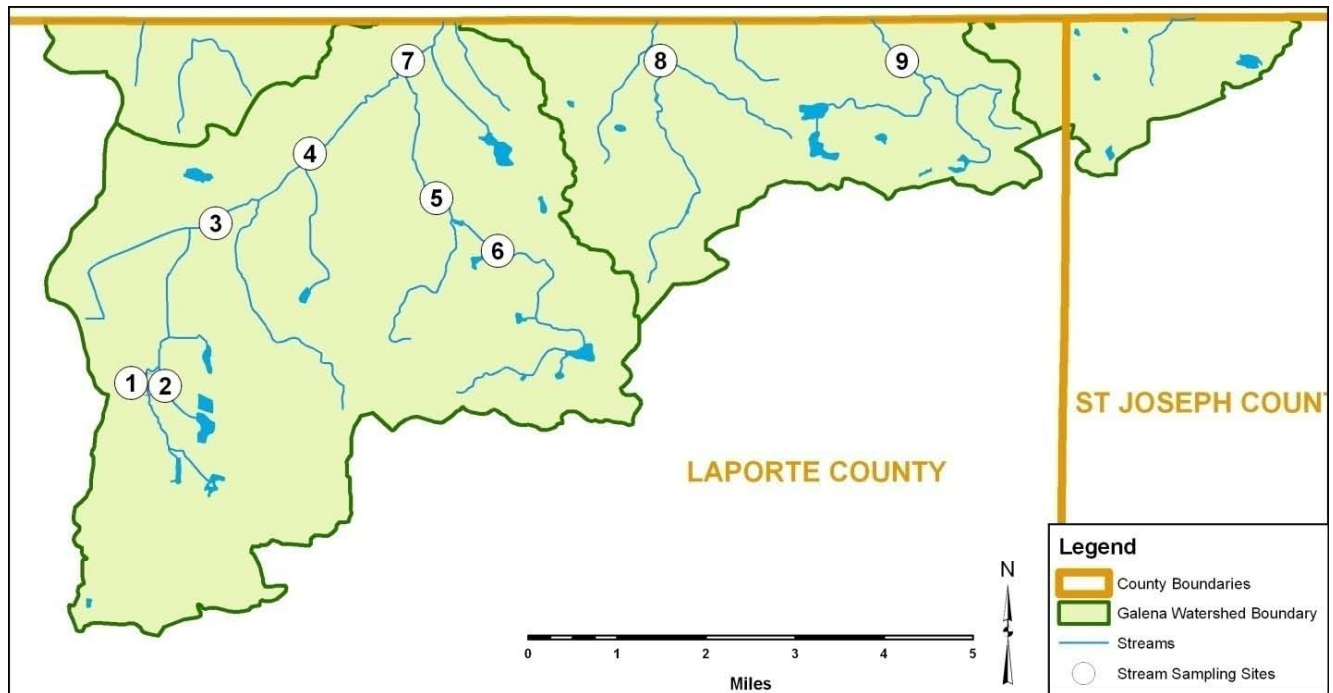


Figure 10. Location of Sampling Sites.

Indiana's water quality standard for *E. coli* bacteria for full body contact recreational uses during the recreational season is:

April 1<sup>st</sup> through October 31<sup>st</sup> *E. coli* shall not exceed 125 cfu per 100 milliliters as a geometric mean based on not less than five samples equally spaced over a 30-day period nor exceed 235 cfu per 100 milliliters in any one sample in a 30-day period (Indiana Administrative Code 327 IAC 2-1-6(d)).

Table 7 provides the results of the study and shows the waterbodies that are non-supporting the water quality standard for *E. coli*.

**Table 7**

***E. COLI* DENSITIES IN THE GALENA RIVER WATERSHED**

(Table taken from: Prast, J. and M. AK. 2009. Water Quality Assessment for *Escherichia coli* (*E. coli*) Bacteria in the Galena River Watershed. Indiana Department of Environmental Management, Assessment Branch).

Site #	AIMS Lsite #	Stream Name Designation	Sample Dates	AIMS Sample #'s	<i>E. coli</i> MPN/100ml
#1	LMG100-0010	Galena River	9/16/08	AA54767	248.1
			9/23/08	AA54777	686.7
			9/30/08	AA54788	866.4
			10/07/08	AA54799	1203.3
			10/14/08	AA54810	488.4
		<b>Non-Supporting</b>		<b>Geometric Mean</b>	<b>613</b>
#2	LMG100-0008	Galena River East	9/16/08	AA54769	*160.7
			9/23/08	AA54779	*139.6
			9/30/08	AA54790	613.1
			10/07/08	AA54801	*42.8
			10/14/08	AA54811	*105.0
		<b>Non-Supporting</b>		<b>Geometric Mean</b>	<b>144</b>
#3	LMG100-0012	Galena River	9/16/08	AA54770	275.5
			9/23/08	AA54780	*142.1
			9/30/08	AA54791	866.4
			10/07/08	AA54802	461.1
			10/14/08	AA54814	501.2
		<b>Non-Supporting</b>		<b>Geometric Mean</b>	<b>379</b>

Site #	AIMS Lsite #	Stream Name Designation	Sample Dates	AIMS Sample #'s	<i>E. coli</i> MPN/100ml
#4	LMG100-0013	Galena River	9/16/08	AA54771	307.6
			9/23/08	AA54781	*159.7
			9/30/08	AA54792	816.4
			10/07/08	AA54803	*161.3
			10/14/08	AA54815	307.6
		<b>Non-Supporting</b>		<b>Geometric Mean</b>	<b>288</b>
#5	LMG100-0014	Unnamed Tributary East to Galena River	9/16/08	AA54772	261.3
			9/23/08	AA54782	307.6
			9/30/08	AA54793	325.5
			10/07/08	AA54804	*228.2
			10/14/08	AA54816	325.5
		<b>Non-Supporting</b>		<b>Geometric Mean</b>	<b>287</b>
#6	LMG100-0011	Main Tributary East to Galena River	9/16/08	AA54773	*206.3
			9/23/08	AA54783	*73.8
			9/30/08	AA54794	*129.6
			10/07/08	AA54805	*63.8
			10/14/08	AA54817	*166.4
		<b>Supporting</b>		<b>Geometric Mean</b>	<b>*116</b>
#7	LMG100-0015	Galena River	9/16/08	AA54774	613.1
			9/23/08	AA54784	*172.3
			9/30/08	AA54795	686.7
			10/07/08	AA54806	*172.5
			10/14/08	AA54818	*185.0

Site #'	AIMS Lsite #	Stream Name Designation	Sample Dates	AIMS Sample #'s	<i>E. coli</i> MPN/100ml
		Non-Supporting		Geometric Mean	297
#8	LMG100-0017	Spring Creek	9/16/08	AA54775	686.7
			9/23/08	AA54785	435.2
			9/30/08	AA54796	344.8
			10/07/08	AA54807	*146.7
			10/14/08	AA54819	547.5
		Non-Supporting		Geometric Mean	383
#9	LMG100-0009	Unnamed Tributary to Spring Creek	9/16/08	AA54776	410.6
			9/23/08	AA54786	579.4
			9/30/08	AA54797	344.8
			10/07/08	AA54808	*193.5
			10/14/08	AA54820	866.4
		Non-Supporting		Geometric Mean	424
Geometric Mean ≤125 MPN → 1 site In-Compliance → 8 sites Non-Compliance					
Single Sample ≤ 235 MPN →18 samples In-Compliance → 27 samples Non-Compliance					

***This section to be developed further with results of TMDL , macroinvertebrate and habitat studies.***

#### 4.0 REFERENCES

- Indiana Department of Environmental Management (IDEM). 2008. 2008 303(D) List of Impaired Waters. <http://www.in.gov/idem/4680.htm>. Accessed 2/26/09.
- Indiana Department of Environmental Management (IDEM). Confined Feeding Operations Fact Sheet. <http://www.in.gov/idem/4565.htm>. Accessed 3/3/09.
- Indiana Department of Natural Resources (IDNR) Division of Water. 1969. Geohydrogeology and Ground Water Potential of St. Joseph County, Indiana. Bulletin No. 33.
- Indiana Department of Natural Resources (IDNR) Lake Michigan Coastal Program. 2005. Indiana Coastal Nonpoint Pollution Control Plan. [www.in.gov/dnr/lakemich/pdf/6217%20Final.pdf](http://www.in.gov/dnr/lakemich/pdf/6217%20Final.pdf)
- Indiana Department of Natural Resources. List of Endangered, Threatened, and Rare Species by County. [www.in.gov/dnr/naturepreserve/4666.htm](http://www.in.gov/dnr/naturepreserve/4666.htm). Accessed 2/26/09.
- Indiana Farm Bureau. 1994. Nitrate and Pesticides in Private Wells of Indiana. Prepared by The Water Quality Laboratory, Heidelberg College and Indiana Farm Bureau.
- Indiana State Climate Office. [www.agry.purdue.edu/climate/index.asp](http://www.agry.purdue.edu/climate/index.asp). Accessed 3/2/09.
- Kurz, D.R. 1979. Inventory of Natural Areas in LaPorte County, Indiana. Prepared by the Natural Land Institute, Rockford, IL.
- Malott, C.A. 1922. The Physiography of Indiana, In Indian Department of Conservation, Handbook of Indiana Geology: Division of Geology.
- Michigan Department of Environmental Quality (MDEQ). 2003. Galien River Watershed Management Plan. Prepared by Fishbeck, Thompson, Carr, and Huber for the MDEQ.
- Mierzwa, K.S. 2005. Habitat Utilization and Status of the Eastern Massasauga Rattlesnake, *Sistrurus catenatus catenatus*, in the Chicago Region. Prepared for the Rattlesnake Symposium. [www.brocku.ca/massasauga/Mierzwa.pdf](http://www.brocku.ca/massasauga/Mierzwa.pdf)

- Northwestern Indiana Regional Planning Commission (NIRPC). 2005. Watershed Management Plan for Lake, Porter, and LaPorte Counties. Funded by the Indiana Department Environmental Management.
- Northwestern Indiana Regional Planning Commission (NIRPC). 2007. Connections 2030 Regional Transportation Plan.
- Northwestern Indiana Regional Planning Commission (NIRPC). 2008. Where We Stand, A Snapshot of Northwest Indiana.
- Omerik, J.M. 1987. Ecoregions of the Conterminous United States. Map supplement. Annals of the Association of American Geographers 77(1): 118-125 (map scale 1:7,500,000).
- Prast, J. and M. AK. 2009. Water Quality Assessment for *Escherichia coli* (*E. coli*) Bacteria in the Galena River Watershed. Indiana Department of Environmental Management, Assessment Branch.
- U.S. Census Bureau. United States Census 2000. [www.census.gov/main/www/cen2000.html](http://www.census.gov/main/www/cen2000.html). Accessed 2/26/09.
- U.S. Census Bureau. American Community Survey. [www.census.gov/acs/www/](http://www.census.gov/acs/www/) Accessed 3/2/09.
- U.S. Department of Agriculture (USDA), National Agricultural Statistics Service. 2009 (issued in). 2007 Census of Agriculture. [www.agcensus.usda.gov/Publications/2007/index.asp](http://www.agcensus.usda.gov/Publications/2007/index.asp) Accessed 3/3/09.
- U.S. Department of Agriculture (USDA), Soil Conservation Service. 1982. Soil Survey of LaPorte County, Indiana.
- U.S. Department of Agriculture (USDA), Soil Conservation Service. 2004. Soil Survey of St. Joseph County, Indiana.
- U.S. Department of Commerce. 2001. Indiana Lake Michigan Coastal Program Document and Draft Environmental Impact Statement for the State of Indiana. Prepared by the National Oceanic and Atmospheric Administration and the Indiana Department of Natural Resources.



U.S. Environmental Protection Agency (USEPA). 2002. Primary Distinguishing Characteristics of Level III Ecoregions in the Continental United States. [www.epa.gov/wed/pages/ecoregions/level\\_iii.htm](http://www.epa.gov/wed/pages/ecoregions/level_iii.htm). Accessed 3/2/09.

U.S. Environmental Protection Agency (USEPA). Envirofacts Data Warehouse. [www.epa.gov/enviro/index.html](http://www.epa.gov/enviro/index.html). Accessed 3/5/09.

Wittman Hydro Planning Associates. 2002. Watershed Restoration Action Strategy for the Little Calumet-Galien Watershed. Prepared for Indiana Department of Environmental Management.

## **APPENDIX A**

### **State-listed Threatened and Endangered Species For LaPorte and St. Joseph Counties**

Indiana County Endangered, Threatened and Rare Species List

County: La Porte

Species Name	Common Name	FED	STATE	GRANK	SRANK
<b>Mollusk: Gastropoda</b>					
Lymnaea stagnalis	Swamp Lymnaea		SSC	G5	S2
<b>Insect: Lepidoptera (Butterflies &amp; Moths)</b>					
Capis curvata	A Noctuid Moth		ST	G4	S2S3
Catocala amestris	The Leadplant Underwing Moth		SE	G4	S1
Catocala praeclara	Praeclara Underwing		SR	G5	S2S3
Euphydryas phaeton	Baltimore		SR	G4	S2
Leucania multilinea			ST	G5	S1S2
Macrochilo absorptalis	A Moth		SR	G4G5	S2S3
Macrochilo hypocritalis	A Noctuid Moth		SR	G4	S2
Neonympha mitchellii mitchellii	Mitchell's Satyr	LE	SE	G1G2T1T2	S1
Papaipema beeriana	Beer's Blazing Star Borer Moth		ST	G2G3	S1S3
Papaipema limpida	The Ironweed Borer Moth		SR	G4	S1S2
Papaipema maritima	The Giant Sunflower Borer Moth		ST	G3	S2
<b>Insect: Odonata (Dragonflies &amp; Damselflies)</b>					
Aeshna mutata	Spatterdock Darner		ST	G4	S1S2
Sympetrum semicinctum	Band-winged Meadowhawk		SR	G5	S2S3
<b>Fish</b>					
Acipenser fulvescens	Lake Sturgeon		SE	G3G4	S1
<b>Amphibian</b>					
Rana pipiens	Northern Leopard Frog		SSC	G5	S2
<b>Reptile</b>					
Clemmys guttata	Spotted Turtle		SE	G5	S2
Clonophis kirtlandii	Kirtland's Snake		SE	G2	S2
Emydoidea blandingii	Blanding's Turtle		SE	G4	S2
Liochlorophis vernalis	Smooth Green Snake		SE	G5	S2
Sistrurus catenatus catenatus	Eastern Massasauga	C	SE	G3G4T3T4	S2
Terrapene ornata	Ornate Box Turtle		SE	G5	S2
Thamnophis proximus	Western Ribbon Snake		SSC	G5	S3
<b>Bird</b>					
Ammodramus henslowii	Henslow's Sparrow		SE	G4	S3B
Ardea herodias	Great Blue Heron			G5	S4B
Bartramia longicauda	Upland Sandpiper		SE	G5	S3B
Botaurus lentiginosus	American Bittern		SE	G4	S2B
Buteo lineatus	Red-shouldered Hawk		SSC	G5	S3
Buteo platypterus	Broad-winged Hawk	No Status	SSC	G5	S3B
Certhia americana	Brown Creeper			G5	S2B
Chlidonias niger	Black Tern		SE	G4	S1B
Circus cyaneus	Northern Harrier		SE	G5	S2
Cistothorus palustris	Marsh Wren		SE	G5	S3B
Cistothorus platensis	Sedge Wren		SE	G5	S3B
Dendroica cerulea	Cerulean Warbler		SSC	G4	S3B
Empidonax alnorum	Alder Flycatcher			G5	S2B
Euphagus cyanocephalus	Brewer's Blackbird			G5	SHB,S1N
Falco peregrinus	Peregrine Falcon	No Status	SE	G4	S2B
Gallinula chloropus	Common Moorhen	No Status	SE	G5	S3B
Grus canadensis	Sandhill Crane	No Status	SSC	G5	S2B,S1N
Ixobrychus exilis	Least Bittern		SE	G5	S3B
Lanius ludovicianus	Loggerhead Shrike	No Status	SE	G4	S3B
Mniotilta varia	Black-and-white Warbler		SSC	G5	S1S2B
Nycticorax nycticorax	Black-crowned Night-heron		SE	G5	S1B
Pandion haliaetus	Osprey		SE	G5	S1B
Phalacrocorax auritus	Double-crested Cormorant		SX	G5	SHB
Rallus limicola	Virginia Rail		SE	G5	S3B
Sturnella neglecta	Western Meadowlark		SSC	G5	S2B

Indiana Natural Heritage Data Center	Fed:	LE = Endangered; LT = Threatened; C = candidate; PDL = proposed for delisting
Division of Nature Preserves	State:	SE = state endangered; ST = state threatened; SR = state rare; SSC = state species of special concern;
Indiana Department of Natural Resources		SX = state extirpated; SG = state significant; WL = watch list
This data is not the result of comprehensive county surveys.	GRANK:	Global Heritage Rank: G1 = critically imperiled globally; G2 = imperiled globally; G3 = rare or uncommon globally; G4 = widespread and abundant globally but with long term concerns; G5 = widespread and abundant globally; G? = unranked; GX = extinct; Q = uncertain rank; T = taxonomic subunit rank
	SRANK:	State Heritage Rank: S1 = critically imperiled in state; S2 = imperiled in state; S3 = rare or uncommon in state; G4 = widespread and abundant in state but with long term concern; SG = state significant; SH = historical in state; SX = state extirpated; B = breeding status; S? = unranked; SNR = unranked; SNA = nonbreeding status unranked

Indiana County Endangered, Threatened and Rare Species List

County: La Porte

Species Name	Common Name	FED	STATE	GRANK	SRANK
Wilsonia canadensis	Canada Warbler			G5	S2B
Wilsonia citrina	Hooded Warbler		SSC	G5	S3B
Xanthocephalus xanthocephalus	Yellow-headed Blackbird		SE	G5	S1B
Mammal					
Condylura cristata	Star-nosed Mole		SSC	G5	S2?
Lynx rufus	Bobcat	No Status		G5	S1
Mustela nivalis	Least Weasel		SSC	G5	S2?
Myotis sodalis	Indiana Bat or Social Myotis	LE	SE	G2	S1
Spermophilus franklinii	Franklin's Ground Squirrel		SE	G5	S2
Taxidea taxus	American Badger			G5	S2
Vascular Plant					
Andromeda glaucophylla	Bog Rosemary		SR	G5	S2
Arabis glabra	Tower-mustard		WL	G5	S2
Aralia hispida	Bristly Sarsaparilla		SE	G5	S1
Arctostaphylos uva-ursi	Bearberry		SR	G5	S2
Arenaria stricta	Michaux's Stitchwort		SR	G5	S2
Aristida intermedia	Slim-spike Three-awn Grass		SR	GNR	S2
Aristida tuberculosa	Seabeach Needlegrass		SR	G5	S2
Aster borealis	Rushlike Aster		SR	G5	S2
Betula populifolia	Gray Birch		SE	G5	S1
Bidens beckii	Beck Water-marigold		ST	G4G5T4	S1
Botrychium matricariifolium	Chamomile Grape-fern		SR	G5	S2
Calla palustris	Wild Calla		SE	G5	S1
Carex arctata	Black Sedge		SE	G5?	S1
Carex atherodes	Awned Sedge		SE	G5	S1
Carex atlantica ssp. capillacea	Howe Sedge		SE	G5T5?	S1
Carex chordorrhiza	Creeping Sedge		SE	G5	S1
Carex debilis var. rudgei	White-edge Sedge		SR	G5T5	S2
Carex echinata	Little Prickly Sedge		SE	G5	S1
Carex flava	Yellow Sedge		ST	G5	S2
Carex folliculata	Long Sedge		SR	G4G5	S2
Carex leptonervia	Finely-nerved Sedge		SE	G4	S1
Carex limosa	Mud Sedge		SE	G5	S1
Carex pedunculata	Longstalk Sedge		SR	G5	S2
Carex scabrata	Rough Sedge		SE	G5	S1
Carex seorsa	Weak Stellate Sedge		SR	G4	S2
Carex sparganioides var. cephaloidea	Thinleaf Sedge		SE	G5	S2
Chrysosplenium americanum	American Golden-saxifrage		ST	G5	S2
Circaea alpina	Small Enchanter's Nightshade		SX	G5	SX
Conioselinum chinense	Hemlock Parsley		SE	G5	S1
Cornus rugosa	Roundleaf Dogwood		SR	G5	S2
Corydalis sempervirens	Pale Corydalis		ST	G4G5	S1
Cyperus dentatus	Toothed Sedge		SE	G4	S1
Cypripedium calceolus var. parviflorum	Small Yellow Lady's-slipper		SR	G5	S2
Cypripedium candidum	Small White Lady's-slipper		WL	G4	S2
Deschampsia cespitosa	Tufted Hairgrass		SR	G5	S2
Diervilla lonicera	Northern Bush-honeysuckle		SR	G5	S2
Drosera intermedia	Spoon-leaved Sundew		SR	G5	S2
Dryopteris clintoniana	Clinton Woodfern		SX	G5	SX
Eleocharis melanocarpa	Black-fruited Spike-rush		ST	G4	S2
Epigaea repens	Trailing Arbutus		WL	G5	S3
Equisetum variegatum	Variegated Horsetail		SE	G5	S1
Eriocaulon aquaticum	Pipewort		SE	G5	S1
Eriophorum angustifolium	Narrow-leaved Cotton-grass		SR	G5	S2
Eriophorum gracile	Slender Cotton-grass		ST	G5	S2

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Indiana County Endangered, Threatened and Rare Species List

County: La Porte

Species Name	Common Name	FED	STATE	GRANK	SRANK
Eriophorum spissum	Dense Cotton-grass		SX	G5T5	SX
Eriophorum viridicarinatum	Green-keeled Cotton-grass		SR	G5	S2
Fragaria vesca var. americana	Woodland Strawberry		SE	G5T5	S1
Gentiana puberulenta	Downy Gentian		ST	G4G5	S2
Geranium robertianum	Herb-robert		ST	G5	S2
Hydrastis canadensis	Golden Seal		WL	G4	S3
Juncus balticus var. littoralis	Baltic Rush		SR	G5T5	S2
Juncus pelocarpus	Brown-fruited Rush		SE	G5	S2
Juncus scirpoides	Scirpus-like Rush		ST	G5	S2
Juniperus communis	Ground Juniper		SR	G5	S2
Lathyrus maritimus var. glaber	Beach Peavine		SE	G5T4T5	S1
Lathyrus venosus	Smooth Veiny Pea		ST	G5	S2
Linum striatum	Ridged Yellow Flax		WL	G5	S3
Lonicera canadensis	American Fly-honeysuckle		SX	G5	SX
Luzula acuminata	Hairy Woodrush		SE	G5	S1
Lycopodiella inundata	Northern Bog Clubmoss		SE	G5	S1
Lycopodium hickeyi	Hickey's Clubmoss		SR	G5	S2
Lycopodium obscurum	Tree Clubmoss		SR	G5	S2
Lycopodium tristachyum	Deep-root Clubmoss		SR	G5	S2
Malaxis unifolia	Green Adder's-mouth		SE	G5	S1
Matteuccia struthiopteris	Ostrich Fern		SR	G5	S2
Melampyrum lineare	American Cow-wheat		SR	G5	S2
Milium effusum	Tall Millet-grass		SR	G5	S2
Myosotis laxa	Smaller Forget-me-not		ST	G5	S1
Myriophyllum pinnatum	Cutleaf Water-milfoil		SE	G5	S1
Najas gracillima	Thread-like Naiad		ST	G5?	S1
Oenothera perennis	Small Sundrops		SR	G5	S2
Oryzopsis asperifolia	White-grained Mountain-ricegrass		SE	G5	S1
Oryzopsis pungens	Slender Mountain-ricegrass		SX	G5	SX
Panax trifolius	Dwarf Ginseng		WL	G5	S2
Panicum boreale	Northern Witchgrass		SR	G5	S2
Panicum leibergii	Leiberg's Witchgrass		ST	G5	S2
Panicum verrucosum	Warty Panic-grass		ST	G4	S2
Pinus banksiana	Jack Pine		SR	G5	S2
Pinus strobus	Eastern White Pine		SR	G5	S2
Platanthera ciliaris	Yellow-fringe Orchis		SE	G5	S1
Platanthera hyperborea	Leafy Northern Green Orchis		ST	G5	S2
Platanthera leucophaea	Prairie White-fringed Orchid	LT	SE	G3	S1
Platanthera psycodes	Small Purple-fringe Orchis		SR	G5	S2
Poa alsodes	Grove Meadow Grass		SR	G4G5	S2
Poa paludigena	Bog Bluegrass		WL	G3	S3
Polygonella articulata	Eastern Jointweed		SR	G5	S2
Polygonum careyi	Carey's Smartweed		ST	G4	S2
Polygonum cilinode	Fringed Black Bindweed		SE	G5	S1
Polytaenia nuttallii	Prairie Parsley		SE	G5	S1
Potamogeton epihydrus	Nuttall Pondweed		SE	G5	S1
Potamogeton friesii	Fries' Pondweed		ST	G4	S1
Potamogeton praelongus	White-stem Pondweed		ST	G5	S1
Potamogeton pulcher	Spotted Pondweed		SE	G5	S1
Potamogeton pusillus	Slender Pondweed		WL	G5	S2
Potamogeton robbinsii	Flatleaf Pondweed		SR	G5	S2
Potamogeton strictifolius	Straight-leaf Pondweed		ST	G5	S1
Potamogeton vaseyi	Vasey's Pondweed		SE	G4	S1
Potentilla anserina	Silverweed		ST	G5	S2
Prenanthes aspera	Rough Rattlesnake-root		SR	G4?	S2

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	SRANK:	State Heritage Rank: S1 = critically imperiled in state; S2 = imperiled in state; S3 = rare or uncommon in state; G4 = widespread and abundant in state but with long term concern; SG = state significant; SH = historical in state; SX = state extirpated; B = breeding status; S? = unranked; SNR = unranked; SNA = nonbreeding status unranked

Indiana County Endangered, Threatened and Rare Species List

County:   La Porte

Species Name	Common Name	FED	STATE	GRANK	SRANK
Prunus pensylvanica	Fire Cherry		SR	G5	S2
Psilocarya scirpoides	Long-beaked Baldrush		ST	G4	S2
Pyrola rotundifolia var. americana	American Wintergreen		SR	G5	S2
Pyrola secunda	One-sided Wintergreen		SX	G5	SX
Rhynchospora recognita	Globe Beaked-rush		SE	G5?	S1
Rubus alumnus	A Bramble		SX	G5	SX
Satureja glabella var. angustifolia	Calamint		SE	G5	S1
Scheuchzeria palustris ssp. americana	American Scheuchzeria		SE	G5T5	S1
Silene regia	Royal Catchfly		ST	G3	S2
Sisyrinchium montanum	Strict Blue-eyed-grass		SE	G5	S1
Solidago simplex var. gillmanii	Sticky Goldenrod		ST	G5T3?	S2
Sorbus decora	Northern Mountain-ash		SX	G4G5	SX
Sparganium androcladum	Branching Bur-reed		ST	G4G5	S2
Spiranthes lucida	Shining Ladies'-tresses		SR	G5	S2
Stipa avenacea	Blackseed Needlegrass		SR	G5	S2
Styrax americanus	American Snowbell		WL	G5	S3
Tofieldia glutinosa	False Asphodel		SR	G5	S2
Triglochin palustris	Marsh Arrow-grass		SR	G5	S2
Utricularia geminiscapa	Hidden-fruited Bladderwort		SE	G4G5	S1
Utricularia minor	Lesser Bladderwort		ST	G5	S1
Utricularia purpurea	Purple Bladderwort		SR	G5	S2
Utricularia subulata	Zigzag Bladderwort		ST	G5	S2
Vaccinium oxycoccos	Small Cranberry		ST	G5	S2
Valeriana edulis	Hairy Valerian		SE	G5	S1
Valeriana uliginosa	Marsh Valerian		SE	G4Q	S1
Valerianella chenopodiifolia	Goose-foot Corn-salad		SE	G5	S1
Wolffiella gladiata	Sword Bogmat		SE	G5	S1
Xyris difformis	Carolina Yellow-eyed Grass		ST	G5	S2
Zigadenus elegans var. glaucus	White Camas		SR	G5T4T5	S2
<b>High Quality Natural Community</b>					
Forest - flatwoods boreal	Boreal Flatwoods		SG	G2?	S2
Forest - floodplain wet-mesic	Wet-mesic Floodplain Forest		SG	G3?	S3
Forest - upland dry	Dry Upland Forest		SG	G4	S4
Forest - upland dry-mesic	Dry-mesic Upland Forest		SG	G4	S4
Forest - upland mesic	Mesic Upland Forest		SG	G3?	S3
Lake - lake	Lake		SG	GNR	S2
Prairie - dry-mesic	Dry-mesic Prairie		SG	G3	S2
Prairie - mesic	Mesic Prairie		SG	G2	S2
Prairie - sand dry	Dry Sand Prairie		SG	G3	S2
Prairie - sand dry-mesic	Dry-mesic Sand Prairie		SG	G3	S3
Prairie - sand wet-mesic	Wet-mesic Sand Prairie		SG	G1?	S2
Prairie - wet	Wet Prairie		SG	G3	S1
Wetland - bog acid	Acid Bog		SG	G3	S2
Wetland - bog circumneutral	Circumneutral Bog		SG	G3	S3
Wetland - fen	Fen		SG	G3	S3
Wetland - fen forested	Forested Fen		SG	G3	S1
Wetland - marsh	Marsh		SG	GU	S4
Wetland - meadow sedge	Sedge Meadow		SG	G3?	S1
Wetland - seep circumneutral	Circumneutral Seep		SG	GU	S1
Wetland - swamp shrub	Shrub Swamp		SG	GU	S2

Indiana County Endangered, Threatened and Rare Species List

County: St. Joseph

Species Name	Common Name	FED	STATE	GRANK	SRANK
<b>Mollusk: Gastropoda</b>					
Campeloma decisum	Pointed Campeloma		SSC	G5	S2
Lymnaea stagnalis	Swamp Lymnaea		SSC	G5	S2
<b>Insect: Odonata (Dragonflies &amp; Damselflies)</b>					
Sympetrum semicinctum	Band-winged Meadowhawk		SR	G5	S2S3
<b>Amphibian</b>					
Ambystoma laterale	Blue-spotted Salamander		SSC	G5	S2
Rana pipiens	Northern Leopard Frog		SSC	G5	S2
<b>Reptile</b>					
Clemmys guttata	Spotted Turtle		SE	G5	S2
Clonophis kirtlandii	Kirtland's Snake		SE	G2	S2
Emydoidea blandingii	Blanding's Turtle		SE	G4	S2
Nerodia erythrogaster neglecta	Copperbelly Water Snake	PS:LT	SE	G5T2T3	S2
Sistrurus catenatus catenatus	Eastern Massasauga	C	SE	G3G4T3T4	S2
<b>Bird</b>					
Accipiter striatus	Sharp-shinned Hawk	No Status	SSC	G5	S2B
Ammodramus henslowii	Henslow's Sparrow		SE	G4	S3B
Ardea herodias	Great Blue Heron			G5	S4B
Bartramia longicauda	Upland Sandpiper		SE	G5	S3B
Botaurus lentiginosus	American Bittern		SE	G4	S2B
Buteo platypterus	Broad-winged Hawk	No Status	SSC	G5	S3B
Certhia americana	Brown Creeper			G5	S2B
Chlidonias niger	Black Tern		SE	G4	S1B
Cistothorus palustris	Marsh Wren		SE	G5	S3B
Cistothorus platensis	Sedge Wren		SE	G5	S3B
Dendroica cerulea	Cerulean Warbler		SSC	G4	S3B
Dendroica virens	Black-throated Green Warbler			G5	S2B
Empidonax alnorum	Alder Flycatcher			G5	S2B
Falco peregrinus	Peregrine Falcon	No Status	SE	G4	S2B
Grus canadensis	Sandhill Crane	No Status	SSC	G5	S2B,S1N
Ixobrychus exilis	Least Bittern		SE	G5	S3B
Lanius ludovicianus	Loggerhead Shrike	No Status	SE	G4	S3B
Lophodytes cucullatus	Hooded Merganser			G5	S2S3B
Mniotilta varia	Black-and-white Warbler		SSC	G5	S1S2B
Pandion haliaetus	Osprey		SE	G5	S1B
Rallus limicola	Virginia Rail		SE	G5	S3B
Vermivora chrysoptera	Golden-winged Warbler		SE	G4	S1B
Wilsonia citrina	Hooded Warbler		SSC	G5	S3B
<b>Mammal</b>					
Lutra canadensis	Northern River Otter			G5	S2
Lynx rufus	Bobcat	No Status		G5	S1
Myotis sodalis	Indiana Bat or Social Myotis	LE	SE	G2	S1
Spermophilus franklinii	Franklin's Ground Squirrel		SE	G5	S2
Taxidea taxus	American Badger			G5	S2
<b>Vascular Plant</b>					
Actaea rubra	Red Baneberry		SR	G5	S2
Amelanchier humilis	Running Serviceberry		SE	G5	S1
Arabis drummondii	Drummond Rockcress		SE	G5	S1
Arabis glabra	Tower-mustard		WL	G5	S2
Arabis missouriensis var. deamii	Missouri Rockcress		SE	G4G5QT3?Q	S1
Arenaria stricta	Michaux's Stitchwort		SR	G5	S2
Armoracia aquatica	Lake Cress		SE	G4?	S1
Botrychium matricariifolium	Chamomile Grape-fern		SR	G5	S2
Carex alopecoidea	Foxtail Sedge		SE	G5	S1
Carex atherodes	Awned Sedge		SE	G5	S1

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Division of Nature Preserves	State:	SE = state endangered; ST = state threatened; SR = state rare; SSC = state species of special concern;
Indiana Department of Natural Resources		SX = state extirpated; SG = state significant; WL = watch list
This data is not the result of comprehensive county surveys.	GRANK:	Global Heritage Rank: G1 = critically imperiled globally; G2 = imperiled globally; G3 = rare or uncommon globally; G4 = widespread and abundant globally but with long term concerns; G5 = widespread and abundant globally; G? = unranked; GX = extinct; Q = uncertain rank; T = taxonomic subunit rank
	SRANK:	State Heritage Rank: S1 = critically imperiled in state; S2 = imperiled in state; S3 = rare or uncommon in state; G4 = widespread and abundant in state but with long term concern; SG = state significant; SH = historical in state; SX = state extirpated; B = breeding status; S? = unranked; SNR = unranked; SNA = nonbreeding status unranked



Indiana County Endangered, Threatened and Rare Species List

County: St. Joseph

Species Name	Common Name	FED	STATE	GRANK	SRANK
Carex atlantica ssp. atlantica	Atlantic Sedge		ST	G5T4	S2
Carex bebbii	Bebb's Sedge		ST	G5	S2
Carex crawei	Crawe Sedge		ST	G5	S2
Carex debilis var. rudgei	White-edge Sedge		SR	G5T5	S2
Carex flava	Yellow Sedge		ST	G5	S2
Carex pedunculata	Longstalk Sedge		SR	G5	S2
Carex retrorsa	Retorse Sedge		SE	G5	S1
Carex scabrata	Rough Sedge		SE	G5	S1
Carex seorsa	Weak Stellate Sedge		SR	G4	S2
Carex straminea	Straw Sedge		ST	G5	S2
Ceratophyllum echinatum	Prickly Hornwort		SR	G4?	S2
Chrysosplenium americanum	American Golden-saxifrage		ST	G5	S2
Cirsium hillii	Hill's Thistle		SE	G3	S1
Cypripedium candidum	Small White Lady's-slipper		WL	G4	S2
Deschampsia cespitosa	Tufted Hairgrass		SR	G5	S2
Diervilla lonicera	Northern Bush-honeysuckle		SR	G5	S2
Drosera intermedia	Spoon-leaved Sundew		SR	G5	S2
Eleocharis melanocarpa	Black-fruited Spike-rush		ST	G4	S2
Eleocharis robbinsii	Robbins Spikerush		SR	G4G5	S2
Eriocaulon aquaticum	Pipewort		SE	G5	S1
Eriophorum angustifolium	Narrow-leaved Cotton-grass		SR	G5	S2
Fuirena pumila	Dwarf Umbrella-sedge		ST	G4	S2
Geranium robertianum	Herb-robert		ST	G5	S2
Gnaphalium macounii	Winged Cudweed		SX	G5	SX
Juglans cinerea	Butternut		WL	G3G4	S3
Juncus militaris	Bayonet Rush		SE	G4	S1
Juncus pelocarpus	Brown-fruited Rush		SE	G5	S2
Lathyrus maritimus var. glaber	Beach Peavine		SE	G5T4T5	S1
Lathyrus venosus	Smooth Veiny Pea		ST	G5	S2
Linum sulcatum	Grooved Yellow Flax		SR	G5	S2
Ludwigia sphaerocarpa	Globe-fruited False-loosestrife		SE	G5	S1
Lycopodium hickeyi	Hickey's Clubmoss		SR	G5	S2
Lycopodium obscurum	Tree Clubmoss		SR	G5	S2
Matteuccia struthiopteris	Ostrich Fern		SR	G5	S2
Myriophyllum pinnatum	Cutleaf Water-milfoil		SE	G5	S1
Oryzopsis racemosa	Black-fruit Mountain-ricegrass		SR	G5	S2
Panax trifolius	Dwarf Ginseng		WL	G5	S2
Panicum columbianum	Hemlock Panic-grass		SR	G5	S2
Panicum commonsianum var. addisonii	Commons' Panic-grass		SE	G5T5	S2
Panicum verrucosum	Warty Panic-grass		ST	G4	S2
Pinus strobus	Eastern White Pine		SR	G5	S2
Platanthera dilatata	Leafy White Orchis		SE	G5	S1
Platanthera leucophaea	Prairie White-fringed Orchid	LT	SE	G3	S1
Poa alsodes	Grove Meadow Grass		SR	G4G5	S2
Poa paludigena	Bog Bluegrass		WL	G3	S3
Polygonum hydropiperoides var. opelousanum	Northeastern Smartweed		ST	G5TNRQ	S2
Polygonum hydropiperoides var. setaceum	Swamp Smartweed		SE	G5	S1
Populus balsamifera	Balsam Poplar		SX	G5	SX
Potamogeton bicupulatus	Snail-seed Pondweed		SE	G4	S1
Psilocarya scirpoides	Long-beaked Baldrush		ST	G4	S2
Pyrola virens	Greenish-flowered Wintergreen		SX	G5	SX
Rhynchospora macrostachya	Tall Beaked-rush		SR	G4	S2
Rubus enslenii	Southern Dewberry		SE	G4G5Q	S1
Rubus setosus	Small Bristleberry		SE	G5	S1
Salix serissima	Autumn Willow		ST	G4	S2

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	SRANK:	State Heritage Rank: S1 = critically imperiled in state; S2 = imperiled in state; S3 = rare or uncommon in state; G4 = widespread and abundant in state but with long term concern; SG = state significant; SH = historical in state; SX = state extirpated; B = breeding status; S? = unranked; SNR = unranked; SNA = nonbreeding status unranked

Indiana County Endangered, Threatened and Rare Species List

County: St. Joseph

Species Name	Common Name	FED	STATE	GRANK	SRANK
Scheuchzeria palustris ssp. americana	American Scheuchzeria		SE	G5T5	S1
Scirpus smithii	Smith's Bulrush		SE	G5?	S1
Scirpus subterminalis	Water Bulrush		SR	G4G5	S2
Selaginella apoda	Meadow Spike-moss		WL	G5	S1
Silene regia	Royal Catchfly		ST	G3	S2
Sorbus decora	Northern Mountain-ash		SX	G4G5	SX
Sparganium androcladum	Branching Bur-reed		ST	G4G5	S2
Stipa avenacea	Blackseed Needlegrass		SR	G5	S2
Strophostyles leiosperma	Slick-seed Wild-bean		ST	G5	S2
Tofieldia glutinosa	False Asphodel		SR	G5	S2
Triglochin palustris	Marsh Arrow-grass		SR	G5	S2
Utricularia cornuta	Horned Bladderwort		ST	G5	S2
Utricularia purpurea	Purple Bladderwort		SR	G5	S2
Vaccinium oxycoccos	Small Cranberry		ST	G5	S2
Valeriana uliginosa	Marsh Valerian		SE	G4Q	S1
Valerianella chenopodiifolia	Goose-foot Corn-salad		SE	G5	S1
Viburnum cassinoides	Northern Wild-raisin		SE	G5T5	S1
Viola primulifolia	Primrose-leaf Violet		ST	G5	S2
Xyris difformis	Carolina Yellow-eyed Grass		ST	G5	S2
<b>High Quality Natural Community</b>					
Forest - floodplain wet-mesic	Wet-mesic Floodplain Forest		SG	G3?	S3
Forest - upland dry-mesic	Dry-mesic Upland Forest		SG	G4	S4
Forest - upland mesic	Mesic Upland Forest		SG	G3?	S3
Lake - pond	Pond		SG	GNR	SNR
Prairie - wet	Wet Prairie		SG	G3	S1
Wetland - bog acid	Acid Bog		SG	G3	S2
Wetland - fen	Fen		SG	G3	S3
Wetland - flat muck	Muck Flat		SG	G2	S2
Wetland - marsh	Marsh		SG	GU	S4
Wetland - meadow sedge	Sedge Meadow		SG	G3?	S1
Wetland - swamp forest	Forested Swamp		SG	G2?	S2
Wetland - swamp shrub	Shrub Swamp		SG	GU	S2

## **APPENDIX B**

### **Galena River General Water Chemistry and Nutrient Measurements**

## Galena River Watershed General Chemistry and Nutrients Measurements

(Table taken from: Prast, J. and M. AK. 2009. Water Quality Assessment for *Escherichia coli* (*E. coli*) Bacteria in the Galena River Watershed. Indiana Department of Environmental Management, Assessment Branch).

<b>Galena River Site #1 LMG100-0010</b>	9/16/08 AA54766	9/23/08 AA54777	9/30/08 AA54788	10/07/08 AA54799	10/14/08 AA54810
Hardness mg/L	NA	234	274	273	265
T. Solids mg/L	288.0	351	413	434	432
S. Solids mg/L	8.0	<4.0	5.0	7.0	<4.0
D Solids mg/L	280.0	333	397	404	400
Alkalinity mg/L	132.0	199	231	255	247
Nitrogen- Ammonia mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
TKN mg/L	0.6	0.4	0.4	0.5	0.5
Nitrogen- Nitrate+ Nitrite mg/L	0.2	<0.1	<0.1	<0.1	<0.1
T Phosphorus mg/L	0.04	<0.03	<0.03	<0.03	<0.03
Sulfate mg/L	30	35	39	41	44
Chloride mg/L	28	41	47	49	49

<b>Galena River East Site #2 LMG100-0008</b>	9/16/08 AA54769	9/23/08 AA54779	9/30/08 AA54790	10/07/08 AA54801	10/14/08 AA54811
Hardness mg/L	NA	176	235	209	214
T. Solids mg/L	235	249	309	267	293
S. Solids mg/L	6.0	8.0	4.0	4.0	<4.0
D Solids mg/L	216	224	298	251	273
Alkalinity mg/L	124	132	206	174	191
Nitrogen- Ammonia mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
TKN mg/L	0.7	0.5	0.4	0.5	0.5
Nitrogen- Nitrate+ Nitrite mg/L	0.1	<0.1	0.1	<0.1	<0.1
T Phosphorus mg/L	<0.03	<0.03	<0.03	<0.03	<0.03
Sulfate mg/L	30	33	28	30	30
Chloride mg/L	18	20	17	20	19

**Table 2. (Continued)**

<b>Galena River Site #3 LMG100-0012</b>	9/16/08 AA54770	9/23/08 AA54780	9/30/08 AA54791	10/07/08 AA54802	10/14/08 AA54814
Hardness mg/L	NA	387.0	306.0	317.0	372.0
T. Solids mg/L	402.0	499.0	485.0	454.0	492.0
S. Solids mg/L	19.0	17.0	10.0	6.0	8.0
D Solids mg/L	361.0	473.0	445.0	420.0	449.0
Alkalinity mg/L	153.0	218.0	222.0	230.0	234.0
Nitrogen- Ammonia mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
TKN mg/L	1.0	0.8	0.5	0.5	0.5
Nitrogen- Nitrate+ Nitrite mg/L	0.8	0.6	0.4	0.4	0.5
T Phosphorus mg/L	0.04	<0.03	<0.03	<0.03	<0.03
Sulfate mg/L	90	114.0	82.0	91.0	105.0
Chloride mg/L	22	26.0	34.0	32.0	32.0

<b>Galena River Site #4 LMG100-0013</b>	9/16/08 AA54771	9/23/08 AA54781	9/30/08 AA54792	10/07/08 AA54803	10/14/08 AA54815
Hardness mg/L	NA	374.0	315.0	325.0	304.0
T. Solids mg/L	390.0	480.0	458.0	445.0	347.0
S. Solids mg/L	16.0	6.0	7.0	4.0	<4.0
D Solids mg/L	351.0	457.0	458.0	412.0	322.0
Alkalinity mg/L	145.0	227.0	223.0	236.0	251.0
Nitrogen- Ammonia mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
TKN mg/L	1.2	0.7	0.4	0.4	0.3
Nitrogen- Nitrate+ Nitrite mg/L	0.8	0.4	0.3	0.3	0.2
T Phosphorus mg/L	0.05	<0.03	<0.03	<0.03	<0.03
Sulfate mg/L	76.0	112.0	92.0	89.0	28.0
Chloride mg/L	17.0	20.0	29.0	25.0	15.0

<b>Unnamed Tributary East to Galena River Site #5 LMG100-0014</b>	9/16/08 AA54772	9/23/08 AA54782	9/30/08 AA54793	10/07/08 AA54804	10/14/08 AA54816
Hardness mg/L	NA	234.0	207.0	268.0	304.0
T. Solids mg/L	201.0	288.0	314.0	336.0	347.0
S. Solids mg/L	8.0	5.0	5.0	6.0	<4.0
D Solids mg/L	188.0	265.0	300.0	315.0	322.0
Alkalinity mg/L	78.0	187.0	206.0	241.0	251.0
Nitrogen- Ammonia mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
TKN mg/L	0.7	0.4	0.4	0.5	0.3
Nitrogen- Nitrate+ Nitrite mg/L	<0.1	0.2	0.2	0.3	0.2
T Phosphorus mg/L	0.04	<0.03	<0.03	<0.03	<0.03
Sulfate mg/L	12.0	19.0	25.0	27.0	28.0
Chloride mg/L	46.0	21.0	22.0	17.0	15.0

**Table 2. (Continued)**

<b>Unnamed Tributary East to Galena River Site #6 LMG100-0011</b>	9/16/08 AA54773	9/23/08 AA54783	9/30/08 AA54794	10/07/08 AA54805	10/14/08 AA54817
Hardness mg/L	NA	142.0	164.0	232.0	277.0
T. Solids mg/L	199.0	230.0	258.0	320.0	354.0
S. Solids mg/L	35.0	12.0	6.0	<4.0	<4.0
D Solids mg/L	171.0	211.0	248.0	298.0	334.0
Alkalinity mg/L	44.0	111.0	134.0	206.0	236.0
Nitrogen- Ammonia mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
TKN mg/L	0.8	0.8	0.6	0.6	0.4
Nitrogen- Nitrate+ Nitrite mg/L	0.1	0.6	0.8	1.4	1.7
T Phosphorus mg/L	0.06	0.06	0.04	<0.03	<0.03
Sulfate mg/L	6.8	12.0	18.0	27.0	25.0
Chloride mg/L	50.0	32.0	38.0	28.0	23.0

<b>Galena River Site #7 LMG100-0015</b>	9/16/08 AA54774	9/23/08 AA54784	9/30/08 AA54795	10/07/08 AA54806	10/14/08 AA54818
Hardness mg/L	NA	354.0	332.0	324.0	354.0
T. Solids mg/L	349.0	443.0	450.0	427.0	445.0
S. Solids mg/L	28.0	4.0	5.0	4.0	<4.0
D Solids mg/L	339.0	429.0	440.0	401.0	412.0

Alkalinity mg/L	132.0	220.0	222.0	236.0	238.0
Nitrogen- Ammonia mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
TKN mg/L	0.9	0.4	0.4	0.3	0.4
Nitrogen- Nitrate+ Nitrite mg/L	0.6	0.4	0.4	0.3	0.3
T Phosphorus mg/L	0.05	<0.03	<0.03	<0.03	<0.03
Sulfate mg/L	65.0	100.0	89.0	76.0	88.0
Chloride mg/L	21.0	19.0	26.0	22.0	22.0

<b>Spring Creek Site # 8 LMG100-0017</b>	9/16/08 AA54775	9/23/08 AA54785	9/30/08 AA54796	10/07/08 AA54807	10/14/08 AA54819
Hardness mg/L	NA	351.0	337.0	315.0	305.0
T. Solids mg/L	254.0	403.0	411.0	410.0	411.0
S. Solids mg/L	20.0	7.0	4.0	5.0	<4.0
D Solids mg/L	222.0	373.0	400.0	388.0	380.0
Alkalinity mg/L	146.0	269.0	276.0	286.0	285.0
Nitrogen- Ammonia mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
TKN mg/L	0.7	0.3	0.2	0.5	0.3
Nitrogen- Nitrate+ Nitrite mg/L	0.1	0.2	0.2	0.2	0.2
T Phosphorus mg/L	0.06	<0.03	<0.03	<0.03	<0.03
Sulfate mg/L	19.0	34.0	34.0	32.0	33.0
Chloride mg/L	13.0	23.0	23.0	23.0	23.0

**Table 2. (Continued)**

<b>Unnamed Tributary to Spring Creek Site #9 LMG100-0009</b>	9/16/08 AA54776	9/23/08 AA54786	9/30/08 AA54797	10/07/08 AA54808	10/14/08 AA54820
Hardness mg/L	NA	276.0	312.0	319.0	352.0
T. Solids mg/L	207.0	335.0	384.0	396.0	413.0
S. Solids mg/L	16.0	4.0	4.0	4.0	<4.0
D Solids mg/L	178.0	314.0	364.0	373.0	378.0
Alkalinity mg/L	113.0	221.0	251.0	277.0	289.0
Nitrogen- Ammonia mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
TKN mg/L	0.8	0.5	0.4	0.4	0.3
Nitrogen- Nitrate+ Nitrite mg/L	0.1	0.3	0.3	0.4	0.3
T Phosphorus mg/L	0.08	0.03	<0.03	<0.03	<0.03
Sulfate mg/L	14.0	19.0	24.0	27.0	24.0
Chloride mg/L	10.0	19.0	22.0	23.0	25.0

**N/A = No sample was collected**

**For General Chemistry and Nutrient WQS and Interim Criteria see Galena River Sampling and Analysis Workplan, and Indiana Rules 327-IAC 2-1-6 and 327 IAC 2-1.5-8.**

## Galena River Watershed YSI Field Measurements

(Table taken from: Prast, J. and M. AK. 2009. Water Quality Assessment for *Escherichia coli* (*E. coli*) Bacteria in the Galena River Watershed. Indiana Department of Environmental Management, Assessment Branch.

Stream Name Site # / Lsite	Date	DO (mg/L)	% Saturation	pH (SU)	Temperature (° C)	Specific Conductance (µS/cm)	Turbidity (NTU)
Galena River #1 LMG100-0010	9/16/08	8.69	101.3	7.73	21.42	415	24.5
	9/23/08	8.5	91.8	7.75	19.27	560	4.7
	9/30/08	9.61	97.7	7.73	15.93	651	12.3
	10/07/08	10.39	101.4	7.59	14.20	358	7.9
	10/14/08	9.03	94.5	7.72	17.43	691	8.5
Galena River East #2 LMG100-0008	9/16/08	8.9	92.5	7.45	18.95	495	19.5
	9/23/08	8.08	90.0	7.95	20.92	374	7.1
	9/30/08	9.87	100.4	7.75	15.60	490	5.0
	10/07/08	10.73	105.1	7.71	14.56	427	7.8
	10/14/08	9.86	100.8	7.81	16.46	468	4.7
Galena River #3 LMG100-0012	9/16/08	8.38	90.4	7.46	19.31	542	21.7
	9/23/08	7.75	82.9	7.62	18.97	694	9.7
	9/30/08	9.46	94.1	7.65	14.96	692	17.3
	10/07/08	10.54	103.4	7.61	14.18	685	23.5
	10/14/08	9.72	99.1	7.72	16.26	716	13.3
Galena River #4 LMG100-0013	9/16/08	8.59	91.3	7.4	18.12	516	19.7
	9/23/08	8.81	88.0	7.66	16.26	680	13.7
	9/30/08	9.84	96.8	7.70	14.50	667	6.7
	10/07/08	11.23	106.0	7.65	12.87	664	7.9
	10/14/08	9.51	93.9	7.74	15.38	690	6.9
Unnamed Tributary East to Galena River #5 LMG100-0014	9/16/08	8.27	90.3	7.65	19.98	331	43.8
	9/23/08	8.38	84.7	7.63	17.57	456	4.8
	9/30/08	9.66	96.0	7.64	14.50	504	5.0
	10/07/08	10.33	97.0	7.62	12.99	533	18.5
	10/14/08	10.03	99.9	7.69	15.36	552	4.9
Unnamed Tributary East to Galena River #6 LMG100-0011	9/16/08	8.99	96.5	7.6	18.83	287	17.5
	9/23/08	7.87	83.5	7.47	18.16	350	14.8
	9/30/08	8.21	81.8	7.50	15.24	419	5.0
	10/07/08	9.31	95.7	7.46	13.42	513	6.5
	10/14/08	8.35	80.6	7.51	14.12	561	5.5
Galena River #7 LMG100-0015	9/16/08	9.54	94.5	7.92	17.35	389	15.9
	9/23/08	8.15	85.4	7.67	17.50	640	5.5
	9/30/08	9.44	92.9	7.72	14.60	645	9.7
	10/07/08	10.32	99.1	7.73	13.45	638	4.6
	10/14/08	10.06	101.4	7.80	15.88	662	5.9
Spring Creek #8 LMG100-0017	9/16/08	8.93	92.6	7.62	17.37	368	13.5
	9/23/08	8.27	87.8	7.65	18.25	620	4.2
	9/30/08	9.09	89.2	7.66	14.36	638	8.6



Stream Name Site # / Lsite	Date	DO (mg/L)	% Saturation	pH (SU)	Temperature (° C)	Specific Conductance (µS/cm)	Turbidity (NTU)
	10/07/08	10.58	103.9	7.57	14.10	642	5.3
	10/14/08	8.83	88.7	7.72	15.67	644	4.8
Unnamed Tributary to Spring Creek #9 LMG100-0009	9/16/08	9.47	97.9	7.81	17.24	290	16.5
	9/23/08	8.13	84.5	7.64	17.33	508	5.1
	9/30/08	9.85	94.2	7.68	13.87	578	3.4
	10/07/08	10.15	96.2	7.64	13.06	608	9.1
	10/14/08	10.39	102.9	7.71	14.86	639	3.7