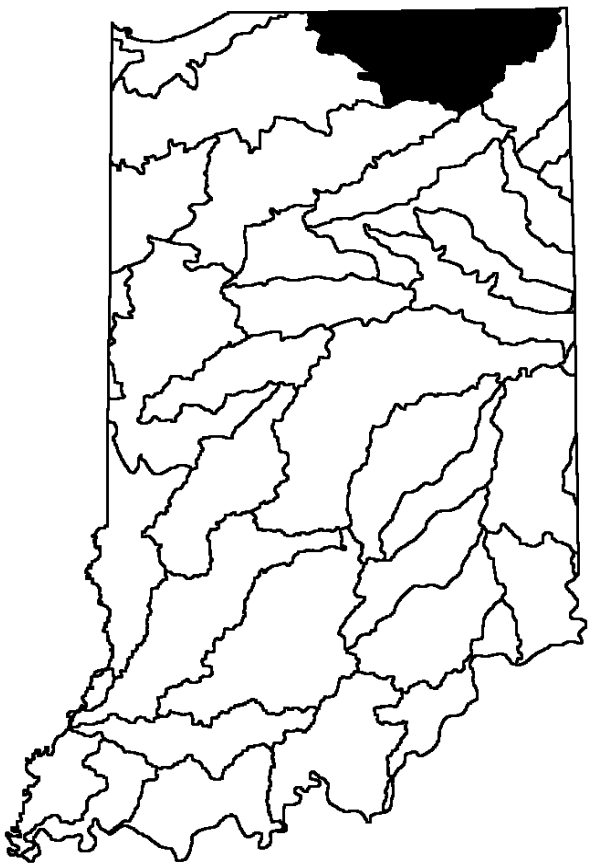
St. Joseph-Lake Michigan Watershed Restoration Action Strategy

Part I: Characterization and Responsibilities



Prepared by

Indiana Department of
Environmental Management
Office of Water Quality

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FOREWORD

The First Draft (October 1999) of the Watershed Restoration Action Strategy (WRAS) was reviewed internally by IDEM and revised accordingly. The Second Draft (March 2000) was reviewed by stakeholders and revised accordingly. This Third Draft (January 2000) is intended to be a living document to assist restoration and protection efforts of stakeholders in their sub-watersheds. As a "living document" information contained within the WRAS will need to be revised and updated periodically.

The WRAS is divided into two parts: Part I, Characterization and Responsibilities and Part II, Concerns and Recommendations.

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EXECUTIVE SUMMARY

The overall goal and purpose of Part I of the Watershed Restoration Action Strategy (WRAS) is to provide a reference point and map to assist local citizens with improving water quality. The major water quality concerns and recommended management strategies will be addressed in Part II: Concerns and Recommendations of the WRAS.

This Strategy broadly covers the entire watershed; therefore, it is intended to be an overall strategy and does not dictate management and activities at the stream site or segment level. Water quality management decisions and activities for individual portions of the watershed are most effective and efficient when managed through sub-watershed plans. However, these sub-watershed plans must also consider the impact on the watershed as a whole.

This Strategy is intended to be a fluid document in order to respond to the changing and dynamic quality of our environment. Therefore, this Strategy will require revision when updated information becomes available.

Overview of the St. Joseph-Lake Michigan Watershed

The St. Joseph-Lake Michigan Watershed is located in southwest Michigan and northeast Indiana. The river begins in Michigan's Hillsdale County at Baw Beese Lake, and flows in a northerly arc before turning south and entering Indiana. The river then flows west through Indiana before making an abrupt turn north in South Bend. It re-enters Michigan between the cities of St. Joseph and Benton Harbor. The St. Joseph River mainstem is 210 miles long, and its tributary streams total an additional 1,641 miles (Brown 1944). The river drains a watershed of 4,685 square miles: 3,000 square miles in Michigan and 1,685 square miles in Indiana. Its major tributaries are the Coldwater, Prairie, Fawn, Pigeon, Elkhart, Dowagiac, and Paw Paw rivers (MDNR 1999).

Current Status of Water Quality in the St. Joseph-Lake Michigan Watershed

Section 303(d) of the Clean Water Act requires states to identify waters that do not meet, or are not expected to meet, applicable water quality standards. The Clean Water Act Section 303(d) list for Indiana provides a basis for understanding the current status of water quality in the St. Joseph-Lake Michigan Watershed. The following waterbodies are on Indiana's 1998 Clean Water Act Section 303(d) list submitted to and approved by EPA:

Crawford Ditch/Elkhart County:	Copper, Oil
Elkhart River/Elkhart County:	Fish Consumption Advisory(FCA) for polychlorinated byphenols (PCB) and mercury; E. coli
Jimmerson Lake/Steuben County:	FCA for mercury
Juday Creek/St. Joseph County:	FCA for PCBs
Lake James/Steuben County:	FCA for mercury
Lake Shipshewana/Lagrange County:	FCA for mercury
Lake Waubee/Kosciusko County:	FCA for mercury
Lake Wawasee/Kosciusko County:	FCA for PCBs & mercury
Long Lake/Steuben County:	FCA for mercury
Marsh Lake/Steuben County:	FCA for mercury

Mather's Ditch/Elkhart County:	Low dissolved oxygen & Endrin
Olin Lake/LaGrange County:	FCA for mercury
Oliver Lake/LaGrange County :	FCA for mercury
Orland Tributary/Steuben County:	Low dissolved oxygen
Pigeon Creek/Steuben County:	FCA for PCBs & mercury
Snow Lake/Steuben County:	FCA for PCBs & mercury
St. Joseph River/Elkhart & St. Joseph County:	FCA for PCBs & mercury; E. coli

**FCA	Fish Consumption Advisory
PCB	polychlorinated byphenols

Water Quality Goal

The overall water quality goal for the St. Joseph-Lake Michigan Watershed is that all waterbodies meet the applicable water quality standards for their designated uses as determined by the State of Indiana, under the provisions of the Clean Water Act.

St. Joseph-Lake Michigan Watershed Restoration Action Strategy

Part I: Characterization and Responsibilities

1. Introduction

The Clean Water Action Plan states that "States and tribes should work with public agencies and private-sector organizations and citizens to develop, based on the initial schedule for the first two years, Watershed Restoration Action Strategies, for watersheds most in need of restoration." A WRAS is essentially a large-scale coordination plan for an eight-digit hydrologic unit watershed targeted by the Unified Watershed Assessment. In Indiana, 11 such units, including the St. Joseph–Lake Michigan watershed, were designated for restoration by the FFY 1999 Unified Watershed Assessment. Each year, the Assessment will be refined further as additional information becomes available, and targeted areas will become more specific. This will require amendments to the WRAS, which must be flexible and broad enough to accommodate change. The WRAS will also foster greater cooperation among State and Federal agencies, which should result in more effective use of personnel and resources.

The WRAS provides an opportunity to assemble, in one place, projects and monitoring that has been completed or is on going within a watershed. It also allows agencies and stakeholders to compare watershed goals and provides a guide for future work within a watershed.

The WRAS for the St. Joseph-Lake Michigan watershed contains two parts. Part I provides a characterization of water quality in the watershed and agency responsibilities. Part II provides a discussion of resource concerns and recommended strategies.

1.1 Purpose of This Document

The overall goal and purpose of the Watershed Restoration Action Strategy Part I is to provide a reference point and roadmap to assist with improving water quality. Part I is a compilation of information, facts, and local concerns in this watershed. It will serve as a reference document for watershed groups and others involved in the assessment and planning of watershed restoration activities.

Part I of the Strategy is intended to be a fluid document in order to respond to the changing and dynamic quality of our environment. Therefore, it will require revision when updated information becomes available.

1.2 Guide to the Use of This Document

Chapter 1: Introduction - This Chapter provides a non-technical description of the purpose of Part 1 of the Strategy. This Chapter also provides an overview of stakeholder groups in the St. Joseph-Lake Michigan watershed.

Chapter 2: General Watershed Description- Some of the specific topics covered in this chapter include:

An overview of the watershed
Hydrology of the watershed
A summary of land use within the watershed
Natural resources in the watershed
Population statistics
Major water uses in the watershed
Water quality classifications and standards

Chapter 3: Causes and Sources of Water Pollution - This Chapter describes a number of important causes of water quality impacts including biochemical oxygen demand (BOD), toxic substances, nutrients, E. coli bacteria and others. This Chapter also describes both point and nonpoint sources of pollution.

Chapter 4: Water Quality and Use Support Ratings - This Chapter describes the various types of water quality monitoring conducted by IDEM. It summarizes water quality in the watershed based on Office of Water Quality data, and presents a summary of use support ratings for those surface waters that have been monitored or evaluated.

Chapter 5: State and Federal Water Quality Programs - Chapter 5 summarizes the existing State and Federal point and nonpoint source pollution control programs available to address water quality problems. These programs are management tools available for addressing the priority water quality concerns and issues that are discussed in Part II of the Strategy. Chapter 5 also describes the concept of Total Maximum Daily Loads (TMDLs). TMDLs represent management strategies aimed at controlling point and nonpoint source pollutants. IDEM=s TMDL Strategy will also be discussed.

1.3 Stakeholder Groups in the Watershed

The St. Joseph-Lake Michigan watershed contains several stakeholder groups that have different missions (Appendix C). Many of these groups have a long history of conservation work in the St. Joseph-Lake Michigan watershed. The following discussions briefly describe some of the watershed groups.

Elkhart County Soil and Water Conservation District

The Elkhart County Soil and Water Conservation District has developed a Long Range Plan and Annual Work Plan. Listed below are concerns addressed in their plans.

1. Monitor surface water quality
2. Facilitate communication between ag and urban
3. Education and information on septic systems
4. Assist farmers in removing livestock from drainage ways

Kosciusko County Soil and Water Conservation District

The Kosciusko County Soil and Water Conservation District has held locally led meetings to prioritize concerns of the local people related to natural resources. Following are some of the concerns addressed through this process:

1. Loss of land to urban sprawl
2. Threats to right to farm
3. Lack of erosion control
4. Lack of water usage plan
5. Loss of fish and wildlife habitat
6. Disappearing wetlands as they relate to water quality
7. Lack of Stewardship Ethic
8. Lack of manure management

LaGrange County Soil and Water Conservation District

Through public meetings the LaGrange County Soil and Water Conservation District has developed the following list as concerns for their county:

1. Water and wind erosion
2. Erosion on development sites
3. Groundwater contamination from agriculture (chemicals and nutrients)
4. Streambank erosion
5. Animal waste
6. Lack of productive woodlands
7. Eutrophication and sedimentation

Noble County Soil and Water Conservation District

The Noble County Soil and Water Conservation District has held meetings to gather input on local concerns within the county. The results of these meetings provide direction for the District. Thirty concerns were identified. Listed below are the top seven concerns. This spring the District will be hosting a meeting to re-visit these concerns and to identify new concerns with the local citizens.

1. Groundwater Contamination
2. Poor Surface Water Quality
3. Soil Erosion on Agricultural Land
4. Streambank Stabilization
5. Lack of Woodland Management
6. Loss of Woodland
7. Manure Management

St. Joseph County Soil and Water Conservation District

The St. Joseph County Soil and Water Conservation District has conducted locally led meetings to gather the concerns of the local people on issues related to natural resources. Through these meetings the concerns have been prioritized and are listed below.

1. Zoning to protect farmland, highly productive land
2. Water quality, ground and surface water related to septic and wells
3. Urban Growth
4. Education, stewardship in natural resources, soils and drainage, conservation

St. Joseph River Basin Commission

The St. Joseph River Basin Commission (SJRBC) was organized under an act of the 1988 Indiana State Legislature. It consists of seven counties (St. Joseph, Elkhart, Kosciusko, Noble, LaGrange, Steuben, Dekalb) and was formed for the following purposes:

1. Provide a forum for discussion, study, and evaluation of water resources issues of common concern in the Basin
2. Facilitate and foster cooperative planning and coordinated management of the Basin's water and related land resources
3. Develop positions on major water source issues and serve as an advocate of the Basin's interests
4. Make recommendations on matters related to the Commission's functions and objectives, to political subdivisions in the Basin, and to other public and private agencies
5. Develop plans to improve water quality in the Basin

The Steuben County Soil and Water Conservation District

The Steuben County Soil and Water Conservation District has developed, through their Agricultural Needs Assessment Committee, a list of concerns and priorities. The following are the top nine:

1. Lack of filterstrips
2. Need more hay/CRP on sensitive land
3. Old drainage tile over burdened and broken down (installed In 1900's – 1920's)
4. Increased runoff/Erosion due to No-till and conventional till
5. Waste Management and odor (management aspects)
6. Lack of retention ponds and areas
7. Wash outs in ditches due to tile blow outs
8. Too many deer (population)
9. Nutrient, fertilizer, and herbicide management in agricultural setting

Steuben County Water Quality Committee

This committee receives technical and educational support from the Steuben County SWCD, IDNR-Division of Soil Conservation, USDA-Natural Resources Conservation Service, Purdue Cooperative Extension Service, Steuben County Surveyor, and Steuben County Plan Commission.

The mission of the committee is to review, assess, target and monitor watershed land treatment (ag and urban) necessary to achieve water quality and water management in Steuben County.

Friends of the St. Joe River Association Inc.

The Friends of the St. Joe River Association Inc. was established in April 1994 for the purpose of bringing together communities located within the St. Joseph River watershed to work together clean and restore the St. Joe River and its tributaries.

Michigan Department of Natural Resources, Fisheries Division

The Michigan Department of Natural Resources, Fisheries Division has developed an Assessment for the St. Joseph River. It is a comprehensive reference for citizens and agency personnel primarily within the Michigan area section of the watershed; however there has been an effort made to include the entire watershed throughout the assessment.

2 General Watershed Description

This Chapter provides a general description of St. Joseph-Lake Michigan and its watershed and includes the following:

Section 2.1 St. Joseph-Lake Michigan Watershed Overview
Section 2.2 Land Cover, Population, and Growth Trends
Section 2.3 Agricultural Activities in the St. Joseph-Lake Michigan Watershed
Section 2.4 Significant Natural Areas in the St. Joseph-Lake Michigan Watershed
Section 2.5 Surface Water Use Designations and Classifications
Section 2.6 US Geological Survey Water Use Information for the St. Joseph-Lake Michigan Watershed

2.1 St. Joseph-Lake Michigan Watershed Overview

The St. Joseph-Lake Michigan Watershed is an 8-digit (04050001) hydrologic unit code (HUC) watershed located in southwest Michigan and northeast Indiana. This watershed is large in size which makes describing it very difficult. The watershed can be broken down into five distinct sections. Following is a description of these five sections from the " St. Joseph River Assessment, Fisheries Division, Special Report 24." (MDNR 99).

The Headwater portion of the St. Joseph River consists of Beebe, Sand, Soap, Tekonsha, and Burnett creeks. This segment of the river is 59 miles in length and flows through the towns of Jonesville, Litchfield, Tekonsha, and Burlington. The river is small with low gradient, cool summer temperatures and moderately stable flows.

The Upper Section begins near Union City and continues 26 miles to Mendon. Along this stretch the river is medium sized and picks up drainage of the Coldwater River, and Little Portage, Nottawa and Swan Creeks.

The Middle Section begins at Mendon and flows 52 miles downstream to just beyond Elkhart. The river becomes larger and warmer and drains a major portion of the watershed. Within this section are Portage, Rocky, Pigeon, Fawn, Prairie, Elkhart, and Little Elkhart River and Christianan Creek.

The Lower section begins downstream of Elkhart and extends northwesterly for 65 miles flowing through Mishawaka, South Bend, Niles, Buchanan, Berrien Springs. The Dowagiac River in Michigan and Juday Bowman, Baugo, and Cobus Creeks in Indiana, join the river in this section.

The mouth of the St. Joseph River is the last section and consists of 8 miles. The St. Joseph River enters Lake Michigan between the cities of St. Joseph and Benton Harbor. The Paw Paw River and Hickory and Yellow Creeks join the river in this section.

Geology and Soils

The St. Joseph-Lake Michigan watershed consists of outwash sands, ice contact material (unsorted sands and gravel), coarse end moriane (sands and gravel), fine end moriane (loamy), and lake plain (lineback et al. 1983). Glacial deposits influence the way the streams and rivers are in the watershed. Outwash and fine-textured end moriane areas are sandy loam and loam type soils that are used for agriculture. The steep-slope moraines, with coarse texture, are normally forested since the land is rugged.

Most of the soils are moderately well drained or well drained. Poorly drained soils are on the fine textured ground moraine and the very poorly drained soils exist in the kettle depressions.

Climate

Mainly its latitude and Lake Michigan control the St. Joseph –Lake Michigan Watershed. The mean annual air temperature is 49° F. Precipitation is approximately 34 inches annually with a growing season of 151 days. The average extreme minimum temperature is –7.6° F. The watershed receives considerable lake effect precipitation in the fall and winter months (Albert et al. 1986).

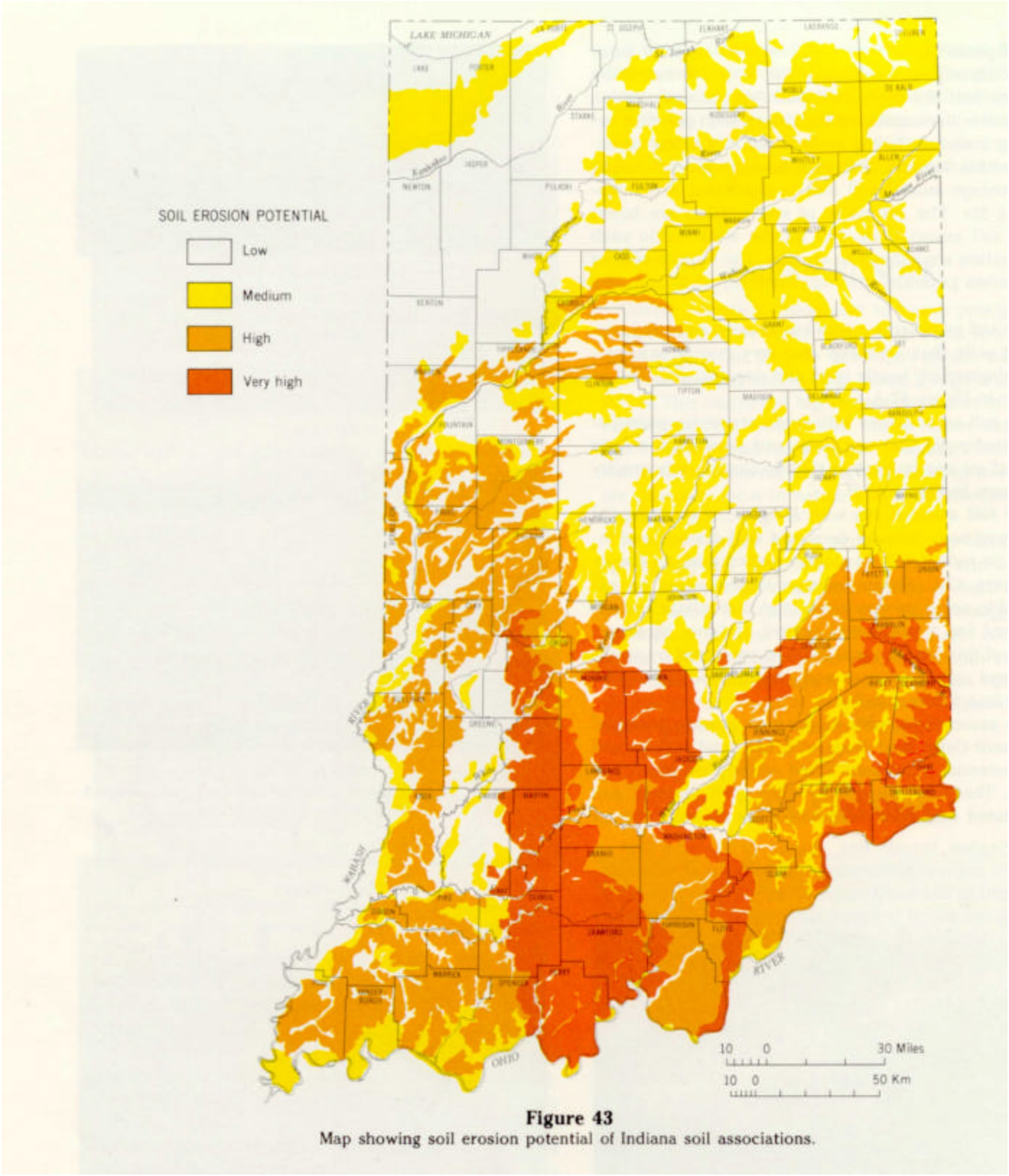


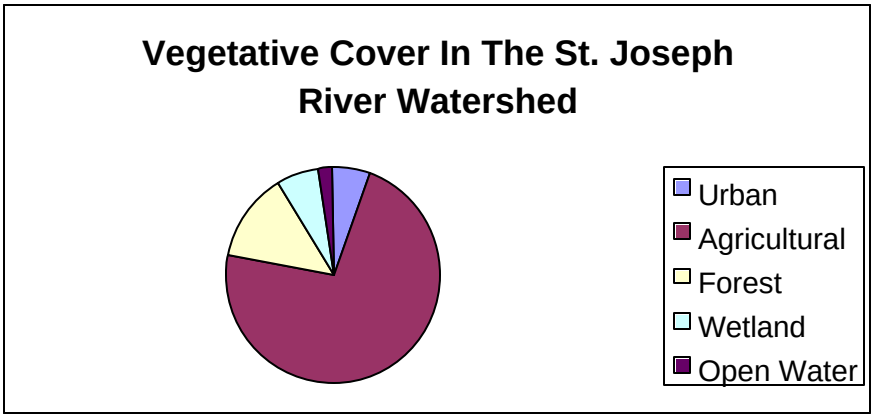
Figure 43
Map showing soil erosion potential of Indiana soil associations.

Figure 2-3 Erosion Potential *
** from The Indiana Water Resource, IDNR, 1980*

2.2 Land Cover, Population, and Growth Trends

2.2.1 General Land Cover

The U.S. Geological Survey - Biological Resources Division and the U.S. Fish and Wildlife Service are overseeing the National Gap Analysis Program (GAP). In Indiana, Indiana State University and Indiana University are carrying out the Indiana GAP Project which involves an analysis of current vegetative land cover through remote sensing (ISU 1999). This analysis provides vegetative land cover data in 30 by 30-meter grids (Figure 2-4). The following is a summary of vegetative cover in the watershed determined from the GAP image:



2.2.2 Population

The 1990 total population in the seven counties that have land portions in the watershed was 589,700 (IBRC 1993). Table 2-1 shows a break down of population by county and estimated population projections. It should be noted that these numbers do not reflect the actual population living in the St. Joseph-Lake Michigan watershed. A better estimate of the population within the St. Joseph-Lake Michigan watershed may be the 1990 and 1995 U.S. Geological Survey Water Use Reports, which show a total population in the watershed of 455,710 in 1990 and 494,440 in 1995 (Table 2-6). These reports indicate that the population in the watershed appears to have grown by about 7.8 percent between 1990 and 1995.

The U.S. Census and the Indiana Business Research Center also provide information about the population in cities and towns. Table 2-2 contains population estimates for various cities and towns located wholly within the watershed.

TABLE 2-1
St. Joseph-Lake Michigan COUNTY POPULATION PROJECTIONS 1990-2020*

County	1990	2000	2010	2020	Percent Change (1990 to 2020)
Dekalb	35,300	37,100	39,000	40,400	14.4
Elkhart	156,200	169,600	178,400	184,800	18.3
Kosciusko	65,300	70,300	74,600	78,300	19.9
Lagrange	29,500	33,800	38,400	43,400	47.1
Noble	37,900	40,200	42,300	44,100	16.4
St. Joseph	247,100	254,500	258,300	260,100	5.3
Steuben	27,400	28,900	29,400	29,300	6.9

* IBRC 1993

TABLE 2-2
St. Joseph-Lake Michigan CITY AND TOWN POPULATION ESTIMATES*

City/Town	Census 1990	Estimate 1996	Percent Change (1990 to 1996)
Albion	1,823	1,949	6.9
Angola	5,851	8,248	41.0
Cromwell	520	537	3.3
Elkhart	44,661	44,224	-1.0
Fremont	1,407	1,509	7.2
Goshen	23,794	24,930	4.8
Hudson	442	452	2.3
Indian Village	142	141	-0.7
Kendallville	7,773	8,754	12.6
LaGrange	2,382	2,470	3.7
Ligonier	3,443	3,636	5.6
Middelbury	2,004	2,277	13.6
Milford	1,388	1,500	8.1
Millersburg	854	957	12.1
Mishawaka	42,635	45,045	5.7
Nappanee	5,474	5,812	6.2
Orland	361	376	4.2
Osceola	1,999	1,980	-1.0
Roseland	706	800	13.3
Shipshewana	524	509	-2.9
Syracuse	2,729	2,938	7.7
Topeka	912	999	9.5
Wakarusa	1,667	1,810	8.6
Wolcottville	879	955	8.6

* IBRC 1997

2.3 Agricultural Activities in the St. Joseph-Lake Michigan Watershed

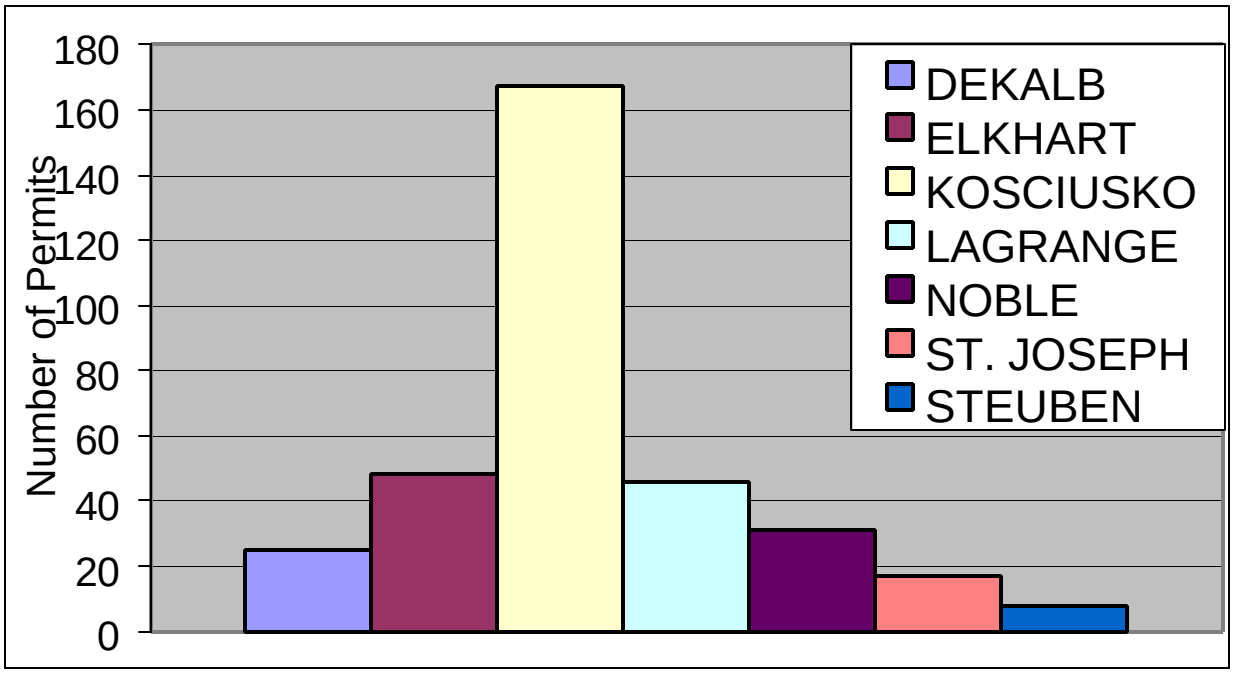
Agriculture is the dominant land use in the St. Joseph-Lake Michigan Watershed. Section 2.2.1 shows that 72.52 percent of land cover in the watershed is agricultural vegetation. This section provides an overview of the agricultural activities in the watershed.

2.3.1 Livestock Operations

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. Livestock markets and sale barns are generally excluded (IDEM 1999).

Indiana law defines a confined feeding operation as any livestock operation engaged in the confined feeding of at least 300 cattle, or 600 swine or sheep, or 30,000 fowl, such as chickens, ducks and other poultry. The IDEM regulates these confined feeding operations, as well as smaller livestock operations which have violated water pollution rules or laws, under IC 13-18-10.

As of October 1999, there were 342 livestock producers operating under the Confined Feeding Rules in the seven counties of the watershed (IDEM 1999).



2.3.2 Crop Production

As discussed previously, the soils of the St. Joseph-Lake Michigan watershed are good for crop production. Table 2-4 lists the 1997 acres of the major crops produced in 1997 throughout the seven counties in the watershed. Soybeans and corn for grain are clearly the primary crops produced in the watershed on basis of total acres.

TABLE 2-3
LIVESTOCK IN THE St. Joseph-Lake Michigan WATERSHED

	1997 Livestock Inventory*							
	Hogs and pigs		Cattle and calves		Ducks, geese, and other poultry		Layers, 20 weeks and older	
County	Number	State Rank**	Number	State Rank**	Number	State Rank**	Number	State Rank**
Dekalb	18,355	60	8,500	49	@	@	382	59
Elkhart	73,951	16	45,200	1	278,686	2	77,185	23
Kosciusko	@	@	26,400	5	552,118	1	2,461,526	3
LaGrange	69,338	20	40,300	2	173,859	3	258,050	15
Noble	43,481	33	18,000	14	D	4	@	@
St. Joseph	27,430	46	6,800	60	2,152	9	D	13
Steuben	6,859	76	10,200	39	276	27	262	67

* USDA-NASS 1997

@ indicates species is not in the top 4 for this county

** State Rank is out of a total of 92 counties in Indiana

(D) Numbers not disclosed by USDA-NASS

TABLE 2-4
CROPS PRODUCED IN THE St. Joseph-Lake Michigan WATERSHED

	1997 Crops*							
	Corn for grain		Soybeans for beans		Wheat		Hay crops	
County	Acres	State Rank**	Acres	State Rank**	Acres	State Rank**	Acres	State Rank**
Dekalb	39,500	63	51,300	49	12,100	8	6,500	38
Elkhart	65,700	46	44,500	56	4,500	60	18,800	3
Kosciusko	96,600	11	76,400	22	7,900	25	11,900	12
LaGrange	63,800	54	33,300	65	4,900	62	22,000	4
Noble	61,400	37	50,000	42	7,000	31	11,300	23
St. Joseph	74,000	31	49,200	53	4,100	58	5,900	44
Steuben	35,000	68	25,600	69	5,100	57	10,700	27

* USDA-NASS 1997

** State Rank is out of a total of 92 counties in Indiana

2.4 Significant Natural Areas in the St. Joseph-Lake Michigan Watershed

In 1993, the Indiana Natural Resources Commission (NRC) adopted its “Outstanding Rivers” List for Indiana. This listing is referenced in the standards for utility line crossings within floodways, formerly governed by IC 14-28-2 and now controlled by 310 IAC 6-1-16 through 310 IAC 6-1-18. Except where incorporated into a statute or rule, the "Outstanding Rivers List" is intended to provide guidance rather than to have regulatory application (NRC 1997). To help identify the rivers and streams which have particular environmental or aesthetic interest, a special listing has been prepared by IDNR=s Division of Outdoor Recreation. This listing is a corrected and condensed version of a list compiled by American Rivers and dated October 1990. The NRC has adopted the IDNR listing as an official recognition of the resource values of these waters. A river included in the "Outstanding Rivers List" qualifies under one or more of 22 categories. Table 2-5 presents the rivers in the St. Joseph-Lake Michigan watershed which are on the "Outstanding Rivers List" and their significance.

TABLE 2-5
Waters Of The St. Joseph-Lake Michigan Watershed On The Outstanding Rivers List For Indiana*

River Segment	County	Significance
Elkhart River: S.R 13 to Island Park in Elkhart	Elkhart, Noble	Canoe Trails. State-designated canoe/boating routes.
Elkhart River: C.R. 100 N to U.S. 6	Noble	Rivers identified in State Inventories Assessments. Outstanding rivers from state inventories or assessments, i.e. rivers identified as having state wide or greater significance. State Heritage Program Sites. Rivers identified by state natural heritage programs or similar state programs as having outstanding ecological importance. Canoe Trails. State Designated canoe/boating routes. State Study Rivers. Rivers that have been formally proposed for state protection or designation.
Fawn River: Nevada Mills to Indiana/Michigan line and	LaGrange, Steuben	State Heritage Program Sites. Rivers identified by state natural heritage programs or similar state programs as having outstanding ecological importance. Canoe Trails. State-designated canoe/boating routes.
Pigeon: S.R. 327 to Indiana/Michigan line.	LaGrange	State Heritage Program Sites. Rivers identified by state natural heritage programs or similar state programs as having outstanding ecological importance. Canoe Trails. State-designated canoe/boating routes.

*NRC 1997

2.5 Surface Water Use Designations and Classifications

The following uses are designated by the Indiana Water Pollution Control Board (327 IAC 2-1-3):

- Surface waters of the state are designated for full-body contact recreation during the recreational season (April through October).
- All waters, except limited use waters, will be capable of supporting a well-balanced, warm water aquatic community.
- All waters, which are used for public or industrial water supply, must meet the standards for those uses at the point where water is withdrawn.
- All waters, which are used for agricultural purposes, must meet minimum surface water quality standards.
- All waters in which naturally poor physical characteristics (including lack of sufficient flow), naturally poor or reversible man-induced conditions, which came into existence prior to January 1, 1983, and having been established by use attainability analysis, public comment period, and hearing may qualify to be classified for limited use and must be evaluated for restoration and upgrading at each triennial review of this rule.
- All waters, which provide unusual aquatic habitat, which are an integral feature of an area of exceptional natural beauty or character, or which support unique assemblages of aquatic organisms may be classified for exceptional use.

All waters of the state, at all times and at all places, including the mixing zone, shall meet the minimum conditions of being free from substances, materials, floating debris, oil, or scum attributable to municipal, industrial, agricultural, and other land use practices, or other discharges:

- that will settle to form putrescent or otherwise objectionable deposits,
- that are in amounts sufficient to be unsightly or deleterious,
- that produce color, visible oil sheen, odor, or other conditions in such degree as to create a nuisance,
- which are in amounts sufficient to be acutely toxic to, or to otherwise severely injure or kill aquatic life, other animals, plants, or humans, or
- which are in concentrations or combinations that will cause or contribute to the growth of aquatic plants or algae to such degree as to create a nuisance, be unsightly, or otherwise impair designated uses.

2.6 US Geological Survey Water Use Information for the St. Joseph-Lake Michigan Watershed

The U.S. Geological Survey=s (USGS) National Water-Use Information Program is responsible for compiling and disseminating the nation=s water-use data. The USGS works in cooperation with local, State, and Federal environmental agencies to collect water-use information at a site-specific level. USGS also compiles the data from hundreds of thousands of sites to produce water-use information aggregated up to the county, state, and national levels. Every five years, data at the state and hydrologic region level are compiled into a national water-use data system. Table 2-6 shows the USGS Water-Use information for the St. Joseph-Lake Michigan Watershed for 1990 and 1995.

TABLE 2-6
1990 & 1995 Water Use Information for the St. Joseph-Lake Michigan Watershed

Population and Water Use totals	1990	1995
Total population in the watershed (thousands)	455.71	494.44
Public Water Supply	**1990**	**1995**
Population served by public groundwater supply (thousands)	262.19	281.7
Population served by surface water supply (thousands)	0.6	1.1
Total population served by public water supply (thousands)	262.79	282.8
Total groundwater withdrawals (mgd)	42.35	50.1
Total surface water withdrawals (mgd)	0	0
Total water withdrawals (mgd)	42.35	50.1
Total per capita withdrawal (gal/day)	161.16	177.16
Population self-supplied with water (thousands)	192.92	211.64
Commercial Water Use	**1990**	**1995**
Groundwater withdrawal for commercial use (mgd)	5.53	9.57
Surface water withdrawal for commercial use (mgd)	19.75	25.07
Deliveries from public water supplies for commercial use (mgd)	3.63	4.51
Total commercial water use (mgd)	28.91	39.15
Industrial Water Use	**1990**	**1995**
Groundwater withdrawal for industrial use (mgd)	11.89	14.2
Surface water withdrawals for industrial use (mgd)	5.41	6.88
Deliveries from public water suppliers for industrial use (mgd)	10.66	13.08
Total industrial water use (mgd)	27.96	34.16
Agricultural Water Use	**1990**	**1995**
Groundwater withdrawals for livestock use (mgd)	1.44	1.86
Surface water withdrawals for livestock use (mgd)	1.42	2.13
Total livestock water use (mgd)	2.86	3.99
Groundwater withdrawals for irrigation (mgd)	7.25	15.53
Surface water withdrawals for irrigation (mgd)	2.54	4.2
Total irrigation water use (mgd)	9.79	19.73
Mining Use	**1990**	**1995**
Groundwater withdrawals	0.9	4.04
Surface water withdrawals	1.85	1.92
Total withdrawals (mgd)	2.75	5.96

Notes:
mgd million gallon per day
gal/day gallon per day

The water-use information presented in this table was compiled from information provided in the U.S. Geological Survey's National Water-Use Information Program data system for 1990 and 1995. The National Water-Use Information Program is responsible for compiling and disseminating the nation's water-use data. The U.S. Geological Survey works in cooperation with local, State, and Federal environmental agencies to collect water-use information at a site-specific level. Every five years, the U.S. Geological Survey compiles data at the state and hydrologic region level into a national water-use data system and are published in a national circular.

3 Causes and Sources of Water Pollution

A number of substances including nutrients, bacteria, oxygen-demanding wastes, metals, and toxic substances, cause water pollution. Sources of these pollution-causing substances are divided into two broad categories: point sources and nonpoint sources. Point sources are typically piped discharges from wastewater treatment plants, large urban and industrial stormwater systems, and other facilities. Nonpoint sources can include atmospheric deposition, groundwater inputs, and runoff from urban areas, agricultural lands and others. Chapter 3 includes the following:

Section 3.1 Causes of Pollution
Section 3.2 Point Sources of Pollution
Section 3.3 Nonpoint Sources of Pollution

3.1 Causes of Pollution

ACauses of pollution@ refer to the substances which enter surface waters from point and nonpoint sources and result in water quality degradation and impairment. Major causes of water quality impairment include biochemical oxygen demand (BOD), nutrients, toxicants (such as heavy metals, polychlorinated biphenyls [PCBs], chlorine, pH and ammonia) and E. coli bacteria. Table 3-1 provides a general overview of causes of impairment and the activities that may lead to their introduction into surface waters. Each of these causes is discussed in the following sections.

TABLE 3-1
CAUSES OF WATER POLLUTION AND CONTRIBUTING ACTIVITIES

Cause	Activity associated with cause
Nutrients	Fertilizer on agricultural crops and residential/ commercial lawns, animal wastes, leaky sewers and septic tanks, direct septic discharge, atmospheric deposition, wastewater treatment plants
Toxic Chemicals	Pesticide applications, disinfectants, automobile fluids, accidental spills, illegal dumping, urban stormwater runoff, direct septic discharge, industrial effluent
Oxygen-Consuming Substances	Wastewater effluent, leaking sewers and septic tanks, direct septic discharge, animal waste
E. coli	Failing septic systems, direct septic discharge, animal waste (including runoff from livestock operations and impacts from wildlife), improperly disinfected wastewater treatment plant effluent

3.1.1 E. coli Bacteria

E. coli bacteria are associated with the intestinal tract of warm-blooded animals. They are widely used as an indicator of the potential presence of waterborne disease-causing (pathogenic) bacteria, protozoa, and viruses because they are easier and less costly to detect than the actual pathogenic organisms. The presence of waterborne disease-causing organisms can lead to outbreaks of such diseases as typhoid fever, dysentery, cholera, and cryptosporidiosis. The detection and identification of specific bacteria, viruses, and protozoa, (such as Giardia, Cryptosporidium, and Shigella) require special sampling protocols and very sophisticated laboratory techniques which are not commonly available.

E. coli water quality standards have been established in order to ensure safe use of waters for water supplies and recreation. 327 IAC 2-1-6 Section 6(d) states that *E. coli* bacteria, using membrane filter count (MF), shall not exceed 125 per 100 milliliters as a geometric mean based on not less than five samples equally spaced over a 30 day period nor exceed 235 per 100 milliliters in any one sample in a 30 day period.

E. coli bacteria may enter surface waters from nonpoint source runoff, but they also come from improperly treated discharges of domestic wastewater. Common potential sources of *E. coli* bacteria include leaking or failing septic systems, direct septic discharge, leaking sewer lines or pump station overflows, runoff from livestock operations, urban stormwater and wildlife. *E. coli* bacteria in treatment plant effluent are controlled through disinfection methods including chlorination (often followed by dechlorination), ozonation or ultraviolet light radiation.

3.1.2 Toxic Substances

327 IAC 2-1-9(45) defines toxic substances as substances, which are or may become harmful to plant or animal life, or to food chains when present in sufficient concentrations or combinations. Toxic substances include, but are not limited to, those pollutants identified as toxic under Section 307 (a)(1) of the Clean Water Act. Standards for individual toxic substances are listed 327 IAC 2-1-6. Toxic substances frequently encountered include chlorine, ammonia, organics (hydrocarbons and pesticides) heavy metals and pH. These materials are toxic to different organisms in varying amounts, and the effects may be evident immediately or may only be manifested after long-term exposure or accumulation in living tissue.

Whole effluent toxicity testing is required for major NPDES dischargers (discharge over 1 million gallons per day or population greater than 10,000). This test shows whether the effluent from a treatment plant is toxic, but it does not identify the specific cause of toxicity. If the effluent is found to be toxic, further testing is done to determine the specific cause. This follow-up testing is called a toxicity reduction evaluation. Other testing, or monitoring, done to detect aquatic toxicity problems include fish tissue analyses, chemical water quality sampling and assessment of fish community and bottom-dwelling organisms such as aquatic insect larvae. These monitoring programs are discussed in Chapter 4.

Each of the substances below can be toxic in sufficient quantity or concentration.

<u>Metals</u>

Municipal and industrial dischargers and urban runoff are the main sources of metal contamination in surface water. Indiana has stream standards for many heavy metals, but the

most common ones in municipal permits are cadmium, chromium, copper, nickel, lead, mercury, and zinc. Standards are listed in 327 IAC 2-1-6. Point source discharges of metals are controlled through the National Pollution Discharge Elimination System (NPDES) permit process. Mass balance models are employed to determine allowable concentrations for a permit limit. Municipalities with significant industrial users discharging wastes to their treatment facilities limit the heavy metals from these industries through a pretreatment program. Source reduction and wastewater recycling at waste water treatment plants (WWTP) also reduces the amount of metals being discharged to a stream. Nonpoint sources of pollution are controlled through best management practices.

In Indiana, as well as many other areas of the country, mercury contamination in fish has caused the need to post widespread fish consumption advisories. The source of the mercury is unclear; however, atmospheric sources are suspected and are currently being studied.

Polychlorinated biphenyls (PCBs)

Polychlorinated biphenyls (PCBs) were first created in 1881 and subsequently began to be commercially manufactured around 1929 (Bunce 1994). Because of their fire-resistant and insulating properties, PCBs were widely used in transformers, capacitors, and in hydraulic and heat transfer systems. In addition, PCBs were used in products such as plasticizers, rubber, ink, and wax. In 1966, PCBs were first detected in wildlife, and were soon found to be ubiquitous in the environment (Bunce 1994). PCBs entered the environment through unregulated disposal of products such as waste oils, transformers, capacitors, sealants, paints, and carbonless copy paper. In 1977, production of PCBs in North America was halted. Subsequently, the PCB contamination present in our surface waters and environment today is the result of historical waste disposal practices.

Ammonia (NH_3)

Point source dischargers are one of the major sources of ammonia. In addition, discharge of untreated septic effluent, decaying organisms which may come from nonpoint source runoff and bacterial decomposition of animal waste also contribute to the level of ammonia in a waterbody. Standards for ammonia are listed in 327 IAC 2-1-6.

3.1.3 Oxygen-Consuming Wastes

Oxygen-consuming wastes include decomposing organic matter or chemicals, which reduce dissolved oxygen in water through chemical reactions. Raw domestic wastewater contains high concentrations of oxygen-consuming wastes that need to be removed from the wastewater before it can be discharged into a waterway. Maintaining a sufficient level of dissolved oxygen in the water is critical to most forms of aquatic life.

The concentration of dissolved oxygen in a water body is one indicator of the general health of an aquatic ecosystem. 327 IAC Section 6 (b)(3) states that concentrations of dissolved oxygen shall average at least five milligrams per liter per calendar day and shall not be less than four milligrams per liter at any time. Dissolved oxygen concentrations are affected by a number of factors. Higher dissolved oxygen is produced by turbulent actions, such as waves, which mix air and water. Lower water temperatures also generally allows for retention of higher dissolved oxygen concentrations. Low dissolved oxygen levels tend to occur more often in warmer,

slow-moving waters. In general, the lowest dissolved oxygen concentrations occur during the warmest summer months and particularly during low flow periods.

Sources of dissolved oxygen depletion include wastewater treatment plant effluent, the decomposition of organic matter (such as leaves, dead plants and animals) and organic waste matter that is washed or discharged into the water. Sewage from human and household wastes is high in organic waste matter. Bacterial decomposition can rapidly deplete dissolved oxygen levels unless these wastes are adequately treated at a wastewater treatment plant. In addition, excess nutrients in a water body may lead to an over-abundance of algae and reduce dissolved oxygen in the water through algal respiration and decomposition of dead algae. Also, some chemicals may react with and bind up dissolved oxygen. Industrial discharges with oxygen consuming wasteflow may be resilient instream and continue to use oxygen for a long distance downstream.

3.1.4 Nutrients

The term "nutrients" in this Strategy refers to two major plant nutrients, phosphorus and nitrogen. These are common components of fertilizers, animal and human wastes, vegetation, and some industrial processes. Nutrients in surface waters come from both point and nonpoint sources. Nutrients are beneficial to aquatic life in small amounts. However, in over-abundance and under favorable conditions, they can stimulate the occurrence of algal blooms and excessive plant growth in quiet waters or low flow conditions. The algal blooms and excessive plant growth often reduce the dissolved oxygen content of surface waters through plant respiration and decomposition of dead algae and other plants. This is accentuated in hot weather and low flow conditions because of the reduced capacity of the water to retain dissolved oxygen.

3.2 Point Sources of Pollution

As discussed previously, sources of water pollution are divided into two broad categories: point sources and nonpoint sources. This section focuses on point sources. Section 3.3.1 defines point sources and Section 3.3.2 discusses point sources in the St. Joseph-Lake Michigan Watershed.

3.2.1 Defining Point Sources

Point sources refer to discharges that enter surface waters through a pipe, ditch or other well-defined point of discharge. The term applies to wastewater and stormwater discharges from a variety of sources. Wastewater point source discharges include municipal (city and county) and industrial wastewater treatment plants and small domestic wastewater treatment systems that may serve schools, commercial offices, residential subdivisions and individual homes. Stormwater point source discharges include stormwater collection systems for medium and large municipalities which serve populations greater than 100,000 and stormwater discharges associated with industrial activity as defined in the Code of Federal Regulations (40 CFR 122.26(a)(14)). The primary pollutants associated with point source discharges are Oxygen demanding wastes, nutrients, sediment, color and toxic substances including chlorine, ammonia and metals.

Point source dischargers in Indiana must apply for and obtain a National Pollutant Discharge Elimination System (NPDES) permit from the state. Discharge permits are issued under the

NPDES program, which is delegated to Indiana by the US Environmental Protection Agency (EPA). See Chapter 5 for a description of the NPDES program and permitting strategies.

3.2.2 Point Source Discharges in the St. Joseph-Lake Michigan Watershed

As of June 1999, there were 214 active NPDES permits within the St. Joseph-Lake Michigan watershed (Table 3-2, Figure 3-1).

Another point source covered by NPDES permits is combined sewer overflows (CSO). A combined sewer system is a wastewater collection system that conveys sanitary wastewater (domestic, commercial and industrial wastewater) and stormwater through a single-pipe system to a Publicly Owned Treatment Works. A CSO is the discharge from a combined sewer system at a point prior to the Publicly Owned Treatment Works. CSOs are point sources subject to NPDES permit requirements including both technology-based and water quality-based requirements of the Clean Water Act.

CITY/ TOWN	NUMBER OF CSOs
Albion	2
Angola	2
Elkhart	39
Goshen	6
Kendallville	1
LaGrange	7
Ligonier	9
Millford	1
Mishawaka	18
Nappanee	15
Wakarusa	6

In addition to the NPDES permitted dischargers in the watershed, there may be many unpermitted, illegal discharges to the St. Joseph-Lake Michigan system. Illegal discharges of residential wastewater (septic tank effluent) to streams and ditches from straight pipe discharges and old inadequate systems are a problem within the watershed.

Table 3-2
NPDES PERMITTED FACILITIES
St. Joseph-Lake Michigan WATERSHED

NPDES	Facility Name	Maj/Mi	City	County	Status
ING080019	Middlebury EMS Bld, Town of	Minor	Middlebury	Elkhart	Active
ING080044	Elkhart Mun. Airport, Hawkeye	Minor	Elkhart	Elkhart	Inactive
ING080056	Marathon Gasoline Station	Minor	Elkhart,	Elkhart	Active
ING080059	IDOT Toll Road Area 5 North	Minor	Elkhart	Elkhart	Active
ING080063	Amoco Oil Co., Granger Site	Minor	Granger	St. Joseph	Inactive
ING080064	Amoco Oil Co, Granger Terminal	Minor	Granger	St. Joseph	Active
ING080077	MDK Corp., Red-D-Mart Store	Minor	Elkhart	Elkhart	Active
ING080103	Henschen Oil, Inc.	Minor	Wakarusa	Elkhart	Active
ING250005	Freudenberg Nok	Minor	Ligonier	Noble	Active
ING250010	Goshen Industries, Inc.	Minor	Goshen	Elkhart	Inactive
ING250013	Uniroyal Technology Corp.	Minor	Mishawaka	St. Joseph	Inactive
ING250027	Perfection/walker Manuf. Co.	Minor	Goshen,	Elkhart	Inactive
ING250035	Silgan Plastics Corporation	Minor	Ligonier	Noble	Active
ING250037	Syracuse Rubber Products, Inc.	Minor	Syracuse	Kosciusko	Active
ING250041	Tenneco Automotive Inc.	Minor	Goshen,	Elkhart	Active
ING250053	Notre Dame Power Plant	Minor	Notre Dame	St. Joseph	Active
ING250060	Elkhart General Hospital	Minor	Elkhart	Elkhart	Active
ING340022	Coz Terminaling Inc. - S. Bend	Minor	South Bend	St. Joseph	Active
ING670009	Coz Terminaling, South Bend	Minor	South Bend	St. Joseph	Active
INP000009	Duo-Therm Corporation	Minor		LaGrange	Inactive
INP000016	Harris Kayot, Incorporated	Minor	LaGrange	LaGrange	Inactive
INP000017	Rittal Electromate (Robroy)	Minor	Fremont	Steuben	Active
INP000045	Vitco, Inc.	Minor	Nappanee	Elkhart	Active
INP000056	Albion Wire, Incorporated	Minor	Albion	Noble	Inactive
INP000058	Cadillac Frames	Minor		LaGrange	Inactive
INP000065	Wheeltek Division, Amcast Corp	Minor	Fremont	Steuben	Active
INP000092	Freudenburg - Nok, Plant #2	Minor	Ligonier	Noble	Active
INP000097	P & J Industries, Inc.	Minor		Noble	Active
INP000103	Laclede Steel Company	Minor	Fremont	Steuben	Active
INP000115	Angola Wire Products, Inc.	Minor	Angola	Steuben	Active
INP000118	American Rollform	Minor	Angola	Steuben	Active
INP000119	Advanced Metal Etching,Inc.	Minor	Ligonier	Noble	Active
INP000124	Kawneer Rubber & Plastics	Minor	Bristol	Elkhart	Active
INP000130	Meijer Central Kitchen	Minor	Middlebury	Elkhart	Active
INP000131	Freudenburg Nok, Plant #1	Minor	Ligonier	Noble	Active
INP000135	Moore Pressure Sensitive Sys.	Minor	Angola	Steuben	Active
INP000137	Transguard Industries	Minor	Angola	Steuben	Active
INP000140	Clevite Elastomers	Minor	Angola	Steuben	Active
INP000155	ITW Ransburg	Minor	Angola	Steuben	Inactive
INP000175	Dana Corp. Weatherhead Div.	Minor	Angola	Steuben	Active
INP000180	Syracuse Rubber Products, Inc.	Minor	Syracuse	Kosciusko	Active
INP000182	Univertical Chemical Company	Minor	Angola	Steuben	Active
INP000202	Ingersoll-Rand Fluid Products	Minor	Angola	Steuben	Active
INP000206	Hinsdale Farms L.t.d.	Minor	Bristol	Elkhart	Active
INU059455	Amoco Oil Co., Granger Bulk	Minor	Granger	St. Joseph	Active
INU059595	Metech International	Minor	South Bend	St. Joseph	Active
INU060062	Dexter Axle Div. - Plant 113	Minor	Albion	Noble	Active

Table 3-2 (Continued)

NPDES	Facility Name	Maj/Mi	City	County	Status
IN0000345	Mishawaka Utilities Water Dept	Minor	Mishawaka	St. Joseph	Active
IN0000426	Dana Corp. Weatherhead Div.	Minor	Angola	Steuben	Inactive
IN0000434	Middlebury Coop Creamery	Minor		Elkhart	Inactive
IN0000493	Westinghouse Electric Corp.	Minor	Mishawaka	St. Joseph	Active
IN0000698	Goshen Water Plant	Minor		Elkhart	Inactive
IN0000701	Silgan Plastic Corporation	Minor	Ligonier	Noble	Inactive
IN0000710	Burger Dairy Company	Minor	New Paris	Elkhart	Active
IN0000736	Uniroyal Technology Corp	Minor	Mishawaka	St. Joseph	Inactive
IN0000744	Weatherhead Co-Syracuse	Minor		Kosciusko	Inactive
IN0000761	Johnson Controls, Inc.	Minor	Goshen	Elkhart	Active
IN0000779	Newman Foundry Company Inc	Minor		Noble	Inactive
IN0000787	A M General Corp	Minor		St. Joseph	Inactive
IN0000809	Syracuse Rubber Products, Inc.	Minor	Syracuse	Kosciusko	Inactive
IN0000817	Syracuse Rubber Products Inc	Minor		Kosciusko	Inactive
IN0000876	Maple Leaf Farms, Inc.	Minor	Milford	Kosciusko	Active
IN0000884	Berliner & Marx, Inc.	Minor	South Bend	St. Joseph	Active
IN0000914	IDNR	Minor		LaGrange	Inactive
IN0000922	Holy Cross Services Corporation	Minor	South Bend	St. Joseph	Active
IN0000981	Keene Products Inc	Minor		Elkhart	Inactive
IN0001015	Mogull Rubber Corp	Minor		Elkhart	Inactive
IN0003981	Cuneo Press Inc of Ind	Minor		LaGrange	Inactive
IN0004421	LBL Corp DBA Indy 500 Trk Plz	Minor		LaGrange	Inactive
IN0004723	IDNR	Minor		LaGrange	Inactive
IN0004812	IDNR	Minor		LaGrange	Inactive
IN0020478	LaGrange Municipal STP	Minor	LaGrange	LaGrange	Active
IN0020656	Kendallville Municipal STP	Major	Kendallville	Noble	Active
IN0020915	Indiana Toll Road Commission #	Minor		St. Joseph	Inactive
IN0020923	Indiana Toll Road Commission #	Minor		St. Joseph	Inactive
IN0021172	Syracuse Municipal STP	Major	Syracuse	Kosciusko	Active
IN0021229	Wolcottville Municipal STP	Minor	Wolcottville	LaGrange	Active
IN0021296	Angola Municipal STP	Major	Angola	Steuben	Active
IN0021458	Mishawaka City of	Minor		St. Joseph	Inactive
IN0021466	Nappanee Municipal STP	Major	Nappanee	Elkhart	Active
IN0021571	Topeka Municipal STP	Minor	Topeka	LaGrange	Active
IN0021792	Atlantic Richfield Co	Minor		St Joseph	Inactive
IN0021814	Cromwell Municipal STP	Minor	Cromwell	Noble	Active
IN0021865	Lincoln National Life Ins Co.	Minor		St. Joseph	Inactive
IN0022063	Western Rubber Co.	Minor		Elkhart	Inactive
IN0022144	Albion Municipal STP	Minor	Albion	Noble	Active
IN0022292	Ashley Municipal STP	Minor	Ashley	Steuben	Active
IN0022845	Jimtown Elem. and High School	Minor	Elkhart	Elkhart	Active
IN0022942	Fremont Municipal STP	Minor	Fremont	Steuben	Active
IN0023582	Ligonier Municipal STP	Minor	Ligonier	Noble	Active
IN0023761	Middlebury Municipal STP	Minor	Middlebury	Elkhart	Active
IN0024520	South Bend Municipal STP	Major	South Bend	St. Joseph	Active
IN0024775	Wakarusa Municipal STP	Minor	Wakarusa	Elkhart	Active

Table 3-2 (Continued)

NPDES	Facility Name	Maj/Mi	City	County	Status
IN0025119	Indiana and Michigan Elec Co -	Minor		St Joseph	Inactive
IN0025640	Mishawaka Municipal STP	Major	Mishawaka	St. Joseph	Active
IN0025674	Elkhart Municipal STP	Major	Elkhart	Elkhart	Active
IN0025755	Goshen Municipal STP	Major	Goshen	Elkhart	Active
IN0029637	Concord Mall	Minor	Elkhart	Elkhart	Inactive
IN0029645	Suburban Utilities Inc	Minor		Elkhart	Inactive
IN0030309	Pokagon State Park	Minor	Angola	Steuben	Active
IN0030317	Chain O Lakes State Park	Minor		Noble	Inactive
IN0030333	Chain O'lakes State Park	Minor	Albion	Noble	Active
IN0030660	Concord Ox-bow Elem. School	Minor	Elkhart	Elkhart	Inactive
IN0030848	Virgil Grissom Middle School	Minor	Mishawaka	St. Joseph	Active
IN0030864	Concord Eastside Elem. School	Minor	Elkhart	Elkhart	Inactive
IN0030872	Concord Jr.&Sr. High School	Minor	Elkhart	Elkhart	Inactive
IN0031623	West Noble High School	Minor	Ligonier	Noble	Inactive
IN0032026	Hochstler Egg Factory	Minor		Elkhart	Inactive
IN0032131	Fremont Swg Trmt Plt	Minor		Steuben	Inactive
IN0032735	Weaver Melvin L	Minor		Kosciusko	Inactive
IN0032891	Angola 76 Truck Plaza	Minor	Fremont	Steuben	Active
IN0032930	Culvers Duck Farm	Minor		Spencer	Inactive
IN0033065	Timberbrook Mobile Home Park	Minor	Bristol	Elkhart	Active
IN0035190	Redbrush Mobile Home Village	Minor		Kosciusko	Inactive
IN0035254	Bristol, Town of	Minor		Elkhart	Inactive
IN0035394	Diversified Utilities Inc-Lake	Minor		Noble	Inactive
IN0035459	Benton Community School Corp	Minor		Elkhart	Inactive
IN0036081	First Baptist Church - WWTP	Minor	Elkhart	Elkhart	Active
IN0036111	Federal Paperboard Co.	Minor		Elkhart	Inactive
IN0036781	Fairfield Jr-Sr High School	Minor	Goshen	Elkhart	Active
IN0036846	Bristol Municipal STP	Minor	Bristol	Elkhart	Active
IN0037648	Indian Lake Mobile Hm Village	Minor	Ligonier	Noble	Active
IN0037699	Bashor Home	Minor	Goshen	Elkhart	Inactive
IN0037761	Clear Water Mobile Village	Minor	South Bend	St. Joseph	Active
IN0038318	Milford Junction Mun. STP	Minor	Milford	Kosciusko	Active
IN0038822	Bear, High, Wolf Lake Regional	Minor	Wolf Lake	Noble	Active
IN0038989	Three Oaks Mobile Manor	Minor	Goshen	Elkhart	Active
IN0039543	Silver Lake Group	Minor	Angola	Steuben	Active
IN0040126	Hudson Municipal STP	Minor		Steuben	Inactive
IN0040258	Leesburg Municipal STP	Minor		Kosciusko	Inactive
IN0040363	Millersburg Municipal STP	Minor	Millersburg	Elkhart	Active
IN0040461	Osceola, Town of	Minor		St Joseph	Inactive
IN0040541	Rome City Municipal STP	Minor	Rome City	Noble	Active
IN0040622	Shipshewana Municipal STP	Minor	Shipshewana	LaGrange	Active
IN0041602	Sunset Trailer Village	Minor	South Bend	St. Joseph	Active
IN0042196	Angola Inn	Minor	Angola	Steuben	Active
IN0042579	Elpaco Manor Subd.	Minor		Elkhart	Inactive
IN0042587	Chain O'lakes Youth Camp	Minor	Albion	Noble	Active
IN0043605	Atlantic Richfield Co	Minor		St. Joseph	Inactive

Table 3-2 (Continued)

NPDES	Facility Name	Maj/Mi	City	County	Status
IN0045225	Wawasee Plaza	Minor		Kosciusko	Inactive
IN0045276	Culligan Water Conditioning	Minor		Noble	Inactive
IN0045802	Turkey Creek Regional Sewer Dis	Minor	Cromwell	Kosciusko	Active
IN0045853	Westview School Corporation	Minor	Topeka	LaGrange	Active
IN0046272	Orland Public Water Supply	Minor	Orland	Steuben	Inactive
IN0046337	H&S Industries, Inc.	Minor	Elkhart	Elkhart	Inactive
IN0046345	Midway Transportation Center	Minor	Elkhart	Elkhart	Active
IN0046825	Deutsch Kase Haus, Inc.	Minor	Middlebury	Elkhart	Active
IN0046914	Angola Die Casting Corporation	Minor	Angola	Steuben	Inactive
IN0047112	Albion Wire, Inc.	Minor	Albion	Noble	Active
IN0048461	Consolidated Freightways, Corp	Minor	Fremont	Steuben	Inactive
IN0048771	INCO Alloys International, Inc	Minor	Elkhart	Elkhart	Inactive
IN0049051	Pent Incorporated	Minor		LaGrange	Inactive
IN0049077	Kendallville Public Water Sup.	Minor	Kendallville	Noble	Active
IN0049123	Elkhart Water Works	Minor		Elkhart	Inactive
IN0049336	Headquarters Co	Minor		St. Joseph	Inactive
IN0049573	Topeka Municipal Water Utility	Minor	Topeka	LaGrange	Active
IN0049875	Bodine State Fish Hatchery	Minor	Mishawaka	St. Joseph	Active
IN0050091	Lydall Inc, Acadia Polymers	Minor	Ligonier	Noble	Inactive
IN0050300	Service Area 7, Howe-Lagrange	Minor	Howe	LaGrange	Active
IN0050318	IDOH-toll Road Service Area 8	Minor	Granger	Steuben	Inactive
IN0050717	Norfolk Southern Corp, Elkhart	Minor	Elkhart	Elkhart	Active
IN0050806	Dana Corp. Spicer Axle Div.	Minor		Kosciusko	Inactive
IN0051080	Bristol Products, Inc.	Minor	Bristol	Elkhart	Active
IN0051179	Maple Leaf Farms Hatchery	Minor	Cromwell	Noble	Active
IN0051322	Benteler Industries Inc.	Minor	Goshen	Elkhart	Inactive
IN0051799	Eagle-Picher	Minor		Dekalb	Inactive
IN0052043	Pigeon Creek Rest Area I-69 Sb	Minor	Angola	Steuben	Active
IN0052388	Way College of Biblical-NPR	Minor		Noble	Inactive
IN0052400	Syndicate Store Fixtures, Inc.	Major	Middlebury	Elkhart	Active
IN0052710	Excel Corp	Minor		Elkhart	Inactive
IN0053261	Steuben Lakes RWD	Minor		Steuben	Inactive
IN0053333	Cable Line Meats	Minor		Elkhart	Inactive
IN0053465	NIBCO-Goshen Division	Minor	Goshen	Elkhart	Active
IN0053856	A/C Fabricating Corporation	Minor	Goshen	Elkhart	Inactive
IN0053970	Freudenberg N.O.K.	Minor	Ligonier	Noble	Inactive
IN0054003	Midwest Foundry Company	Minor	Hudson	Steuben	Inactive
IN0054011	Western Rubber Company	Minor	Fremont	Steuben	Active
IN0054372	Elkhart Products Corporation	Minor	Elkhart	Elkhart	Inactive
IN0054381	Ind. Shotblast & Impregnating,	Minor		Elkhart	Inactive
IN0054453	Dutchwest Indiana, Inc.	Minor		Noble	Inactive
IN0055123	Adams Lake Reg.Sewer Dist.	Minor	Wolcottville	LaGrange	Active
IN0055298	MDK Corp., Mobil Red-D-Mart	Minor	Elkhart	Elkhart	Inactive
IN0055468	Juday Creek Estates Subd.	Minor	Granger	St. Joseph	Active
IN0055522	Yoder Oil Company	Minor	Elkhart	Elkhart	Inactive
IN0055565	Dairy Farms Products Company	Minor	Goshen	Elkhart	Active

Table 3-2 (Continued)

NPDES	Facility Name	Maj/Mi	City	County	Status
IN0055956	Amoco Oil Company - Granger	Minor	Granger	Saint Joseph	Inactive
IN0056065	LaGrange Packaging Center	Minor	LaGrange	LaGrange	Inactive
IN0056146	Sea Nymph Boats, Inc.	Minor	Syracuse	Kosciusko	Active
IN0056464	Amoco Oil Company, Granger Trm	Minor	Granger	St. Joseph	Inactive
IN0056707	Bayer Corporation	Minor	Elkhart	Elkhart	Active
IN0056855	Sunrise Orchards, Inc.	Minor	Goshen	Elkhart	Active
IN0057134	Plastic Processors, Inc.	Minor	Hudson	Steuben	Inactive
IN0057371	Ashley Water Works	Minor	Ashley	Steuben	Active
IN0057657	Siebe Appliance Controls, Inc.	Minor	Kendallville	Noble	Active
IN0057673	American Rollform & Man. Co.	Minor	Angola	Steuben	Active
IN0057967	LaGrange County Sewer District	Minor		LaGrange	Inactive
IN0058025	New Paris Conservancy District	Minor	New Paris	Elkhart	Active
IN0058505	Fish and Royer Lake WWTP	Minor	LaGrange	LaGrange	Active
IN0059145	South Bend Water Works	Minor	South Bend	St. Joseph	Inactive
IN0059242	Timberbrook Mobile Home Comm	Minor	Bristol	Elkhart	Active
IN0059820	CMI-Precision Mold, Inc.	Minor	Bristol	Elkhart	Active
IN0059927	Notre Dame Power Plant, Univ.	Minor	Notre Dame	St. Joseph	Active

3.3 Nonpoint Sources of Pollution

Nonpoint source pollution refers to runoff that enters surface waters through stormwater runoff, contaminated ground water, snowmelt or atmospheric deposition. There are many types of land use activities that can serve as sources of nonpoint source pollution including land development, construction, mining operations, crop production, animal feeding lots, timber harvesting, failing septic systems, landfills, roads and paved areas. Stormwater from large urban areas (greater than100,000 people) and from certain industrial and construction sites is technically considered a point source since NPDES permits are required for discharges of stormwater from these areas.

Sediment and nutrients are major pollution causing substances associated with nonpoint source pollution. Others include *E. coli* bacteria, heavy metals, pesticides, oil and grease, and any other substance that may be washed off the ground or removed from the atmosphere and carried into surface waters. Unlike point source pollution, nonpoint pollution sources are diffuse in nature and occur at random time intervals depending on rainfall events. Below is a brief description of major areas of nonpoint sources of pollution in the St. Joseph-Lake Michigan watershed.

3.3.1 Agriculture

There are a number of activities associated with agriculture that can serve as potential sources of water pollution. Land clearing and tilling make soils susceptible to erosion, which can then cause stream sedimentation. Pesticides and fertilizers (including synthetic fertilizers and animal wastes) can be washed from fields or improperly designed storage or disposal sites. Construction of drainage ditches on poorly drained soils enhances the movement of oxygen consuming wastes, sediment and soluble nutrients into groundwater and surface waters.

Concentrated animal operations can be a significant source of nutrients, biochemical oxygen demand and *E. coli* bacteria if wastes are not properly managed. Impacts can result from over application of wastes to fields, from leaking lagoons and from flows of lagoon liquids to surface waters due to improper waste lagoon management. Also there are potential concerns associated with nitrate-nitrogen movement through the soil from poorly constructed lagoons and from wastes applied to the soil surface.

Grassed waterways, conservation tillage, and no-till practices are several common practices used by many farmers to minimize soil loss. Maintaining a vegetated buffer between fields and streams is another excellent way to minimize sediment and nutrient loads to streams.

3.3.2 Urban/Residential

Runoff from urbanized areas, as a rule, is more localized and can often be more severe in magnitude than agricultural runoff. Any type of land-disturbing activity such as land clearing or excavation can result in soil loss and sedimentation. The rate and volume of runoff in urban areas is much greater due both to the high concentration of impervious surface areas and to storm drainage systems that rapidly transport stormwater to nearby surface waters. This increase in volume and rate of runoff can result in streambank erosion and sedimentation in surface waters.

Urban drainage systems, including curb and guttered roadways, also allow urban pollutants to reach surface waters quickly and with little or no filtering. Pollutants include lawn care pesticides and fertilizers; automobile fluids; lawn and household wastes; road salts, and E. coli bacteria (from animals and failing septic systems). The diversity of these pollutants makes it very challenging to attribute water quality degradation to any one pollutant.

Replacement of natural vegetation with pavement and removal of buffers reduces the ability of the watershed to filter pollutants before they enter surface waters. The chronic introduction of these pollutants and increased flow and velocity into a stream results in degraded waters. Many waters adjacent to urban areas are rated as biologically poor. This degradation also exists in lakes, which have been heavily influenced by adjacent urban development.

The population figures discussed in Section 2.3.2 are good indicators of where urban development and potential urban water quality impacts are likely to occur. Concentrated areas where urban development is high may lead to further water quality problems associated with the addition of impervious surfaces next to surface waters.

3.3.3 Onsite Wastewater Disposal

Septic systems contain all of the wastewater from a household or business. A complete septic system consists of a septic tank and an absorption field to receive effluent from the septic tank. The septic tank removes some wastes, but the soil absorption field provides further absorption and treatment. Septic systems can be a safe and effective method for treating wastewater if they are sized, sited, and maintained properly. However, if the tank or absorption field malfunction or are improperly placed, constructed or maintained, nearby wells and surface waters may become contaminated.

Some of the potential problems from malfunctioning septic systems include:

- Polluted groundwater: Pollutants in septic effluent include bacteria, nutrients, toxic substances, and oxygen-consuming wastes. Nearby wells can become contaminated by failing septic systems.

- Polluted surface water: Groundwater often carries the pollutants mentioned above into surface waters, where they can cause serious harm to aquatic ecosystems. Leaking septic tanks can also leak into surface waters through or over the soil. In addition, some septic tanks may directly discharge to surface waters.

- Risks to human health: Septic system malfunctions can endanger human health when they contaminate nearby wells, drinking water supplies, and fishing and swimming areas.

Pollutants associated with onsite wastewater disposal may also be discharged directly to surface waters through direct pipe connections between the septic system and surface waters (straight pipe discharge). However, 327 IAC 5-1-1.5 specifically states that “point source discharge of sewage treated or untreated, from a dwelling or its associated residential sewage disposal system, to the waters of the state is prohibited”.

3.3.4 Construction

Construction activities that involve excavation, grading or filling can produce significant sedimentation if not properly controlled. Sedimentation from developing urban areas can be a major source of pollution due to the cumulative number of acres disturbed in a watershed. Construction of single family homes in rural areas can also be a source of sedimentation when homes are placed in or near stream corridors.

As a pollution source, construction activities are typically temporary, but the impacts on water quality can be severe and long lasting. Construction activities tend to be concentrated in the more rapidly developing areas of the watershed.

4. Water Quality and Use Support Ratings in the St. Joseph-Lake Michigan Watershed

This section provides a detailed overview of water quality monitoring, water quality, and use support ratings in the St. Joseph-Lake Michigan watershed and includes the following:

4.1 Water Quality Monitoring Programs

This section discusses water quality monitoring programs. Specifically, Section 4.1.1 describes IDEM's Office of Water Quality monitoring programs and Section 4.1.2 discusses other monitoring efforts in the watershed.

4.1.1 Office of Water Quality Programs

The Water Quality Assessment Branch of the Office of Water Quality is responsible for assessing the quality of water in Indiana's lakes, rivers and streams. This assessment is performed by field staff from the Survey Section and the Biological Studies Section. Virtually every element of IDEM=s surface water quality management program of IDEM is directly or indirectly related to activities currently carried out by this Branch. The biological and surface water monitoring activities identify stream reaches, watersheds or segments where physical, chemical and/or biological quality has been or would be impaired by either point or nonpoint sources. This information is used to help allocate waste loads equitably among various sources in a way that would ensure that water quality standards are met along stream reaches in each of the nearly 100 stream segments in Indiana.

The purpose of the Surveys Section is to provide the water quality and hydrological data required for the assessment of Indiana's waters by conducting Watershed/Basin Surveys and Stream Reach Surveys. In 1996, the Section began a five-year synoptic study (Basin Monitoring Strategy) of the State's ten major watersheds. Information from these studies will be integrated with data from biological and nonpoint source studies as well as the Fixed Station Monitoring Program to make a major assessment of the State's waters. Such surveys determine the extent to which water quality standards are being met and whether the fishable, swimmable and water supply uses are being maintained.

Information derived from this strategy will contribute significantly to improved planning processes throughout the Office of Water Quality. This plan should initiate the development of interrelated action plans, which encompass the wide range of responsibilities, such as rule making, permitting, compliance, nonpoint source issues, and wastewater treatment facility oversight.

The Biological Studies Section conducts studies of fish and macroinvertebrate communities as well as stream habitats to establish biological conditions to which other streams may be compared in order to identify impaired streams or watersheds. The Biological Studies Section also conducts fish tissue and sediment sampling to pinpoint sources of toxic and bioconcentrating substances. Fish tissue data serve as the basis for fish consumption advisories, which are issued, through the Indiana State Department of Health, to protect the health of Indiana citizens. This Section also participates in the development of site-specific water quality standards.

The Biological Studies Section relies on the Volunteer Water Quality Monitoring Programs to provide additional data on lakes and wetlands that may not be sampling sites in the Monitoring Strategy. Volunteer collected data provides IDEM scientists with an overall view of water quality trends and early warning of problems that may be occurring in a lake or wetland. If volunteers detect that a lake or wetland is severely degraded, professional IDEM scientists will conduct follow up investigation.

4.1.2 Other Monitoring Efforts

There are two initiatives under way to do volunteer water quality monitoring in the St. Joseph-Lake Michigan watershed. In Michigan an effort is being developed to do extensive water quality monitoring by using local schools, adjacent to the St. Joseph River. This process will involve checking the macro invertebrate population living in the feeder streams and at the mouth of these streams that flow into and make up the river. Sampling will take place twice a year. In an effort to collect data for the whole watershed the same data management is being used in Indiana and Michigan.

In Indiana the Soil and Water Conservation Districts in the St. Joseph-Lake Michigan watershed are working through an IDEM 319 grant to do water quality monitoring. They are also working with the Water Watchers of Indiana to incorporate water-testing information collected by this group. The Water Watchers program works with schools and their students to collect information on waters within the watershed.

4.2 Summary of Ambient Monitoring Data for the St. Joseph-Lake Michigan Watershed

The fixed station-monitoring program managed by IDEM=s Office of Water Quality has been monitoring surface water chemistry throughout the state since 1957. The data set from 1986 to 1995 was analyzed using the Seasonal Kendall test. This test deduces if a statistical change in the surface water chemistry occurred over a time period. The results of the Seasonal Kendall analysis for stations located in the St. Joseph-Lake Michigan watershed are provided in Table 4-1. The data collected from 1991 to 1997 from this monitoring program was also analyzed to determine benchmark characteristics. The results of the benchmark characteristic analysis for stations located in the St. Joseph-Lake Michigan watershed are provided in Appendix B. For a more in depth discussion of this analysis, please refer to the Indiana Fixed Station Statistical Analysis 1997 (IDEM 32/02/005/1998), published in May 1998 by the Assessment Branch of the Office of Water Quality - IDEM.

TABLE 4-1
RESULTS OF SEASONAL KENDALL ANALYSIS FOR STATIONS LOCATED IN THE St. Joseph-Lake Michigan WATERSHED 1986 TO 1995

Parameter	SJR 51 St. Joseph River, Auten Road Bridge South Bend	SJR 64 St. Joseph River, Petro Park Bridge Mishawaka	SJR 87 St. Joseph River County Rd. Through Bristol	ER 0.3 Elkhart River S.R. 120 Bridge Elkhart
Biological Oxygen Demand	«	↓	«	↘
Chemical Oxygen Demand	«	↗	↘	↘
Dissolved Oxygen	«	«	↘	↗
E. coli	«	«	↗	↓
Ammonia	«	«	«	«
Nitrite + Nitrate	↑	↗	↑	«
Total phosphorus	↑	↘	«	↘
Total Residue	↑	↗	↑	↗
Total Residue, Filterable	?	?	?	?
Total Residue, Nonfilterable	?	«	«	«
Copper	«	?	«	«
Cyanide (total)	«	«	«	«

Notes

« No Statistical Change; significance < 80% or reported slope = 0.00000

↓ Statistically Decreasing; significance >95% with a negative slope

↘ Potentially Decreasing; significance >80% with a negative slope

↗ Potentially Increasing; significance >80% with a positive slope

↑ Statistically Increasing; significance >95 % with a positive slope

? Insufficient Data for analysis

4.3 Fish Consumption Advisories

Since 1972, the Indiana Department of Natural Resources, the IDEM, and the Indiana State Department of Health (ISDH) have worked together to create the Indiana Fish Consumption Advisory. Each year members from these three agencies meet to discuss the findings of recent fish monitoring data and to develop the new statewide fish consumption advisory.

The 1998 advisory is based on levels of PCBs and mercury found in fish tissue. Fish are tested regularly only in areas where there is suspected contamination. In each area, samples were taken of bottom-feeding fish, top-feeding fish, and fish feeding in between. Over 1,600 fish tissue samples collected throughout the state were analyzed for PCBs, pesticides, and heavy metals. Of those samples, 99 percent contained mercury. Criteria for placing fish on the 1996 Indiana Fish Consumption Advisory have changed from using the Food and Drug Administration guidelines to using the Great Lakes Task Force risk-based approach.

The ISDH defines the Advisory Groups as follows:

Group 1	Unrestricted consumption
Group 2	One meal per week (52 meals per year) for adult males and females. One meal per month for women who are pregnant or breastfeeding, women who plan to have children, and children under the age of 15.
Group 3	One meal per month (12 meals per year) for adult males and females. Women who are pregnant or breastfeeding, women who plan to have children, and children under the age of 15 do not eat.
Group 4	One meal every two months (six meals per year) for adult males and females. Women who are pregnant or breastfeeding, women who plan to have children, and children under the age of 15 do not eat.
Group 5	No consumption (DO NOT EAT)

Carp generally are contaminated with both PCBs and mercury. Except as otherwise noted, carp in all Indiana rivers and streams fall under the following risk groups:

Carp, 15-20 inches - Group 3
Carp, 20-25 inches - Group 4
Carp over 25 inches - Group 5

In the St. Joseph-Lake Michigan Watershed, the following waterbodies are under the 1998 fish consumption advisory:

Waterbody/County	Species	Size	Contaminant	Group
St. Joseph River/St. Joseph County	Black Redhorse	14-17	Mercury, PCBs	3
		17+	Mercury, PCBs	4
	Carp	20+	Mercury, PCBs	5
	Channel Catfish	22+	Mercury, PCBs	5
	Golden Redhorse	13-22	PCBs	3
		22+	PCBs	4
	Largemouth Bass	15-16	Mercury, PCBs	3
		16-18	Mercury, PCBs	4
		18+	Mercury, PCBs	5
	Shorthead Redhorse	15-19	Mercury, PCBs	3
		19+	Mercury, PCBs	4
	Smallmouth Bass	7-9	Mercury, PCBs	2
		9+	Mercury, PCBs	3
	Steelhead	25-26	PCBs	3
		26+	PCBs	4
	Quillback	18+	PCBs	3
	White Sucker	14-16	PCBs	3
		16+	PCBs	4
Crooked Lake/Noble County	Largemouth Bass	9-17	Mercury	2
		17+	Mercury	3
Jimmerson Lake/Steuben County	Bullhead	8-10	Mercury	2
		10+	Mercury	3
	Largemouth Bass	9-15	Mercury	2
		15+	Mercury	3
Lake James/Steuben County	Largemouth Bass	10-13	Mercury	2
		13+	Mercury	3
	Yellow Bullhead	10+	Mercury	2
Lake Waubee/Kosciusko County	Bowfin	14-23	Mercury	2
		23+	Mercury	3
	Bullhead	10-13	Mercury	2
		13+	Mercury	3
	Largemouth Bass	4-8	Mercury	2
		8+	Mercury	3
Lake Wawasee/Kosciusko County	Bullhead	9-15	PCBs	2
		15+	PCBs	3
	Largemouth Bass	11-12	Mercury	2
		12+	Mercury	3
Long Lake/Steuben County	Largemouth Bass	7-12	Mercury	2
		12+	Mercury	3

Waterbody/County	Species	Size	Contaminant	Group
Marsh Lake/Steuben County	Largemouth Bass	13-17	Mercury	2
		17+	Mercury	3
	Yellow Bullhead	6-11	Mercury	2
		11+	Mercury	3
Olin Lake/LaGrange County	Bowfin	22+	Mercury	2
	Largemouth Bass	19+	Mercury	5
	Smallmouth Bass	5+	Mercury	2
Oliver Lake/LaGrange County	Largemouth Bass	6-11	Mercury	2
		11+	Mercury	3
Snow Lake/Steuben County	Largemouth Bass	9-16	Mercury	2
		16+	Mercury	3

4.4 Clean Water Act Section 305(b) Report

Section 305(b) of the Clean Water Act requires states to prepare and submit to the EPA a water quality assessment report of state water resources. A new surface water monitoring strategy for the Office of Water Quality was implemented in 1996 with the goal of monitoring all waters of the state by 2001 and reporting the assessments by 2003. Each year approximately 20 percent of the waterbodies in the state will be assessed and reported the following year. AIndiana 305(b) Report 1994-95" provides the most recent comprehensive report on Indiana water quality and is the baseline report for areas of the state for which water quality assessments have not yet been updated (IDEM 1994-95). The methodology of the Clean Water Act Section 305(b) assessment and use support ratings are discussed in Section 4.5.

Appendix B contains the listing of the St. Joseph-Lake Michigan watershed waterbodies assessed, status of designated use support, probable causes of impairment, and stream miles affected.

4.5 Clean Water Act Section 305(b) Assessment and Use-Support: Methodology

The Office of Water Quality determines use support status for each stream and waterbody in accordance with the assessment guidelines provided by EPA (1997). Results from four monitoring programs are integrated to provide an assessment for each stream and waterbody:

Physical/chemical water column results,
Benthic aquatic macroinvertebrate community assessments,
Fish tissue and surficial aquatic sediment contaminant results, and
E. coli monitoring results.

The assessment process was applied to each data sampling program. The individual assessments were integrated into an overall assessment for each waterbody by use designation: aquatic life support, fish consumption, and recreational use. River miles in a watershed appear as one waterbody while each lake in a watershed is reported as a separate waterbody.

Physical/chemical data for toxicants (total recoverable metals), conventional water chemistry parameters (dissolved oxygen, pH, and temperature), and bacteria (*E. coli*) were evaluated for exceedance of the Indiana Water Quality Standards (327 IAC 2-1-6). U.S. EPA 305(b) Guidelines were applied to sample results as indicated in Table 4-3 (U.S. EPA 1997b).

TABLE 4-2
CRITERIA FOR USE SUPPORT ASSESSMENT*

Parameter	Fully Supporting	Partially Supporting	Not Supporting
Aquatic Life Use Support			
Toxicants	Metals were evaluated on a site by site basis and judged according to magnitude of exceedance and the number of times exceedances occurred.		
Conventional inorganics	There were very few water quality violations, almost all of which were due to natural conditions.		
Benthic aquatic macroinvertebrate Index of Biotic Integrity (mIBI)	mIBI $\geq$ 4.	mIBI $<$ 4 and $\geq$ 2.	mIBI $<$ 2.
Qualitative habitat use evaluation (QHEI)	QHEI $\geq$ 64.	QHEI $<$ 64 and $\geq$ 51.	QHEI $<$ 51.
Fish community (fIBI) (Lower White River only)	IBI $\geq$ 44.	IBI $<$ 44 and $\geq$ 22	IBI $<$ 22.
Sediment (PAHs = polynuclear aromatic hydrocarbons. AVS/SEM = acid volatile sulfide/ simultaneously extracted metals.)	All PAHs $\leq$ 75th percentile. All AVS/SEMs $\leq$ 75th percentile. All other parameters $\leq$ 95th percentile.	PAHs or AVS/SEMs $>$ 75th percentile. (Includes Grand Calumet River and Indiana Harbor Canal sediment results, and so is a conservative number.)	Parameters $>$ 95thpercentile as derived from IDEM Sediment Contaminants Database.
Indiana Trophic State Index (lakes only)	Nutrients, dissolved oxygen, turbidity, algal growth, and sometimes pH were evaluated on a lake-by-lake basis. Each parameter judged according to magnitude.		
Fish Consumption			
Fish tissue	No specific Advisory*	Limited Group 2 - 4 Advisory*	Group 5 Advisory*
* Indiana Fish Consumption Advisory, 1997, includes a state wide advisory for carp consumption. This was not included in individual waterbody reports because it obscures the magnitude of impairment caused by other parameters.			
Recreational Use Support (Swimmable)			
Bacteria (cfu = colony forming units.)	No more than one grab sample slightly $>$ 235 cfu/100ml, and geometric mean not exceeded.	No samples in this classification.	One or more grab sample exceeded 235 cfu/100ml, and geometric mean exceeded.

*From Indiana Water Quality Report for 1998

5 State and Federal Water Programs

This Chapter summarizes the existing point and nonpoint source pollution control programs available for addressing water quality problems in the St. Joseph-Lake Michigan watershed. Chapter 5 includes:

Section 5.1 Indiana Department of Environmental Management Water Quality Programs
Section 5.2 Indiana Department of Natural Resources Water Programs
Section 5.3 USDA/Natural Resources Conservation Service Water Programs

5.1 Indiana Department of Environmental Management Water Quality Programs

This Section describes the water quality programs managed by the Office of Water Quality within IDEM and includes:

Section 5.1.1 State and Federal Legislative Authorities for Indiana's Water Quality Program
Section 5.1.2 Indiana's Point Source Control Program
Section 5.1.3 Indiana's Nonpoint Source Control Programs
Section 5.1.4 Integrating Point and Nonpoint Source Pollution Control Strategies
Section 5.1.5 Potential Sources of Funding for Water Quality Projects

5.1.1 State and Federal Legislative Authorities for Indiana's Water Quality Program

Authorities for some of the programs and responsibilities carried out by the Office of Water Quality are derived from a number of federal and state legislative mandates outlined below. The major federal authorities for the state's water quality program are found in sections of the Clean Water Act. State authorities are from state statutes.

Federal Authorities for Indiana's Water Quality Program

- The Clean Water Act Section 301 - Prohibits the discharge of pollutants into surface waters unless permitted by EPA.
- The Clean Water Act Section 303(c) - States are responsible for reviewing, establishing and revising water quality standards for all surface waters.
- The Clean Water Act Section 303(d) - Each state shall identify waters within its boundaries for which the effluent limits required by 301(b)(1) A and B are not stringent enough to protect any water quality standards applicable to such waters.
- The Clean Water Act Section 305(b) - Each state is required to submit a biennial report to the EPA describing the status of surface waters in that state.
- The Clean Water Act Section 319 - Each state is required to develop and implement a nonpoint source pollution management program.

- The Clean Water Act Section 402 - Establishes the National Pollutant Discharge Elimination System (NPDES) permitting program. Allows for delegation of permitting authority to qualifying states (which Indiana has received).

- The Clean Water Act Section 404/401 - Section 404 regulates the discharge of dredge and fill materials into navigable waters and adjoining wetlands. Section 401 requires the U.S. Army Corps of Engineers to receive a state Water Quality Certification prior to issuance a 404 permit.

State Authorities for Indiana's Water Quality Program

IC 13-13-5 Designation of Department for Purposes of Federal Law: Designates the Indiana Department of Environmental Management as the water pollution agency for Indiana for all purposes of the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.) effective January 1, 1988, and the federal Safe Drinking Water Act (42 U.S.C. 300f through 300j) effective January 1, 1988.

5.1.2 Indiana's Point Source Control Program

The State of Indiana's efforts to control the direct discharge of pollutants to waters of the State were inaugurated by the passage of the Stream Pollution Control Law of 1943. The vehicle currently used to control direct discharges to waters of the State is the NPDES (National Pollutant Discharge Elimination System) permit program. This was made possible by the passage of the Federal Water Pollution Control Act Amendments of 1972 (also referred to as the Clean Water Act). These permits place limits on the amount of pollutants that may be discharged to waters of the State by each discharger. These limits are set at levels protective of both the aquatic life in the waters which receive the discharge and human health.

The State of Indiana was granted primacy from U.S. EPA to issue NPDES permits on January 1, 1975 through a Memorandum of Agreement.

U.S. EPA, Region V, has oversight authority for the NPDES permits program. Under terms of the Memorandum of Agreement, Region V has the right to comment on all draft Major discharger permits. In addition to NPDES, the Office of Water Quality Permits Section has a pretreatment group which regulates municipalities in their development of municipal pretreatment programs and indirect discharges, or those discharges of process wastewater to municipal sewage treatment plants through Industrial Waste Pretreatment permits and regulation of Stormwater, CSO's, and variance requests through a special projects group currently known as the Urban Wet Weather Group. Land Application of waste treatment plant sludge is no longer a part of the Office of Water Quality but is now a part of the Office of Land Quality (formerly, Office of Solid and Hazardous Waste).

The purpose of the NPDES permit is to control the point source discharge of pollutants into the waters of the State such that the quality of the water of the State is maintained in accordance with the standards contained in 327 IAC 2. The NPDES permit requirements must ensure that the minimum amount of control is imposed upon any new or existing point source through the application of technology-based treatment requirement contained in 327 IAC 5-5-2. According to 327 IAC 5-2-2, "Any discharge of pollutants into waters of the State as a point source discharge, except for exclusions made in 327 IAC 5-2-4 is prohibited unless in conformity with a valid NPDES permit obtained prior to discharge." This is the most basic principal of the NPDES permit program.

The majority of NPDES permits have existed since 1974. This means that most of the permit writing is for permit renewals. Approximately 10 percent of each year's workload is attributed to new permits, modifications and requests for estimated limits. NPDES permits are designed to be re-issued every five years but are administratively extended in full force and effect indefinitely if the permittee applied for a renewal before the current permit expires.

There are several different types of permits that are issued in the NPDES permitting program. Table 5-1 lists and describes the various permits.

TABLE 5-1
TYPES OF PERMITS ISSUED UNDER THE NPDES PROGRAM

Type of Permit	Subtype	Comment
Municipal, Semi-Public or State (sanitary discharger)	Major	A facility owned by a municipality with a design flow Municipal of 1 MGD or greater (Cities, Towns, Regional Sewer Districts)
	Minor	Any municipally owned facility with a design flow of less than 1 MGD (Cities, Towns, Regional Sewer Districts)
	Semipublic	Any facility not municipally, State or Federally owned (i.e.- mobile home parks, schools, restaurants, etc.)
	State Owned	A facility owned or managed by a State agency (State parks, prisons, etc.)
	Federally Owned	A facility owned by a federal agency (military Owned installation, national park, federal penitentiary, etc.)
Industrial (Wastewater generated in the process of producing a product)	Major	Any point source discharger designated annually by agreement between the commissioner and EPA. Classification of discharger as a major involves consideration of factors relating to significance of impact on the environment, such as: Nature and quantity of pollutants discharged; Character and assimilative capacity of receiving waters; Presence of toxic pollutants in discharge; Compliance history of discharger.
	Minor	All dischargers which are not designated as major dischargers.
	General	General permit rule provides streamlined NPDES permitting process for certain categories of industrial point source discharges under requirements of the applicable general permit rule, rather than requirements of an individual permit specific to a single discharge. General permit rules: 327 IAC 15-7 Coal mining, coal processing, and reclamation activities; 327 IAC 15-8 Non-contact cooling water; 327 IAC 15-9 Petroleum product terminals; 327 IAC 15-10 Groundwater petroleum remediation systems; 327 IAC 15-11 Hydrostatic testing of commercial pipelines; 327 IAC 15-12 Sand, gravel, dimension stone or crushed stone operations.
	Cooling Water	Water which is used to remove heat from a product or process; the water may or may not come in contact with the product.
	Public Water Supply	Wastewater generated from the process of removing pollutants from ground or surface water for the purpose of producing drinking water.
Pretreatment Urban Wet Weather Group (Associated with NPDES but do not fall under same rule.)	Stormwater-related	Wastewater resulting from precipitation coming in contact with a substance which is dissolved or suspended in the water.
	Industrial Wastewater Pre-treatment	Processed wastewater generated by Industries that contribute to the overall wastewater received by the wastewater treatment plant.
	Combined Sewer Overflow (CSO)	Wastewater discharged from combined storm and sanitary sewers due to precipitation events. Municipal and Industrial Urban Wet Weather Programs

5.1.3 Nonpoint Source Control Programs

Nonpoint source (NPS) pollution is so named because the pollutants do not originate at single point sources, such as industrial and municipal waste discharge pipes. Instead, NPS pollutants are carried over fields, lawns, and streets by rainwater, wind, or snowmelt. This runoff may carry with it such things as fertilizer, road salt, sediment, motor oil, or pesticides. These pollutants either enter lakes and streams or seep into groundwater. While some NPS pollution is naturally occurring, most of it is a result of human activities.

Reducing NPS pollution requires careful attention to land use management and local geographic and economic conditions. The NPS Program was established to fully integrate methods for coping with the state's varied NPS water pollution problems. While a number of agencies and organizations currently have their own programs for addressing specific NPS issues, overall NPS coordination is being aided through the consolidated NPS Management Plan that was developed in the early stages of the Program's formation. Approximately, over 180 NPS-related projects have been funded and managed by the NPS Program since 1990. The NPS Management Plan was prepared in 1989, partially based on findings from the NPS Assessment Report, which was also completed that year. The NPS Management Plan was updated and received EPA approval in 1999. Some of the objectives of the Management Plan included the education of land users, the reduction and remediation of NPS pollution caused by erosion and sedimentation of forested and agricultural lands, and urban runoff. Other objectives addressed pesticide and fertilizer use, land application of sludge, animal waste practices, past and present mining practices, on-site sewage disposal, and atmospheric deposition.

The state's NPS Program, administered by the IDEM Office of Water Quality's Watershed Management Section, focuses on the assessment and prevention of NPS water pollution. The program also provides for the exchange of education and information in order to improve the way land is managed. Through the use of federal funding for the installation of best management practices (BMPs), the NPS Program effectively reaches out to citizens and assists in the development of BMPs to manage land in such a way that less pollution is generated. The NPS program promotes a non-regulatory, voluntary approach to solving water quality problems.

The many nonpoint source projects funded through the Office of Water Quality are a combination of local, regional, and statewide efforts sponsored by various public and not-for-profit organizations. The emphasis of these projects has been on the local, voluntary implementation of NPS water pollution controls. Since the inception of the program in the late 1980s, it has utilized over $12 million of federal funds for the development of over 180 projects.

The federal Clean Water Act contains nonpoint source provisions in several sections of the Act including the Section 319 Nonpoint Source Program, the Section 314 Clean Lakes Program (no longer funded), the Section 104(b)(3) Watershed Management Program, and the Section 205(j) Water Quality Planning Program. The Section 319 program provides for various voluntary projects throughout the state to prevent water pollution and also provides for assessment and management plans related to water bodies in Indiana impacted by NPS pollution. Section 314 has assessment provisions that assist in determining the nonpoint and point source water quality impacts on lakes and provides recommendations for improvements, but no longer receives funding. Section 104(b)(3) provides assistance in the development of watershed management planning efforts and education/information and implementation projects. Section 604(b) provides for planning activities relating to the improvement of water quality from

nonpoint and point sources. The Watershed Management Section within the Planning Branch of the Office of Water Quality provides for the administration of the Section 319 funding source for the NPS-related projects. The Financial Management Services Branch of the Office of Water Quality administers the Section 104(b)(3) and Section 604(b) grants.

Clean Water Act Section 319(h) grant monies are made available to the states on an annual basis by EPA. Agencies and organizations in the state that deal with NPS problems submit proposals to the Office of Water Quality each year for use of these funds in various projects.

One of the most important aspects of all NPS pollution prevention programs is the emphasis on the watershed approach to these programs. This calls for users in the watershed to become involved in the planning and implementation of practices, which are designed to prevent pollution. By looking at the watershed as a whole, all situations causing the degradation of water quality will be addressed, not just a few. Appendix C lists the conservation partners and local stakeholders located in the St. Joseph-Lake Michigan watershed.

5.1.4 Integrating Point and Nonpoint Source Pollution Control Strategies

Integrating point and nonpoint source pollution controls and determining the amount and location of the remaining assimilative capacity in a watershed are key long-term objectives of watershed management. The information is used for a number of purposes including: determining if and where new or expanded municipal or industrial wastewater treatment facilities can be allowed; setting the recommended treatment level at these facilities; and identifying where point and nonpoint source pollution controls must be implemented to restore capacity and maintain water quality standards.

Total Maximum Daily Loads

The Clean Water Act mandates an integrated point and nonpoint source pollution control approach. This approach, called a total maximum daily load (TMDL), uses the concept of determining the total pollutant loading from point and nonpoint sources that a waterbody can assimilate while still maintaining its designated use (maintaining water quality standards). EPA is responsible for ensuring that TMDLs are completed by States and for approving the completed TMDLs.

Under the TMDL approach, waterbodies that do not meet water quality standards are identified. States establish priorities for action, and then determine reductions in pollutant loads or other actions needed to meet water quality goals. The approach is flexible and promotes a watershed approach driven by local needs and directed by the State's list of priority waterbodies. The overall goal in establishing the TMDL is to establish the management actions on point and nonpoint sources of pollution necessary for a waterbody to meet water quality standards.

The Office of Water Quality at IDEM is in the process of reorganizing its work activities around a five year rotating basin schedule. The waters of the state have been grouped geographically into major river basins, and water quality data and other information will be collected and analyzed from each basin, or group of basins, once every five years. The schedule for implementing the TMDL Strategy is proposed to follow this rotating basin plan to the extent possible. The TMDL Strategy discusses activities to be accomplished in three phases. Phase One involves planning, sampling and data collection and would take place the first year. Phase Two involves TMDL development and would occur in the second year, and Phase Three is the TMDL implementation and would occur the third year. It is expected that some phases,

especially implementation of TMDLs (Phase Three) in the basin(s), may take more than one year to fully accomplish.

Initially, as part of the TMDL Strategy in a watershed, the IDEM TMDL Program Manager, in coordination with the IDEM Basin Coordinator of the target basin, will develop an activity reference guide for each TMDL. This activity reference guide will provide: (1) a list of the necessary activities and tasks, (2) a schedule for completing activities and tasks associated with an individual TMDL, and (3) a roster that indicates which Section, staff, and /or contractor are responsible for completion of each activity/task.

In Phase Three, the TMDL scenario chosen in conjunction with watershed stakeholders during Phase Two will be used to develop a plan to implement the TMDL. During this process, stakeholder participation will be essential. The Basin Coordinator, in conjunction with the stakeholder groups, will develop a plan to implement the TMDL. Once the draft plan has been finalized through comments from stakeholder groups and IDEM, the plan becomes Adraft-final@ and open public review. Public meetings will be held in areas affected to solicit comments.

5.1.5 Potential Sources of Funding for Water Quality Projects

There are numerous sources of funding for all types of water quality projects. The sources of funding include federal and state agencies, nonprofits, and private funding. Funds may be loans, cost-share projects, or grants. Section 319(h) grants and other funding sources are discussed below.

If a local government, environmental group, university researcher, or other individual or agency wants to find funding to address a local water quality problem, it is well worth the time to prepare a thorough but concise proposal and submit it to applicable funding agencies. Even if a project is not funded, follow-up should be done to determine what changes may be needed in order to make the application more competitive.

Section 319(h) Grants

EPA offers to the state Clean Water Act Section 319(h) grant moneys on an annual basis. These grants must be used to fund projects that address nonpoint source pollution issues. Some projects which the Office of Water Quality has funded with this money in the past include best management practice (BMP) demonstrations, watershed water quality improvements, data management, educational programs, modeling, stream restoration, and riparian buffer establishment. Units of government, nonprofit groups, and universities in the state that have expertise in nonpoint source pollution problems are invited to submit Section 319(h) proposals to the Office of Water Quality.

Office of Water Quality staff review proposals for minimum 319 eligibility criteria such as:

- Does it support the state NPS Management Program milestones?
- Does the project address targeted, high priority watersheds?
- Is there sufficient non-federal cost-share match available (25% of project costs)?
- Are measurable outputs identified?
- Is monitoring required? Is there a Quality Assurance/Quality Control plan for monitoring?
- If a Geographical Information System is used, is it compatible with that of the state?
- Is there a commitment for educational activities and a final report?

- Are upstream sources of NPS pollution addressed?
- Are stakeholders involved in the project?

Office of Water Quality staff separately review and rank each proposal which meets the minimum 319 eligibility criteria. In their review, members consider such factors as: technical soundness; likelihood of achieving water quality results; degree of balance lent to the statewide NPS Program in terms of project type; and competence/reliability of contracting agency. They then convene to discuss individual project merits, to pool all rankings and to arrive at final rankings for the projects. Comments are also sought from outside experts in other governmental agencies, nonprofit groups, and universities. The Office of Water Quality seeks a balance between geographic regions of the state and types of projects. All proposals that rank above the funding target are included in the annual grant application to EPA, with EPA reserving the right to make final changes to the list. Actual funding depends on approval from EPA and yearly congressional appropriations.

Other Sources of Funding

Besides Section 319(h) funding, there are numerous sources of funding for all types of water quality projects. The sources of funding include federal and state agencies, nonprofit, and private funding. Funds may be loans, cost-shares, or grants. Appendix D provides a summary list of agencies and funding opportunities.

5.2 Indiana Department of Natural Resources Water Programs

5.2.1 Division of Soil Conservation

The Division of Soil Conservation's mission is to ensure the protection, wise use, and enhancement of Indiana's soil and water resources. The Division's employees are part of Indiana's Conservation Partnership, which includes the 92 soil and water conservation districts (SWCDs), the USDA Natural Resources Conservation Service, and the Purdue University Cooperative Extension Service. Working together, the partnership provides technical, educational, and financial assistance to citizens to solve erosion and sediment-related problems occurring on the land or impacting public waters.

The Division administers the Clean Water Indiana soil conservation and water quality program under guidelines established by the State Soil Conservation Board, primarily through the SWCDs in direct service to landusers. The Division staff includes field-based resource specialists who work closely with landusers, assisting in the selection, design, and installation of practices to reduce soil erosion on their land. Regional Urban Conservation Specialists work primarily with developers, contractors, and others to address erosion and sediment concerns in urban settings, developments under construction, and in landfills. The Lake and River Enhancement staff (LARE) oversee all administrative, operational, and technical aspects of the LARE program, which provides financial assistance to local entities concerned with improving and maintaining water quality in public-access lakes, rivers, and streams.

The St. Joseph-Lake Michigan Watershed has had several LARE projects. The following table lists the LARE projects by county.

LAKE AND RIVER ENHANCEMENT PROGRAM

COUNTY	LAKE/STREAM	PROJECT TYPE	INITIAL APPROVAL AMOUNT
Kosciusko	28 Lakes	Pre-Investigation	$9,500
	Pike Lake	Diagnostic	$19,700
	Little Barbee Lake	Diagnostic/Design	$41,000
	Lake Wawasee	Diagnostic	$48,000
	Little Barbee Lake	Design	$16,171
	Pike Lake	1st Year WLT	$30,000
	Lake Wawasee	1st Year WLT	$90,000
	Pike Lake	2nd Year WLT	$40,000
	Lake Wawasee	2nd Year WLT	$80,000
	Barbee Lakes Chain	Diagnostic	$40,500
	Webster/Backwater Lakes	Diagnostic	$32,000
	Pike Lake	3rd Year WLT	$55,000
	Lake Wawasee	3rd Year WLT	$30,000
	Little Barbee Lake	Construction	$36,383
	Lake Wawasee	4th Year WLT	$20,000
	Pike Lake	4th Year WLT	$30,000
LaGrange	24 Lakes	Pre-Investigation	$9,200
	Shipshewana Lake	Diagnostic	$25,425
	Fish/Royer Lakes	Diagnostic	$23,800
	Big/Little Turkey Lakes	Diagnostic	$33,000
	B. Long/Pretty/Lake Woods/McClish	Diagnostic	$28,700
	Shipshewana Lake	Design	$237,393
	Big/Little Turkey Lakes	Diagnostic - Supplement	$4,900
	10 Lakes	Diagnostic	$115,978
	Shipshewana Lake	WLT	$315,920
	Shipshewana Lake	Monitoring	$26,850
	Shipshewana Lake	Design - Supplement	$64,658
	Adams Lake	1st Year WLT	$32,457
	Adams Lake	Monitoring	$5,794
	Pretty Lake	Design	$37,000
	Adams Lake	2nd Year WLT	$37,000
	Adams Lake	3rd Year WLT	$36,000
	Pretty Lake	1st Year WLT	$37,000
	Pretty Lake	Rescind Design	($37,000)
	Witmer Lake	1st Year WLT	$30,000
	Pretty Lake	Fund Transfer	($20,000)
	Indian Lakes Chain	Engineering Feasibility	$22,500
	Witmer Lake	2nd Year WLT	$24,000
	Witmer Lake	3rd Year WLT	$30,000
Noble	Sylvan Lake	Diagnostic	$15,300
	Bixler Lake	Diagnostic	$19,553
	Cree/Shockopee Lakes	Diagnostic	$22,348
	Skinner Lake	Construction	$44,726
	Sylvan Lake	Design	$96,200
	Cree/Shockopee Lakes	1st Year WLT	$18,922

COUNTY	LAKE/STREAM	PROJECT TYPE	INITIAL APPROVAL AMOUNT
	Upper Long Lake	Diagnostic	$22,185
	Cree/Shockopee Lakes	Monitoring	$2,838
	Cree/Shockopee Lakes	2nd Year WLT	$44,151
	Cree/Shockopee Lakes	3rd Year WLT	$30,000
	Sylvan Lake	Construction	$75,000
	Loon/Goose Lakes	Diagnostic	$21,670
	Big Lake	Preliminary Assessment	
	Chain O' Lakes	Diagnostic	$30,000
	Loon/Goose Lakes	1st Year WLT	$40,000
	Loon/Goose Lakes	2nd Year WLT	$40,000
Steuben	Crooked Lake	Diagnostic	$6,900
	Lake James	Diagnostic	$6,500
	Hamilton Lake	Diagnostic	$21,870
	West Otter Lake	Diagnostic	$14,832
	Hamilton Lake	Design	$72,270
	Hamilton Lake	1st Year WLT	$103,180
	Lake James	Design	$6,000
	Hamilton Lake	2nd Year WLT	$147,400
	Hamilton Lake	3rd Year WLT	$44,220
	West Otter Lake	1st Year WLT	$20,000
	West Otter Lake	2nd Year WLT	$15,000
	Hamilton Lake	Construction	$73,973
	West Otter Lake	Supplemental WLT	$20,000
	Crooked Lake	Construction	$100,000
	West Otter Lake	3rd Year WLT	$23,000

5.2.2 Division of Water

The IDNR, Division of Water (DOW) is charged by the State of Indiana to maintain, regulate, collect data, and evaluate Indiana's surface and ground water resources.

The Engineering Branch of the DOW includes Dam and Levee Safety, Project Development, Surveying, Drafting, and Computer Services. The Dam and Levee Safety Section performs geotechnical and hydraulic evaluation on existing and proposed dams and levees throughout the State. The Project Development Section provides technical support to locally funded water resource projects along with engineering leadership and construction management to State funded water resource projects. The remaining sections provide support services to all Sections within the DOW such as reservoir depth mapping, topographic mapping, highwater marks, design of publications and brochures, and computer procurement and maintenance.

The Planning Branch of the DOW consists of Basin Studies, Coastal Coordination, Floodplain Management, Ground Water, Hydrology and Hydraulics, and Water Rights. Basin Studies are comprehensive reports on surface-and ground-water availability and use. Coastal Coordination is a communication vehicle to address Lake Michigan's diverse shoreline issues. Floodplain Management involves various floodplain management aspects including coordination with the National Flood Insurance Program and with State and Federal Emergency Management

agencies during major flooding events. The Ground Water Section maintains the water-well record computer database and publishes reports and maps on the ground-water resource for the State. Hydrology and Hydraulics Section develops and reviews floodplain mapping and performs hydrologic studies and modeling. The Water Rights Section investigates and mediates groundwater/surface water rights issues, licenses water-well drillers, and develops well construction and abandonment procedures.

The Regulations Branch of DOW is made up of Stream Permits, Lake Permits, Permit Administration, Public Assistance, and Legal Counsel. The Stream Permits Section is responsible for reviewing permit applications for construction activity in the 100-year regulatory floodway along Indiana's waterways. The Lake Permits Section reviews construction projects at or below the legal lake level for all of Indiana's public freshwater lakes. Permit Administration Section provides administrative support to Branch staff, maintains the application database, and coordinates the application review process with other Divisions. The Public Assistance Section provides technical assistance on possible permit applications on proposed construction projects, investigates and mediates unpermitted construction activities and in some cases with the support of Legal Counsel pursues legal action for violation of State laws.

5.3 USDA/Natural Resources Conservation Service Water Quality Programs

While there are a variety of USDA programs available to assist people with their conservation needs. The following assistance programs are the principal programs available.

Conservation Technical Assistance (CTA)

The purpose of the program is to assist landusers, communities, units of state and local government, and other Federal agencies in planning and implementing conservation systems. The purpose of the conservation systems are to reduce erosion, improve soil and water quality, improve and conserve wetlands, enhance fish and wildlife habitat, improve air quality, improve pasture and range condition, reduce upstream flooding, and improve woodlands.

The objective of the program is to: Assist individual landusers, communities, conservation districts, and other units of State and local government and Federal agencies to meet their goals for resource stewardship and assist individuals to comply with State and local requirements. NRCS assistance to individuals is provided through conservation districts in accordance with the Memorandum of Understanding signed by the Secretary of Agriculture, the Governor of the State, and the conservation district. Assistance is provided to landusers voluntarily applying conservation and to those who must comply with local or State laws and regulations. Assistance is also provided to agricultural producers to comply with the highly erodible land (HEL) and wetland (Swampbuster) provisions of the 1985 Food Security Act as amended by the Food, Agriculture, Conservation and Trade Act of 1990 (16 U.S.C. 3801 et. seq.); the Federal Agriculture Improvement and Reform Act of 1996, and wetlands requirements of Section 404 of the Clean Water Act. NRCS makes HEL and wetland determinations and helps land users develop and implement conservation plans to comply with the law. They also provide technical assistance to participants in USDA cost-share and conservation incentive programs. NRCS collects, analyzes, interprets, displays, and disseminates information about the condition and trends of the Nation's soil and other natural resources so that people can make good decisions about resource use and about public policies for resource conservation. They also develop effective science-based technologies for natural resource assessment, management, and conservation.

Conservation of Private Grazing Land Initiative (CPGL)

The Conservation of Private Grazing Land initiative will ensure that technical, educational, and related assistance is provided to those who own private grazing lands. It is not a cost-share program. This technical assistance will offer opportunities for: better grazing land management; protecting soil from erosive wind and water; using more energy-efficient ways to produce food and fiber; conserving water; providing habitat for wildlife; sustaining forage and grazing plants; using plants to sequester greenhouse gases and increase soil organic matter; and using grazing lands as a source of biomass energy and raw materials for industrial products.

Conservation Reserve Program (CRP)

NRCS provides technical assistance to landowners interested in participating in the Conservation Reserve Program administered by the USDA Farm Service Agency. The Conservation Reserve Program reduces soil erosion, protects the Nation's ability to produce food and fiber, reduces sedimentation in streams and lakes, improves water quality, establishes wildlife habitat, and enhances forest and wetland resources. It encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filterstrips, or riparian buffers. Farmers receive an annual rental payment for the term of the multi-year contract. Cost-share funding is provided to establish the vegetative cover practices.

Environmental Quality Incentives Program (EQIP)

The Environmental Quality Incentives Program provides technical, educational, and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost effective manner. The program provides assistance to farmers and ranchers in complying with Federal, State, and tribal environmental laws, and encourages environmental enhancement. The program is funded through the Commodity Credit Corporation. The purposes of the program are achieved through the implementation of a conservation plan, which includes structural, vegetative, and land management practices on eligible land. Five to ten year contracts are made with eligible producers. Cost-share payments may be made to implement one or more eligible structural or vegetative practices, such as animal waste management facilities, terraces, filter strips, tree planting, and permanent wildlife habitat. Incentive payments can be made to implement one or more land management practices, such as nutrient management, pest management, and grazing land management.

Fifty percent of the funding available for the program is targeted at natural resource concerns relating to livestock production. The program is carried out primarily in priority areas that may be watersheds, regions, or multi-state areas, and for significant statewide natural resource concerns that are outside of geographic priority areas.

Watershed Surveys and Planning

The Watershed and Flood Prevention Act, P.L. 83-566, August 4, 1954, (16 U.S.C. 1001-1008) authorized this program. Prior to fiscal year 1996, small watershed planning activities and the cooperative river basin surveys and investigations authorized by Section 6 of the Act were operated as separate programs. The 1996 appropriations act combined the activities into a

single program entitled the Watershed Surveys and Planning program. Activities under both programs are continuing under this authority.

The purpose of the program is to assist Federal, State, and local agencies and tribal governments to protect watersheds from damage caused by erosion, floodwater, and sediment and to conserve and develop water and land resources. Resource concerns addressed by the program include water quality, opportunities for water conservation, wetland and water storage capacity, agricultural drought problems, rural development, municipal and industrial water needs, upstream flood damages, and water needs for fish, wildlife, and forest-based industries.

Types of surveys and plans include watershed plans, river basin surveys and studies, flood hazard analyses, and flood plain management assistance. The focus of these plans is to identify solutions that use land treatment and non-structural measures to solve resource problems.

Watershed Program and Flood Prevention Program (WF 08 or FP 03)

The Small Watershed Program works through local government sponsors and helps participants solve natural resource and related economic problems on a watershed basis. Projects include watershed protection, flood prevention, erosion and sediment control, water supply, water quality, fish and wildlife habitat enhancement, wetlands creation and restoration, and public recreation in watersheds of 250,000 or fewer acres. Both technical and financial assistance are available.

Wetlands Reserve Program (WRP)

The Wetlands Reserve Program is a voluntary program to restore wetlands. Participating landowners can establish conservation easements of either permanent or 30 year duration, or can enter into restoration cost-share agreements where no easement is involved. In exchange for establishing a permanent easement, the landowner receives payment up to the agricultural value of the land and 100 percent of the restoration costs for restoring the wetlands. The 30 year easement payment is 75 percent of what would be provided for a permanent easement on the same site and 75 percent of the restoration cost. The voluntary agreements are for a minimum 10 year duration and provide for 75 percent of the cost of restoring the involved wetlands. Easements and restoration cost-share agreements establish wetland protection and restoration as the primary land use for the duration of the easement or agreement. In all instances, landowners continue to control access to their land.

Wildlife Habitat Incentives Program (WHIP)

The Wildlife Habitat Incentives Program provides financial incentives to develop habitat for fish and wildlife on private lands. Participants agree to implement a wildlife habitat development plan and USDA agrees to provide cost-share assistance for the initial implementation of wildlife habitat development practices. USDA and program participants enter into a cost-share agreement for wildlife habitat development. This agreement generally lasts a minimum of 10 years from the date that the contract is signed.

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St. Joseph-Lake Michigan Watershed Restoration Action Strategy

Part II: Concerns and Recommendations

Prepared by

Indiana Department of
Environmental Management
Office of Water Quality

January 20001

Foreword

The First Draft (October 1999) of the Watershed Restoration Action Strategy (WRAS) was reviewed internally by IDEM and revised accordingly. The Second Draft (March 2000) was reviewed by stakeholders and revised accordingly. This Third Draft (January 2000) is intended to be a living document to assist restoration and protection efforts of stakeholders in their sub-watersheds. As a "living document" information contained within the WRAS will need to be revised and updated periodically.

The WRAS is divided into two parts: Part I, Characterization and Responsibilities and Part II, Concerns and Recommendations.

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St. Joseph-Lake Michigan Watershed Restoration Action Strategy
Part II: Concerns and Recommendations

Part II of the Watershed Restoration Action Strategy discusses the water quality concerns identified for the St. Joseph-Lake Michigan Watershed and lists recommended management strategies to address these concerns.

Part II includes:

1 Water Quality Concerns and Priority Issues Identified by Stakeholder Groups

The St. Joseph-Lake Michigan watershed contains potential stakeholder groups that have different missions. Many of these groups have a long history of working in the St. Joseph-Lake Michigan watershed. The following discussion briefly describes some of the watershed groups and lists their priorities and concerns.

Elkhart County Soil and Water Conservation District

The Elkhart County Soil and Water Conservation District has developed a Long Range Plan and Annual Work Plan. Listed below are concerns addressed in their plans.

1. Monitor surface water quality
2. Facilitate communication between ag and urban
3. Education and information on septic systems
4. Assist farmers in removing livestock from drainage ways

Kosciusko County Soil and Water Conservation District

The Kosciusko County Soil and Water Conservation District has held locally led meetings to prioritize concerns of the local people related to natural resources. Following are some of the concerns addressed through this process:

1. Loss of land to urban sprawl
2. Threats to right to farm
3. Lack of erosion control
4. Lack of water usage plan

5. Loss of fish and wildlife habitat
6. Disappearing wetlands as they relate to water quality
7. Lack of Stewardship Ethic
8. Lack of manure management

LaGrange County Soil and Water Conservation District

Through public meetings the LaGrange County Soil and Water Conservation District has developed the following list as concerns for their county:

1. Water and wind erosion
2. Erosion on development sites
3. Groundwater contamination from agriculture (chemicals and nutrients)
4. Streambank erosion
5. Animal waste
6. Lack of productive woodlands
7. Eutrophication and sedimentation

Noble County Soil and Water Conservation District

The Noble County Soil and Water Conservation District has held meetings to gather input on local concerns within the county. The results of these meetings provide direction for the District. Thirty concerns were identified. Listed below are the top seven concerns. This winter the District will be hosting a meeting to re-visit these concerns and to identify new concerns with the local citizens.

1. Groundwater Contamination
2. Poor Surface Water Quality
3. Soil Erosion on Agricultural Land
4. Streambank Stabilization
5. Lack of Woodland Management
6. Loss of Woodland
7. Manure Management

St. Joseph County Soil and Water Conservation District

The St. Joseph County Soil and Water Conservation District has conducted locally led meetings to gather the concerns of the local people on issues related to natural resources. Through these meetings the concerns have been prioritized and are listed below.

1. Zoning to protect farmland, highly productive land
2. Water quality, ground and surface water related to septic and wells
3. Urban Growth
4. Education, stewardship in natural resources, soils and drainage, conservation

St. Joseph River Basin Commission

The St. Joseph River Basin Commission (SJRBC) was organized under an act of the 1988 Indiana State Legislature. It consists of seven counties (St. Joseph, Elkhart, Kosciusko, Noble, LaGrange, Steuben, Dekalb) and was formed for the following purposes:

1. Provide a forum for discussion, study, and evaluation of water resources issues of common concern in the Basin
2. Facilitate and foster cooperative planning and coordinated management of the Basin's water and related land resources
3. Develop positions on major water source issues and serve as an advocate of the Basin's interests
4. Make recommendations on matters related to the Commission's functions and objectives, to political subdivisions in the Basin, and to other public and private agencies
5. Develop plans to improve water quality in the Basin

The Steuben County Soil and Water Conservation District

The Steuben County Soil and Water Conservation District has developed, through their Agricultural Needs Assessment Committee, a list of concerns and priorities. The following are the top nine:

1. Lack of filterstrips
2. Need more hay/CRP on sensitive land
3. Old drainage tile over burdened and broken down (installed In 1900's – 1920's)
4. Increased runoff/Erosion due to No-till and conventional till
5. Waste Management and odor (management aspects)
6. Lack of retention ponds and areas
7. Wash outs in ditches due to tile blow outs
8. Too many deer (population)
9. Nutrient, fertilizer, and herbicide management in agricultural setting

Steuben County Water Quality Committee

This committee receives technical and educational support from the Steuben County SWCD, IDNR-Division of Soil Conservation, USDA-Natural Resources Conservation Service, Purdue Cooperative Extension Service, Steuben County Surveyor, and Steuben County Plan Commission.

The mission of the committee is to review, assess, target and monitor watershed land treatment (ag and urban) necessary to achieve water quality and water management in Steuben County.

Friends of the St. Joe River Association Inc.

The Friends of the St. Joe River Association Inc. was established in April 1994 for the purpose of bringing together communities located within the St. Joseph River watershed to work together clean and restore the St. Joe River and its tributaries.

Michigan Department of Natural Resources, Fisheries Division
The Michigan Department of Natural Resources, Fisheries Division has developed an Assessment for the St. Joseph River. It is a comprehensive reference for citizens and agency personnel primarily within the Michigan area section of the watershed; however there has been an effort made to include the entire watershed throughout the assessment.

2 Water Quality Concerns and Priority Issues Identified by State and Federal Agencies

This section presents the combined efforts of state and federal agencies, and universities (such as IDEM, IDNR, USDA-Natural Resources Conservation Service, Ohio River Valley Water Sanitation Commission, Purdue University, Indiana University, Indiana Geologic Survey, and US Geological Survey) to assess water quality concerns and priority issues in the St. Joseph-Lake Michigan Watershed. This multi-organization effort formed the basis of the Unified Watershed Assessment for Indiana. At this time, the Unified Watershed Assessment has been completed for 1998 and 2000-2001, as described below.

Indiana=s 1998 Unified Watershed Assessment (UWA)

The UWA workgroup gathered a wide range of water quality data that could be used to characterize Indiana's water resources. These data were used in Alayers@ in order to sort the 8-digit HUC watersheds according to the present condition of the water in lakes, rivers, and streams. The workgroup used only those data which concerned the water column, organisms living in the water, or the suitability of the water for supporting aquatic ecosystems. Each Alayer@ of information/data was partitioned by percentiles into scores. The scores ranged between one and five, with a score of one indicative of good water quality or minimum impairment, and a score of five indicating heavily impacted or degraded water quality. The scoring derived through the UWA process is presented in Table 2-1.

The data layers listed in Table 2-1 can be defined as:

- Lake Fishery: Large mouth bass community information for lakes
- Stream Fishery: Small mouth bass community information for streams
- Aquatic Life Use Support: The >livability= of the water column for aquatic life, determined from evaluation of chemical and physical water data, and assessment of aquatic life
- Fish Consumption Advisories: Site specific advisories based on current data
- Fish Index of Biotic Integrity: Based on fish community diversity and fish health

- Qualitative Habitat Evaluation Index: Measure of whether the aquatic habitat is suitable for diverse communities, based on visual observations
- Lake Trophic Scores: Indicator for the rate at which a lake is >aging= due to inputs of nutrients and other factors
- Sediment Potential: Indicator of potential sediment input to waterbodies in the watershed

The sources and additional information for these data layers include:

- Lake Fishery: From IDNR fisheries surveys of lakes and reservoirs from 1972 to 1994. Raw scores were averaged for all lakes in the watershed
- Stream Fishery: From IDNR fisheries surveys of streams from 1970 to 1994. Raw scores were averaged for all streams in the watershed
- Aquatic Life Use Support: IDEM, Office of Water Quality, Assessment Branch
- Fish Consumption Advisories: ISDH and IDEM, Office of Water Quality, Assessment Branch
- Fish Index of Biotic Integrity: IDEM, Office of Water Quality, Assessment Branch
- Qualitative Habitat Evaluation Index: IDEM, Office of Water Quality, Assessment Branch
- Lake Trophic Scores: Indiana Clean Lakes Program through IDEM, Office of Water Quality, Assessment Branch. This score was based on information gathered from sampling conducted in the 1970's and 1980's
- Sediment Potential: U.S. Geological Survey scored the population rate of change and the 1996 Conservation Tillage Transect data. The scores were then added and normalized to produce a sediment yield indicator for each watershed

From this scoring, it is evident that lake fishery and sediment potential are the key concerns. The other categories, except stream fishery, are in the moderate to high index indicating there are also significant problems in the St. Joseph-Lake Michigan watershed.

TABLE 2-1
RESULTS OF THE UNIFIED WATERSHED ASSESSMENT
FOR St. Joseph-Lake Michigan

Data/Information Layer	St. Joseph-Lake Michigan (04050001) Score
Lake Fishery	4
Stream Fishery	1
Aquatic Life Use Support	3
Fish Consumption Advisories	3
Fish Index of Biotic Integrity	*
Qualitative Habitat Evaluation Index	3
Lake Trophic Scores	2
Sediment Potential	4

Note:
The UWA scores range from one to five, with a score of one indicating good water quality and a score of five indicating severe impairment.

Indiana's 2000-2001 Unified Watershed Assessment (UWA)

During summer 1999 the UWA workgroup used additional layers of information to identify the **resource concerns and stressors** for each of the 361 11-digit watersheds in Indiana. Examination of the human activities that have the potential to impact the ecosystem will help planners to focus on those areas where restoration may be most critical. Organizations can identify opportunities to use their programs and resources to address those areas.

This focusing process will illuminate areas where the interests of two or more partner agencies may converge. It is intended that this will lead to more effective allocation of resources for restoration and protection activities. At the local level, this information can assist groups to prioritize watershed activities and provide some discussion points for planning.

This amended assessment has the following benefits:

- Provides a logical process for targeting funds, which may be expanded or updated without changing the basic framework.
- Provides information at a finer resolution (11-digit hydrologic units) to agencies and local groups interested in watershed assessment.
- Identifies data gaps.

- Can be used as a compliment to other assessments, such as the 305(b) Report and 303(d) List.

Table 2-2 and Figure 2-1 show the results of the 2000-2001 UWA for the St. Joseph-Lake Michigan watershed.

3 Identification of Impaired Waters

Section 303(d) of the Clean Water Act requires states to identify waters that do not or are not expected to meet applicable water quality standards with federal technology based standards alone. States are also required to develop a priority ranking for these waters taking into account the severity of the pollution and the designated uses of the waters. Indiana's 303(d) list was approved by EPA on February 16, 1999.

Once the Section 303(d) list and ranking of waters is completed, the states are required to develop Total Maximum Daily Loads (TMDLs) for these waters in order to achieve compliance with the water quality standards. The TMDL is an allocation that determines the point and nonpoint source (plus margin of safety) load reductions required in order for the waterbody to meet water quality standards. IDEM=s Office of Water Quality has and continues to perform point source waste load allocations for receiving waters. Part I of the WRAS briefly outlines IDEM=s strategy for developing TMDLs.

The following St. Joseph-Lake Michigan Watershed waterbodies are on Indiana=s 1998 Clean Water Act Section 303(d) list submitted and approved by EPA 303(d) list (Figure 3-1):

Crawford Ditch/Elkhart County:	Copper, Oil
Elkhart River/Elkhart County:	Fish Consumption Advisory(FCA) for polychlorinated byphenols (PCB) and mercury; E. coli
Jimmerson Lake/Steuben County:	FCA for mercury
Juday Creek/St. Joseph County:	FCA for PCBs
Lake James/Steuben County:	FCA for mercury
Lake Shipshewana/Lagrange County:	FCA for mercury
Lake Waubee/Kosciusko County:	FCA for mercury
Lake Wawasee/Kosciusko County:	FCA for PCBs & mercury
Long Lake/Steuben County:	FCA for mercury
Marsh Lake/Steuben County:	FCA for mercury
Mather's Ditch/Elkhart County:	Low dissolved oxygen & Endrin
Olin Lake/LaGrange County:	FCA for mercury
Oliver Lake/LaGrange County :	FCA for mercury
Orland Tributary/Steuben County:	Low dissolved oxygen
Pigeon Creek/Steuben County:	FCA for PCBs & mercury
Snow Lake/Steuben County:	FCA for PCBs & mercury
St. Joseph River/Elkhart & St. Joseph County:	FCA for PCBs & mercury; E. coli

**FCA	Fish Consumption Advisory
PCBs	polychlorinated byphenols

4 Priority Issues and Recommended Management Strategies

Part I provided the existing water quality information for the St. Joseph-Lake Michigan watershed and Part II lists priority issues and concerns from local, state, and federal stakeholders in the watershed. This section pulls together the priority issues and concerns held by all stakeholders and recommends management strategies. Underlying all discussions of priority issues and concerns is the fact that improving water quality in the St. Joseph-Lake Michigan Watershed will also enhance the natural and recreational values of St. Joseph-Lake Michigan. Each subsection below focuses on a single priority issue.

4.1 Data\Information and Targeting

Stakeholder groups identified a need for more water quality data and information in order to prioritize and target specific areas of the St. Joseph-Lake Michigan watershed. In addition to targeting areas, stakeholders identified the need for more data and information about the actual impact on water quality from nonpoint sources. Success in restoring water quality in the St. Joseph-Lake Michigan Watershed is fundamentally based on identifying the specific geographic problem areas; identifying all sources contributing to the impairment of the waterbody; and quantifying the contribution of a pollutant by each source.

Recommended Management Strategy 1: The local soil and water conservation districts in this watershed have worked together and applied for and received an IDEM 319 grant. This grant will allow for sampling and monitoring of water quality data in an effort to better understand the impact of nonpoint sources.

Recommended Management Strategy 2: Through the development of Total Maximum Daily Loads (TMDLs) for impaired waterbodies in the St. Joseph-Lake Michigan watershed, all sources contributing to the impairment of a waterbody will be identified and quantified in terms of their contribution to the waterbody. This includes gathering more data and information on nonpoint sources of water pollution. Throughout the TMDL process, information and feedback from watershed stakeholders will be required in order to generate appropriate allocation scenarios. The result of developing TMDLs will be an understanding of the impact of nonpoint sources on water quality in the watershed.

Recommended Management Strategy 3: As discussed in Part I, there has been little coordination between individual volunteer water quality monitoring groups within the St. Joseph-Lake Michigan watershed. In addition, a database that would hold the volunteer water quality monitoring data for the St. Joseph-Lake Michigan Watershed does not exist. Michigan's Water Quality Program sponsored by the Department of Environmental Quality, and the Lake Michigan Tributary Monitoring Program, sponsored by U.S. EPA Region 5, are being coordinated through the Friends of the St. Joe River Association, Inc. The information gathered will be located on their web page.

In Indiana several groups are working on water quality data collection. John Rouch, through IDEM 319 grants, is working to develop a database accessible to anyone with interest in the St. Joseph-Lake Michigan watershed. Both the Indiana and Michigan database will be compatible.

4.2 Streambank Erosion and Stabilization

The cutting and erosion of streambanks within the St. Joseph-Lake Michigan Watershed was identified by many local, state, and federal stakeholders as a major concern. This cutting and erosion increases the sediment load in waterbodies and directly impacts the scenic and recreational values of waterbodies in the St. Joseph-Lake Michigan watershed. Streambank cutting and erosion is often a function of many factors that include stream energy and velocity, flooding, and land management. Increased drainage in headwater streams and ditches increases stream energies during rainfall events and often leads to increased streambank cutting and erosion downstream. Hence, this problem is not easily solved.

Recommended Management Strategy: IDEM's Office of Water Quality offers their active support to the primary agency that has jurisdiction over this problem in order to facilitate the development of solutions..

Structural stabilization of specific streambank areas in the St. Joseph-Lake Michigan Watershed may solve problems on a temporary basis. However, a comprehensive understanding of drainage, stream flows and energies, and land management practices is required to adequately approach this problem. Conservation partners (local, state, and federal) are actively working within their specific geographic areas (typically at the county level); however, this may not facilitate solving the streambank cutting and erosion problems because efforts may not be coordinated between headwater and downstream areas.

4.3 Failing Septic Systems and Straight Pipe Discharges

Local county health departments and other stakeholders have identified failing septic systems and straight pipe discharge from septic tanks as significant sources of water pollution in the St. Joseph-Lake Michigan watershed. Straight pipe discharges from septic tanks and septic tanks connected to drainage tiles are illegal (327 IAC 5-1-1.5); however, these practices are ongoing in the St. Joseph-Lake Michigan watershed.

Recommended Management Strategy: To further educational efforts, the direct impact of communities discharging their septic tank effluent to waterbodies needs to be adequately characterized. This will involve coordination between the Office of Water Quality, local health departments, Indiana State Department of Health, and other stakeholders. The option of choice to eliminate the illegal discharges will be a cooperative effort between homeowners and local, state, and federal stakeholders. If a cooperative solution can not be reached, illegal dischargers will be required to cease discharge until they obtain an appropriate NPDES permit.

4.4 Water Quality - General

The Clean Water Act Section 303(d) list presented in Section 3 lists water quality limited waterbodies for the St. Joseph-Lake Michigan watershed

Recommended Management Strategy: The Clean Water Act requires states to complete TMDLs for waterbodies listed on the Section 303(d) list. The Office of Water Quality is currently evaluating and exploring the modeling process and data needs required to complete TMDLs for the Section 303(d) listed waterbodies. Completion of a TMDL will involve loading allocations of a pollutant to both point and nonpoint sources. The TMDL development process is in its early

stages for the St. Joseph-Lake Michigan watershed. This will involve meetings with stakeholder groups linked to the Section 303(d) waterbodies. As TMDLs are developed, this Watershed Restoration Action Strategy will be amended to incorporate the final TMDLs.

4.5 Fish Consumption Advisories

As noted in Part I and Part II, fish consumption advisories are clearly major concerns and priority issues within the St. Joseph-Lake Michigan watershed.

Recommended Management Strategy 1: The St. Joseph-Lake Michigan fish consumption advisories are related to PCB contamination and mercury. Continued monitoring will give a better assessment of these problems and corrective actions that may be taken. Also, development of TMDLs, as addressed in Section 4.4, will be a primary strategy.

4.6 Nonpoint Source Pollution - General

Nonpoint source pollution contributions are often difficult to assess or quantify. Currently, loadings of nonpoint source pollutants to water are often inferred by examination of land use practices, without actual measurements. In addition, the actual water quality impairments related to nonpoint source pollutants have not been well characterized in the St. Joseph-Lake Michigan watershed. Finally, very few regulatory control mechanisms exist to control nonpoint source pollution.

Recommended Management Strategy 1: Through the TMDL development process, the Office of Water Quality will identify, assess, and quantify nonpoint source pollutant loadings to impaired waterbodies. In order to accomplish this task, the Office of Water Quality will work closely with local, state, and federal stakeholders at the watershed and subwatershed level. Loading scenarios for nonpoint source pollutants will be developed by the Office of Water Quality and reviewed by local, state, and federal stakeholders. Implementation of nonpoint source controls will involve a blend of funding assistance and regulatory action, where applicable.

Recommended Management Strategy 2: Numerous funding mechanisms, such as Conservation Reserve Program, Environmental Quality Incentive Program, Lake and River Enhancement program, and 319(h) grants, exist to promote practices to reduce nonpoint source pollution in the watershed. In addition, to effectively address nonpoint source pollution in the watershed, the prioritization and targeting discussed previously in Part II should be used to allocate further application of resources.

Recommended Management Strategy 3: The St. Joseph-Lake Michigan Watershed has high livestock inventories. Although not shown in Part I due to disclosure problems, this watershed has counties that rank in the top ten counties in Indiana for poultry. Indiana (due to some of the counties in this watershed) ranks in the top five states in the U.S. for poultry production. Most of the watershed is in agricultural production (84%, see Part 1 - section 2.2.1). In an effort to better understand the impact of livestock and waste management and crop production management practices, the local soil and water conservation districts are working with IDEM through 319 grants to identify concerns and work with agricultural producers to address these concerns.

4.7 Point Sources - General

Illegal point source discharges, such as tiles discharging septic tank effluent, exist in the watershed.

Recommended Management Strategy: The Permitting and Compliance Branch of the Office of Water Quality is responsible for issuing and monitoring compliance of NPDES permit holders. Clearly, more emphasis and resources are needed to identify and correct illegal point sources and non-complying point sources. Improving compliance of NPDES dischargers and identifying illegal dischargers will involve fostering a working relationship with other local, state, and federal stakeholders to monitor compliance and report unusual discharges or stream appearance. In regards to illegal discharges, the Office of Water Quality will work with local, state, and federal stakeholders to identify and eliminate these sources of water pollution.

5 Future Expectations and Actions

As discussed in Part I, this Watershed Restoration Action Strategy is intended to be fluid document that will be revised or amended as new information becomes available. Section 5.1 discusses expectations derived from the Strategy and how progress will be measured. Specific revisions and amendments to the Watershed Restoration Action Strategy are discussed in Section 5.2. Finally, the Watershed Restoration Action Strategy will be reviewed by all stakeholders before it becomes final, as described in Section 5.3.

5.1 Expectations and Measuring Progress

The St. Joseph-Lake Michigan Strategy provides a starting point to address water quality concerns held by local, state, and federal stakeholders. Part II provides recommended management strategies to address these concerns. Through cooperative efforts with stakeholders, all of the recommended management strategies listed will begin implementation by the summer of 2000.

Measurement of progress is critical to the success of any plan. Water quality improvements will not take place overnight. Measuring of progress in terms of water quality will be provided through the Office of Water Quality Assessment Branch's rotating basin monitoring strategy. This will allow an assessment of progress in improving water quality.

5.2 Expected Revisions and Amendments

This Watershed Restoration Action Strategy is intended to provide a starting point to improve water quality and measure the improvement. Hence, this document will require revisions and amendments as new information becomes available. The future revisions and amendments have been divided into those that are expected within the next year (Section 5.2.1) and those that will occur over a long-term basis (Section 5.2.2).

5.2.1 Short Term Revisions and Amendments

The most significant revisions and amendments will likely occur during 2001 and after, as a result of the rotating basin assessments to be completed during 2001. The Section 305(b) assessments will be completed by late 1999 or early 2000. Local, state, and federal stakeholder comments regarding the Watershed Restoration Action Strategy will be addressed in future revisions of the document.

5.2.2 Long Term Revisions and Amendments

The Office of Water Quality is moving toward adopting a watershed management approach to solve water quality problems. Part of the watershed approach is the use of a rotating basin management cycle. The Assessment Branch of the Office of Water Quality has already adopted this rotating basin cycle in its intensive monitoring and assessment of Indiana waterbodies (this is in addition to the already established fixed monitoring station monitoring which occurs on a monthly basis). Based on the cycle the Assessment Branch is using, the next intensive monitoring of the St. Joseph-Lake Michigan watershed will occur during the sampling season of

2001. The information from the 2001 monitoring effort will be incorporated into the Watershed Restoration Action Strategy.

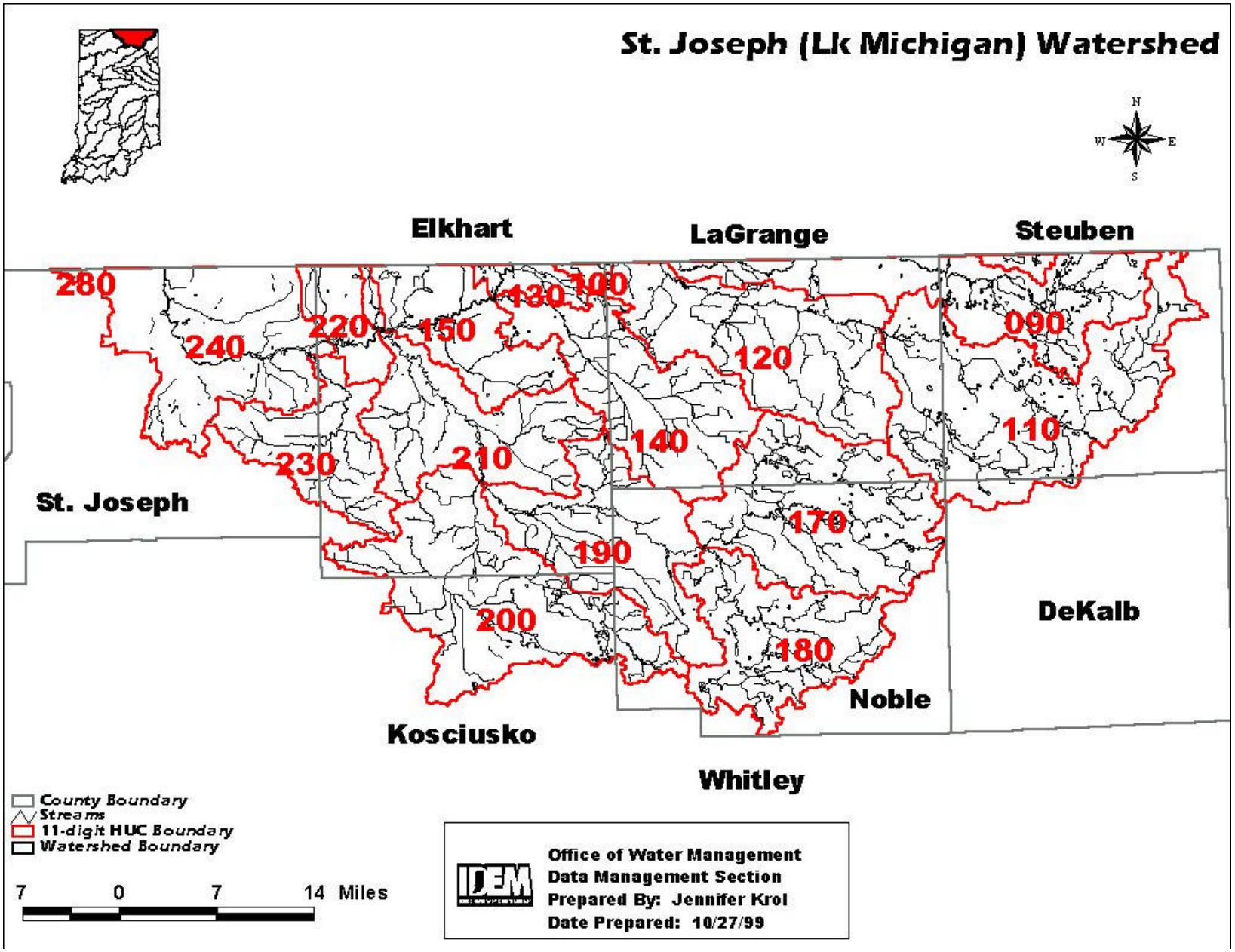
In addition, the Watershed Restoration Action Strategy may be revised or amended prior to 2001, if sufficient information becomes available.

5.3 Review of the Watershed Restoration Action Strategy

Before this Watershed Restoration Action Strategy becomes final, it will undergo rigorous review. The first stage of review will be performed internally by the Office of Water Quality. Once the Watershed Restoration Action Strategy has been revised to address internal Office of Water Quality comments, it will be circulated to local, state, and federal stakeholders in the watershed and meetings within the watershed will be held to discuss the document. Written comments from local, state, and federal stakeholders will be addressed and the Watershed Restoration Action Strategy will again be revised to incorporate applicable comments. Once internal and external comments have been addressed, the final version of the Watershed Restoration Action Strategy will be released.

TABLE 2-2

HYDROLOGIC UNIT SCORES for Each Parameter Used in the Unified Watershed Assessment [2000-2001]																
11 Digit Hydrologic Unit		Mussel Diversity and Occurrence	Aquatic Life Use Support	Recreational Use Attainment	Stream Fishery	Lake Fishery	Eurasian Milfoil Infestation Status	Lake Trophic Status	Critical Biodiversity Resource	Aquifer Vulnerability	Population Using Surface Water for Drinking Water	Residential Septic System Density	Degree of Urbanization	Density of Livestock	% Cropland	Mineral Extraction Activities
St Joe LM	04050001020	3	nd	nd	nd	nd	nd	nd	1	5	1	4	1	2	2	1
	04050001080	nd	nd	nd	nd	5	nd	3	2	1	1	4	2	2	2	1
	04050001090	nd	nd	nd	nd	nd	nd	nd	5	2	1	5	2	4	3	1
	04050001100	nd	nd	nd	nd	1	2	2	5	1	1	4	2	5	3	1
	04050001110	nd	nd	nd	4	nd	nd	nd	5	3	1	4	2	4	3	1
	04050001120	nd	nd	nd	2	5	nd	3	5	2	1	4	2	5	4	1
	04050001130	nd	nd	nd	nd	nd	nd	nd	3	1	1	5	2	5	3	1
	04050001140	nd	nd	nd	nd	2	3	4	4	2	1	4	2	5	3	1
	04050001150	nd	nd	nd	nd	5	nd	nd	4	1	1	5	2	5	3	1
	04050001160	nd	nd	nd	3	nd	nd	2	2	1	1	5	3	5	3	1
	04050001170	nd	nd	nd	3	nd	nd	nd	5	3	1	4	2	5	3	1
	04050001180	nd	nd	nd	5	3	2	4	5	4	1	3	2	3	3	1
	04050001190	nd	nd	nd	1	4	nd	nd	3	2	1	4	2	4	3	1
	04050001200	nd	nd	nd	nd	3	3	3	4	3	1	4	2	4	3	1
	04050001210	nd	nd	nd	2	nd	nd	nd	2	2	1	5	2	5	3	1
	04050001220	nd	nd	nd	nd	nd	nd	3	2	1	1	5	3	5	3	1
	04050001230	nd	nd	nd	nd	nd	nd	nd	2	4	1	5	2	5	3	1
	04050001240	nd	nd	nd	nd	nd	nd	2	4	1	1	5	3	3	2	1
	04050001280	nd	nd	nd	nd	nd	nd	2	2	2	1	5	nd	3	2	1


St. Joseph (Lk Michigan) Watershed
N
W
E
S
Elkhart
LaGrange
Steuben
280
240
220
150
130
100
090
120
110
140
230
210
St. Joseph
170
190
DeKalb
200
180
Noble
Kosciusko
Whitley
County Boundary
Streams
11-digit HUC Boundary
Watershed Boundary
7 0 7 14 Miles
IDEM
Office of Water Management
Data Management Section
Prepared By: Jennifer Krol
Date Prepared: 10/27/99

APPENDIX A

BENCHMARK CHARACTERISTIC ANALYSIS OF DATA FROM FIXED STATIONS IN THE ST. JOSEPH-LAKE MICHIGAN WATERSHED 1991 TO 1997

tation: SJR-87

	Valid N	Mean	Confid -95.000%	Confid +95.000%	Median	Sum	Minimum	Maximum	Lower Quartile	Upper Quartile	Range	Quartile Range	Variance	Std.Dev.	Standard Error	Skewness	Std.Err. Skewness	Kurtosis	Std.Err. Kurtosis
Alkalinity (mg/l)	75	225.3067	218.7711	231.8423	230	16898	149	345	210	241	196	31	806.8912	28.40583	3.280023	0.24734	0.2774	3.770018	0.548211
Ammonia (mg/l as N)	75	0.444	-0.24447	1.132473	0.05	33.3	0.05	26	0.05	0.1	25.95	0.05	8.954051	2.992332	0.345525	8.646941	0.2774	74.84335	0.548211
BOD (mg/l)	37	1.586486	1.143172	2.029801	1.5	58.7	0.5	6.1	0.5	1.9	5.6	1.4	1.767868	1.329612	0.218587	1.557531	0.387589	2.697506	0.758719
COD (mg/l)	75	79.90533	-43.7864	203.5971	15.6	5992.9	6.1	4673	11	24	4666.9	13	289019.4	537.6052	62.0773	8.656626	0.2774	74.95746	0.548211
Cyanide (mg/l)	75	0.00544	0.004695	0.006185	0.005	0.408	0.005	0.033	0.005	0.005	0.028	0	1E-05	0.003239	0.000374	8.549928	0.2774	73.66611	0.548211
Nitrate (mg/l as N)	75	2.003333	1.86674	2.139927	2	150.25	0.05	3.4	1.6	2.4	3.35	0.8	0.352455	0.593679	0.068552	-0.3255	0.2774	0.734378	0.548211
Total Phosphorus (mg/l as P)	76	0.243421	-0.09053	0.577371	0.05	18.5	0.015	12.8	0.04	0.085	12.785	0.045	2.135764	1.461425	0.167637	8.683612	0.275637	75.59324	0.544804
Total Solids (mg/l)	75	414.8533	345.2502	484.4564	394	31114	183	2970	369	407	2787	38	91517.18	302.5181	34.93178	8.350087	0.2774	71.46768	0.548211
Suspended Solids (mg/l)	76	19.75	4.400621	35.09938	9	1501	2	590	5	15	588	10	4512.03	67.17165	7.705116	8.374726	0.275637	71.90381	0.544804
Dissolved Solids (mg/l)	0																		
Sulfate (mg/l)	1	21				21	21	21											
TKN (mg/l as N)	75	4.0988	-2.52317	10.72077	0.6	307.41	0.3	250	0.5	1	249.7	0.5	828.3619	28.78128	3.323376	8.65716	0.2774	74.9637	0.548211
E. coli (CFU/100ml)	73	4073.041	-605.847	8751.929	340	297332	10	154800	100	760	154790	660	4E+08	20053.76	2347.115	6.680121	0.281029	47.30087	0.555223
TOC (mg/l)	0																		
Hardness (mg/l)	75	285.12	275.3084	294.9316	300	21384	122	341	268	314	219	46	1818.539	42.64434	4.924144	-1.61494	0.2774	3.085309	0.548211
Chloride (mg/l)	2	55.5	-420.983	531.9827	55.5	111	18	93			75		2812.5	53.03301	37.5				
Dissolved Oxygen (mg/l)	59	9.932203	9.524617	10.33979	10.16	586	7.09	13.47	8.57	11	6.38	2.43	2.446166	1.564022	0.203618	0.087698	0.311176	-0.70377	0.613257
pH	58	8.005	7.925165	8.084835	8.035	464.29	6.82	8.45	7.9	8.18	1.63	0.28	0.09219	0.303629	0.039868	-1.70384	0.31372	4.189751	0.618136
Copper (ug/l)	76	2.589474	2.285597	2.893351	2	196.8	2	8	2	2	6	0	1.768421	1.32982	0.152541	2.390179	0.275637	5.306548	0.544804
Iron (ug/l)	76	551.9737	421.1633	682.7841	370	41950	110	4100	285	575	3990	290	327698.7	572.4498	65.66449	3.831406	0.275637	19.63231	0.544804
Zinc (ug/l)	76	7.411842	6.421257	8.402428	8.4	563.3	2.25	30	5	10	27.75	5	18.79206	4.334981	0.497256	2.002278	0.275637	9.058143	0.544804

Station: SJR-64

	Valid N	Mean	Confid. -95.000%	Confid. +95.000%	Median	Sum	Minimum	Maximum	Lower Quartile	Upper Quartile	Range	Quartile Range	Variance	Std Dev.	Standard Error	Skewness	Std.Err. Skewness	Kurtosis	Std.Err. Kurtosis
Alkalinity (mg/l)	72	204.8889	200.5158	209.262	206	14752	94	239	198.5	216	145	17.5	346.3255	18.60982	2.193189	-3.10405	0.282898	17.30373	0.558831
Ammonia (mg/l as N)	72	0.075694	0.062033	0.089356	0.05	5.45	0.05	0.4	0.05	0.1	0.35	0.05	0.00338	0.058136	0.006851	3.310917	0.282898	13.66952	0.558831
BOD (mg/l)	35	1.488571	1.165278	1.811865	1.3	52.1	0.5	4.8	1	1.7	4.3	0.7	0.885748	0.941142	0.159082	1.769789	0.397694	3.891352	0.777794
COD (mg/l)	72	17.45139	16.31966	18.58312	16.5	1256.5	11	34.3	13.85	19.8	23.3	5.95	23.19493	4.816111	0.567584	1.202755	0.282898	1.569289	0.558831
Cyanide (mg/l)	71	0.005042	0.00498	0.005105	0.005	0.358	0.005	0.007	0.005	0.005	0.002	0	7E-08	0.000264	3.1E-05	6.703714	0.284805	46.7458	0.562511
Nitrate (mg/l as N)	72	1.777778	1.637602	1.917953	1.7	128	0.5	4.1	1.3	2.2	3.6	0.9	0.355837	0.596521	0.070301	0.889501	0.282898	1.874668	0.558831
Total Phosphorus (mg/l as P)	72	0.059722	0.051326	0.068119	0.05	4.3	0.015	0.26	0.04	0.07	0.245	0.03	0.001277	0.035731	0.004211	2.813683	0.282898	13.25468	0.558831
Total Solids (mg/l)	72	359.0278	352.443	365.6125	360.5	25850	197	425	350.5	370	228	19.5	785.2105	28.02161	3.302378	-2.55723	0.282898	15.20453	0.558831
Suspended Solids (mg/l)	71	12.92958	10.18777	15.67138	11	918	2	84	6	16	82	10	134.1807	11.58364	1.374725	3.582702	0.284805	19.66708	0.562511
Dissolved Solids (mg/l)	0																		
Sulfate (mg/l)	0																		
TKN (mg/l as N)	1	1.2				1.2	1.2	1.2											
E. coli (CFU/100ml)	72	812.0208	433.1876	1190.854	205	58465.5	0.5	11000	35	705	10999.5	670	2598980	1612.135	189.992	4.09863	0.282898	22.30207	0.558831
TOC (mg/l)	0																		
Hardness (mg/l)	72	263.0833	256.1399	270.0268	270	18942	135	308	255.5	281	173	25.5	873.0915	29.54812	3.48228	-2.06415	0.282898	5.845849	0.558831
Chloride (mg/l)	1	27				27	27	27											
Dissolved Oxygen (mg/l)	56	10.17125	9.735336	10.60716	10.125	569.59	6.92	13.44	8.905	11.68	6.52	2.775	2.649564	1.627748	0.217517	0.057537	0.319	-0.84701	0.628256
pH	56	8.037143	7.957361	8.116924	8.08	450.08	6.95	8.55	7.9	8.2	1.6	0.3	0.088752	0.297912	0.03981	-1.25182	0.319	2.760028	0.628256
Copper (ug/l)	11	2.636364	1.883894	3.388833	2	29	2	5	2	4	3	2	1.254545	1.120065	0.337712	1.410374	0.660687	0.427431	1.279416
Iron (ug/l)	0																		
Zinc (ug/l)	11	8.840909	5.687811	11.99401	10	97.25	2.25	20	5		17.75		22.02841	4.693443	1.415126	1.114341	0.660687	2.655604	1.279416

Station SJR-51

	Valid N	Mean	Confid -95.000%	Confid +95.000%	Median	Sum	Minimum	Maximum	Lower Quartile	Upper Quartile	Range	Quartile Range	Variance	Std.Dev.	Standard Error	Skewness	Std.Err. Skewness	Kurtosis	Std.Err. Kurtosis
Alkalinity (mg/l)	76	214.2895	208.6178	219.9612	216.5	16286	46	245	206	227.5	199	21.5	616.0484	24.82032	2.847086	-4.2662	0.275637	27.80346	0.544804
Ammonia (mg/l as N)	76	0.140132	0.109758	0.170505	0.1	10.65	0.05	0.7	0.05	0.2	0.65	0.15	0.017668	0.132921	0.015247	2.129338	0.275637	4.917985	0.544804
BOD (mg/l)	35	2.285714	1.661575	2.909854	1.7	80	0.5	8.3	1.4	2.7	7.8	1.3	3.301261	1.816937	0.307118	2.068088	0.397694	4.428435	0.777794
COD (mg/l)	76	18.28947	16.97655	19.6024	18	1390	6	34.7	14	20.6	28.7	6.6	33.01189	5.745597	0.659065	0.785946	0.275637	0.357616	0.544804
Cyanide (mg/l)	17	0.005176	0.004802	0.005551	0.005	0.088	0.005	0.008	0.005	0.005	0.003	0	5.3E-07	0.000728	0.000176	4.123106	0.549747	17	1.063198
Nitrate (mg/l as N)	76	2.796053	1.589357	4.002748	2.15	212.5	0.9	48	1.9	2.5	47.1	0.6	27.88598	5.280718	0.60574	8.584864	0.275637	74.43462	0.544804
Total Phosphorus (mg/l as P)	76	0.132895	0.116686	0.149104	0.11	10.1	0.04	0.4	0.09	0.16	0.36	0.07	0.005032	0.070933	0.008137	1.658014	0.275637	3.085471	0.544804
Total Solids (mg/l)	76	429.5789	420.0036	439.1543	432	32648	351	593	405	459.5	242	54.5	1755.9	41.90346	4.806657	0.495066	0.275637	1.794875	0.544804
Suspended Solids (mg/l)	76	12.73684	9.554645	15.91904	11	968	2	95	5	15.5	93	10.5	193.9298	13.92587	1.597407	3.903926	0.275637	19.15529	0.544804
Dissolved Solids (mg/l)	0																		
Sulfate (mg/l)	0																		
TKN (mg/l as N)	76	0.8775	0.823055	0.931945	0.8	66.69	0.3	1.7	0.7	1	1.4	0.3	0.056768	0.238261	0.02733	1.018966	0.275637	1.858689	0.544804
E. coli (CFU/100ml)	76	4761.118	763.3733	8758.863	875	361845	5	120400	400	1850	20395	1450	3.1E+08	17494.85	2006.797	5.366044	0.275637	30.04485	0.544804
TOC (mg/l)	0																		
Hardness (mg/l)	76	281.7368	276.2839	287.1898	283.5	21412	194	336	271	299	142	28	569.4498	23.86315	2.737291	-0.95411	0.275637	2.036472	0.544804
Chloride (mg/l)	75	46.69333	43.89201	49.49466	48	3502	19	66	40	57	47	17	148.2425	12.17549	1.405904	-0.63014	0.2774	-0.36099	0.548211
Dissolved Oxygen (mg/l)	58	9.971897	9.53567	10.40812	10.05	578.37	6.3	13.72	8.6	11.25	7.42	2.65	2.752461	1.659054	0.217845	0.214737	0.31372	-0.47458	0.618136
pH	57	7.894035	7.813368	7.974702	7.94	449.96	6.84	8.43	7.75	8.08	1.59	0.33	0.092428	0.30402	0.040268	-0.80979	0.316327	1.589012	0.623134
Copper (ug/l)	76	2.947368	2.542199	3.352538	2	224	2	9	2	4	7	2	3.14386	1.773093	0.203388	1.879854	0.275637	2.606484	0.544804
Iron (ug/l)	76	534.3421	418.9549	649.7293	400	40610	140	3500	295	555	3360	260	254979.6	504.955	57.92231	3.805372	0.275637	17.61803	0.544804
Zinc (ug/l)	76	20.03026	9.192548	30.86798	10	1522.3	5	420	10	20	415	10	2249.395	47.42779	5.440341	8.220294	0.275637	69.94763	0.544804

Station: ER-3

	Valid N	Mean	Confid. -95.000%	Confid. +95.000%	Median	Sum	Minimum	Maximum	Lower Quartile	Upper Quartile	Range	Quartile Range	Variance	Std.Dev.	Standard Error	Skewness	Std.Err. Skewness	Kurtosis	Std.Err. Kurtosis
Alkalinity (mg/l)	75	221.2533	215.4106	227.096	223	16594	171	318	202	241	147	39	644.8674	25.39424	2.932274	0.440735	0.2774	1.460309	0.548211
Ammonia (mg/l as N)	75	0.264667	-0.05197	0.5813	0.05	19.85	0.05	12	0.05	0.2	11.95	0.15	1.893904	1.376192	0.158909	8.606614	0.2774	74.36629	0.548211
BOD (mg/l)	35	1.937143	1.387581	2.486704	1.4	67.8	0.5	7.2	0.5	2.9	6.7	2.4	2.559462	1.599832	0.270421	1.613751	0.397694	2.691662	0.777794
COD (mg/l)	75	20.40267	18.61881	22.18652	18	1530.2	8	43	15	25.8	35	10.8	60.1127	7.753238	0.895267	0.931994	0.2774	0.48658	0.548211
Cyanide (mg/l)	54	0.005333	0.005048	0.005619	0.005	0.288	0.005	0.01	0.005	0.005	0.005	0	1.09E-06	0.001046	0.000142	3.286152	0.324556	10.31436	0.638893
Nitrate (mg/l as N)	75	2.252667	1.962493	2.54284	1.9	168.95	0.05	8.6	1.5	2.6	8.55	1.1	1.590601	1.26119	0.14563	2.515555	0.2774	9.419992	0.548211
Total Phosphorus (mg/l as P)	75	0.1712	0.031959	0.310441	0.07	12.84	0.03	5.3	0.06	0.13	5.27	0.07	0.366254	0.605189	0.069881	8.447445	0.2774	72.46976	0.548211
Total Solids (mg/l)	75	414.12	404.4973	423.7427	420	31059	286	552	393	435	266	42	1749.188	41.8233	4.829338	0.312889	0.2774	2.742184	0.548211
Suspended Solids (mg/l)	75	21.76	14.29127	29.22873	12	1632	2	241	7	25	239	18	1053.752	32.46155	3.748337	4.708888	0.2774	28.47415	0.548211
Dissolved Solids (mg/l)	0																		
Sulfate (mg/l)	1	43				43	43	43											
TKN (mg/l as N)	75	1.1008	0.739714	1.461886	0.8	82.56	0.3	14	0.66	1.1	13.7	0.44	2.463021	1.569401	0.181219	7.713924	0.2774	63.78051	0.548211
E. coli (CFU/100ml)	72	3206.049	-1078.43	7490.532	280	230835.5	0.5	154800	70	915	154799.5	845	3.32E+08	18232.74	2148.749	8.325242	0.282898	70.11425	0.558831
TOC (mg/l)	0																		
Hardness (mg/l)	75	286.52	278.3239	294.7161	292	21489	138	340	270	314	202	44	1269.01	35.62316	4.113409	-1.36469	0.2774	3.001459	0.548211
Chloride (mg/l)	2	51	-253.949	355.9489	51	102	27	75			48		1152	33.94113	24				
Dissolved Oxygen (mg/l)	59	10.01407	9.565167	10.46297	10.1	590.83	7.2	13.41	8.36	11.36	6.21	3	2.9672	1.722556	0.224258	0.15569	0.311176	-0.97588	0.613257
pH	58	7.951897	7.870003	8.03379	7.99	461.21	6.93	8.5	7.83	8.11	1.57	0.28	0.097005	0.311456	0.040896	-1.11345	0.31372	2.173917	0.618136
Copper (ug/l)	10	4.5	2.181979	6.818021	4	45	2	12	2	5	10	3	10.5	3.24037	1.024695	1.641004	0.687043	2.53126	1.334249
Iron (ug/l)	0																		
Zinc (ug/l)	53	9.630189	7.81529	11.44509	10	510.4	2.25	40	5	10	37.75	5	43.35494	6.584447	0.904443	2.208186	0.327446	7.684771	0.64442

APPENDIX B

ST. JOSEPH-LAKE MICHIGAN WATERS ASSESSED IN THE CLEAN WATER ACT SECTION 305(B) REPORT 1996 TO 1998

Table 27. *Waters assessed, status of designated use support, probable causes of impairment, and miles affected in the Lake Michigan Basin-Northeast*

WATERBODY	NEAREST TOW N(S)	STATUS OF DESIGNATED USE SUPPORT1	METHOD OF ASSESSMENT 2	PROBABLE CAUSE OF IMPAIRMENT	MILES AFFECTED	COMMENTS
Turkey Creek	Lake Village	FS(Aquatic Life) FS(Recreational)	Monitored (c)		9.0	
Turkey Creek	Syracuse	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	7.0	
Turkey Creek	Milford	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	9.3	High suspended solids as results of algae bloom.
Turkey Creek	Milford	FS(Aquatic Life) FS(Recreational)	Monitored (c)		3.0	
Skinner Ditch	Syracuse	FS(Aquatic Life) FS(Recreational)	Monitored (c)		5.8	Ditch choked with lily pads and heavy algae. Limited access.
Coppes Ditch (Lower reach)	Leesburg Milford	NS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli Sewage Discharge	1.5	
Coppes Ditch	Leesburg Milford	FS(Aquatic Life) FS(Recreational)	Monitored (c)		8.5	
Hoopingarner Ditch	Milford	FS(Aquatic Life) FS(Recreational)	Monitored (c)		4.5	
Preston Miles Ditch	Milford Junction	FS(Aquatic Life)	Evaluated		4.2	
Kiefer Ditch	Milford Junction	FS(Aquatic Life)	Evaluated		6.1	
Dausman Ditch	Milford	FS(Aquatic Life)	Monitored (c) (b)		8.8	Biological Assessment "Fair".
Swoveland Ditch	New Paris	FS(Aquatic Life) FS(Recreational)	Evaluated		7.0	
Wisler Ditch and Tributaries	Wakarusa	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	17.8	
Werntz Ditch	Wakarusa	PS(Aquatic Life)	Monitored (c)		4.0	Lack of dilution water for Wakarusa STP lagoon waters. Stream also impacted by cattle operations. Limited use stream.
Grimes/Barkley Ditches	Wakarusa	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	25.0	Recreational uses impaired due to nearby cattle operations.

Table 27. *Water assessed, status of designated use support, probable causes of impairment, and miles affected in the Lake Michigan Basin -Northeast (cont.)*

WATERBODY	NEAREST TOWN(S)	STATUS OF DESIGNATED USE SUPPORT1	METHOD OF ASSESSMENT 2	PROBABLE CAUSE OF IMPAIRMENT	MILES AFFECTED	COMMENTS
Baugo Creek	Wakurasa	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	10	
Baugo Creek	Jamestown	FS(Aquatic Life) FS(Recreational)	Monitored (c)		5.7	
Uhl Ditch	South Milford	FS(Aquatic Life) FS(Recreational)	Monitored (c)		7.5	
Little Elkhart Creek	South Milford	FS(Aquatic Life) FS(Recreational)	Monitored (c)		0.3	
Little Elkhart Creek	South Milford	FS(Aquatic Life) FS(Recreational)	Monitored (c)		2.2	
Little Elkhart Creek	South Milford	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	1.5	
Little Elkhart Creek	Wolcottville	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	2.6	
Little Elkhart Creek	Wolcotville	FS(Aquatic Life) (Threatened) NS(Recreational)	Monitored (c)	E. coli	0.7	Wolcottville STP should be upgraded to alleviate treatment problems.
Little Elkhart River and tributaries	Topeka Middlebury	FS(Aquatic Life) NS(Recreational)	Monitored ©	E. coli	30.0	Farm areas, Middlebury STP impact stream.
Tributary from Blackman Lake including trib from unnamed pond toAdams Lake	South Milford	FS(Aquatic Life) FS(Recreational)	Monitored (c)		3.2	
Bixler Lake Ditch	Kendallville	FS(Aquatic Life) FS(Recreational)	Monitored (c)		2.0	Cadmium slightly high but not affecting water quality.
Henderson Lake Ditch	Kendallville	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	1.96	
Tributary to Round Lake	Kendallville	FS(Aquatic Life) FS(Recreational)	Monitored (c)		1.9	

Table 27. *Water assessed, status of designated use support, probable causes of impairment, and miles affected in the Lake Michigan Basin -Northeast (cont.)*

WATERBODY	NEAREST TOWN(S)	STATUS OF DESIGNATED USE SUPPORT1	METHOD OF ASSESSMENT 2	PROBABLE CAUSE OF IMPAIRMENT	MILES AFFECTED	COMMENTS
Waterhouse Ditch	Albion	NS(Aquatic Life) FS(Recreational)	Monitored (c)	D.O. Iron	1.7	
Oviatt Ditch	Rome City	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	2.7	
Oliver Lake Outlet Tributary	Eddy	FS(Aquatic Life) FS(Recreational)	Monitored (c)		1.5	
North Branch Elkhart River	Eddy	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	5.8	
North Branch Elkhart River	Cosperville	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. Coli	5.1	
North Branch Elkhart River	Cosperville	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	6.1	
Tributary to Jones Lake	Rome City	FS(Aquatic Life) FS(Recreational)	Monitored (c)		5.0	
Branch from Little Lake to Lake Jones	Rome City	FS(Aquatic Life) FS(Recreational)	Monitored (c)		3.4	
Gretzinger Ditch	Brimfield	FS(Aquatic Life) FS(Recreational)	Monitored (c)		4.1	Insignificant flow. Bordered by farmland
Tributary from Munk Lake to Clock Creek	Brimfield	FS(Aquatic Life) FS(Recreational)	Monitored (c)		1.9	
Clock Creek	Brimfield	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	2.65	Marsh/muddy conditions.
Dry Run	Brimfield	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	6.0	
Boyd Ditch	Cosperville	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	1	

Table 27. *Waters assessed, status of designated use support, probable causes of impairment, and miles affected in the Lake Michigan Basin -Northeast (cont.)*

WATERBODY	NEAREST TOWN(S)	STATUS OF DESIGNATED USE SUPPORT 1	METHOD OF ASSESSMENT 2	PROBABLE CAUSE OF IMPAIRMENT	MILES AFFECTED	COMMENTS
Huston Ditch	Wawaka	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	7.2	
Jacobs Ditch	Cosperville	FS(Aquatic Life) FS(Recreational)	Monitored (c)		5.0	
Thumma-Rousch Ditch	Bakerstown	FS(Aquatic Life) FS(Recreational)	Monitored (c)		6.0	
Forker Creek	Burr Oak	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	1.36	Occasional low D.O. due to heavy duckweed cover in areas.
Brown Ditch/Parker Ditch	Burr Oak	FS(Aquatic Life) FS(Recreational)	Monitored (c)		6.6	
Winebreemer Branch	Merriam	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	6.0	
Carrol Creek	Wolflake	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	3.0	
South Branch Elkhart River	Albion	FS(Aquatic Life) FS(Recreational)	Monitored (c)		1.9	
South Branch Elkhart River	Albion	FS(Aquatic Life) FS(Recreational)	Monitored (c)		1.9	
South Branch Elkhart River	Albion	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	1.9	
South Branch Elkhart River	Wawaka	FS(Aquatic Life) FS(Recreational)	Monitored (c)		13.2	Some low D.O. values due to Marshland.
Rimmell Branch	Bakertown	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	7.3	
Croft Ditch	Albion	FS(Aquatic Life) (Threatened) NS(Recreational)	Monitored (c)	D.O. Ammonia E. coli	1.7	
Croft Ditch	Albion	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	3.7	Heavy algae growth.

Table 27. *Waters assessed, status of designated use support, probable causes of impairment, and miles affected in the Lake Michigan Basin Northeast (cont.)*

WATERBODY	NEAREST TOWN(S)	STATUS OF DESIGNATED USE SUPPORT 1	METHOD OF ASSESSMENT 2	PROBABLE CAUSE OF IMPAIRMENT	MILES AFFECTED	COMMENTS
Long Ditch	Albion	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	4.0	
Tributary from Lower Long Lake	Port Mitchell	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	2.4	
Elkhart River	Ligonier	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	2.75	Variety of fish found; bass, pike bluegill, etc.
Elkhart River	Ligonier	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	2.2	
Elkhart River	Goshen	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	10.0	
Elkhart River	Goshen	FS(Aquatic Life) (Threatened) FS(Recreational)	Monitored (c)		7	
Eaton Creek	Fremont	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	4.4	
Unnamed tributary from Fremont STP	Fremont	NS(Aquatic Life) FS(Recreational)	Monitored (c)	pH Chlorides Copper	3.0	
Toll Road Rest Stop Tributary	Fremont	FS(Aquatic Life) FS(Recreational)	Monitored (c)		1.0	
Follette Creek	Jamestown	FS(Aquatic Life) FS(Recreational)	Monitored (c)		.05	
Follette Creek	Glen Eden	FS(Aquatic Life) FS(Recreational)	Monitored (c)		2.2	
Unnamed tributary from Walters Lake	Angola	FS(Aquatic Life) FS(Recreational)	Monitored (c)		3.6	
Crooked Creek	Jamestown	FS(Aquatic Life) FS(Recreational)	Monitored (c)		1.4	
Crooked Creek	Nevada Mills	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	3.7	
Crooked Creek from Tamarack Lake	Orland	FS(Aquatic Life) FS(Recreational)	Monitored (c)		1.3	

Table 27. *Waters assessed, status of designated use support, probable causes of impairment, and miles affected in the Lake Michigan Basin Northeast (cont.)*

WATERBODY	NEAREST TOWN(S)	STATUS OF DESIGNATED USE SUPPORT 1	METHOD OF ASSESSMENT 2	PROBABLE CAUSE OF IMPAIRMENT	MILES AFFECTED	COMMENTS
Bell Lake Ditch	Nevada Mills	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	2.4	
Unnamed tributary from Lime Lake	Nevada Mills	FS(Aquatic Life) FS(Recreational)	Monitored (c)		1.5	
Orland Tributary	Orland	NS(Aquatic Life) NS(Recreational)	Monitored (c)	Low D.O, E. coli	1.0	
Fawn River from Fawn River Fish Hatchery	Greenfield Mills	FS(Aquatic Life) FS(Recreational)	Monitored (c)		4.8	
South tributary to Lake James	Crooked Lake	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	0.4	
Lake James/Lake Jimmerson Channel	Lake James	FS(Aquatic Life) FS(Recreational)	Monitored (c)		.1	
Ditch to Little Center Lake	Angola	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	1.5	Metals in sediment. Dana Corporation effluent discharges into this ditch.
East tributary to Crooked Lake	Glen Eden	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	1.9	
Southeast tributary to Crooked Lake	Crooked Lake	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	1.7	E. coli counts of 940/100 ml.
South tributary to Crooked Lake	Crooked Lake	PS(Aquatic Life) PS(Recreational)	Monitored (c)	E. coli	1.1	
Tributary between the Third Basin of Crooked Lake and Lake Loon	Iverness	FS(Aquatic Life) FS(Recreational)	Monitored (c)		1.4	
Lake Gage/Lime Lake Channel	Panama	FS(Aquatic Life) FS(Recreational)	Monitored (c)		0.3	
Pigeon Creek	Angola	FS(Aquatic Life) FS(Recreational)	Monitored (c)		8.0	
Pigeon Creek from Pigeon Lake	Angola	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	5.0	E. coli counts of 420/100 ml.

Table 27. *Waters assessed, status of designated use support, probable causes of impairment, and miles affected in Lake Michigan Basin -Northeast (cont.)*

WATERBODY	NEAREST TOWN(S)	STATUS OF DESIGNATED USE SUPPORT 1	METHOD OF ASSESSMENT 2	PROBABLE CAUSE OF IMPAIRMENT	MILES AFFECTED	COMMENTS
Pigeon Creek from Mud Creek	Angola	NS(Aquatic Life) NS(Recreational)	Monitored (c)	Ammonia E. coli	1.5	Continuation of problems with ammonia and E. coli from Mud Creek. Also poor treatment from Angola STP.
Pigeon Creek from CR 400	Pleasant Lake	FS(Aquatic Life) FS(Recreational)	Monitored (c)		1.5	
Pigeon Creek from Golden Lake	Angola	FS(Aquatic Life) FS(Recreational)	Monitored (c)		1.3	
Pigeon Creek from Hogback Lake	Flint	FS(Aquatic Life) FS(Recreational)	Monitored (c)		5.4	
Pigeon Creek from Otter Lake	Flint	FS(Aquatic Life) FS(Recreational)	Monitored (c)		2.6	
Ewing Ditch	Angola	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	2.6	E. coli counts of 1600/100 ml.
Berlin Court Ditch	Berlin	PS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli D.O.	3.9	
Mud Creek from Angola STP Discharge	Angola	NS(Aquatic Life) NS(Recreational)	Monitored (c)	Ammonia Low D.O. E. coli	3.0	Poor treatment from Angola STP.
Johnson Ditch	Hudson	NS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli TSS Low D.O. Ammonia	5,7	Impairments from Pigeon Creek Rest. Area.
Trout Creek	Bristol	FS(Aquatic Life) FS(Recreational)	Monitored (c)		1.0	
St. Joseph River	Bristol	FS(Aquatic Life) NS(Recreational)	Monitored(b) (c)	E. coli	7.6	
St. Joseph River	Elkhart	FS(Aquatic Life) NS(Recreational)	Monitored (b)	E. coli	5.9	
St. Joseph River	Elkhart	FS(Aquatic Life) FS(Recreational)	Monitored (c)		12.3	

Table 27. *Waters assessed, status of designated use support, probable causes of impairment, and miles affected in the Lake Michigan Basin-Northeast (cont.)*

WATERBODY	NEAREST TOWN(S)	STATUS OF DESIGNATED USE SUPPORT 1	METHOD OF ASSESSMENT 2	PROBABLE CAUSE OF IMPAIRMENT	MILES AFFECTED	COMMENTS
St. Joseph River	Mishawaka	FS (Aquatic Life) NS(Recreational)	Monitored (c)	PCB's E. coli	3.2	Salmonid classification.
St. Joseph River	South Bend	FS(Aquatic Life) NS(Recreational)	Monitored (c)	PCB's E. coli	2.6	
Sheep Creek	Bristol	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	8.0	
Pine Creek	Bristol	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	18.0	
Peterbaugh Creek	Elkhart	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	6.0	
Christianna Creek	Elkhart	FS(Aquatic Life) FS(Recreational)	Monitored (c)		6.0	
Osborn-Manning Ditch	Elkhart	PS(Aquatic Life)	Monitored (c)		3.8	
Cobus Creek	Elkhart	FS(Aquatic Life) FS(Recreational)	Monitored (c)		11.0	
Crawford Ditch	Elkhart	NS(Aquatic Life) NS(Recreational)	Monitored (c)	Metals Oil E. coli	.75	
Auten Ditch	South Bend	PS (Aquatic Life) NS(Recreational)	Monitored (c)	E. coli Ammonia	1.5	Impacts from two mobile home parks and Berliner-Maux industry.
Juday Creek	South Bend	FS(Aquatic Life)	Monitored (c)		24.6	
Solomon Creek	Cromwell	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli Non point source	3.7	Cromwell STP adds to E. coli count.
Cromwell Ditch	Cromwell	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	6.7	Intermittent stream.

Table 27. *Waters assessed, status of designated use support, probable causes of impairment, and miles affected in the Lake Michigan Basin-Northeast (cont.)*

WATERBODY	NEAREST TOWN(S)	STATUS OF DESIGNATED USE SUPPORT 1	METHOD OF ASSESSMENT 2	PROBABLE CAUSE OF IMPAIRMENT	MILES AFFECTED	COMMENTS
Meyer Ditch	Cromwell	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	20	Channelized drainage ditch with no point sources, but E. coli exceeds standard.
Stoney Creek	Millersburg	FS(Aquatic Life) FS(Recreational)	Monitored (c)		2	
Long Ditch/Dry Run	Millersburg	FS(Aquatic Life) FS(Recreational)	Monitored (c)		8.0	
Rock Run Creek and tributaries	Goshen	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	42.0	
Turkey Creek	Bushy Prairie	FS(Aquatic Life) FS(Recreational)	Monitored (c)		6.0	
Pigeon River	Mongo	FS(Aquatic Life) FS(Recreational)	Monitored (c)		2.3	
Pigeon River	Howe	FS(Aquatic Life) PS(Recreational)	Monitored (c)	E. coli	1.7	
Pigeon River	Scott	FS(Aquatic Life) NS(Recreational)	Monitor ed (c)	E. coli	6.0	
Pigeon River	Scott to State Line	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	3.0	
Fly Creek	LaGrange	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	10.1	
E. Fly Creek	LaGrange	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	7.8	
Rowe Ditch	Howe	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	2.3	
West Buck Creek	Valentine	NS(Aquatic Life) NS(Recreational)	Monitored (c)	Low D.O. E. coli	4.0	Low D.O. from lack of stream aeration after going through wetlands.

Table 27. *Waters assessed, status of designated use support, probable causes of impairment, and miles affected in the Lake Michigan Basin-Northeast (cont.)*

WATERBODY	NEAREST TOWN(S)	STATUS OF DESIGNATED USE SUPPORT 1	METHOD OF ASSESSMENT 2	PROBABLE CAUSE OF IMPAIRMENT	MILES AFFECTED	COMMENTS
Van Netta Ditch	Seyberts	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	2.0	
Page Ditch	Shipshewana	FS(Aquatic Life) NS(Recreational)	Monitored (c)	TSS E. coli	6.0	Impacts from Shipshewana Lake and STP.
Buck Creek	Seyberts	FS(Aquatic Life) FS(Recreational)	Monitored (c)		1.5	
Unnamed tributary	Shipshewana	NS(Aquatic Life) NS(Recreational)	Monitored (c)	Ammonia TSS D.O. E. coli	2.1	Impacts from Shipshewana STP.
Fawn River	Scott	FS(Aquatic Life) FS(Recreational)	Monitored (c)		6.5	
Wagner Ditch	Nappanee	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	1.5	
Nunemaker-Township Ditch	Nappanee	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	1	
Rogers Ditch	Nappanee	FS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli	1	
Mather's Ditch	Middlebury	NS(Aquatic Life) NS(Recreational)	Monitored (c)	E. coli D.O. Endrin	10	

1 PS = Partial Support; NS = Non Support; FS = Full Support. If a use is not listed, it was not monitored or evaluated
2 b = biological; c = chemical.

APPENDIX C

Potential Stakeholders in the St. Joseph-Lake Michigan Watershed

Potential Stakeholders in the St. Joseph-Lake Michigan Watershed

Dekalb County

Dekalb County Soil and Water Conservation District
942 W 15th Street
Auburn, IN 46706-2031
(219) 925-3710/925-5620

USDA-NRCS
942 W 15th Street
Auburn, IN 46706-2031
(219) 925-3710

County Highway Garage
100 S Main Street
Auburn, In 46706
(219) 925-1864

Dekalb County Extension
215 E 9th Street
Suite 300
Auburn, IN 46706
(219) 925-2562

Dekalb County Planning Commission
301 S Union Street
Auburn, IN 46706
(219) 925-1923

Dekalb County Health Department
215 E. Ninth, Suite 201
Auburn, IN 46706-2336
(219) 925-2220

Dekalb County Surveyor
110 S Main Street
Auburn, IN 46706
(219) 925-2222

Elkhart County

Elkhart County Soil and Water Conservation District
17746-B County Road 34
Goshen, IN 46528-9261
(219) 533-4383

USDA-NRCS
17746-B County Road 34
Goshen, IN 46528-9261
(219) 533-4383

Goshen City Engineer
302 S 5th Street
Goshen, IN 46528
(219) 534-2201

Goshen Mayor's Office
111 E Jefferson Street
Goshen, IN 46528
(219) 533-9322

Goshen Planning/Zoning
302 S 5th Street
Goshen, IN 46528
(219) 534-3600

Goshen Sewage Treatment Plant
1000 W Wilden Ave
Goshen, IN 46528
(219) 534-4102

Goshen Water Treatment Plant
308 N 5th Street
Goshen, IN 46528
(219) 534-5306

Elkhart County Commissioners
117 N 2nd Street
Goshen, IN 46528
(219) 534-3541

Elkhart County Extension
17746 County Road 34
Goshen, IN 46528
(219) 533-0554

Elkhart County Highway Engineer
4230 Elkhart Road
Goshen, IN 46256
(219) 875-3365

Elkhart County Health Department
117 N Second Street, Room 112
Goshen, IN 46526-3231
(219) 533-4431

Kosciusko County

Kosciusko County Health Department
Courthouse Third Floor, Rm. 2
100 West Center Street
Warsaw, IN 46580-2877
(219) 372-2349

Kosciusko County Soil and Water
Conservation District
217 E Bell Drive
Warsaw, IN 46580-9350
(219) 267-7445

USDA-NRCS
217 E Bell Drive
Warsaw, IN 46580-9350
(219) 267-7445

Kosciusko Area Plan Commission
100 W Center Street
Warsaw, IN 46580
(219) 372-2304

Kosciusko County Co-Op Ext Svc
100 W Center Street
Warsaw, IN 46580
(219) 372-2340

Kosciusko County Commissioner
100 Center Street
Warsaw, IN 46580
(219) 372-2433

Kosciusko County Surveyor
100 W Center Street
Warsaw, IN 46580
(219) 372-2366

LaGrange County

LaGrange County Health Department
114 W Michigan Street
LaGrange, IN 46761-1860
(219) 463-7832

LaGrange County Soil and Water
Conservation District
910 S Detroit Street
LaGrange, IN 46761-2235
(219) 4633166

USDA-NRCS
910 S Detroit Street
LaGrange, IN 46761-2235
(219) 463-3166

LaGrange County Nature Center
114 W Michigan Street
LaGrange, IN 46761
(219) 463-4022

LaGrange County Highway Engnr
300 E Factory Street
LaGrange, IN 46761
(219) 463-3452

LaGrange County Commissioners
114 W Michigan Street
LaGrange, IN 46761
(219) 463-2183

LaGrange County Surveyors Office
114 W Michigan Street
LaGrange, IN 46761
(219) 463-2183

LaGrange Extension Agent
114 W Michigan Street
LaGrange, IN 46761
(219) 463-7808

Noble County

Noble County Soil and Water
Conservation District
100 E Park Drive
Albion, IN 46701-9797
(219) 636-7682

USDA-NRCS
100 E. Park Drive
Albion, IN 46701-9797
(219) 636-7682

Noble County Health Department
2090 N State Road 9, Suite C
Albion, IN 46701-9566
(219) 636-2191

Noble County Commissioners
101 N Orange Street
Albion, IN 46701
(219) 636-7877

Noble County Extension Agent
2090 N State Road 9, Suite D
Albion, IN 46701
(219) 636-2111

Noble County Plan Commission
2090 N State Road 9, Suite A
Albion, IN 46701
(219) 636-7217

Noble County Surveyor
2090 N State Road 9, Suite B
Albion, IN 46701
(219) 636-2131

St. Joseph County

St. Joseph County Soil and Water
Conservation District
St. Joseph Co. Farm Bureau
60455 U.S. 31 South, Suite 4
South Bend, IN 46614-5137
(219) 291-7444

St. Joseph County Health Department
County-City Building, Floor 8
227 W. Jefferson Blvd
South, Bend, IN 46601-1870
(219) 235-9750

USDA-NRCS
St. Joseph Co. Farm Bureau
60455 U.S. 31 South, Suite 4
South, Bend IN 46614-5137
(219) 291-7444

South Bend Mayor
227 W Jefferson Blvd # 1400
South Bend, IN 46601
(219) 235-9261

River Park Partnership Ctr
2214 Mishawaka Ave
South Bend, IN 46615
(219) 282-2531

Roseland Town Board
200 Independence Dr
South Bend, IN 46637
(219) 272-6485

South Bend Community Affairs
1400 County-City Building
SouthBend, IN 46601
(219) 235-9951

South Bend Audubon Society
P.O. Box 581
Mishawaka, IN 46546
(219) 243-8739

Steuben County

Steuben County Soil and Water
Conservation District
Peachtree Plaza 200
1220 N 200 W
Angola, IN 46703-8901
(219) 665-3211

USDA-NRCS
Peachtree Plaza 200
1120 N 200 W
Angola, IN 46703-8901
(219) 665-3211

Steuben County Health Department
317 S Wayne Street, Suite 3-A
Angola, IN 46703-1938
(219) 668-1000, ext 1500

The Nature Conservancy
Northwest Indiana Office
2400 New York Ave, Suite 411
Whiting, IN 46934
(219) 473-4312

Great Lakes Program
8 S Michigan Ave
Suite 2301
Chicago, IL 60603
(312) 759-8017

Southwestern Michigan Commission
185 E Main Street
Suite 701
Benton Harbor, MI 49022
(616) 925-1137

Nature Conservancy of Michigan
2840 E Grand River Ave
Suite 5
East Lansing, MI 48823
(517) 332-1741

Trout Unlimited
15498 Marshfield Road
Hickory Corners, MI 49060
1-800-461-1235, code 37
rhchambe@ccm.tds.net

Indiana Lakes Management Society
207 Wayne Street, Suite B
Angola, IN 46703
(219) 264-2883
http://www.nalms.org/ilms/index.htm

Friends of the St. Jo River Association Inc.
P.O. Box 354
Athens, MI 49011
(616) 729-5174
algs@net-link.net

Steuben County Lakes Council Inc.
207 South Wayne Street, Suite B
Angola, IN 46703
(219) 665-1730

Crooked Lake
Jeff Smith
3645 W Sycamore Rd
Angola, IN 46703
(219) 833-4722

Lake Gage/Lime Lake
Jim Kidd
60 Lane 185 Lake Gage
Angola, In 46703
(219) 833-2205

Lake Syl-Van
Dan Warner
480 Ln 250 Lake Gage
Angola, IN 46703
(219) 833-4566

Jimmerson Lake
Jim Horstman
20 Lane 150B Jimmerson Lake
Angola, IN 46703
(219) 833-2133

Lake James
Bill Thompson
2180 Lane 105 Lake James
Angola, IN 46703
(219) 833-3198

Pine Canyon Lake
John Morgner
100 Lane 100A Pine Canyon
Angola, IN 46703
(219) 833-4790

Silver Lake
Margaret Smith
887 S 355 W
Angola, IN 46703
(219) 665-2974

West Otter Lake
Helen Miller
280 Lane 250 West Otter Lake
Angola, IN 46703
(219) 665-2937

Hogback Lake
Bonnie Schoppman
155 Lane 100 Hogback Lake
Angola, IN 46703
(219) 665-8256

Glynna Nosek
Fish/Royer Lake Association
1490 S 505 E
LaGrange, IN 46761

Robert Christen
Witmer Lake
1675 E 765 S
Wolcottville, IN 46795

Mike Martin
Shipshewana Lake
3485 N 980 W
Shipshewana, IN 46565

Loretta Purcell
Oliver Lake Association
1160 E 455 S
LaGrange, IN 46761

Kenneth Everett
Big Turkey Lake Association
1175 Park Drive Turkey Lake
LaGrange, IN 46761

Harlan Stull
Little Turkey Lake
3215 S 1075 E
LaGrange, IN 46761

Rex Pranger
Adams Lake Association
5985 S 550 E
Wolcottville, IN 46795

Rick Hart
Westler Lake
0700 E 650 S
Wolcottville, IN 46795

Thomas Rofkahr
Dallas Lake
P.O. Box 301
Wolcottville, IN 46795

David Mehas

6170 S 085 W
Wolcottville, IN 46795

Donald Wingstrom
5 Lakes Cons. Club
0330 W 590 S
Wolcottville, IN 46795

Randy Houser
Atwood Lake
7055 S 020 E
Wolcottville, IN 46795

M LaPlace
Stone Lake
106 Stone Lake
Middlebury, IN 46540

Leon Wolfe
Pretty Lake
4570 S 930 E
Wolcottville, IN 46795

Plainwell District Office
Southern Lake MI Management Unit
Michigan Department of Natural Resources
621 North 10th Street
Plainwell, MI 49080-1004

Wawasee Conservancy Foundation
P.O. Box 548
Syracuse, IN
(219) 457-4549
HHarwood@aol.com

Izaak Walton League
54568 Maple Lane Ave
South Bend, IN
(219) 277-5715

Friends of Juday Creek
54568 Maple Lane Ave
South Bend, IN
(219) 277-5715

Upper St. Joe River Assoc.
21624 C.R. 10
Elkhart, IN

C.L.E.A.N.
300051 C.R. 16
Elkhart, IN
(219) 522-0184

Elkhart Envirocorps
1201 So. Nappanee
Elkhart, IN
(219) 293-2572

St. Joseph River Basin Commission
227 W. Jefferson Blvd, Room 1120
South Bend, IN 46601-1830
(219) 287-1829
sjrbcplanr@aol.com

Water Watchers of Indiana
John Rouch
10464 North Grove road
Milford, IN 46542
(219) 658-9108
jrouch@npcc.net

Indiana Farm Bureau
P.O. Box 1290
Indianapolis, IN 46206-1290
(317) 692-7810

Indiana Department of Environmental Management
100 N. Senate Ave
P.O. Box 6015
Indianapolis, IN 46206-6015

IDEM Switchboard
(317) 232-8603 or (800) 451-6027

Agricultural Liaison	(317) 232-8587
Air Management	(317) 233-0178
Community Relations	(317) 233-6648
Compliance and Technical Assistance	(317) 232-8172
Criminal Investigations	(317) 232-8128
Enforcement	(317) 233-5529
Environmental Response	(317) 308-3017
Legal Counsel	(317) 232-8493
Media and Communication Services	(317) 232-8560
Pollution Prevention and Technical Assistance	(317) 232-8172
Solid and Hazardous Waste Management	(317) 233-3656

Water Management	(317) 232-8670

Indiana Department of Natural Resources
402 West Washington Street
Indianapolis, IN 46204-2748

IDNR Field Representatives are located in the individual County SWCDs.

Division of Engineering	(317) 232-4150
Division of Entomology and Plant Pathology	(317) 232-4120
Division of Fish & Wildlife	(317) 232-4080
Division of Forestry	(317)-232-4105
Division of Historic Preservation & Archaeology	(317) 232-1646
Division of Law Enforcement	(317) 232-4010
Division of Nature Preserves	(317)-232-4052
Division of Oil and Gas	(317) 232-4055
Division of Outdoor Recreation	(317)-232-4070
Division of Public Information and Education	(317) 232-4200
Division of Reclamation	(317)-232-1547
Division of Safety and Training	(317) 232-4145
Division of Soil Conservation	(317)-233-3870
Division of State Parks and Reservoirs	(317)-232-4124
Division of Water	(317)-232-4160

Indiana State Department of Health
2 North Meridian St.
Indianapolis, IN 46204
(317) 233-1325

Indiana Natural Resources Conservation Service
6013 Lakeside Blvd
Indianapolis, In 46278
(317) 290-3200

NRCS Field Representatives are located in the individual County SWCDs.

Wood-Land-Lakes RC & D
214 W. North Street
Kendallville, IN 46755-1134
(219) 349-1433

U.S. EPA Region 5
77 West Jackson Blvd
Chicago, IL 60604
(312) 353-2000
(800) 632-8431

U.S. Corps of Engineers
South Bend Sub-Office
6910 N Grumwood
Granger, IN 46530
(219) 277-6044

APPENDIX D

FUNDING SOURCES

FUNDING SOURCES

This listing of funding sources was derived from the November 1998 *Watershed Action Guide for Indiana*, which is available from the Watershed Management Section of IDEM.

FEDERAL CONSERVATION AND WATERSHED PROGRAMS

Environmental Protection Agency

Section 319, 604(b), and 104(b)3 Grants

Grants for conservation practices, water body assessment, watershed planning, and watershed projects. Available to non-profit or governmental entities. These monies, enabled by the Clean Water Act, are funneled through the Indiana Department of Environmental Management. *For details see IDEM below.*

U.S. Department of Agriculture (See county listings for local federal agency contacts.)

EQIP: Environmental Quality Incentive Program. Administered by the Natural Resources Conservation Service. Conservation cost-share program for implementing Best Management Practices, available to agricultural producers who agree to implement a whole-farm plan that addresses major resource concerns. Up to $50,000 over a 5- to 10-year period. Some parts of the state are designated Conservation Priority Areas and receive a larger funding allotments.

WRP: Wetland Reserve Program. Administered by the Natural Resources Conservation Service. Easement and restoration program to restore agricultural production land to wetland. Easements may be for 10 years, 30 years, or permanent. Longer easements are preferred. Partnerships with other acquisition programs are encouraged. Restoration and legal costs are paid by NRCS. Landowner retains ownership of the property and may use the land in ways that do not interfere with wetland function and habitat, such as hunting, recreational development, and timber harvesting.

CRP: Conservation Reserve Program. Administered by the Farm Service Agency with technical assistance from NRCS. Conservation easements in certain critical areas on private property. Agricultural producers are eligible. Easements are for 10 or 15 years, depending on vegetative cover, and compensation payments are made yearly to replace income lost through not farming the land. Cost share is available for planting vegetative cover on restored areas.

WHIP: Wildlife Habitat Incentive Program. Administered by the Natural Resources Conservation Service. Cost share to restore habitat on previously farmed land. Private landowners who are agricultural producers are eligible. Cost share up to 75%, and contracts are for 10 years.

FIP: Forestry Incentive Program. Administered by the Natural Resources Conservation Service. Cost-share to assist forest management on private lands. Funds may be limited.

U.S. Fish & Wildlife Service

Partners for Wildlife: assistance for habitat restoration.

STATE CONSERVATION AND WATERSHED PROGRAMS

IDNR Division of Soil Conservation

LARE: Lake & River Enhancement Program. Funds diagnostic and feasibility studies in selected watersheds and cost-share programs through local Soil & Water Conservation Districts. Project oversight provided through county-based Resource Specialists and Lake & River Enhancement Watershed Coordinators. Funding requests for Watershed Land Treatment projects must come from Soil & Water Conservation Districts. If a proposed project area includes more than one district, the affected SWCDs should work together to develop an implementation plan. The SWCDs should then apply for the funding necessary to administer the watershed project. Before applying for funding, the SWCDs should contact the Lake & River Enhancement Coordinators to determine (1) the appropriate watershed to include in the project, (2) if the proposed project meets the eligibility criteria, and (3) if funding is available.

IDNR Division of Fish & Wildlife

Classified Wildlife Habitat Program: Incentive program to foster private wildlife habitat management through tax reduction and technical assistance. Landowners need 15 or more acres of habitat to be eligible. IDNR provides management plans and assistance through District Wildlife Managers. See county listings.

Wildlife Habitat Cost-share Program: Similar to above.

IDNR Division of Forestry

Classified Forest Program: Incentive program to foster private forest management through tax reduction and technical assistance. Landowners need 10 or more acres of woods to be eligible. IDNR provides management plans and assistance through District Foresters. (See county listings.)

Classified Windbreak Act: Establishment of windbreaks at least 450 feet long adjacent to tillable land. Provides tax incentive, technical assistance through IDNR District Foresters.

Forest Stewardship Program & Stewardship Incentives Program: Cost share and technical assistance to encourage responsibly managed and productive private forests.

IDNR Division of Reclamation

Appalachian Clean Streams Initiative: Funds for acid mine drainage abatement.

IDNR Division of Nature Preserves

State Nature Preserve Dedication: Acquisition and management of threatened habitat.

IDEM Office of Water Management

State Revolving Fund: Available to municipalities and counties for facilities development. Will be available in 1999 for nonpoint source projects as well. Funding is through very low-interest loans.

Section 319 Grants: Available to nonprofit groups, municipalities, counties, and institutions for implementing water quality improvement projects that address nonpoint source pollution concerns. Twenty-five percent match is required, which may be cash or in-kind. Maximum grant amount is $112,500. Projects are allowed two years for completion. Projects may be for land treatment through implementing Best Management Practices, for education, and for developing tools and applications for state-wide use.

Section 205(j) Grants, formerly called 604(b) Grants: Available to municipalities, counties, conservation districts, drainage districts. These are for water quality management projects such as studies of nonpoint pollution impacts, nonagricultural NPS mapping, and watershed management projects targeted to Northwest Indiana (including BMPs, wetland restoration, etc.)

Section 104(b)(3) Grants: These are watershed project grants for innovative demonstration projects to promote statewide watershed approaches for permitted discharges, development of storm water management plans by small municipalities, projects involving a watershed approach to municipal separate sewer systems, and projects that directly promote community based environmental protection. NOTE: the application time frame for IDEM grant programs is annually, by March 31st.

PRIVATE FUNDING SOURCES

National Fish and Wildlife Foundation

1120 Connecticut Avenue, NW Suite 900, Washington DC 20036. Nonprofit, established by Congress 1984, awards challenge grants for natural resource conservation. Federally appropriated funds are used to match private sector funds. Six program areas include wetland conservation, conservation education, fisheries, migratory bird conservation, conservation policy, and wildlife habitat.

Individual Utilities

Check local utilities such as IPALCO, CINergy, REMC, NIPSCO. Many have grants for educational and environmental purposes.

Indiana Hardwood Lumbermen's Association

Indiana Tree Farm Program

The Nature Conservancy

Land acquisition and restoration.

Southern Lake Michigan Conservation Initiative
Blue River Focus Area
Fish Creek Focus Area
Natural Areas Registry
Hoosier Landscapes Capitol Campaign

Conservation Technology Information Center (CTIC)

'Know Your Watershed' educational materials are available

Indiana Heritage Trust

Land acquisition programs

Ducks Unlimited

Land acquisition and habitat restoration assistance

Quail Unlimited

Pheasants Forever

Sycamore Land Trust

Acres Inc.

Land trust

Oxbow, Inc.

Land trust

SOURCES OF ADDITIONAL FUNDING OPPORTUNITIES

Catalog of Federal Funding Sources for Watershed Protection
EPA Office of Water (EPA841-B-97-008) September 1997

GrantsWeb: http://www.srainternational.org/cws/sra/resource.htm

FIGURE 2-1
ST. JOSEPH WATERSHED

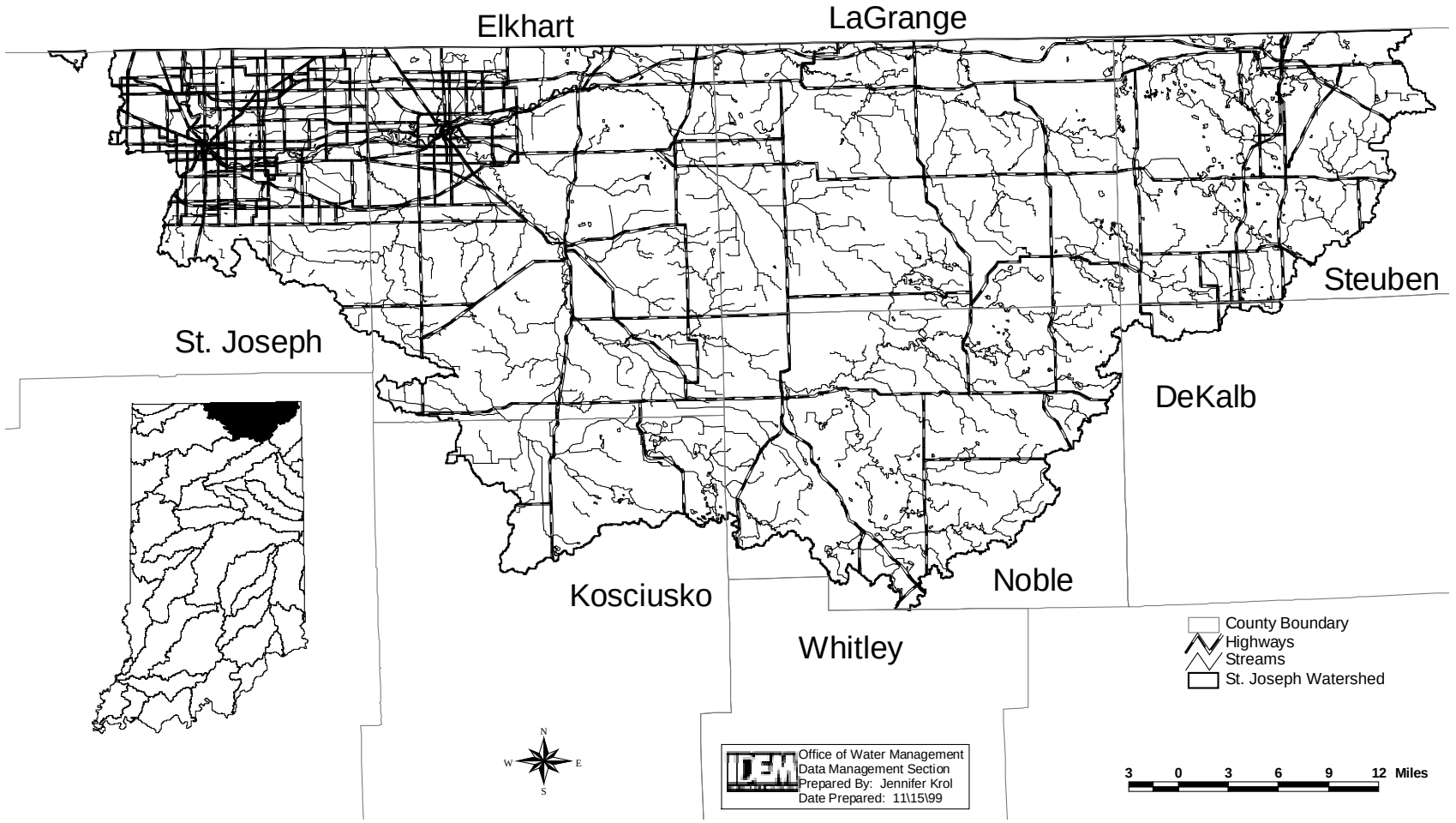


FIGURE 2-2
14-DIGIT HYDROLOGIC UNIT CODE WATERSHEDS
ST. JOSEPH WATERSHED

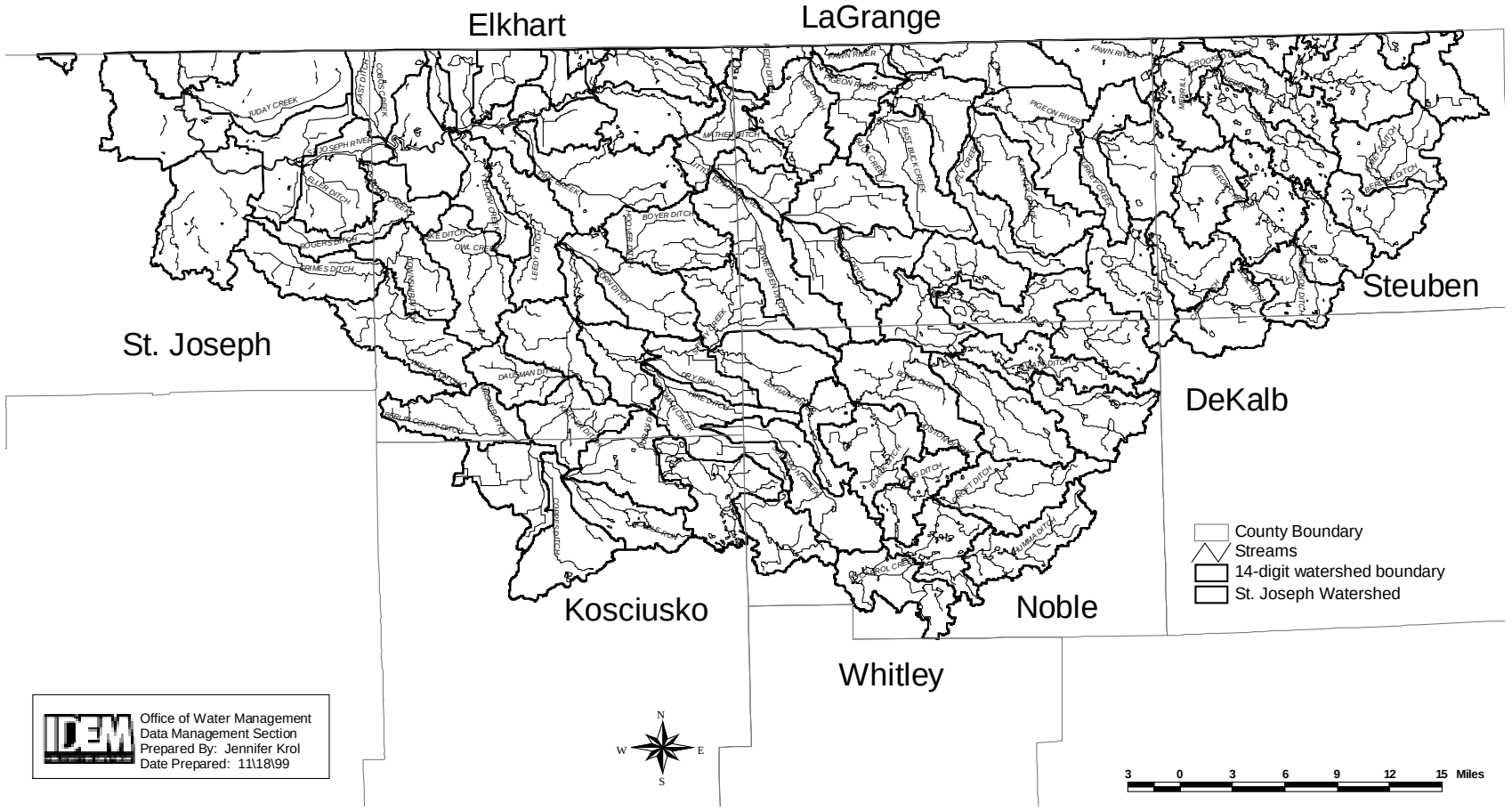


FIGURE 2-3
VEGETATIVE LAND COVER
ST. JOSEPH WATERSHED

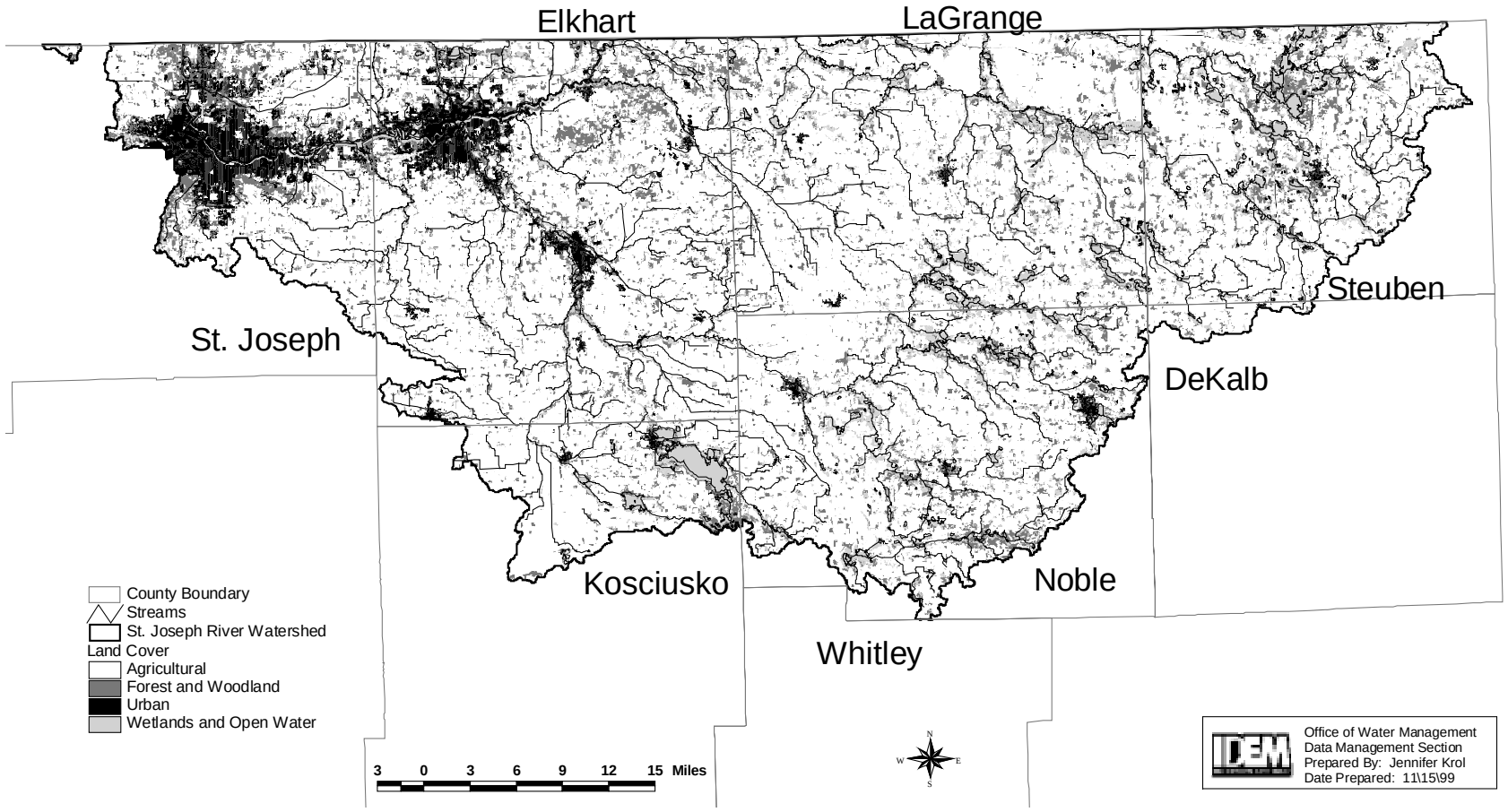


FIGURE 3-1
NPDES DISCHARGES
ST. JOSEPH WATERSHED

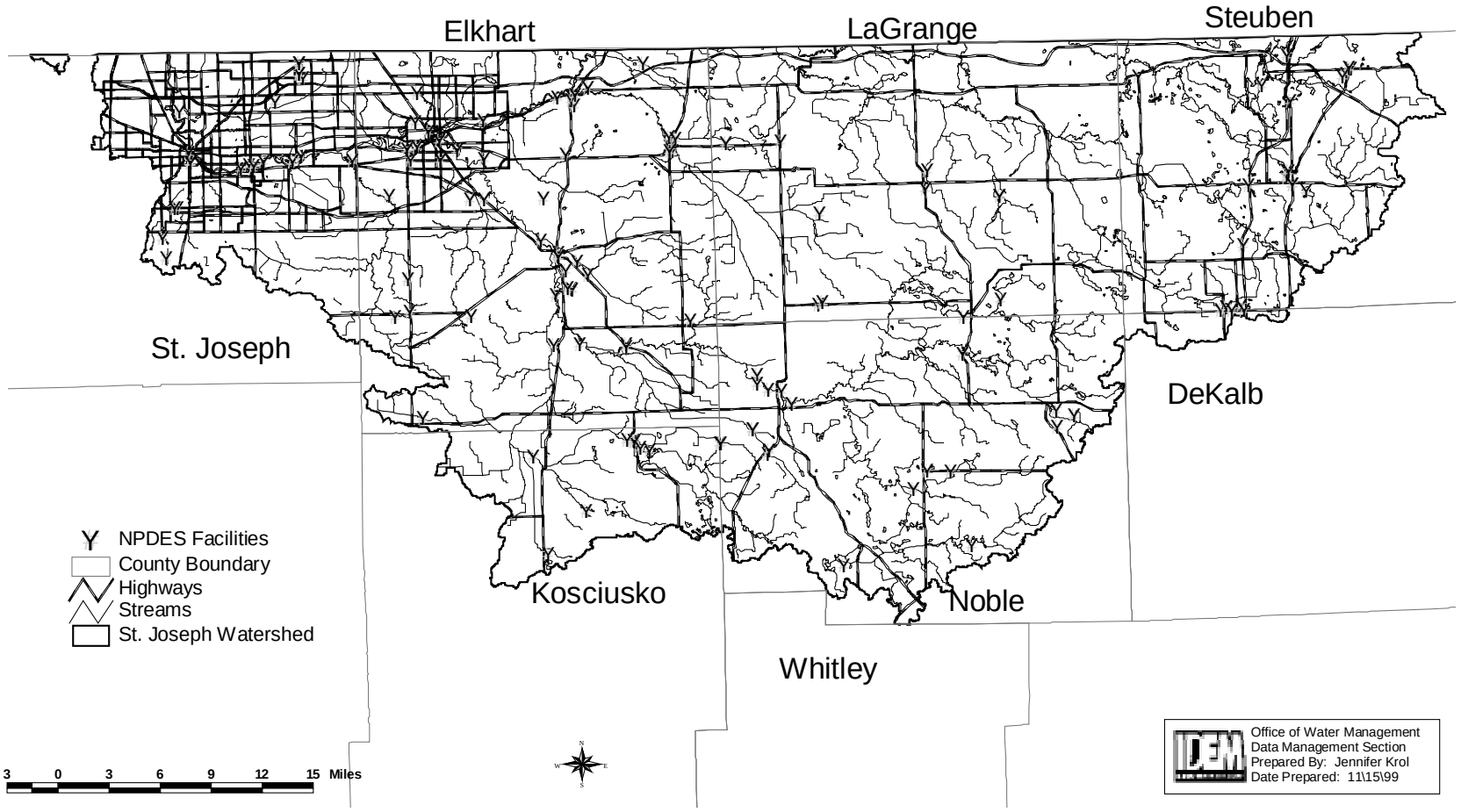


FIGURE 3-1
CLEAN WATER ACT SECTION 303(d) LISTED STREAMS
ST. JOSEPH WATERSHED

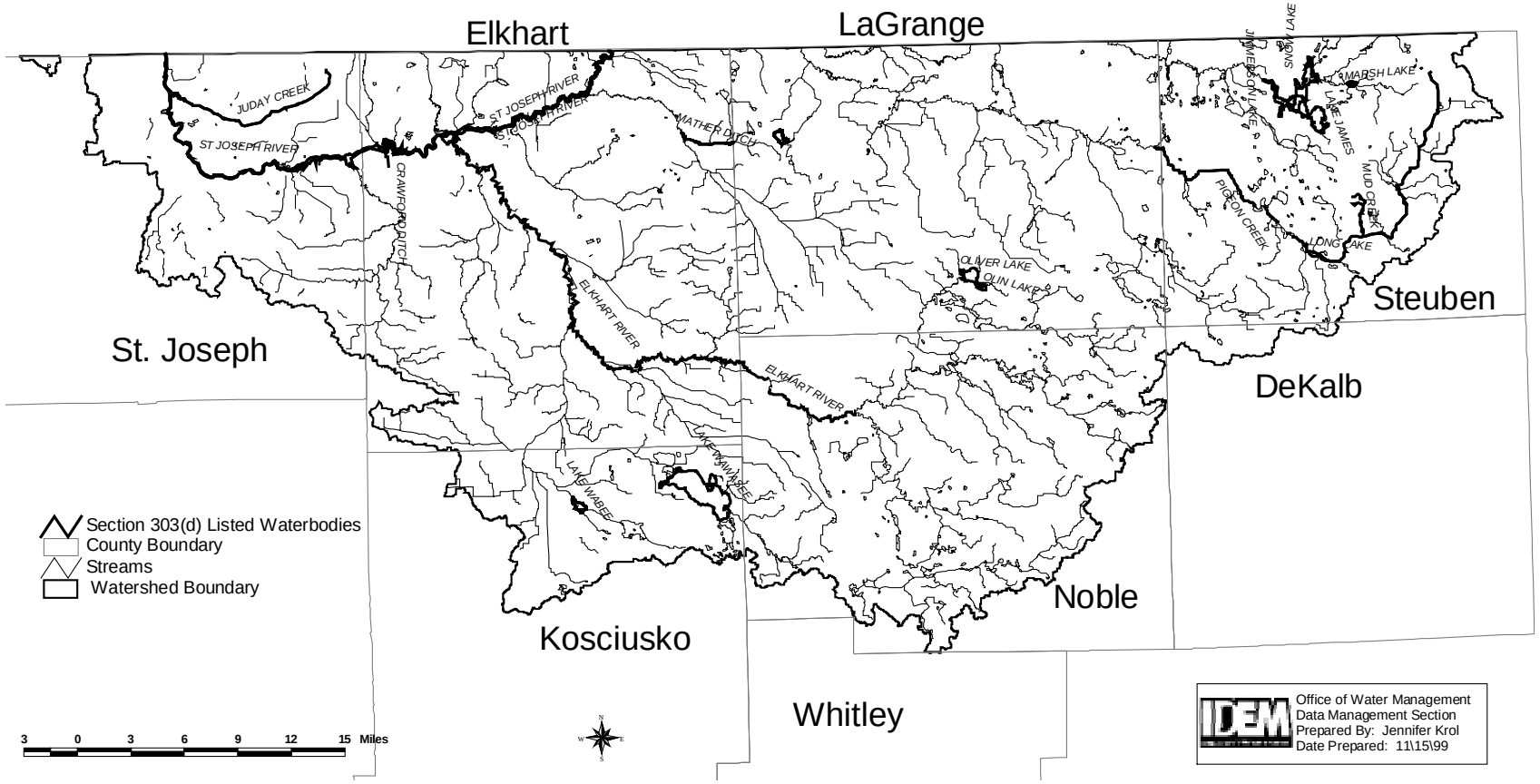


FIGURE 3-1
LARE, S319, EQUIP 97 & 98 AREAS