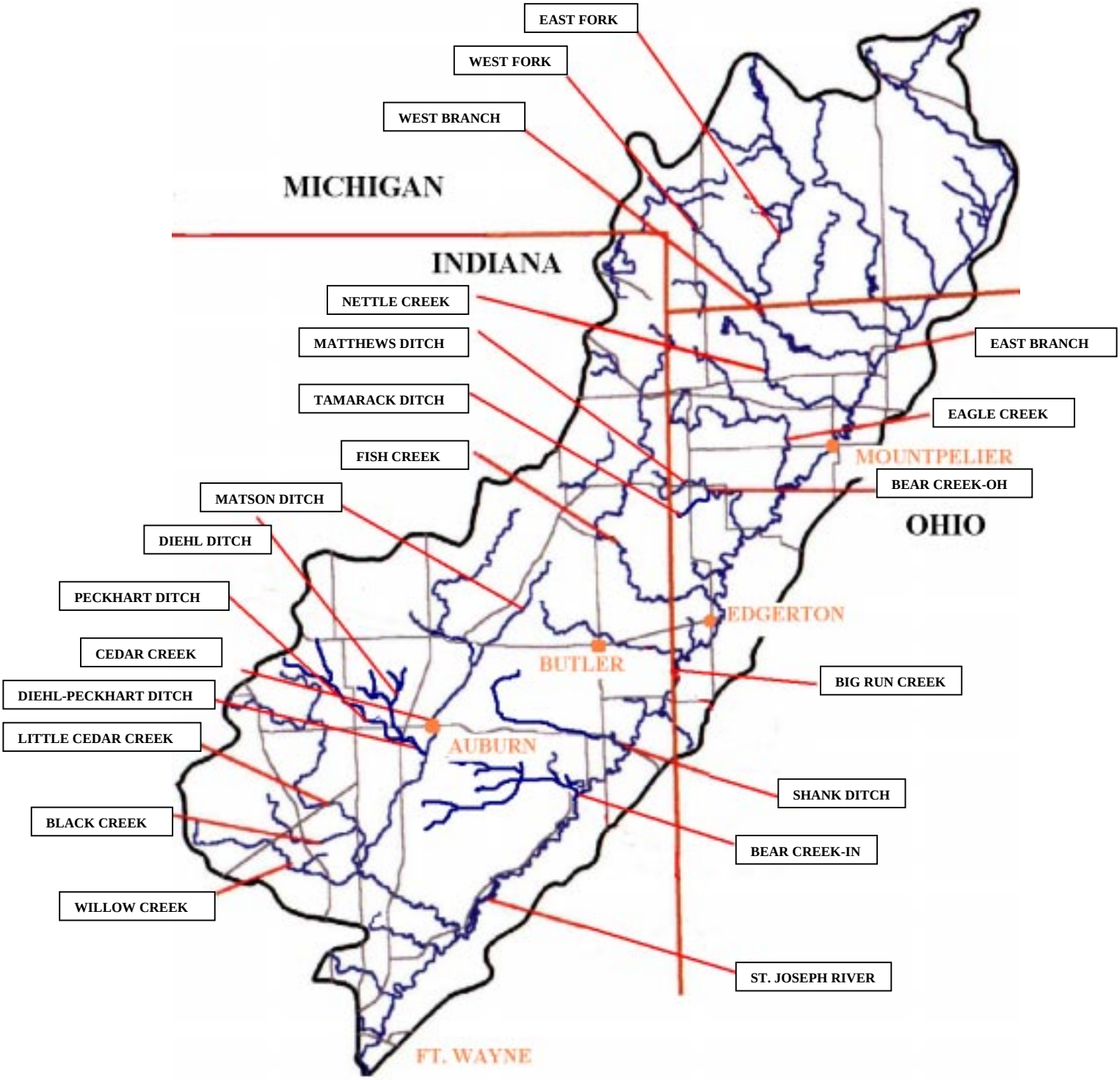
St. Joseph River Watershed Initiative
Watershed Management Plan

Preface

The purpose of this watershed management plan is to provide guidance to the St. Joseph River Watershed Initiative and its Board. We recognize that the watershed management plan does not give specific water quality parameters by which it will evaluate its success. This is due to the size and diversity of the watershed and its concerns. However, the Initiative will address these parameters through the creation and implementation of sub-watershed groups.

We also recognize that the data presented in the watershed management plan does not reflect the same years. More extensive analysis was done in 1996 to evaluate the watershed. To help cut costs the Initiative decided to stop testing for nutrients and sedimentation. That is why for these categories there is only data for 1996. Testing was continued for E.coli and Pesticides during the years of 1996 through 1998. However, since there is a greater potential for inaccuracies in a single year of data, we opted to present our multiple years of data when available to more accurately depict the condition of the watershed. To ensure clarification whenever a single year's data was use it was duly noted.

ST. JOSEPH RIVER WATERSHED



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Forward

Mission Statement

The mission of the St. Joseph River Watershed Initiative is to develop partnerships to promote economically and environmentally compatible land uses that improve water quality in the St. Joseph River Watershed.

Philosophy

Since the size of the St. Joseph River Watershed Initiative is so large compared to the size of the Initiative, the St. Joseph River Watershed is taking an unique way to manage its watershed. The Initiative has taken the position as coordinator and will use its resources and expertise to identify sub-watersheds. Through water sampling, the Initiative will be able to pinpoint which sub-watersheds will require corrective actions. These corrective actions will be achieved with assistance of public education, cost assistance, and state and federal conservation programs. Once the Initiative has instituted the corrective actions within the sub-watersheds, the Initiative will help develop sub-watershed groups that will carry out these actions. The Initiative would then act as a liaison to federal/state governments and mediator to the public that will involve fund raising, educational information for the public The Initiative will continue its water-sampling within the watershed, as well as provide any technical information and support needed by the sub-watershed.

HISTORY OF THE ST. JOSEPH RIVER WATERSHED & INITIATIVE

The St. Joseph River Watershed

LOCATION

The St. Joseph River Watershed, located in northeast Indiana, northwest Ohio, and south central Michigan, encompasses 694,400 acres. With its headwaters in Hillsdale County, Michigan, the St. Joseph River flows in a southwestern direction through Williams County, Ohio; Defiance County, Ohio; DeKalb County, Indiana; and Allen County, Indiana, before converging with the St. Mary's River in Fort Wayne, Indiana to form the Maumee River. Both Noble County and Steuben County contribute water to the St. Joseph River, through Cedar Creek and Fish Creek tributaries.

LAND USES

Of the 694,400 acres in the watershed, Indiana occupies 56% of the watershed, while Michigan and Ohio each occupy 22%. The watershed is primarily agricultural, with approximately 64% in cropland and 15% in pasture or forage. Woodlands and wetlands are found on 10%, while the remaining 11% consist of urban, farmsteads, airports, golf courses, and other land uses.

POPULATION

The majority of the St. Joseph River Watershed is rural, with a population of approximately 65,000 (excluding Fort Wayne). Fort Wayne is the largest city in the watershed with over 200,000 residents. Auburn, Indiana is the second largest city and Montpelier, Ohio is the third largest. The population is increasing throughout the watershed, especially in southern DeKalb and Noble Counties, and northern Allen County. Small 5-10 acre parcels are numerous in these areas. In all three states, industry is claiming areas along interstate and major state highways.

SOILS AND GEOLOGY

The topography of the watershed varies from rolling hills in Hillsdale, Williams, Noble, and Steuben counties to nearly level plains in DeKalb and Allen counties. The St. Joseph River follows the Fort Wayne moraine, and flows past numerous low bluffs and terraces. This indicates that the river was once much wider and deeper. Much of the St. Joseph River bed is composed of sand and gravel deposits. The average slope of the river's bottom is 1.6 feet per mile.

Soils in the watershed were formed from compacted glacial till. The predominate soil textures are silt loam, silty clay loam, and clay loam. Soil associations include Miami-Morley, Morley-Glynwood-Blount, and Blount-Pewamo. Erosion and over-saturation are the major soil limitations.

WATER SUPPLY

The St. Joseph River serves as the drinking water supply for the 200,000 people of Fort Wayne. Fort Wayne's Three Rivers Filtration Plant processes 34 million gallons of water daily from the St. Joseph River. The filtration plant also operates two large reservoirs: Cedarville Reservoir, located in the St. Joseph River; and Hurshtown Reservoir. Together these reservoirs store over 1 billion gallons of water.

The St. Joseph River Watershed Initiative

The St. Joseph River Watershed Initiative is a 501(c)(3) not-for-profit organization that is made up of local citizens, organizations, businesses, and agencies working together to take a PROACTIVE approach to water quality problems by promoting land use practices that are both economically and environmentally compatible.

The St. Joseph River Watershed Initiative is governed by a Board of Directors that represent:

Soil and Water Conservation Districts
Local Business
Organizations
Industry
Schools and Universities
Local Government
At Large

Each group has three representatives, excepting the At Large Group, which can have six representatives. The Organizations, Businesses, and Agencies that are Partners of the St. Joseph River Watershed Initiative:

City of Ft. Wayne-City Utilities
Clean Water Indiana Program
Hillsdale County Drain Commission
Indiana Department of Environmental Management
Indiana Department of Natural Resources-Division of Soil Conservation
Maumee River Basin Commission
Maumee Valley Resource Conservation and Development (RC&D)
Maumee Watershed Conservancy District
Michigan Department of Agriculture Natural Resources Conservation Service
Purdue Cooperative Extension Service
Soil and Water Conservation Districts of the St. Joseph River Watershed
The Nature Conservancy
Williams County Engineer's Office
Wood-Land-Lakes Resource Conservation and Development (RC&D)
Indiana Purdue University of Fort Wayne
Hillsdale College

Current Board Members

<u>Conservation District Representatives</u>		
1. Bob Koerner	Williams Co. SWCD	
2. Matt Ridenour	Steuben Co. SWCD	
3.		
<u>Local Business</u>		
1. Randy Broady	Edon Farmers Co-Op	
2. Ron Delong	Allen County Co-Op	Vice-Chairman
3. Daniel Easterday	Farmer	
<u>Organizations</u>		
1. Larry Clemens	The Nature Conservancy	
2. Marvin Dietsch	Williams Co. Farm Bureau	President
3. Gerry Landon	Williams Co. Farmers Union	Treasurer
<u>Institutions</u>		
1. Jane Loomis	School of Public & Environmental Affairs - IPFW	
2. Roger Moll	Cooperative Extension	
3. Bob Gillespie	Department of Biology - IPFW	

Corporations

1.

2.

3.

Local Government

1.	Ted Rhinehart	City of Fort Wayne	
3.	Rodney Renkenberger	Maumee River Basin Commission	Secretary
3.	Bill Word	Hillsdale Drain Commission	

At Large

1.	Bill Eviston	Allen Co. SWCD, Associate Supervisor
2.	Doug Pooler	Filtration Plant
3.	Doug Sanford	Farmer
4.	Chris LaLonde	Edgerton City
5.	Tony Swinehart	Hillsdale College

The History of Conservation in the Joseph River Watershed

The St. Joseph River Watershed Initiative has some history of conservation efforts over the last several decades. The Maumee River Basin of which, the St. Joseph River Watershed is a part directed nearly all of the watershed-wide conservation efforts in the past. The goal of most past efforts was to reduce non-point source pollution going into Lake Erie from the Maumee River Basin.

In the late 70's and early 80's all of the Soil and Water Conservation Districts in the St. Joseph Watershed participated in an Accelerated Conservation Tillage Adoption Program funded by a grant from the EPA-Great Lakes National Program Office Through the grant, each district in the watershed was able to obtain a no-till planter or drill and then make it available to farmers to try no-till corn or soybean production on up to 40 acres and compare it side by side with their conventional tillage system they were currently using. This program really helped get a jump-start with the adoption of no-till, particularly no-till soybeans, in the watershed.

Later in the early 90's, the watershed again participated in a Lake Erie Sediment Reduction Program funded by the Army Corp. of Engineers. This project lasted only a couple of years, but again focused on providing incentives for the adoption of conservation tillage, cover crops, hay planting, tree planting, filter strips, and other practices that put cover on the land to reduce erosion primarily from cropland.

In addition to these special projects, the Conservation Reserve Program (CRP) has tremendously impacted the land use in the watershed. Currently, over 104,000 acres are enrolled in the CRP, with the largest CRP acreage in DeKalb County (39,725 acres) and Williams County (25,200 acres). The water quality benefits provided by this program include reduced erosion, reduced sedimentation, and improved wildlife habitat. However, contracts for this program began to expire in 1996, and significant acreage is scheduled to be released over the next several years especially since the Great Lakes Basin no longer accrues bonus points toward a landowner's Environmental Benefits Index (EBI) when they make application with USDA to keep their existing CRP lease in the Conservation Reserve Program.

Another important conservation effort that has been in place and continues today is The Nature Conservancy's Fish Creek Watershed project. The Nature Conservancy identified Fish Creek as a unique ecosystem. Three federally endangered species or mussel are found there, and it is the only place on earth where the White Cat's Paw Pearly mussel is found. In the past eight years the Fish Creek Project Partners fostered efforts to improve the riparian corridor and reduce sedimentation in Fish Creek, which still continues today.

The Nature Conservancy has recently started another “Community-Based Project" in the East Fork of the West Branch of the St. Joseph River. This sub-watershed project, much like the Fish Creek effort, will focus on promoting conservation tillage adoption on cropland and buffering the riparion areas along the East Fork and its tributaries.

The St. Joseph Watershed also contains the Cedar Creek sub-watershed of which the lower 13.7 miles, just north of Fort Wayne, is included in Indiana’s State Natural, Scenic, and Recreational Rivers System. This designation effectively protects the river from detrimental impacts, including construction of dams, docks, and bridges, excavation operations, and drainage projects. The upper portion of the Cedar Creek Watershed became an Environmental Quality Incentive Program (EQIP) priority area and was funded three years ago to do accelerated conservation work on agricultural land.

The History of the St. Joseph River Watershed Initiative

The Initiative was formed in 1995 in response to a water quality report issued by the Environmental Working Group. This report questioned the quality of the drinking water in Fort Wayne, Indiana. The watershed also encompasses three states in which none of them wanted to take action.

Concerned citizens took action. These citizens began forming partnerships with agencies and organizations in the St. Joseph basin’s three-state area. This partnership is now known as The St. Joseph River Watershed Initiative. Initially, the group brought local/state natural resource and political leaders together to share information, and to discuss issues and solutions pertaining to water quality. Then, in March 1996, the “Conference on the St. Joseph”, organized by the Initiative, brought together 125 leaders from Indiana, Michigan, and Ohio. The conference participants provided the guidance, energy, and motivation to pursue the development of a Strategic Plan.

After the “Conference on the St. Joseph”, a steering committee formed to develop the organizational structure of the St. Joseph River Watershed Initiative. One of the first tasks undertaken by the steering committee was to start a three-year base line water quality study in 1996. This water quality study had a three-fold purpose: 1) determine the current water quality conditions of the watershed. 2) identify priority areas with distressed water quality on which to focus conservation efforts. 3) establish baseline points on which to measure future improvements in water quality. The study was designed to measure water quality at the mouth of major tributaries, before they emptied into the St. Joseph. Nineteen sites were selected in the St. Joseph River Watershed, and eight were selected in the Cedar Creek sub-watershed. In the first year, 17 different pesticides, 19 different nutrients and chemicals, and three biological factors were measured in the samples collected. The following two years the four most commonly found pesticides, two most commonly found nutrients, and the same three biological factors from the 1996 study were measured in the samples collected according to the St. Joseph River Watershed Initiative's Quality Assurance Project Plan *(see appendix A*).

The second task undertaken by the steering committee was the development of a Strategic Plan. The Strategic Plan outlined the mission and vision of the Initiative. Also, the historical background of the Initiative and information on the watershed were outlined. In addition, the target issues in the watershed were defined and strategic planning points were identified to address the target issues.

Finally, the steering committee raised funds, through donations from three agri-chemical companies and a 319 grant, to hire a public outreach coordinator. The steering committee hired a public outreach coordinator in February of 1998, who then was responsible for the day to day operations, educational, and outreach activities of the St. Joseph River Watershed Initiative. The office of the Initiative has been, up to the current time, housed in the Allen County Soil and Water Conservation District Office.

In April of 1998 the first St. Joseph River Watershed Initiative Board of Directors formed with sixteen directors and four interim officers. The Initiative was incorporated on October 16, 1998 and the Initiative’s By-laws were finalized on November 2, 1998. On January 21, 1999 the Internal Revenue Service designated the Initiative as a 501(c)(3), not-for-profit, organization. In the winter of 1999, the results of the three-year water quality study were reviewed and analyzed with the help of the US Geological Survey and Purdue University. The results of the study were reviewed locally, and based on the water quality information and local factors, two watersheds were selected to begin sub-watershed work.

THE ST. JOSEPH RIVER WATERSHED CONDITION & CONCERNS

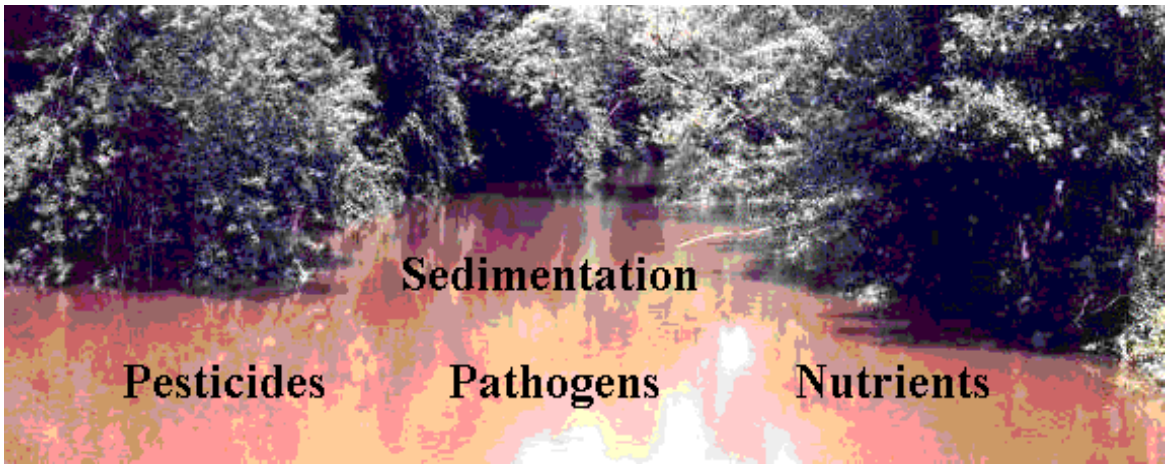
Community Concerns and Target Water Quality Issues

- **SEDIMENTATION:** Sedimentation in tributaries and the river disrupts life cycles, which causes loss of habitat for aquatic plants, insects, and animals. Further downstream, the effects become more costly and noticeable. These effects include loss of reservoir storage capacity and reduced recreational opportunities. Finally, at the river's end, the City of Fort Wayne incurs great costs to remove the sediment and attached pollutants.

- **PESTICIDES:** Pesticides, like sediment, pose a threat to aquatic habitat and wildlife that rely on the river and its tributaries. Once suspended in water, pesticides at levels established by EPA, are a risk to human health. Additionally, the cumulative effects of several types of pesticides present in water supplies are not well understood.

- **PATHOGENS:** Of all the target issues, pathogens currently pose the greatest threat to both humans and animals. Laboratory analysis of water samples has found indicators of potentially harmful pathogens throughout the river system. Several sources are believed to contribute to this problem including: inadequate home sewage disposal systems; agricultural livestock waste; wildlife waste; and other natural sources of pathogens.

- **NUTRIENTS:** Nutrients can reach surface water supplies when attached to sediment particles. They may be conveyed through tile water or surface water runoff. Nutrients, such as nitrates, pose a threat to human health at certain levels. Nitrates in the body inhibit the ability of blood to carry oxygen. This effect is especially noticeable in infants, and is commonly referred to as the "Blue Baby Syndrome." Nutrients can also threaten the environment by causing eutrophication, often evidenced by algae blooms in surface water. Left unchecked, the eutrophication process reduces oxygen in the water. This can cause fish kills.

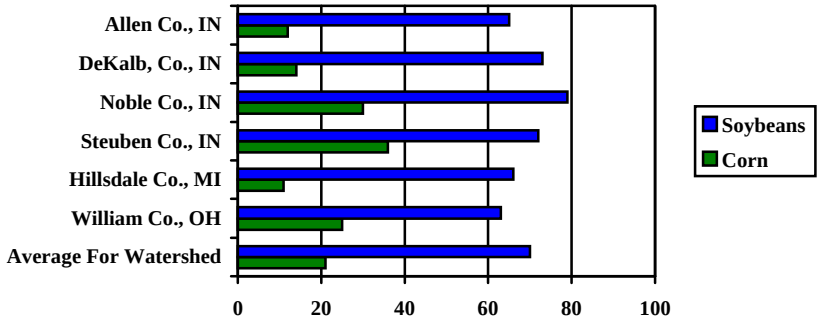


The Current State of the St. Joseph River Watershed

Conservation Tillage *(Figure 1)*

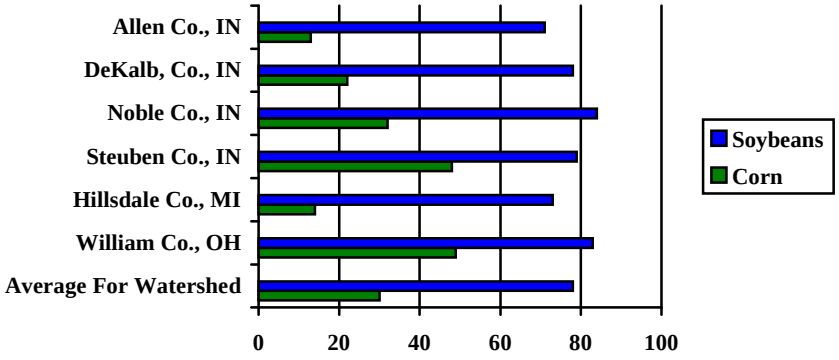
Statistics from current tillage transect data show that conservation tillage adoption in beans is high, while adoption in corn is low.

Percent of No-till Corn & Soybean Adoption by Counties in the St. Joseph River Watershed-1998



Percent of No-till Corn & Soybeans in each County in 1998.

Percent of Conservation Tillage Adoption by Counties in the St. Joseph River Watershed-1998



Conservation Tillage is Defined as any Tillage System leaving 30% or more Crop Residue After Planting.

Water Quality

Pesticides

In 1995 the environmental organization, Environmental Working Group, conducted a study testing tap water in mid-west cities for commonly used herbicides. The City of Ft. Wayne was found to have the largest number of herbicides in its water, compared to the other cities in the study. Statistics from the 96-98 three-year base line water quality study show that on average, pesticide levels in the watershed are not high. At certain times of the year, though, pesticide levels spike, bringing pesticide concentrations above the maximum contaminant levels set by the Environmental Protection Agency. Pesticide spikes are a result of spring agricultural application of herbicides in conjunction with run-off events during heavy spring rains.

Potential Health and Environmental Effect of Pesticides in the Water Supply

Each of the four pesticides tested above can be detrimental to human health when exposed to excessive levels, which are stated above in (figure 9). The effects of atrazine when exposed to high levels include dermatitis, and irritation of eyes, nose, and throat. While excess consumption of atrazine may lead to tremors, organ weight changes, and liver and heart damage. Some of the environmental effects include reduction of population of aquatic organisms such as clams.

Cyanazine is in the same herbicide family as atrazine and carries some of the same characteristics. Although, cyanazine is not quite as toxic as atrazine, it has been discontinued. Over the next years cyanazine levels will decrease until they become non-existent.

Alachlor has been classified as a possible carcinogen. Alachlor has a low acute oral toxicity with effects including hepatotoxicity and eye degeneration. Studies on rodents indicate tumor formation in lungs, stomach, thyroid, and nasal passages. Alachlor's environmental effects show it to be moderately toxic to aquatic invertebrates and fishes, and slightly toxic to waterfowl.

Metolachlor has also been classified as a possible carcinogen. Contact with metolachlor may include irritation of eyes and skin, while intoxication include cramps, nausea, anemia, anemia methemoglobenemia, collapse, convulsions, and shock. Environmentally, metolachlor is moderately toxic to both cold and warm water fish.

Pathogens

The *IDEM* Office of Water Management's **Intensive Segment Survey for Cedar Creek** (1992, Segment 18) listed E. coli concentrations as a major threat to water quality in the Cedar Creek watershed, the largest tributary to the St. Joseph River. Statistics from the 96-98 three-year base line water quality study show that throughout the St. Joseph River Watershed, levels of E.coli are high, usually much higher than 235 colonies/100 ml set by the Indiana Department of Environmental Management as the maximum level for full body contact. Major sources of E.coli in the St. Joseph River Watershed are from faulty septic systems and livestock waste. E. coli is a pathogen that can make humans ill, if ingested. It is an indicator that other pathogens associated with fecal contamination may also be present in the water.

Potential Health and Environmental Concerns of E. coli in the Water Supply

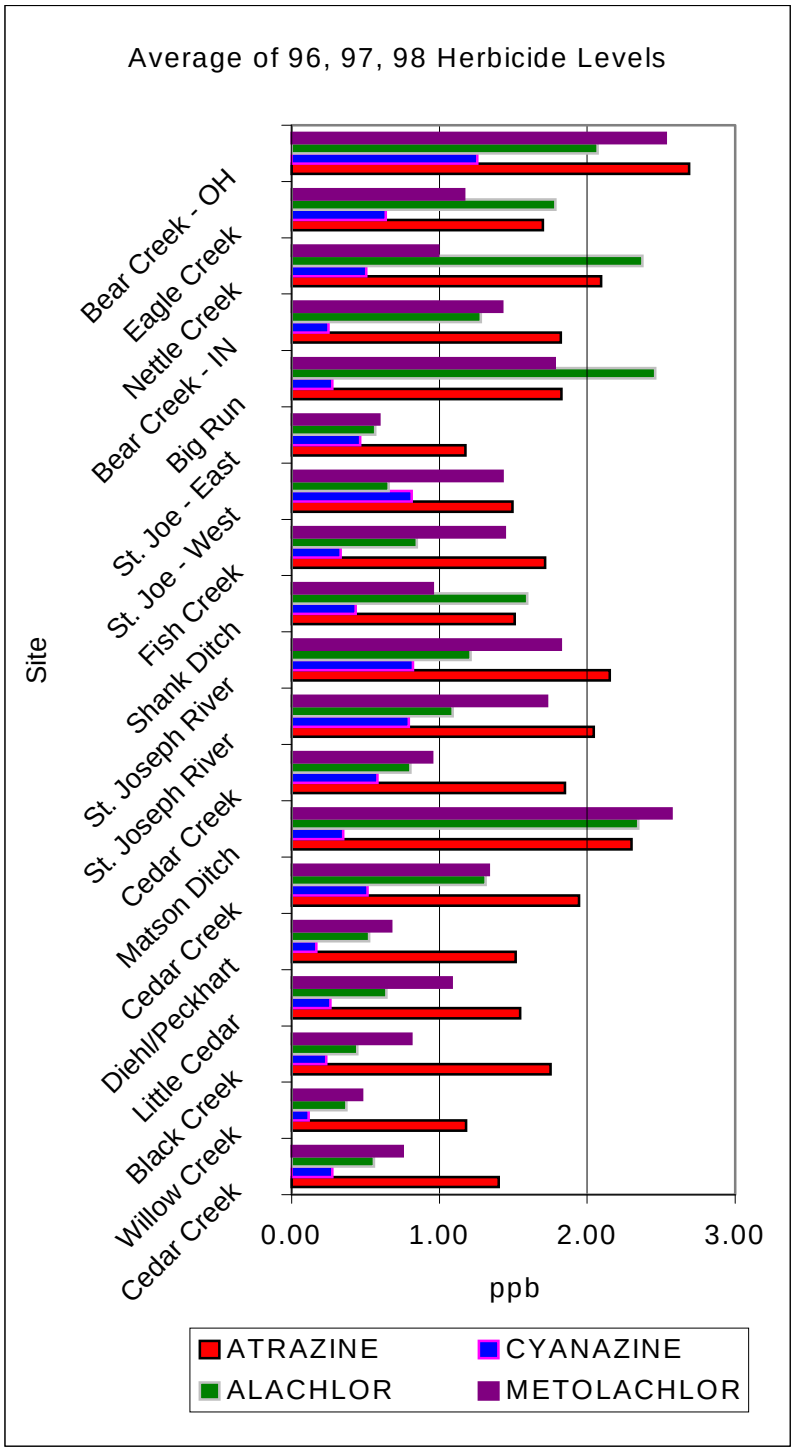
E. coli can pose a serious threat to human health. When exposed to excessive E. coli concentration illness may occur. Symptoms could include nausea, cramps, diarrhea, fever, dizziness, and dysentery. In extreme cases even death may occur.

96-98 Pesticide Averages *(Figure 3)*

SITE #	SITE	ATRAZINE (parts per billion)	CYANAZINE (parts per billion)	ALACHLOR (parts per billion)	METOLACHLOR (parts per billion)
0	Cedar Creek	1.40	0.28	0.56	0.75
1	Willow Creek	1.18	0.12	0.37	0.48
2	Black Creek	1.75	0.23	0.44	0.81
3	Little Cedar	1.55	0.26	0.64	1.08
4	Diehl/Peckhart	1.52	0.17	0.52	0.67
5	Cedar Creek	1.94	0.51	1.31	1.33
6	Matson Ditch	2.30	0.35	2.35	2.57
7	Cedar Creek	1.85	0.58	0.80	0.95
21	St. Joseph River	2.04	0.79	1.09	1.73
22	St. Joseph River	2.15	0.82	1.21	1.82
23	Shank Ditch	1.51	0.43	1.60	0.96
24	Fish Creek	1.72	0.33	0.85	1.44
25	St. Joe - West	1.49	0.81	0.66	1.43
26	St. Joe - East	1.18	0.46	0.57	0.59
27	Big Run	1.83	0.28	2.46	1.78
28	Bear Creek - IN	1.82	0.25	1.28	1.43
29	Nettle Creek	2.09	0.51	2.37	0.99
30	Eagle Creek	1.70	0.64	1.79	1.17
31	Bear Creek - OH	2.69	1.25	2.07	2.53

96-98 Maximums

SITE #	SITE	ATRAZINE (parts per billion)	CYANAZINE (parts per billion)	ALACHLOR (parts per billion)	METOLACHLOR (parts per billion)
0	Cedar Creek	8.00	2.18	3.47	6.97
1	Willow Creek	6.72	1.40	3.63	4.14
2	Black Creek	8.10	1.92	5.13	6.76
3	Little Cedar	7.34	2.71	8.17	5.39
4	Diehl/Peckhart	16.95	1.62	5.10	5.17
5	Cedar Creek	12.04	5.61	8.51	6.66
6	Matson Ditch	10.85	1.68	15.50	12.67
7	Cedar Creek	8.79	3.75	5.41	7.82
21	St. Joseph River	7.01	4.61	4.54	5.42
22	St. Joseph River	8.28	4.33	5.41	5.15
23	Shank Ditch	8.83	3.77	13.45	6.45
24	Fish Creek	6.77	2.31	4.60	5.25
25	St. Joe - West	7.49	4.25	6.22	6.04
26	St. Joe - East	8.17	4.20	5.70	4.66
27	Big Run	9.88	2.12	12.56	6.82
28	Bear Creek - IN	9.83	2.39	7.02	9.80
29	Nettle Creek	6.68	5.38	8.93	7.18
30	Eagle Creek	9.57	5.26	9.75	5.01
31	Bear Creek - OH	9.15	5.84	7.08	9.30

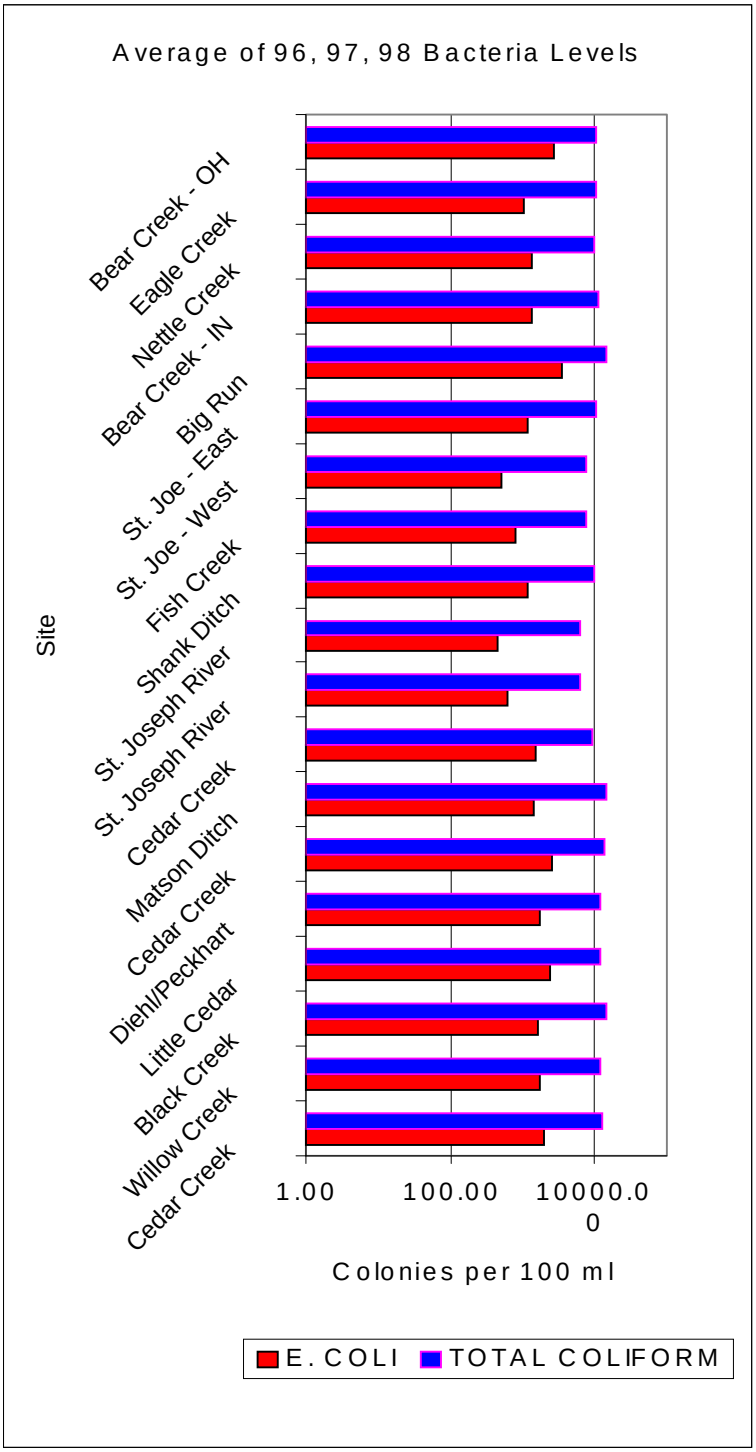


96-98 E. coli Averages *(Figure 4)*

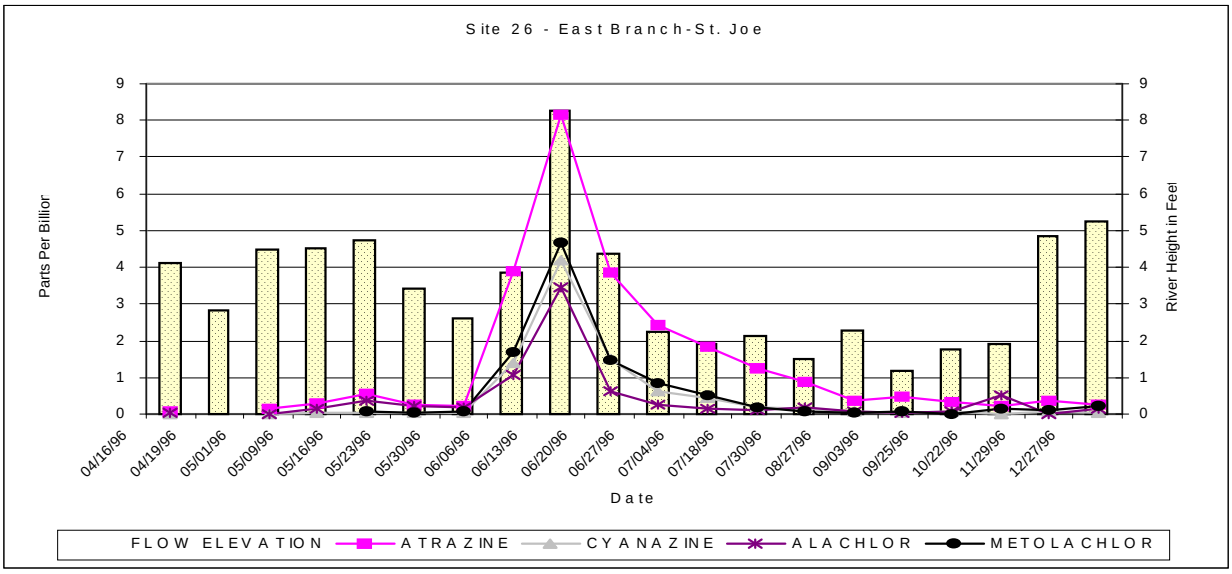
SITE #	SITE	E. coli (Colonies/100ml)	Total Coliform (Colonies/100ml)	Heterotrophic Plate Count
0	Cedar Creek	1923.48	12533.99	
1	Willow Creek	1726.20	11903.73	8719.12
2	Black Creek	1663.77	14068.82	10039.58
3	Little Cedar	2326.17	11965.28	9651.04
4	Diehl/Peckhart	1701.42	11809.79	8763.84
5	Cedar Creek	2498.81	13420.00	6210.42
6	Matson Ditch	1465.89	14317.21	8600.00
7	Cedar Creek	1494.15	9067.17	7830.61
21	St. Joseph River	637.06	6298.12	7829.09
22	St. Joseph River	436.72	6475.01	6403.93
23	Shank Ditch	1213.82	9761.95	10415.38
24	Fish Creek	789.90	7869.92	5934.62
25	St. Joe - West	525.39	7614.29	2992.31
26	St. Joe - East	1183.86	10314.60	8190.38
27	Big Run	3448.68	14432.89	13803.92
28	Bear Creek - IN	1363.99	11426.80	8398.04
29	Nettle Creek	1303.46	10145.56	8588.00
30	Eagle Creek	1030.88	10233.63	8970.59
31	Bear Creek - OH	2790.48	10553.11	16624.90

96-98 Maximums

SITE #	SITE	E. coli (Colonies/100ml)	Total Coliform (Colonies/100ml)	Heterotrophic Plate Count
0	Cedar Creek	20050	80000	57100
1	Willow Creek	20050	62000	96900
2	Black Creek	20050	63000	108300
3	Little Cedar	20050	58700	114000
4	Diehl/Peckhart	20050	43600	62700
5	Cedar Creek	20050	46800	39900
6	Matson Ditch	20050	63200	85500
7	Cedar Creek	20050	46800	125400
21	St. Joseph River	7820	25400	85500
22	St. Joseph River	8310	20050	125400
23	Shank Ditch	20050	20050	125400
24	Fish Creek	9450	20050	91700
25	St. Joe - West	20050	20050	16800
26	St. Joe - East	9450	20050	59800
27	Big Run	20050	109010	91700
28	Bear Creek - IN	20050	20050	68400
29	Nettle Creek	20050	20050	85500
30	Eagle Creek	11840	20050	100000
31	Bear Creek - OH	20050	56000	125400

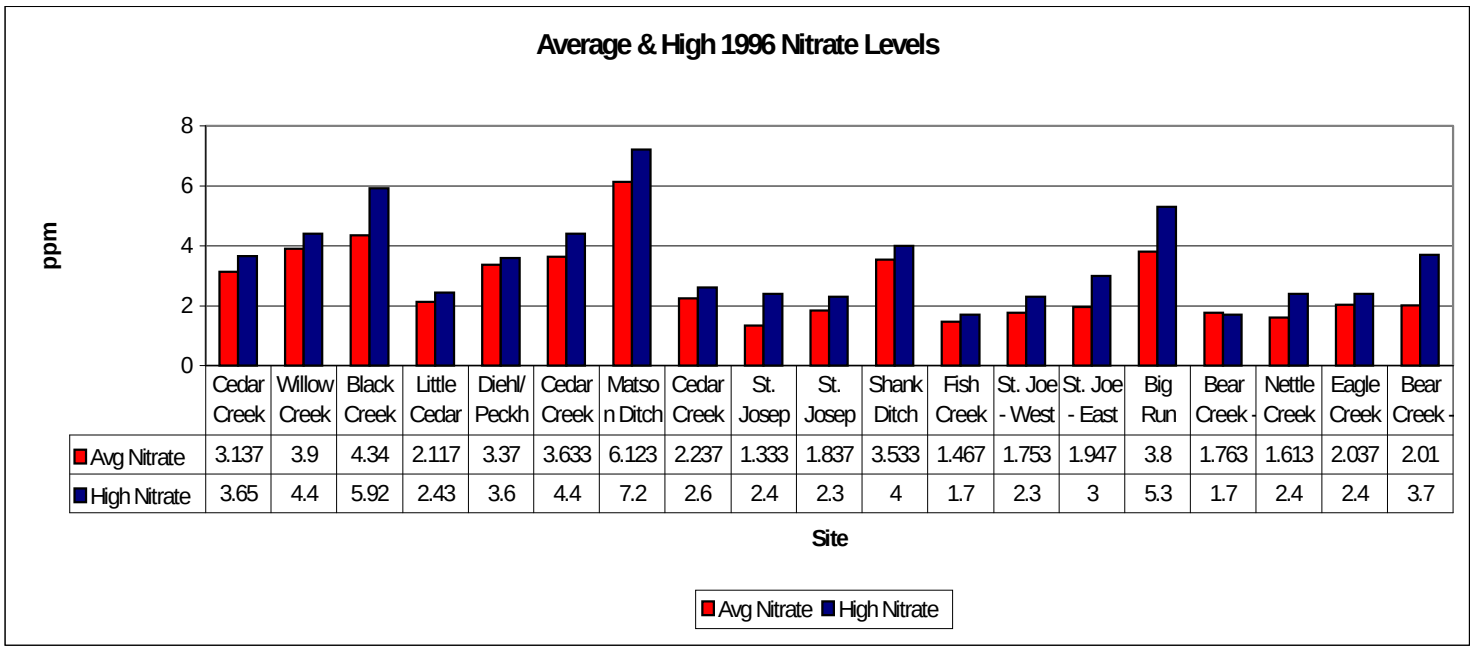


(Figure 5)



The above graph is an example of a typical pesticide, sediment, nitrate, phosphorus, and E.coli graph for a watershed. It shows the typical cycle of elevation due to traditional heavy spring rains.

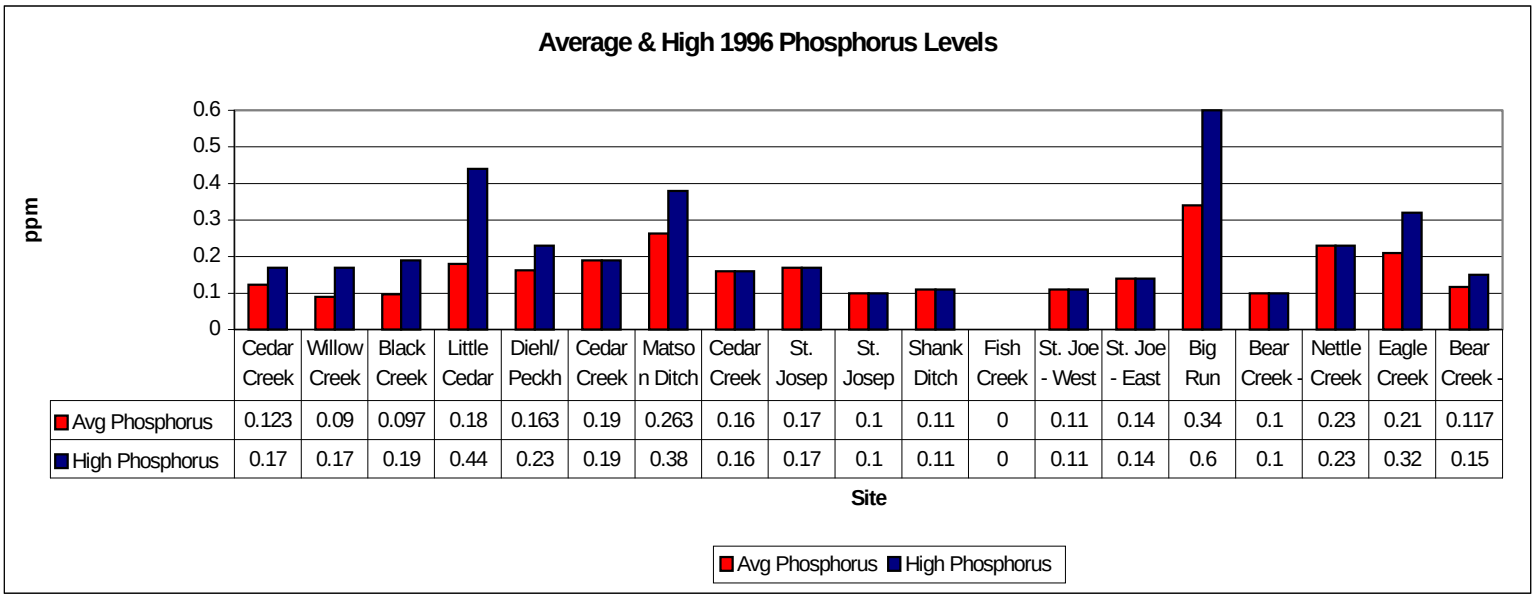
(Figure 6)



	Cedar Creek	Willow Creek	Black Creek	Little Cedar	Diehl/ Peckh	Cedar Creek	Matson Ditch	Cedar Creek	St. Josep	St. Josep	Shank Ditch	Fish Creek	St. Joe - West	St. Joe - East	Big Run	Bear Creek -	Nettle Creek	Eagle Creek	Bear Creek -
Avg Nitrate	3.137	3.9	4.34	2.117	3.37	3.633	6.123	2.237	1.333	1.837	3.533	1.467	1.753	1.947	3.8	1.763	1.613	2.037	2.01
High Nitrate	3.65	4.4	5.92	2.43	3.6	4.4	7.2	2.6	2.4	2.3	4	1.7	2.3	3	5.3	1.7	2.4	2.4	3.7

The above graph shows the average nitrate levels throughout the year of 1996. It also shows the high nitrate level, which usually occurs in the months on April, May, and June. This is due to the widespread application of nitrogen on fields. Heavy spring rains are the cause of nitrates entering the river as the rainwater picks up nitrates as it moves through the soil layer. Once it reaches the tiles it has an easy access to the river. However, the St. Joseph River Watershed does not show high signs of nitrates in the water due to the lack of well-tiled fields.

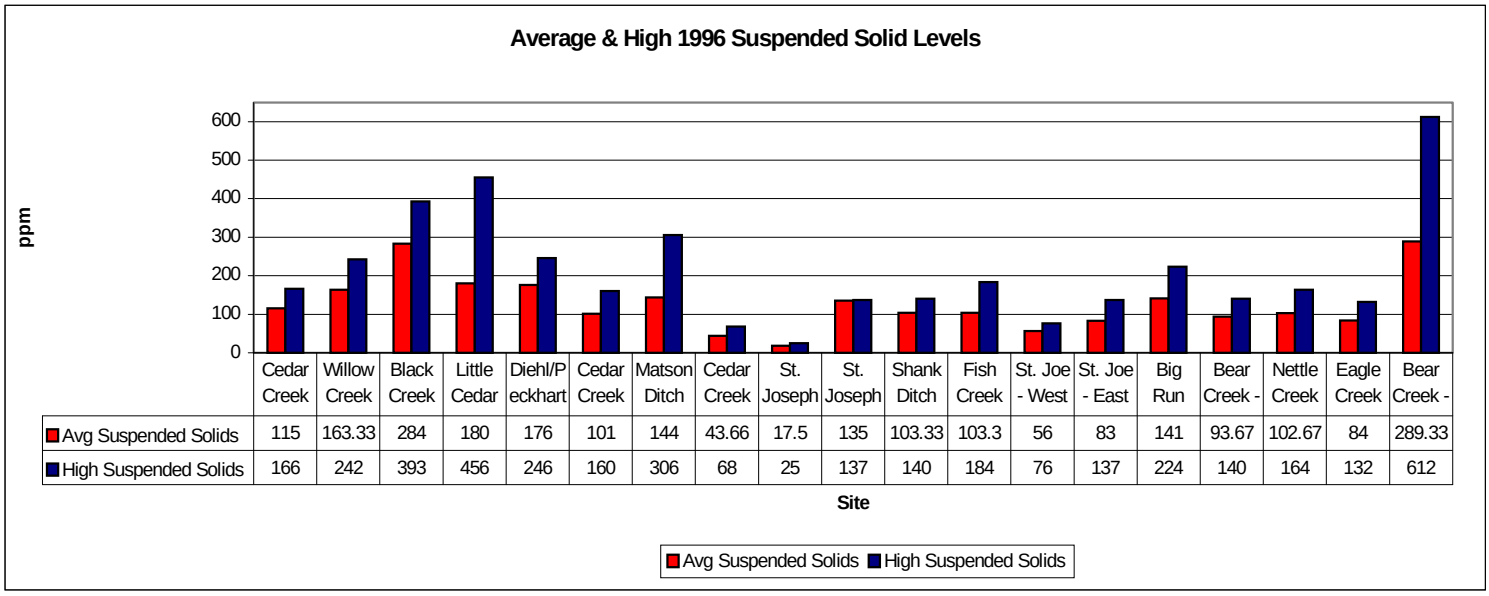
(Figure 7)



	Cedar Creek	Willow Creek	Black Creek	Little Cedar	Diehl/ Peckh	Cedar Creek	Matso n Ditch	Cedar Creek	St. Josep	St. Josep	Shank Ditch	Fish Creek	St. Joe - West	St. Joe - East	Big Run	Bear Creek -	Nettle Creek	Eagle Creek	Bear Creek -
Avg Phosphorus	0.123	0.09	0.097	0.18	0.163	0.19	0.263	0.16	0.17	0.1	0.11	0	0.11	0.14	0.34	0.1	0.23	0.21	0.117
High Phosphorus	0.17	0.17	0.19	0.44	0.23	0.19	0.38	0.16	0.17	0.1	0.11	0	0.11	0.14	0.6	0.1	0.23	0.32	0.15

The above graph shows the average phosphorus levels throughout the year of 1996. It also shows the high phosphorus levels, which usually coincide during periods of heavy rains and erosion. Phosphorus binds tightly to soil particles and travels with them in the water. Other sources include manure from livestock operations and faulty septic systems.

(Figure 8)



	Cedar Creek	Willow Creek	Black Creek	Little Cedar	Diehl/P eckhart	Cedar Creek	Matson Ditch	Cedar Creek	St. Joseph	St. Joseph	Shank Ditch	Fish Creek	St. Joe - West	St. Joe - East	Big Run	Bear Creek -	Nettle Creek	Eagle Creek	Bear Creek -
Avg Suspended Solids	115	163.33	284	180	176	101	144	43.66	17.5	135	103.33	103.3	56	83	141	93.67	102.67	84	289.33
High Suspended Solids	166	242	393	456	246	160	306	68	25	137	140	184	76	137	224	140	164	132	612

The above graph shows the average sedimentation throughout the year of 1996. It also shows the high level of sedimentation during that same period, which usually coincide with heavy rains and erosion. This is cause by maximum tillage, steep slopes, and lack of buffer strips.

Matrix

The table below shows the actual averages of pollutants in each sub-watershed. It will be these averages that we will compare to accepted standards to derive our matrix below. The number in the matrix is the multiple by which each site's average is over or under EPA's MCL limit. The MCL limit is the maximum containment level. It is the maximum level of contaminant in water, which is delivered to any user of a public water system. The green numbers represents the sites and categories that are less than half of the accepted MCL limit. The blue number represents the sites and catagories that are more than half , but less than the accepted MCL limit. The red numbers represent the sites and categories that exceed the accepted MCL limit. From this matrix we will be able to determine which sites need to be prioritized and which problems need to be addressed in each individual watershed. The matrix will also show us what problem is the biggest concern over the whole watershed.

At the end of each row a combined average will rank the sites in order of combined severity. At the end of each column is the combined average, which shows which problems are the most severe throughout the whole watershed. The data below is derived from our water sampling data from 1996-1998 averages of each categories except for nitrate, phosphorus, and suspended solids which are 1996 averages only.

Below are the criteria by which we will set our standards:

Criteria for Water Quality Parameters in Streams and Rivers

(Figure 9)

Nutrient	Criteria Type	Criterion	Citation Source
E. coli	Primary Contact MDC[1]	235 col/100 ml	IDEM
E. coli	Primary Contact AMC[2]	125 col/100 ml	IDEM
Nitrate	Domestic Water	10 ppm	USEPA 1996
Total Phosphorus	Discharge into lake	0.05 ppm	USEPA 1992
Total Phosphorus	No discharge into lake	0.10 ppm	USEPA 1992
Total Suspended Solids	Non-salmonid streams	25 ppm	Waters, 1995
Atrazine	Domestic Water Supply	1.0 ppb	USEPA, 1996
Alachlor	Domestic Water Supply	2.0 ppb	USEPA, 1996
Cyanazine	Domestic Water Supply	1.0 ppb	USEPA, 1996
Metolachlor	No standards exist	--------	

[1] Maximum Daily Concentration

[2] 30-day Geometric Mean

Citation References

IDEM, 1999. Water Quality Criteria. Indiana Statutes

USEPA, 1992.

USEPA, 1996. Drinking Water Regulations and Health Advisories. EPA-822-B-002. October, 1996. Office of Water.

USEPA, 1999a. Ambient Water Quality Criteria for Ammonia. Federal Register, December, 1999. FRL-6513-6

Waters, T.F. 1995. Sediment in streams: Sources, biological effects and control. American Fisheries Society, Bethesda, MD. 251 pp.

Escherichia coli

Only two sites had three-year (1996-1998) geometric mean counts of E. coli that were below the 30-day, primary contact standard of 125 colonies/100 ml. Geometric means of E. coli ranged from 45 to over 2,000 colonies/100 ml.

Nitrate

One-year (1996) average concentrations of nitrate were below the domestic water supply standard of 10 ppm at all sites. Average nitrate concentrations ranged from 1.3 to 6.1 ppm.

Total Phosphorus

Only three sites had one-year (1996) averages of total phosphorus concentrations below the criterion to protect freshwater life of 0.10 ppm. Total phosphorus concentrations ranged from 0.9 to 0.34 ppm.

Total Suspended Solids

The one-year (1996) average of total suspended solid concentrations at all sites exceeded the criteria to protect fish in non-salmonid streams and rivers of 25 ppm. Concentrations of total suspended solids ranged from 17.5 ppm to 306 ppm.

Atrazine

Three-year averages (1996-1998) of atrazine concentrations were below the domestic water supply criteria of 3 ppb at all sites. Atrazine concentrations ranged from 1.2 to 2.7 ppb.

Cyanazine*

The three-year average (1996-1998) of cyanazine concentrations at one site exceeded the tentative domestic water supply criteria of 1 ppb. Cyanazine concentrations ranged from 0.12 ppb to 1.25 ppb.

Alachlor

Three-year averages (1996-1998) of alachlor concentrations at four sites exceeded the domestic water supply criteria of 2 ppb. Alachlor concentrations ranged from 0.37 ppb to 2.46 ppb.

Metolachlor**

Three-year averages (1996-1998) of metalochlor concentrations the ranged from 0.43 ppb to 2.57 ppb.

Specific Sites Average Values 96-98 *(Figure 10)*

	Site	E.coli Colonies/100ml Geometric Mean	Nitrate (ppm) 1996	Phosphorus (ppm) 1996	Suspended Solids (ppm) 1996	Atrazine (ppb)	Cyanazine* (ppb)	Alachlor (ppb)	Metolachlor** (ppb)
1	Cedar Creek	492.03	3.137	0.123	115	1.4	0.28	0.56	0.75
2	Willow Creek	330.62	3.9	.09	163.33	1.18	0.12	.37	0.48
3	Black Creek	598.48	4.34	.097	284	1.75	0.23	.44	0.81
4	Little Cedar	573.83	2.117	0.18	180	1.55	0.26	0.64	1.08
5	Diehl/ Peckhar	617.60	3.37	0.163	176	1.52	0.17	0.52	0.67
6	Cedar Creek	726.21	3.633	0.19	101	1.94	0.51	1.31	1.33
7	Matson Ditch	496.59	6.123	0.263	306	2.3	0.35	2.35	2.57
21	Cedar Creek	263.13	2.237	0.16	43.67	1.85	0.58	0.8	0.95
22	St. Joseph River	98.56	1.333	0.17	17.5	2.04	0.79	1.09	1.73
23	St. Joseph River	45.09	1.837	0.1	135	2.15	0.82	1.21	1.82
24	Shank Ditch	354.05	3.533	0.11	103.33	1.51	0.43	1.6	0.96
25	Fish Creek	297.49	1.467	0	103.3	1.72	0.33	0.85	1.44
26	St. Joe - West	128.64	1.753	0.11	56	1.49	0.81	0.66	1.43
27	St. Joe - East	485.00	1.947	0.14	83	1.18	0.46	0.57	0.59
28	Big Run	1316.50	3.8	0.34	141	1.83	0.28	2.46	1.78
29	Bear Creek - IN	483.21	1.763	0.1	93.67	1.82	0.25	1.28	1.43
30	Nettle Creek	366.51	1.613	0.23	102.67	2.09	0.51	2.37	0.99
31	Eagle Creek	404.68	2.037	0.21	84	1.7	0.64	1.79	1.17
	Bear Creek - OH	538.37	2.1	0.117	289.33	2.69	1.25	2.07	2.53

Matrix of Site Priority & Overall Priority Ranking *(Figure 11)*

	Site	E.coli colonies/100 ml	Nitrate (ppm)	Phosphorus (ppm)	Suspended Solids (ppm)	Atrazine (ppb)	Cyanazine* (ppb)	Alachlor (ppb)	Site Priority
0	Cedar Creek	3.94	.31	1.23	4.60	.47	.28	.28	1.59
1	Willow Creek	2.65	.39	.90	6.53	.39	.12	.19	1.60
2	Black Creek	4.79	.43	.97	11.36	.58	.23	.22	2.65
3	Little Cedar	4.59	.21	1.80	7.20	.52	.26	.32	2.13
4	Diehl/ Peckhar	4.94	.34	1.63	7.04	.51	.17	.26	2.13
5	Cedar Creek	5.81	.36	1.90	4.04	.65	.51	.66	1.99
6	Matson Ditch	3.97	.61	2.63	12.24	.77	.35	1.18	3.11
7	Cedar Creek	2.11	.22	1.60	1.75	.62	.58	.40	1.04
21	St. Joseph River	.79	.13	1.70	.70	.68	.79	.55	.76
22	St. Joseph River	.36	.18	1.00	5.40	.72	.82	.61	1.18
23	Shank Ditch	2.83	.35	1.10	4.13	.50	.43	.80	1.45
24	Fish Creek	2.38	.15	***	4.13	.57	.33	.43	1.14
25	St. Joe - West	1.03	.18	1.10	2.24	.50	.81	.33	.88
26	St. Joe - East	3.88	.19	1.40	3.32	.39	.46	.29	1.42
27	Big Run	10.53	.38	3.40	5.64	.61	.28	1.23	3.15
28	Bear Creek - IN	3.87	.18	1.00	3.75	.61	.25	.64	1.47
29	Nettle Creek	2.93	.16	2.30	4.11	.70	.51	1.19	1.70
30	Eagle Creek	3.24	.20	2.10	3.36	.57	.64	.90	1.57
31	Bear Creek - OH	4.31	.21	1.17	11.57	.90	1.25	1.04	2.92
	Overall Priority	3.63	0.25	1.40	5.43	0.56	0.45	0.58	1.76

Green = > 0 < .5 **Blue = >.5 < 1.0** **Red = >1.0**

Matrix as a Guide

The matrix will serve as a guide to where the Initiative will focus its attention to that year. It will by no means be the only determinate factor. Other factors such as political issues and willingness of local citizen participation in the sub-watershed groups will be considered. However, the matrix will be a big part of the final decision. The matrix will give the Initiative an idea of which strategies to use based on their specific issues of concern and the extent of the problems.

Sources of Pollutants

The source of pollutants varies greatly depending on which sub-watershed is examined in the St. Joseph River Watershed. By using the matrix above, it enables us to determine which problem(s) are most prevalent in each watershed and to what extent. From that, we then can take appropriate actions to correct the problem(s). These pollutants can come from a variety of sources. E. coli can be traced back to faulty septic systems and/or mismanaged livestock waste, depending on the sub-watershed. Phosphorus and nitrate can also be traced back to the above sources, as well as, from field surface runoff. The remainder of problems; suspended solids, atrazine, cyanazine, alachlor, and metalachlor can be traced back to erosion, chemical misapplication, and surface runoff.

GOALS AND STRATEGIES

Visions of Success

The Initiative's overall vision of success is to create seven sub-watershed groups over the next five years. It will be through these sub-watershed groups' actions that we will meet the below mentioned visions of success.

1. **HUMAN HEALTH**: At all times, pathogens, agricultural chemicals, and nutrients will be within the capability of water treatment and filtration to maintain drinking water levels below maximum contaminant levels. The quality of water will support full body contact recreational uses year-round. Fish consumption advisories will be eliminated.

2. **ECONOMIC SUSTAINABILITY**: Residents and land users in the watershed will have a clear understanding of how their actions and operation methods affect water quality. Appropriate technology and management practices will be adopted by a higher percentage of land-users. Stakeholders in the watershed will be able to maintain economic viability while giving full consideration to the environment.

3. **BIO-DIVERSITY**: Water quality will allow the continued presence and re-population of native wildlife and water-based species in their natural habitats. Stresses will be identified, and methods of alleviation will be developed to remove or lessen the stresses threatening biological species.

4. **RECREATION:** The water quality of the St. Joseph River will support adequate habitat for all game fish once native to the river. The water quality of the river will invite increased recreational activities, such as sport fishing, canoeing, and boating. Water clarity will improve with the reduction of sedimentation.

5. **AESTHETICS**: The river and its corridor will become aesthetically appealing and improve the quality of life for all citizens in the watershed.

6. **DRAINAGE:** Drainage for agriculture, development, and flood control will be conducted with economically and ecologically sound methods.

Goals and Targets

The long-term goals of the St. Joseph River Watershed Initiative are to reduce the loads of sedimentation, pesticides, pathogens, and nutrients in the St. Joseph River Watershed below EPA Clean Water Standards throughout the entire year. Due to the size of the St. Joseph River Watershed, meeting specific standardized goals for each sub-watershed would be virtually impossible on such a large scale as the St. Joseph River Watershed. To work toward our long-term target the Initiative has set a goal of organizing and sustaining seven sub-watershed groups over the next five years. Each sub-watershed will then set their own targets and goals based on scientific data and their local concerns. It will be through these sub-watersheds actions that the Initiative will meet the above long-term target in the future.

Operational Strategy

Since the size of the St. Joseph River Watershed Initiative is so large compared to the size of the Initiative, the St. Joseph River Watershed is taking an unique way to manage its watershed. The Initiative has taken the position as coordinator and will use its resources and expertise to identify sub-watersheds. Through water sampling, the Initiative will be able to pinpoint which sub-watersheds will require corrective actions. These corrective actions will be achieved with assistance of public education, cost assistance, and state and federal conservation programs. Once the Initiative has instituted the corrective actions within the sub-watersheds, the Initiative will help develop sub-watershed groups that will carry out these actions. The Initiative would then act as a liaison to federal/state governments and mediator to the public that will involve fund raising, educational information for the public. The Initiative will continue its water sampling within the watershed, as well as provide any technical information and support needed by the sub-watershed.

The goal of the Initiative would be to have as many sub-watershed groups working under its wing and to help manage and serve them as needed. The Initiative would like to see itself as a tree trunk and the sub-watershed groups as branches. The Initiative would providing support, knowledge, direction, and finances to help the groups grow and succeed. The strategies used will depend greatly on the watershed and its problems. Different strategies will be used for the different problems throughout the watershed. Below we have come up with different strategies for the four concerns; sediments, nutrients, pesticides, and E.coli. For each of these concerns there may be many different alternatives available to correct the problem depending on the cause and situation.

The next step for the Initiative will be to collect flow discharge data for each of the sampling sites. With this data the Initiative can take the concentration data and project each sub-watershed total load contribution to the St. Joseph River. This data will help the Initiative to set goals and targets for the sub-watershed groups.

Strategies to Reduce Sedimentation

Increase conservation tillage:

- Introduce new technologies such as tools and equipment to increase conservation tillage acres primarily for corn, and also other crops.
- Help persuade producers to try conservation tillage by providing economic incentives and risk protection to producers who adopt high residue cropping systems.
- Utilize research and demonstration sites like our Center of Excellence Farm to compare the different types of conservation tillage to conventional tillage.
- Utilize Maxx Program to illustrate the economic benefits of conservation tillage through reduced input cost and comparable yields.
- Demonstrate to producers the benefits of conservation tillage in improving soil quality and health, which includes less compaction, more organic matter, better aeration, and better water absorption.

Increase buffer strips:

- Get staff in the necessary sub-watersheds to go out to the producers and encourage signup of CRP buffers.
- Encourage one-on-one contact with landowners to explain the benefits of buffers including the filtering of runoff water, access for maintenance, safety, and aesthetics.
- Educate producers of the benefits of access, safety, aesthetics, and environmental benefits.
- Support other state matching incentive programs such as Conservation Reserve Enhancement Program "CREP".
- Work to obtain greater priority for the St. Joseph River Watershed and the Great Lakes Basin by national programs.
- Help gain support and awareness of CRP buffers and partner with non-traditional groups such as Pheasants Forever.
- Partner with county drain boards to help identify ditches and drains that need structures or buffers installed.
- Encourage state law changes to require buffers on legal ditch reconstruction to ensure our lakes and rivers water quality.

Increase adoption of storm-water management in both Agriculture and urban areas:

- Attract state and federal cost-share dollars for installation for Water and Sediment Control Basin "WASCOBS" and other structural measures.
- Increase direct contact with producers to educate them on the application and proper use of these structures.
- Help promote wetland protection and restoration in both the Agriculture and urban communities with programs like Wetland Reserve Program (WRP), U.S. Fish and Wildlife Service private land programs (USFWS), Ducks Unlimited, etc.
- Support urban efforts to reduce and control storm water runoff through creative storm-water management technologies such as surface water interceptors.

Increase cover crops:

- Encourage greater priority for cost sharing for the utilization of cover crops.
- Educate producers on the benefits of cover crops for erosion control and improved soil quality as well as improved yields through producer meetings.

Increase conversion of marginal Agriculture land to non-row crop use:

- Educate producers on alternative uses of marginal agricultural land to such uses as timber.
- Promote the increase use of Conservation Reserve Program (CRP), Wetland Reserve Program (WRP), Forestry Incentives Program (FIP), and many other national/state programs through increased field contacts.
- Bring greater priority to the St. Joseph River Watershed for more state and federal dollars for non-cropland alternatives.
- Educate producers about the economic benefits that rotational grazing can provide.

Control sedimentation from non-ag areas:

- Advocate the temporary seeding of urban and suburban construction site with developers and contractors by assigning more authority to local government for more timely enforcement.

Strategies to Reduce Nutrients

Increase use of approved nutrient management plans:

- Encourage the use of soil testing to better understand their soils and to more accurately apply fertilizer for each crops needs.
- Promote the adoption of site specific farming technologies like variable rate fertilizer.
- Promote split and side-dress application of nitrogen.

- Procure state and federal cost share dollars to help producers develop and implement nutrient management plans.
- Partner with dealers and crop consultants to inform them of the nutrient management goals of the St. Joseph River Watershed Initiative.
- Host field days and other educational events on nutrient management.

Encourage sound home-site fertilizer application:
- Educate homeowners, gulf course managers, and lawn professionals about proper application rates of fertilizer.
- Locate and distribute literature that describes proper application rates and timing to the public.
- Make information on domestic pet waste available to the public.

Remove livestock from stream areas:
- Host educational events to encourage pasture management, such as pasture walks.
- Increase personal contacts with livestock owners who open graze stream banks.
- Utilize programs such as Lake and River Enhancement (LARE) and Environmental Quality Incentive Program (EQIP).
- To help supplement these programs we would look for sources to increase dollars for livestock fencing and alternative drinking water supply sources.

Promote BMPs of livestock manure management:
- Help sub-watershed groups educate producers of the nutrient value of manure through meetings and by providing incentives to test manure and utilize the test results to apply the proper amount of manure to his field based on crop nutrient needs.
- Help obtain cost share funds for application equipment, custom application, and storage through programs like LARE and EQUIP.
- Encourage producers to consider alternative livestock production methods such as open pastures.

Promote proper disposal/treatment of human waste from on-site systems and small communities, Combined Sewer Overflow (CSOs):
- Attract Health Department and other local officials into the Initiative.
- Collaborate with the Health Department and local officials, sharing water quality data and ideas.
- Support and encourage the Health Department's enforcement of existing rules.
- Investigate new strategies to lengthen the life and effectiveness of on-site systems.
- Help obtain cost-share incentives to install new on-site systems and filters.
- Encourage the state to expedite the use of this state revolving loan fund for septic system improvements.
- Encourage tax abatements for the upgrade of septic systems and the removal of home drain gutters into CSOs.
- Close old open well heads that give a direct route to groundwater aquifers.
- Work with contractors on new installations to lengthen the life and effectiveness of on-site systems.
- Discourage use of on-site systems in areas of high-density populations.
- Demonstrate alternative waste systems to communities with known septic systems problems.
- Provide a clearinghouse of new technologies and resources to the public.

Strategies to Reduce Pesticides

Increase use of sound pesticide management practices in watershed:
- Demonstrate and educate producers on the economics of following good pesticide management plans and the effects pesticides have on the St. Joseph River Watershed through our water quality data.

- Help increase the number of qualified consultants working directly with farmers and custom applicators on sound pest management strategies.
- Align partnerships with Agriculture chemical industry to host educational events for local Ag retailers and farmers.
- Demonstrate new technologies and equipment available.

Increase the distance between application sites and water bodies or conduit (inlets):
- Get staff in the necessary sub-watersheds to go out to the producers and encourage signup of CRP buffers.
- Educate producers of the benefits of access, safety, aesthetics, and environmental benefits.
- Support other state matching incentive programs such as Conservation Reserve Enhancement Program "CREP".
- Help increase the awareness of the St. Joseph River Watershed to increase the priority for the Great Lakes Basin and other national programs.
- Help gain support and awareness of CRP buffers and partner with non-traditional groups such as Pheasants Forever.
- Partner with county drain boards to help identify ditches and drains that need structures or buffers installed.
- Close old open well heads that feed directly to underground aquifers.
- Encourage state law changes to require buffers on legal ditch reconstruction to ensure our lakes and rivers water quality.
- Encourage buffer crops that require no or reduced pesticide applications such as hay.
- Encourage the use of integrated crop management such as long rotations.

Encourage alternative weed control methods:
- Educate and introduce producers to alternative systems to reduce pesticide use and misapplication.

Encourage alternative pesticide strategies that promote mid to late season applications to reduce pesticide runoff during critical times of heavy rains:
- Share our pesticide data with producers to make known to them of their impact on water quality.
- Educate producers on the environmental risk of untimely applications.
- Partner up with Ag industry to identify new technologies and strategies to reduce pesticide runoff and application rates.
- Encourage the use of field scouting by qualified Certified Crop Advisors (CCA) to correctly recommend pesticides and their rates.

Strategies to Reduce Pathogens

Remove livestock from stream areas:
- Host educational events to encourage pasture management, such as pasture walks.
- Increase personal contacts with livestock owners who open graze stream banks.
- Utilize programs such as Lake and River Enhancement (LARE) and Environmental Quality Incentive Program (EQIP).
- To help supplement these programs we would look for sources to increase dollars for livestock fencing and alternative drinking water supply sources.

Promote BMPs of livestock manure management:
- Help sub-watershed groups educate producers of the nutrient value of manure through meetings and by providing incentives to test manure and utilize the test results to apply the proper amount of manure to his field based on crop nutrient needs.
- Help obtain cost share funds for application equipment, custom application, and storage through programs like LARE and EQUIP.

- Encourage producers to consider alternative livestock production methods such as open pastures.

Promote proper disposal/treatment of human waste from on-site systems and small communities, CSOs:
- Attract Health Department and other local officials into the Initiative.
- Collaborate with the Health Department and local officials, sharing water quality data and ideas.
- Support and encourage the Health Departments enforcement of existing rules.
- Investigate new strategies to lengthen the life and effectiveness of on-site systems.
- Help obtain cost-share incentives to install new on-site systems and filters.
- Encourage the state to expedite the use of this state revolving loan fund for septic system improvements.
- Encourage tax abatements for the upgrade of septic systems and the removal of home drain gutters into CSOs.
- Close old open well heads that give a direct route to groundwater aquifers.
- Work with contractors on new installations to lengthen the life and effectiveness of on-site system.
- Discourage use of on-site systems in areas of high-density populations.
- Demonstrate alternative waste systems to communities with known septic systems problems.
- Provide a clearinghouse of new technologies and resources to the public.

Resources

The St. Joseph River Watershed Initiative will continue its efforts and relations with Wood - Land - Lakes, DNR, NRCS, TNC, and local Soil and Water Conservation Districts. However, the Initiative needs to find monetary assistance from other federal, state, and private organizations. Some of the federal programs include the Great Lakes National Program Office (GLNPO), Great Lakes Commission (GLC), Conservation Reserve Program (CRP), Environmental Protection Agency (EPA), Environmental Quality Incentive Program (EQIP), Wetland Reserve Program (WRP), and Forestry Incentive Program (FIP). The Initiative will also look to state-funded programs such as 319 grants, Conservation Reserve Enhancement Program (CREP), and Lake & River Enhancement (LARE). Other sources of support and funding will come from the private sector. Some of these organizations include Kellogg's Foundation, Folinger Foundation, Monsanto, Sygenta, Dow Agro Science, American Cyanamid, and many others.

These above stated sources are great short term resources to the Initiative, but the Initiative needs to find a funding source with shared concerns and a long term commitment. This funding source is the City of Fort Wayne. The city shares many of the same concerns and objectives as the Initiative. The Initiative will need a long-term partnership with the City of Fort Wayne to continue its efforts.

MEASURING OUR PROGRESS

Measuring Progress

The St. Joseph River Watershed Initiative will measure its progress by the number of and success of the sub-watershed groups. At the same time it will measure the progress of each sub-watershed group by their growth. It will also evaluate them by their adoption of practices, such as CRP, CREP, and other implemented programs. The Initiative will also keep up its water monitoring of each sub-watershed to chart its efforts. Many factors will need to be taken into account when evaluating these results, but it will give us a mathematical way to evaluate them.

Follow-up

To ensure that the sub-watershed groups are proceeding with the same goals as the Initiative, periodic follow-up visit will be made. These visits would provide any educational and technical information to the groups as well as

any other kinds of support. It would also enable the Initiative to monitor the progress of the implemented practices. These visits will provide an indication for the Initiative on what services need to be provided to the groups and what the Initiative should modify for the next sub-watershed groups.

Re-evaluate

The watershed plan will be revisited every two years in conjunction with our two-year work plan. At that point, the Initiative would access each sub-watershed group progress and determine if the groups have been a success. The Initiative could then look back and re-evaluate its goal of obtaining seven groups in five years. At this point, the Initiative, based on the above results, could raise or lower its goal. The re-evaluation might also give insight to changes that the Initiative needs to make to reach its goal. Through the approval of the board, revisions to the watershed management plan may need to be made. By being able to revise the plan, makes the plan a living document that can be updated time to time depending on the St. Joseph River Watershed's needs and concerns.

APPENDIX

Quality Assurance Project Plan

For

St. Joseph River Watershed Initiative's 319 Grant - Water Quality Data Collection Program Portion
Fort Wayne, Indiana
ARN 98-180

Introduction

This Quality Assurance Project Plan is submitted by the St. Joseph River Watershed Initiative, and authored by April Ingle, Public Outreach Coordinator. This QAPP addresses quality assurance procedures and information regarding water quality data resulting from funding from the City of Ft. Wayne's 319 grant which funds the St. Joseph River Watershed Initiative's Water Quality Education/Information Project.

SECTION 1: DATA QUALITY OBJECTIVES

Table 1: Data Quality Objectives

Measurement	**Precision**	**Accuracy**
Colilert Test-E. coli, Total Coliform	94% agreement with standard methods	Specificity for E. coli, Sensitive to 1 colony forming unit.
RaPID Assay-Atrazine	<3%	97% recovery
RaPID Assay-Alachlor	<6%	94% recovery
RaPID Assay-Cyanazine	<1%	103% recovery
RaPID Assay-Metolachlor	<6%	107% recovery
Total Phosphorus	± 5%	± 8%
Ammonia	± 15%	± 5% 3 ppm standard
pH/temperature meter (Fisher)	± 10% (goal)	pH ± .02 pH Temp. ± 0.5°C/± 1°C (15°-45°C)
TDS Module (Corning)	± 10% (goal)	± 0.5% of reading
DO Module (Corning)	± 10% (goal)	± 1% of reading
Turbidity	± 10% (goal)	± 1% of reading

Completeness

We expect a 90% completeness factor for our data in order to achieve our objective of identifying sub-watersheds with the highest levels of pollutants and to measure the effect of BMP implementation on water quality. This degree of completeness will be achieved through insuring that sampling occurs due to many trained individuals being able to cover in the absence of the sampler. Also, following QA and QC procedures will insure that mistakes that could potentially ruin or invalidate data are avoided.

Representativeness

Sampling site locations and sampling times will show a high degree of representativeness. This degree of representativeness will be achieved through equally representative sampling site locations and randomized sampling

times. Sampling sites are nearly equally representative due to their location near the mouth of the tributary. This location results in data that shows the levels of contaminants in the water before it empties into the St. Joseph River or Cedar Creek. Representativeness is also achieved through sampling times. Sampling times give random data due to sampling on the same day each week and collecting all samples the same day.

Comparability

There are two data comparability objectives, comparability among points within this project and comparability with data collected in previous projects. Comparability of data within this project will be achieved by following the protocols outlined in this QAPP. Comparability with previously collected data will be achieved by incorporating a portion of the previous program with this program. No sampling sites have been changed so representativeness remains and once a month, samples will be taken twice in one week. One sample will be split and 1/2 will be analyzed as the other samples in this project and the other 1/2 will be composited with an equal amount of the sample taken on the second day and analyzed. This compositing of 2 samples collected within one week is the method used during previous monitoring.

SECTION 2: SAMPLING PROCEDURES

A. Equipment to be used:

Tributary Assessment:

1. 200 ml brown glass jars with screw on lids
2. 100 ml sealed/sterile throw-away plastic bottles with screw on lids
3. Ice Packs- 4, designed for bottles to fit between two so that an ice pack is in contact with nearly all of bottle.
4. 1ml pipetter
5. 1ml sealed/sterile throw-away pipette tips
6. Fisher pH/temperature meter
7. Corning DO meter module
8. Corning TDS meter module
9. Horiba U-10 Water Quality Checker Turbidimeter
10. Sampler- 2 pieces of PVC pipe bolted together and weighted with cement in bottom. See picture in Att. E.
11. Distilled water bottle
12. Measuring tape
13. Automated Sampler-equipped with teflon lined hose, and 24 glass bottles

B. Cleaning of sampling equipment

1. Glass jars and lids: laboratory dish washing machine
2. pH/temp meter: spray w/ distilled water after each use
3. DO meter: spray w/ distilled water after each use
4. TDS meter: spray w/ distilled water after each use
5. Turbidimeter: use distilled water to rinse after each use

C. Sample collection, preservation, transportation, and storage.

Tributary Sample Collection:

1. Two sealed clean brown glass jars are placed into the sampler.
2. The river height measurement is taken with the measuring tape from the marked point on the bridge to the surface of the water.
3. Lids are removed from the bottles and the sampler is lowered into the stream from the predetermined marked location at the center of the bridge and lowered under the surface of the water, taking precautions to

not include surface scum, until the jars are filled with water. The sampler is raised and the filled bottles are recapped.

4. The lid is removed from one jar and has one 1 ml of water pipetted out of it. The brown glass jar is then sealed for a pesticide sample. One sterile practice jar has its plastic seal removed and is uncapped and the 1-ml of water is put into the sterile plastic jar, the jar is recapped for a bacteria sample.
5. Both jars are marked for site location and date and put into the cooler.
6. The sample in the other jar that is not marked for a pesticide sample is tested for water temperature, pH, DO, TDS, and turbidity.
7. Time, cloudiness, wind, air temperature, and the relative turbidity of the water are recorded.
8. If a nutrient sample is required, then the sampler is lowered once and the contents of the pesticide jar are emptied into a plastic jar containing 1 ml of H_2SO4 preservative, and then lowered again to retrieve water for the pesticide and bacteria samples.

Automated Sample Collection:

1. Autosampler will be fitted with teflon lined hose that will draw water from the stream channel through a stainless steel strainer.
2. When storm events are predicted the autosampler will be turned on and iced down.
3. The autosampler will be programmed to pull one sample per hour for 24 hours. Bottles will be marked in sequence to note which hour the sample was collected. The beginning time will be noted.
4. At the end of the 24 hours the samples will be picked up and placed in a cooler with ice packs.
5. All bottles containing samples will taken to the laboratory and analyzed for the presence of atrazine, alachlor, cyanazine, and metolachlor.

Preservation: The only samples that will be preserved are the nutrient samples. Those samples are preserved with 2 ml of 1+1 H2SO4 to a pH of less than 2.

Transportation: During transportation from sampling site to sampling site, as well as transportation to the laboratory, the samples are stored in a cooler that contains plastic ice packs that surround the bottles.

Storage: All samples are stored in a refrigerator until taken to the laboratory. No samples are stored for more than 24 hours before taken to a laboratory.

SECTION 3: CUSTODY PROCEDURES

1. Information to be recorded in field

2. Labeling

Each sample will be given a sample number based on the site location and the date collected. An example, site 4 collected on June 23, 1998 would have a sample number 104062398. Autosampler samples will labeled according to which hour the sample was pulled.

3. Duties

In all likelihood, an intern will be hired to conduct the sampling. If an intern is not available the Public Outreach Coordinator for the St. Joseph River Watershed Initiative or other trained staff from the Allen County SWCD will conduct sampling. The person hired to conduct sampling and any volunteers will be trained by the Public Outreach Coordinator for the St. Joseph River Watershed Initiative on the procedures for sampling outlined in this QAPP, emphasizing the importance of following these procedures.

4. Sample Transfer

While in the field all samples collected will be properly labeled for identification and stored in a cooler with ice packs while sampling occurs. Upon arrival at the office the samples will then be transferred to a refrigerator for storage until they are taken to lab. The samples are stored in a cooler with ice packs while being transferred to the lab, the original labels still in place. A chain of custody form is filled out to accompany the samples to the lab. The chain of custody form (See Attachment A, Chain of Custody Form) contains information for bacteria, nutrient and pesticide samples. The form is filled out with the all samples being listed by their sample number and the date(s) collected. The person delivering the samples and the person receiving the samples signs this form, when the samples are delivered. Labeled samples are stored in a refrigerator during the period before they are analyzed. Bacteria samples are always analyzed the day of delivery.

5. Data files

All data will be stored in one Excel workbook. The workbook will contain separate worksheets for bacteria, pesticides, nutrients, and field data.

All bacteria and pesticide analysis results are entered into the Excel database at the Ft. Wayne Water Filtration Plant following analysis.

All nutrient analysis results are sent to the Initiative's office by mail after analysis is complete.

All field data is entered into the Excel file database at the Initiative's office following its collection.

All nutrient data is entered into the Excel file database at the Initiative's office following its arrival in the office.

All bacteria and pesticide data is either downloaded on diskette at the filtration plant lab or e-mailed to April Ingle and copied into the Excel database.

SECTION 4: CALIBRATION PROCEDURES AND FREQUENCY

Field Equipment

Fisher pH/temperature Meter, Automated sampler, Corning DO and TDS Meter, Horiba U-10 Water Quality Checker Turbidimeter

1. Instruments are maintained and serviced as detailed by manufacturer specifications.

2. Instruments are calibrated on a regularly scheduled basis (with a minimum calibration of one time per sample collection date) to ensure performance within manufacturer's predetermined limits.

Laboratory Equipment

IDEXX Quantitray Sealer/Model #2020
Labline Instruments, Inc. Environmental Chamber #702R3
Jewett commercial Refrigerator #702R3
Equatherm Water Bath #B6557
Spectroline (UV Light) # EA-160
MLA 1ml Pippette
RaPID Assay-Atrazine
RaPID Assay-Alachlor
RaPID Assay-Cyanazine
RaPID Assay-Metolachlor
Techicon Continuous Auto Analyzer
Ion specific Electrode, Orion Model 95-12

1. All equipment shall be calibrated and maintained according to the laboratories Standard Operating Procedure (SOP).

2. All reference standards used in the laboratory are or are being certified by an appropriate agency.

3. Any working standards not prepared from certified standards shall be calibrated against the appropriate reference standard.

4. A log will be kept for each standard to document standard sources, lot numbers, expiration dates, and preparation for working standards.

SECTION 5: ANALYTICAL PROCEDURES

Field Sampling

Whenever possible, standard approved methods are utilized for sampling.

Field parameters measured include:

Weather Conditions
- Estimated degree of sunlight/cloud cover
- Estimated wind levels
- Air Temperature

Stream Conditions
- River Height
- Water temperature
- pH
- DO
- TSD
- Turbidity

Laboratory Analysis

1. Laboratory parameters measured include:

Nutrients
- Ammonia Nitrogen
- Total Phosphorus

Pesticides
- Atrazine
- Alachlor
- Cyanazine
- Metolachlor

Bacteria
- E. coli
- Total Coliform
- Heterotrophic Plate Count

2. Methods used to measure each parameter:

Ammonia-Nitrogen:	Ion selective electrode, EPA 350.3
Total Phosphorus:	Colorimetric, Automated, EPA 365.4
Atrazine:	Immuno-assay, EPA Approval Pending
Alachlor:	Immuno-assay, EPA Approval Pending
Cyanazine:	Immuno-assay, EPA Approval Pending
Metolachlor:	Immuno-assay, EPA Approval Pending

E. coli: MMO-MUG (Colilert), EPA Approved, See Attachment C
Total Coliform: MMO-MUG (Colilert), EPA Approved, See Attachment C
Het. Plate Count: Heterotrophic Plate Count Technique, EPA Approved, Standard Method 9215

3. Where available, only approved methods will be used.

4. All methods will be tested with control samples before they are adapted for use.

5. Data concerning accuracy and precision for the method shall be collected during validation of the method.

6. All methods in use within the laboratory shall have written SOP's which have been reviewed and approved by the Quality Assurance Coordinator and management.

7. Method detection limits (MDL's) shall be determined during the method validation process as outlined in Standard Methods of Water and Wastewater Analysis, 17th edition, Section 1030E.

SECTION 6: QUALITY CONTROL PROCEDURES

1. Public Outreach Coordinator is responsible for maintaining quality control of field samples.

2. The Public Outreach Coordinator will regularly accompany samplers to observe sampling procedures and assess the quality of those procedures in reference to this QAPP. Any procedures not in compliance with those outlined in this QAPP will be pointed out to the sampler and the proper procedure will be explained and put in to practice.

3. A regiment of blank reagent and matrix spike samples as prescribed by the laboratory's SOP will be analyzed with field samples analyzed to detect potential laboratory error or contamination. Laboratory SOP details steps that will be taken if sample analysis errors or contamination is detected.

Table 2: Quality Control Checks

Q.C. Checks	Field	Filtration Plant Lab	Water Pollution Control Plant Lab	Number per Year
Field Replicates	Yes			4
Lab Duplicates		Yes	Yes	4
Reference Standards		Yes	Yes	Beginning of each set of analysis
Performance Evaluation Samples		Yes	Yes	Unknown-Performed randomly by IDEM
Spiked Samples		Yes	Yes	4
Field Blanks	Yes			4

SECTION 7: DATA REDUCTION, REVIEW, AND REPORTING

1. Data reduction:

In all cases data reduction will be done in the manner outlined in Standard Methods of Water and Wastewater Analysis, 17th edition, Section 1050B.

See attachment D, Colilert Data Reduction Table

2. Data review:

   All laboratory data will be considered valid if it is generated under acceptable operating conditions as specified in the analytical SOP used during the determination of the data.

   All Field data will be considered valid of it is generated under acceptable operating conditions as specified in this QAPP.

   After data has been collected and entered into the database the Public Outreach Coordinator will be responsible for auditing the database for errors and/or omissions.

3. Reporting:

   Minimally, all reports will provide the following information:

   a) Sample identification or description
   b) Laboratory number of each sample
   c) Analytical result in appropriate units
   d) Sampling date

4. All final reports will be inspected, verified and initialed by a qualified person other than the analyst(s) before the report is released to the client.

SECTION 8: PERFORMANCE AND SYSTEMS AUDITS

For Field Sampling

Specific Guidelines:

The St. Joseph River Watershed Initiative Public Outreach Coordinator will conduct random performance and system audits on sample collection. The purpose of the performance audits is to detect any deviation from approved procedures and/or detect any procedural errors in the sampling process.

Upon detection of such errors, corrective measure shall be immediately instituted to ensure the integrity of the samples and resulting data. All detected errors will be properly documented and reported in the Quality Assurance section of the project's final report.

For Laboratory Analysis

Specific Guidelines

1. Quality assessment shall be administered by the Ft. Wayne Water Filtration Plant and Water Pollution Control Plant Laboratories respective Quality Assurance Coordinators.

2. A minimum number of random facility audits (as prescribed within the laboratories Standard Operating Procedure (SOP) will be done using a checklist in order to determine adherence to the SOP. Results of all audits will be summarized in writing and reported to laboratory management as soon as possible after audits are complete.

3. Performance audits will be done more often when specific regulations apply or contract specifications require.

4. Control data including spikes, duplicates or control samples will be compiled maintained by the laboratory for a minimum of three years. The results will be provided to the appropriate analysts, management, regulatory agencies and clients when requested.

5. Periodically, at the discretion of the Quality Assurance Coordinator, samples with known amounts of constituents of interest supplied by an outside agency or prepared internally will be supplied to analysts as "blind" samples. Results will be compiled and reported directly to management.

6. Where available, the laboratory shall participate in governmental programs, which supply inter-laboratory comparison samples.

SECTION 9: PREVENTATIVE MAINTENANCE

For Field Equipment

Specific Guidelines

1. Maintenance of field equipment is continuous and requires sampler to monitor condition of equipment

2. Equipment is kept in dry cool facility

3. Equipment is maintained through periodic servicing as prescribed by the manufacturer.

For Laboratory Equipment

Specific Guidelines

1. A routine preventative maintenance schedule is outlined for each instrument or category of instruments in a SOP or in a manufacture's guidelines.

2. Maintenance logs will be kept for all equipment documenting the date and the extent of all maintenance and repairs.

3. Qualified laboratory personnel or a certified manufacturer's representative will perform maintenance.

4. A spare parts inventory will be kept, when economically feasible, to replace worn parts with a minimum of downtime.

SECTION 10: DATA QUALITY ASSESSMENT

For Field Sampling

Sample Collection Quality Assurance Policies

Quality Assurance/Quality Control procedures for sample collection will be established and provided to individuals responsible for sample collection prior to project initiation. Assistance with establishing and meeting QA/QC criteria was received from USGS, IDEM and A& L Great Lakes Laboratories.

Precision: Numbers resulting from *field replication* analysis will used in a *relative percent calculation* to determine *precision* in field sampling and measurement.

Bias: Numbers resulting from *field blank* analysis will used in a *relative bias calculation* to determine *bias* in field sampling and measurement.

Completeness: Completeness will be determined by calculating the percent of valid data points in reference to all data points.

For Laboratory Analysis

Laboratory Quality Policies

1. Quality Assurance activities shall emphasize the prevention of quality problems rather than detection and correction of problems after they occur.

2. All employees engaged in making decisions affecting the quality of laboratory output shall undergo training programs designed to be commensurate with their positions, duties, and responsibilities.

3. The laboratory shall use published analytical methods, whenever possible, which are approved by regulatory or accrediting bodies.

4. The laboratory shall retain copies of all reports onsite for a minimum period of five years.

5. The laboratory shall have a comprehensive calibration and maintenance program involving all instrumentation used for making determinations as a part of their SOP.

6. The laboratory shall use appropriate, fresh reagents and chemicals, certified when necessary and appropriate calibrated glassware.

7. The laboratory shall establish and maintain a total intra-laboratory quality control system to assure continued precision and accuracy of laboratory results.

Precision: Numbers resulting from *Spike* analysis will used in a *relative percent calculation* to determine *precision* in laboratory measurement.

Bias: Numbers resulting from *lab duplicate* analysis will used in a *relative bias calculation* to determine *bias* in laboratory measurement.

Completeness: Completeness will be determined by calculating the percent of valid data points in reference to all data points.

SECTION 11: CORRECTIVE ACTION

Specific Guidelines

1. All analytical SOP's must contain or refer to specific instructions associated with corrective actions to be taken to prevent the production of poor quality data.

2. When data from the analysis of spikes, duplicates, or control samples exceeds established control limits or shows a pattern indicating there is a problem, the process will be stopped immediately. Immediate action will be taken to determine the cause of the problem.

3. In the event that data of questionable quality is produced and if the analyst is able to detect and correct the cause of the problem, the analysis will be rerun to correct the data.

4. If the analyst is unable to determine the cause of the problem, the project manager will be notified immediately.

5. Performance of the method will be validated after correction of the problem and before sample analysis is resumed.

If all QA/QC procedures outlined in this QAPP are followed for laboratory procedures, and sampling or field data collection, that data will be deemed valid and free from errors resulting from laboratory, sampling or field data collection errors. In the event that laboratory or field data seems inaccurate relative to other measurements, any equipment will be recalibrated, and the measurement will be taken again. In the event that the data still appears to be an outlier, it will flagged and taken into consideration during data analysis.

References Cited in QAPP

Non-point Source Assessment Report, published by the Indiana Department of Environmental Management / State Non-point Task Force, 1989.

Intensive Segment Survey for Cedar Creek Report, published by the Indiana Department of Environmental Management, 1992.

Standard Methods of Water and Wastewater Analysis, 17th Edition, published by the American Water Works Association, American Public Health Association, and the Water Environment Federation.

Standard Operating Procedure - Ft. Wayne Water Filtration Plant, written by the Ft. Wayne Water Filtration Plant/SOP Committee

Standard Operating Procedure - Ft. Wayne Water Pollution Control Plant, written by the Ft. Wayne Water Pollution Control Plant/SOP Committee