Lower St. Joseph/Galien River Watershed Management Plan

Prepared for

NPDES Phase II Communities

December 2007

LOWER ST. JOSEPH/GALIEN RIVER

WATERSHED MANAGEMENT PLAN

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PROJECT NO. G07061

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CHAPTER 1 - NATURE AND STATUS OF WATERSHED

1.1 INTRODUCTION

Local governments in Berrien and Cass Counties that have been identified as urbanized areas by the Michigan Department of Environmental Quality (MDEQ) have taken a watershed approach to fulfill their National Pollutant Discharge Elimination System (NPDES) Phase II Municipal Storm Water Discharge Permit requirements. The Berrien and Cass County urbanized areas are located in the Lower St. Joseph/Galien River Watershed (LSJ/GRW) (Figure 1).

The Watershed Management Plan (WMP) is intended to identify and implement actions needed to improve water quality and reduce water quantity impacts by encouraging cooperation between the diverse public and private entities in the watershed. Building on other plans, the focus of this plan is to alleviate the adverse impacts caused by wet weather discharges from separate storm water sewer systems in the watershed.

The LSJ/GRW is made up of three distinct drainage areas within Berrien and Cass Counties, the St. Joseph River Watershed from the Indiana state line (excluding all but the mouth of the Paw Paw and Dowagiac River Watersheds), the Galien River Watershed, and the Lake Michigan coastal drainage areas from Hagar Township to the City of Michiana.

The St. Joseph River Watershed (SJRW) is located in the southwest portion of the Lower Peninsula of Michigan and northwest portion of Indiana. It spans the Michigan-Indiana border and empties into Lake Michigan at the St. Joseph, Michigan. The SJRW drains 4,685 square miles from 15 counties, Berrien, Branch, Calhoun, Cass, Hillsdale, Kalamazoo, St. Joseph, and Van Buren in Michigan and De Kalb, Elkhart, Kosciusko, Lagrange, Noble, St. Joseph, and Steuben in Indiana. The SJRW includes 3,742 river miles and flows through and near the Kalamazoo-Portage, the Elkhart-Goshen, the South Bend, and the St. Joseph/Benton Harbor metropolitan areas. According to the 2000 U.S. Census, approximately 1.5 million people live in the 15 counties of the SJRW, with 53.6% living in Michigan. The most populated county is St. Joseph, Indiana. The SJRW is largely agricultural. More than 50% of the riparian habitat is agricultural and urban, while 25% to 50% remains forested.

The St. Joseph River WMP identified these characteristics of the Lower St. Joseph River Watershed:

- Yellow Creek, Pipestone Creek, Hickory Creek, and McCoy Creek are the major waterways within the Lower St. Joseph River Watershed.

- McCoy Creek is a coldwater creek accessible from Lake Michigan by fish ladders.

- The watershed area was primarily composed of beech-sugar maple forest during the pre-settlement surveys.

- Soils are well drained, making groundwater sources important in moderating stream temperatures.

- The Cities of St. Joseph and Benton Harbor are identified as critical areas in need of mitigation efforts centered on storm water management. Smaller urban areas are also highlighted as needing storm water management as they grow in population.

The Galien River Watershed (GRW) encompasses areas of prime farmland, Warren Woods Preserve, and a portion of the City of New Buffalo, where the Galien River flows into Lake Michigan. The GRW is situated in the southwest corner of Berrien County, Michigan, and is included in the Little Calumet/Galien Tri-State Watershed Management Area, which spans coastal areas of Michigan, Indiana, and Illinois.

The communities in the GRW have expressed concerns of water resource conditions that have threatened public safety, wildlife habitats, and financial livelihoods. The MDEQ has included several reaches in the GRW on the Clean Water Act, Section 303(d) list for not meeting water quality standards (WQS). In consequence, a Total Maximum Daily Load (TMDL) process was initiated. The identified pollutants that are impairing those uses include sediment, nutrients, and bacteria. Complaints and concerns received from the communities led the Berrien County Drain Commissioner (BCDC) to initiate a watershed management planning project to research the causes and potential solutions to water quality and quantity issues, which are described in the Galien River WMP.

The Lake Michigan coastal drainage area includes the areas identified in the Lake Michigan Lakewide Management Plan (LaMP) as directly contributing to water quality of Lake Michigan. The LaMP identifies the Lake Michigan ecosystem as an outstanding natural resource of global significance, yet under stress and in need of special attention. The LaMP recommends the continued efforts to remediate damage from human impacts that are impairing the ecosystem. Many of the water quality concerns of the LSJ/GRW are reflected in the LaMP, including nonpoint source pollution, high bacteria counts at beaches, fragmentation of wildlife habitats, and invasive species. The overall water quality concerns that were applicable to the LSJ/GRW were to:

- Restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin ecosystem by enhancing river environments in their natural states for present and future generations.

- Maintain and improve water quality by promoting sound land use management decisions.

- Assess relationships between water quality and storm water runoff by developing guidelines for storm water management to reduce impacts of urbanization.
- Preserve and restore coldwater fisheries and reintroduce indigenous game fish species where possible.
- Provide for flood protection, minimize risk of flooding, and assess necessity of flood control improvements.
- Ensure pubic safety in recreational opportunities in surface waters.
- Protect healthy habitats for native aquatic life and wildlife.

Other issues are included in the discussions of sources of pollution in Chapter 2.

1.2 DEVELOPING PARTNERSHIPS WITH KEY STAKEHOLDERS

1.2.1 PUBLIC PARTICIPATION PROCESS

Building the Team

The Phase II Communities created a public participation process (PPP) which outlined the outreach efforts for soliciting public participation in the development of the Lower St. Joseph/Galien River WMP. The PPP identified stakeholders in the LSJ/GRW. Categories of stakeholders include government agencies, natural resource and environmental organizations, citizen groups, businesses, planning/development organizations, and education/outreach organizations. The mechanisms for soliciting participation in the development of the WMP included postings on websites, articles in newsletters, mailed personal invitations, press releases, presentations, and contacts through e-mail distribution lists.

Communication during the Planning Phase

Many groups and organizations within the LSJ/GRW are currently involved in watershed planning efforts. The Friends of the St. Joseph River Association have completed a planning grant and have developed a WMP for the SJRW. The BCDC recently led a committee to complete the Galien River WMP. The Conservation Fund received transition funds to implement some of the recommendations in the Galien River WMP. The Great Lakes Commission created the Lake Michigan Lakewide Management Plan in 2002, which provided overall goals and objectives for improving water quality in Lake Michigan.

The LSJ/GRW Committee (Watershed Committee) worked with the organizations above and utilized these documents to develop this WMP to ensure that it satisfies the NPDES Phase II Storm Water Regulations.

Public comment about the Lower St. Joseph/Galien WMP was routed through the Watershed Committee to all the participating NPDES Phase II communities. The following list of communication mechanisms were used to inform stakeholders about the WMP initiative, solicit input for the WMP content, communicate with the Watershed Committee, and update the public on the project status.

Meetings

Meetings were held by the Watershed Committee on October 21, 2004, February 22, 2005, June 2, 2005, August 24, 2005, and November 16, 2005. Meetings were announced through press releases, community websites, faxes, and e-mail distribution lists. All Watershed Committee meetings were open to the public and gave attendees the opportunity for comment. Individuals volunteered to represent the communities at the SJRW and GRW Steering Committee meetings. Adequate representation of local watershed concerns were accomplished by having representatives from the Niles area and the Benton Harbor/St. Joseph area, one from a city and one from a rural township in each area, attend the SJRW meetings. Additional representatives from the southwest Berrien County communities attended the GRW meetings.

Newsletters and Print Media

Local agencies and governments in the LSJ/GRW related information about the WMP through their newsletters. Reporters from local papers were often in attendance at the meeting and announced the next meetings to provide opportunities for public involvement (Appendix 1). Several articles about the watershed project and storm water education were distributed to all communities to use in their newsletters.

Presentations

Presentations at the Watershed Short Course, organized by the Southwestern Michigan Commission in March 2005, offered the attendees an opportunity to get more information about the WMP and what implications the WMP will have for their stakeholder group. Comments from those attending the presentations were incorporated into this WMP.

Public Meetings

The public meetings were held to announce the beginning of the planning process and at the end of the planning process to present the LSJ/GRW Management Plan for additional input on the recommendations. The public meetings were announced in press releases to local newspapers and in local government newsletters. The draft WMP was posted on the Southwestern Michigan Commission website. A mailing list of about 190 stakeholders was developed to hold the public meeting for the WMP review process. Categories of stakeholders include government agencies, natural resource and environmental organizations, citizen groups, businesses, planning/development organizations, and education/outreach organizations. The WMP was posted on a downloadable website and CD-ROM copies of the plan were circulated. Table 3.5 was e-mailed to solicit commitments from municipal separate storm sewer system (MS4) communities. Public comments and MS4 revisions were incorporated into the WMP before being submitted to the MDEQ.

Dovetailing the WMP and Public Education Plan

A public education plan (PEP) for the NPDES Phase II communities was submitted to the MDEQ. The communities hired the Southwestern Michigan Commission to implement the activities outlined in the PEP. The Public Participation Process (PPP) and the PEP are two different components of the NPDES Phase II permit that have some overlap but different goals. The PPP is designed to solicit input and document how the public is participating in the development of the WMP to improve water quality in the LSJ/GRW. The PEP is designed to create awareness, educate, and inspire the public to take action toward improving water quality in storm water runoff.

Throughout the first and second years of the PEP implementation, the Watershed Committee developed partnerships with organizations and agencies that already have education services to adapt those services to the NPDES Phase II Storm Water Education Program. Partnerships that formed with these organizations were very useful for soliciting input for the WMP, and many of the partners identified in the PEP participated in the development of the WMP.

Adaptive Management

The PPP includes many mechanisms for engaging the public in the development of the WMP. These mechanisms were evaluated for their effectiveness by measuring the number and type of participants in the planning process. The public meetings were important for engaging the general public with the ideas put forth in the WMP.

Exit surveys at the Watershed Committee meetings and public meetings asked attendees how they heard about the meeting. The outreach methods that appeared to be the most successful in getting the public to the meetings were emphasized for future public meetings. The exit surveys also gathered information from the attendees about their satisfaction with the planning process and asked for comments on how the process could be improved. The summary of the exit survey was included in the minutes from each meeting to ensure that the attendees were aware that their comments were being addressed. A compilation of the results is located in Table 1.1. A copy of the exit survey is included in Appendix 1.

Table 1.1 - Summary of Exit Survey

	Agree	(Responses)			Disagree
The room setup was adequate for the meeting.	34	5	0	0	0
The time of the meeting was convenient.	24	8	6	1	0
The day of the week was favorable.	28	7	4	0	0
The location was easily accessible.	28	7	3	1	0
The format of the meeting was well organized.	26	12	1	0	0

Question	Responses	Answers and Comments
How did you hear about this meeting?	• E-mail (15) • Board meeting • Personal contact • Co-worker • Volunteered through newspaper ad • Newspaper article • Letter notification to Wightman and Associates, Inc. • Invitation (7) • Flyer • Attended first meeting and was mailed announcement of this meeting • Invitation sent to director/supervisor - I was asked to attend - 3 • Letter - 2 • Through a previous Phase II meeting - 1 • Watershed Planning Committee - 1	• Personal invitations through letters and e-mails are an effective method to solicit participation in the watershed planning process • Announcements will be printed in the newspapers for the next meeting
Would you suggest any changes for the next meeting?	• Allow more time to complete work session • Provide overview of materials for first-timers • No changes - good job at following agenda, productive in groups • Let folks in the room state why they are here • Evening - 6 p.m. or later - would work better for me • Later in the evening - people off work - 2 • We need to call people after mailing letter for a larger turnout • More people • Review objectives of meeting • Better directions • Get more townships represented to get their plans and ordinances	• More time will be allocated for the work session at the next meeting • Brief introduction will be given at the next meeting • Attendees at the next meeting will be asked to state why they are there • The next meeting will be scheduled later in the evening.

Table 1.1 - Summary of Exit Survey

Question	Responses	Answers and Comments
Do you have any questions you would like answered?	• Can the WMP differ at all from the entire St. Joseph River WMP? How do they mesh? • Who pays for all of this? • 10 more meetings and I will have this watershed stuff in hand, you are doing a terrific job • No	• The WMP will use information provided in the entire St. Joseph River WMP so the overall plans will be compatible, but the WMP will be more specific as to activities and actions that communities should take to protect water resources through storm water management • This project is funded through the NPDES Phase II communities in Berrien and Cass Counties as part of their NPDES Phase II permit requirement of developing a WMP.
Are there any organizations or agencies not represented here today that should be contacted about this project? If so, what is an effective way to reach them?	• Landowners and producers • MDNR • Coastal communities and residents • Is there anyone with the Friends of the St. Joe River Association involved? (2) • The City of Niles • Health Departments - call (3) • Townships (2) • MDEQ • Came late, not sure who all was here - zoning board members, farmers, naturalists • All communities involved in Phase II • Developers • Village of Berrien Springs • Oronoko Township • USCG Auxiliary Flotilla 18-10	• Efforts to contact landowners and producers will be stepped up to increase attendance • Personal contact will be made with the Health Department, MDNR, and coastal communities to encourage them to attend the next meeting • Personal contact will be made with the Friends of the St. Joseph River Association, the City of Niles, the Health Departments, and the townships to encourage them to attend the next meeting. • Ms. Chris Bauer from the MDEQ was in attendance at the meeting. • Ms. Heidi Gray from the Fernwood Nature Center was also in attendance.

Table 1.1 - Summary of Exit Survey

Question	Responses	Answers and Comments
Any other comments? (Please write on back, if necessary.)	● Offers to host meetings: ○ Benton Township - holds 100 people, just chairs ○ Sodus Township - holds 50 people with tables and chairs ○ Buchanan Township ○ Fernwood Nature Center - up to 120 people with chairs, 60 people with tables and chairs ● I would like to get a participant list (mail or e-mail) ● Keep to the maximum time limit as specified ● Getting in groups is a good idea. ● I think the planning process may feel long and drawn, BUT it is essential Encourage more participation and get more media involved to participate	● All of these locations will be considered for the next meeting. Thanks for offering! ● The committee participant list is attached. ● The time limit will be strictly adhered to at the next meeting.

WMP = Watershed Management Plan
NPDES = National Pollutant Discharge Elimination System
MDNR = Michigan Department of Natural Resources
MDEQ = Michigan Department of Environmental Quality

1.3 FORMATION OF WATERSHED COMMITTEE

The Watershed Committee was initially formed from the Phase II communities participating in the watershed-based effort to comply with the NPDES Phase II Storm water regulations. A core group from those communities continued to meet and function as the Watershed Committee with additional members joining from the SJRW, the GRW Steering Committee, and the community at large. The members of the Watershed Committee are listed in Table 1.2.

Table 1.2 - Lower St. Joseph/Galien River Watershed Advisory Committee

Name	Representing	Title
Mr. John Gruchot	Berrien County Planning Department	Solid Waste Management Coordinator
Ms. Jill Cooley	Berrien County Administration Center	Resource Recovery Educator
Mr. Roger Zilke	Berrien County Drain Commissioner	Drain Commissioner
Ms. Anne Hendrix	Berrien County Drain Commissioner	Deputy Drain Commissioner
Mr. Ken Priest	Berrien County Health Department	
Mr. Gary Witkowski	Berrien County Health Department	
Mr. Ben Schmidt	Berrien County Natural Resources Conservation Service	District Conservationalist
Ms. Katie McIlwee	Berrien County Planning Department	
Mr. Brian Berndt	Berrien County Road Commission	Engineer Manager
Mr. Joe Margol	Berrien County Road Commission	
Mr. Gary Soper	Benton Charter Township	Township Engineer
Mr. Jason Griffiths	Berrien Township	
Mr. Tom Fox	Bertrand Township	Storm Water Manager, Chair of Watershed Committee
Mr. John Mefford	Bertrand Township	Supervisor
Mr. Lynn Ferris	Buchanan Township	Trustee
Mr. Jeff VanBelle	Cass County Drain Commissioner	Drain Commissioner
Mr. Joe Bellina	Cass County Road Commission	Engineer Manager
Mr. Peter E. Van Nice	Chikaming Open Lands	President
Mr. Richard Knuth	City of Bridgman	
Mr. Rick Smigielski	City of Buchanan	
Mr. Joe Ray	City of Niles	
Mr. Danny Patrick	City of St. Joseph	
Ms. Heidi Gray	Fernwood Botanical Garden and Nature Preserve	
Mr. Scott King	Friends of McCoy Creek	
Mr. Andrew DeGraves	Friends of the St. Joe River	St. Joseph River Watershed Coordinator
Ms. Gaye Blind	St. Joseph River and Galien River Conservation Districts	Executive Director
Mr. Dick Stauffer	Lincoln Charter Township	Supervisor
Ms. Chris Bauer	Michigan Department of Environmental Quality	Environmental Quality Analyst

Table 1.2 - Lower St. Joseph/Galien River Watershed Advisory Committee

Name	Representing	Title
Ms. Agnes Conway	New Buffalo Township	Supervisor
Mr. Gary Schrader	Niles Township	Department of Public Works
Mr. Mark Parrish	Pokagon Band of Potawatomi	Environmental Coordinator
Mr. Jim Soteriou	Royalton Township	Department of Public Works
Ms. Michelle Bennett	Sodus Township	Supervisor
Ms. Kate Sheridan	South Bend Tribune	Reporter
Mr. David Zilke	Southwest Michigan Homebuilders Association	
Ms. Marcy Colclough	Southwestern Michigan Commission	Senior Planner
Mr. Dick Beebe	St. Joseph Charter Township	Manager
Ms. Peg Kohring	The Conservation Fund	
Mr. Jerry Jacobs	Village of Edwardsburg	Street Commissioner
Mr. Robert Dabbs	Village of Grand Beach	
Mr. Bruce Hauch	Village of Three Oaks	
Mr. Jim Cousins	Watershed Resident	
Mr. Joseph Sands	Watershed Resident	
Mr. Todd Cornwell	Watershed Resident	
Mr. Tom Hackley	Watershed Resident	
Ms. Julie Titone	Watershed Resident	
Ms. Liza Moon	Watershed Resident	
Mr. Mark Turner	Wightman Environmental, Inc.	

ST. JOSEPH RIVER WATERSHED

The SJRW formed a steering committee and collected background information on the watershed through reviewing and assembling past reports, conducting personal interviews, and developing a resource library. The resulting St. Joseph River WMP was approved by the MDEQ in June 2005 as meeting the U.S. Environmental Protection Agency (EPA) requirements.

GALIEN RIVER WATERSHED

The Galien River Watershed (GRW) Steering Committee consisted of a variety of members including landowners, organizations, and groups interested in the restoration and preservation of the Watershed. The Steering Committee members provided guidance and input on the development of a WMP that was approved in July 2003 by the MDEQ as meeting the State of Michigan's Clean Michigan Initiative (CMI) requirements. The WMP is currently being updated to meet the EPA requirements and will be submitted to the MDEQ by December 30, 2005.

1.3.1 ISSUES AND CONCERNS OF THE WATERSHED COMMITTEE

The Watershed Committee developed a survey to distribute to the stakeholders of the watershed to gather information about existing environmental and water quality data, concerns of the watershed, and policies and regulations that currently manage storm water. The results of the survey were tabulated in Table 1.3. An example of the survey is included in Appendix 2. The information gathered was reviewed and provided the basis for the development of the WMP. The existing data identified pollutants and water quality impairments that had, or still are, harming the watershed. The issues and concerns were addressed to form the goals and objectives. Recommendations for policies and regulations were made according to existing levels of management.

Table 1.3 - Watershed Management Planning Survey Results

Lower St. Joseph/Galien River Watershed Watershed Management Planning Survey Results					
Community or Agency Name	**Waterbody Name**	**Existing Environmental and Water Quality Data**	**Issues of Concern in Your Watershed**	**Existing Plans and Ordinances**	**Storm Water Management**
Berrien County Drain Commissioner	☒Galien River ☒Lower St. Joseph ☒Lake Michigan Shoreline Tributary ☐Other	We do not collect water quality data, the health department collects for us Samples have been taken in the GRW The MDEQ is also taking water samples for water quality data in the GRW	1) Soil erosion from new construction 2) Failing septic systems 3) Development 4) Illegal sanitary hookups 5) Fertilizers/pesticides 6) Degradation of habitat and loss of natural areas including wetlands	We do monitor soils erosion and sedimentation through permits obtained from our office for new construction. Contact for information: Berrien County Planning Ms. Catherine McIlwee 701 Main Street St. Joseph, MI 49085 269-983-7111 x 8257	Yes - Plans are reviewed by the drain commissioner with most major projects 1) Soil erosion and sedimentation 2) New plat (subdivision) reviews 3) Commercial development reviews
Berrien County Road Commission	☒Galien River ☒Lower St. Joseph River ☒Lake Michigan Shoreline Tributary ☐Other	We have our drinking water wells tested annually by MDEQ Drinking Water Laboratory Some Monitoring wells still in place from UST issues Point source outfalls monitored for storm water issues Some garages have rain gauges	Soil and sedimentation at road stream crossings Sewer systems connected to county drains in New Troy (Weesaw Township) dumping into Galien River with high *E. coli* counts Conveyance of storm water with pipes instead of controlled with detention/retention ponds	County Board of Commissioners starting to form ordinances for open lands and planning	We review development site plans and work hand in hand with the drain commission We use BMPs with all our construction activity
Berrien Township	☐Galien River ☒Lower St. Joseph between Buchanan and Berrien Dams ☐Lake Michigan Shoreline Tributary ☐Other	Berrien Springs Boat Club has monitored water quality at various times in the past in conjunction with the health department	Fertilizer over use runoff to streams and creeks would be a major concern, coupled with excess density of septic systems through too small lot requirements for soil types	No plans currently, one acre minimum lot size	Not managed
Benton Charter Township	☐Galien River ☒Lower St. Joseph River ☒Lake Michigan Shoreline Tributary ☐Other	We don't collect any water quality data We do get some rainfall data from the MAWN network - website is www.agweather.geo.msu.edu/mawn/	No specific numbers, but most likely problems with old/failing septic systems Also problems with old storm sewers	Master Plan - Zoning Ordinances - Subdivision Ordinances in Benton Charter Township soil and sedimentation programs through Berrien County	At this point, we rely primarily on the county drain commissioner's office

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Lower St. Joseph/Galien River Watershed Watershed Management Planning Survey Results					
Community or Agency Name	**Waterbody Name**	**Existing Environmental and Water Quality Data**	**Issues of Concern in Your Watershed**	**Existing Plans and Ordinances**	**Storm Water Management**
Bertrand Township	☒Galien River ☒Lower St. Joseph ☐Lake Michigan Shoreline Tributary ☐Other	Not as a township at this time	Concerned with older failing septic systems - Dayton Lake septic systems and along the South East Berrien Landfill Major gas line through township	We rely upon county and state controls updating master plan We do have a zoning ordinance which sets the minimum allowable lot size We also have procedures for dealing with subdivision planning and construction We have also adopted an Illicit Discharge Ordinance (No. 55)	With assistance of Berrien County Drain Commission At the current time we deal with new development to ensure that storm water management procedures are in place
Buchanan Township	☒Galien River ☒Lower St. Joseph River ☐Lake Michigan Shoreline Tributary ☐Other	No	I believe Buchanan Township is working well to preserve what we have The main concern is with roads and their impact	This is a continual effort with our Master plan and ordinances	I believe this is done more on the county level
Chikaming Township	☒Galien River ☐Lower St. Joseph River ☐Lake Michigan Shoreline Tributary ☐Other	None that I am aware of	We do have these conditions Some that I am aware of are: Prairie and Youngren Road area, Union Pier Drain (along Union Pier Road and Lake Avenue), Paradise Villa, Edgewater Villa, private septic system at the former Bob-A-Ron Campground, and the Indian Trail washout We could use a lot of help in these areas	Chikaming Township Zoning Ordinance No. 87, Master Plan, Site Development Policy, Berrien County SESC Program adopted May 20, 1970	We depend on the county drains
Pipestone Township	☐Galien River ☐Lower St. Joseph River ☐Lake Michigan Shoreline Tributary ☐Other	No		Pipestone Township is in the process of developing a master plan	Do not

Table 1.3 - Watershed Management Planning Survey Results

Lower St. Joseph/Galien River Watershed Watershed Management Planning Survey Results					
Community or Agency Name	**Waterbody Name**	**Existing Environmental and Water Quality Data**	**Issues of Concern in Your Watershed**	**Existing Plans and Ordinances**	**Storm Water Management**
Fernwood Botanical Garden and Nature Preserve	☐Galien River ☒Lower St. Joseph ☐Lake Michigan Shoreline Tributary ☐Other	No, but would like to get involved in educational program for water quality Would like to be community liaisons for public education	Soil erosion along the banks of the St. Joseph River The amount of litter that collects along the banks Storm water overflow discharge and the trash that it creates Fertilizer/pesticide overuse and those chemicals making their way to the river	Need to find out	How would Phase II regulations affect us?
Galien and St. Joseph River Conservation Districts	☒Galien River ☒Lower St. Joseph ☒Lake Michigan Shoreline Tributary ☒Other: Inland Waters	Contact Friends of the St. Joe River Association Contact Conservation Fund Ms. Peg Kohring at 269-426-8825 for Galien River Management Plan	Chikaming Township Ms. Peg Kohring Part of the Galien River Management Plan	Galien River Management Plan (Conservation fund) St. Joe River Management Plan (Friends of the St. Joe River Association)	See drain commissioner
Sarett Nature Center	☐Galien River ☐Lower St. Joseph ☐Lake Michigan Shoreline Tributary ☒Other Lower Paw Paw River			We have formed a private 1,000 acre Paw Paw River biological preserve	
Southwestern Michigan Commission	☒Galien River ☒Lower St. Joseph River ☒Lake Michigan Shoreline Tributary ☐Other:	We do not collect water quality data We have reports in our office from the St. Joseph River that FTC&H did several years ago	Affects on water quality from changes on land use	N/A	N/A
Pokagon Band of Potawatomi	☐Galien River ☐Lower St. Joseph River ☐Lake Michigan Shoreline Tributary ☒Other: Blood Run Creek, Squaw Creek in GRW	D.O., turbidity, pH, Temp, conductivity, nitrate, atrazine, phosphorus	Soil erosion, degradation of wildlife habitat, loss of natural areas	Currently working on ordinance that will address all of the above	We employ BMPs to manage storm water in the most sustainable way as possible

Table 1.3 - Watershed Management Planning Survey Results

Lower St. Joseph/Galien River Watershed Watershed Management Planning Survey Results					
Community or Agency Name	**Waterbody Name**	**Existing Environmental and Water Quality Data**	**Issues of Concern in Your Watershed**	**Existing Plans and Ordinances**	**Storm Water Management**
The Conservation Fund	☒Galien River ☒Lower St. Joseph ☒Lake Michigan Shoreline Tributary ☒Other	Only data is contained in the Galien River WMP developed by FTC&H	Concerned about road/stream crossings, no enforcement of septic laws by Berrien County Health Department and lack of stream buffers on tributaries causing sediments	Galien River WMP will focus on five master plans and ordinance upgrades to improve protection of water quality	No
City of St. Joseph	☐Galien River ☒Lower St. Joseph River ☐Lake Michigan Shoreline Tributary ☐Other:	The City collects information required for our CSO separation effort Information is on file with the City	The City is actively pursuing elimination of CSOs and has made significant progress on this effort over the past five years	IDEP Ordinance is in work The City also has an ordinance prohibiting wells in the City which was instituted as part of a brownfield redevelopment project	Since 1999, the City has undertaken significant projects to upgrade the storm and sanitary sewers, water main and roadways in the City During the course of these projects, suspect connections are investigated and connected to the correct sewer. While the bulk of City's true progress has been directed toward the CSO effort, the City is also participating in the NPDES Phase II program under the direction of FTC&H and Southwest Michigan Commission
Village of Baroda	☐Galien River ☐Lower St. Joseph ☐Lake Michigan Shoreline Tributary ☒Other: Hickory Creek	Our drinking water comes from Lake Township Our wastewater goes through our sewer lagoons They are tested on a monthly basis with EIS Analytical Services in South Bend We also report monthly to the MDEQ	N/A	N/A	Our street storm drains run into Hickory Creek Any questions, call Bubba at 921-8797

Table 1.3 - Watershed Management Planning Survey Results

Lower St. Joseph/Galien River Watershed Watershed Management Planning Survey Results					
Community or Agency Name	**Waterbody Name**	**Existing Environmental and Water Quality Data**	**Issues of Concern in Your Watershed**	**Existing Plans and Ordinances**	**Storm Water Management**
Village of Berrien Springs	☐Galien River ☒Lower St. Joseph ☐Lake Michigan Shoreline Tributary ☐Other:	No	Not in the Village of Berrien Springs that we are aware of	Not in the Village of Berrien Springs	We have a functional storm sewer system
Group 1 - WMP meeting 10-21-04	(Buchanan Township, Bertrand, Township, Niles Township, HBA)	Madron Lake Association - monitoring water at new public boat launch - allows only electric motors Life Action Ministries - may be monitoring at campground Clear Lake Association - does some sampling, installed sandy beach, 2 public beaches Starr Valley Ranch - Mr. Rich Shepardson Wagner Lake - 25 homes being built	Accidental highway spills High speed train Payton Lake Dam Sewage discharge Agricultural runoff Sewage pond spillage Gravel mining - Michiana Aggregate Fisheries management Drain commissioners practices Landfill paying for waterline for residents Buchanan looking to clean our McCoy for mill race Illicit connections into the St. Joseph Housing density at Bertrand Crossing	Illicit Discharge Connections Ordinances Michigan State Residential Code Buchanan has a new master plan Niles Township has master plan City of Buchanan Wellhead Protection Plan - can hook up to City of Niles in emergency	

Table 1.3 - Watershed Management Planning Survey Results

Lower St. Joseph/Galien River Watershed Watershed Management Planning Survey Results					
Community or Agency Name	**Waterbody Name**	**Existing Environmental and Water Quality Data**	**Issues of Concern in Your Watershed**	**Existing Plans and Ordinances**	**Storm Water Management**
Group 2 - WMP meeting 10-21-04	(Conservation District, Fernwood)	Try to get involvement from non-regulated communities	Contaminants Litter Pollution prevention verses end-of-pipe solutions		
Group 3 - WMP meeting 10-21-04	(Berrien Township, BCDC, BCRC, BC Planning)	MDNR Fisheries County planning GIS (wetlands, parcels, zoning, 100-year floodplain, land use) County health department beach water quality monitoring MDEQ water quality monitoring, sampling of surface waters, TMDL studies Galien WMP EPA study of Silver Beach (swimmers' health) St. Joseph River WMP GIS data IDEP database	Encroachment on water, floodplain and beach front by builders and septic systems during periods of low water levels Erosion, pollution, and flooding during high water levels Right-of-way access to waterfront (end of roads) safe, non-erosive access to recreation, limited paving Streambank erosion from urban runoff and fallen trees Soil erosion from development Lack of buffers on riparian lands Development pressure on water front Invasive species Auto junk yards on Farmers Creek in Pipestone Township	Chikaming is re-doing ordinance with Chikaming open lands with environmental impacts in mind Berrien County Drain Commissioner's SESC program	BCDC pre- and post-development peak discharges must equal

UST = Underground Storage Tank
BMPs = Best Management Practices
MAWN = Michigan Automated Weather Network
WMP = Watershed Management Plan
IDEP = Illicit Discharge Elimination Plan
TMDL = Total Maximum Daily Load
FTC&H = Fishbeck, Thompson, Carr & Huber, Inc.
CSO = Combined Sewer Overflow
MDEQ = Michigan Department of Environmental Quality
NPDES = National Pollutant Discharge Elimination System
BC Planning = Berrien County Planning Department
BCDC = Berrien County Drain Commissioner
BCRC = Berrien County Road Commission
GRW = Galien River Watershed
EPA = Environmental Protection Agency
SESC = Soil Erosion and Sedimentation Control
MDNR = Michigan Department of Natural Resources
GIS = Geographic Information System
HBA = Home Builders Association

1.4 DESIGNATED USES

Designated uses are defined as recognized uses of water established by state and federal water quality programs. All waters of within the State of Michigan (State) must meet eight designated uses, according to Public Act 451 of 1994, Chapter I, Part 31, Part 4 (Table 1.4).

Table 1.4 - Designated Uses for Surface Waters in the State of Michigan

Designated Use	General Definition
Agricultural use	Livestock watering, irrigation, and crop spraying
Public water supply at point of intake	Surface waters meet human cancer and non-cancer values set for drinking water
Navigation	Navigation of inland waters
Warmwater or coldwater fishery	Supports warmwater or coldwater species
Other indigenous aquatic life and wildlife	Supports other indigenous animals, plants, and macroinvertebrates
Partial body contact recreation	Supports boating, wading, and fishing activities
Total body contact recreation (between May 1 and October 31)	Supports swimming activities between May 1 to October 31
Industrial water supply	Water utilized in industrial or commercial applications

1.4.1 COLDWATER AND WARMWATER FISHERIES

A coldwater fishery is considered to have summer temperatures below 60°F and to be able to support natural or stocked populations of trout, salmon, whitefish, or cisco (Michigan Department of Natural Resources [MDNR], 2005). Brandywine Creek is a top quality coldwater trout stream located in southwestern Cass County and southeastern Berrien County. It is a small second-order stream that flows in a westerly direction through the city limits of Niles, Michigan, before it empties into the St. Joseph River (MDNR, James L. Dexter, Jr., MDNR, Status of the Fishery Resource Report 91-11, 1991.) The majority of aquatic insect species identified are broadly classified as intolerant, meaning they can succumb easily to polluted water. Given this, the water quality must be good. Nine families of insects were identified, including three species of stoneflies, two species of mayflies, and three species of caddisflies. Freshwater shrimp are very abundant, especially in the watercress, and are excellent food for trout.

Love Creek is a very small first-order tributary to the St. Joseph River. A designated trout stream that has a water quality designation of a top-quality coldwater fishery, Love Creek enters the St. Joseph River downstream of Berrien Springs (*Michigan Department of Natural Resources Status of the Fishery Resource Report 92-2, 1992).* While aquatic organisms are deemed sparse, salmonids found in Love Creek are consistently fat and in excellent condition, and are some of the healthiest trout ever encountered.

The MDEQ examined 13 sampling stations on the Galien River Main Branch, Dowling Creek, East Branch Galien River, Troy Meadow Drain, South Branch Galien River, Blood Run, Squaw Creek, Spring Creek, and an unnamed tributary to Spring Creek. Of the water bodies the Galien River main branch, East Branch, and South Branch contain coldwater reaches.

In the South Branch Galien River, the fish community could not be scored, but the macro invertebrate community was acceptable tending toward excellent and the habitat was good at the first site and fair at the second. Fish diversity is low in the East Branch Galien River, with less than 1 percent of the total number of fish as salmonids. Macro invertebrate communities were acceptable but tending toward poor and habitat was fair.

In summary, the results of the MDEQ Biological Surveys indicate that the East Branch Galien River is not meeting its designated use as a coldwater fishery.

A warmwater fishery is defined by the MDEQ as a water body that is capable of supporting fish species that thrive in relatively warmwater, including any of the following: bass, pike, walleye, and panfish. Generally, summer temperatures are between 60 and 70°F and are capable of supporting warmwater fish on a year-round basis. Two sites on the Galien River were rated acceptable, tending toward excellent, with the downstream site providing evidence of flashy flows and high sand bed load. The fish community in Dowling Creek received an acceptable rating. The macro invertebrate community was acceptable, but tending toward poor, and the habitat received a good rating. Spring Creek scored acceptable, and the unnamed tributary tended toward excellent. Blood Run and Squaw Creek macro invertebrate communities tended toward poor and habitats were rated fair. The Troy Meadow Drain had acceptable, but tending toward poor, macro invertebrate communities and habitat was rated as good.

In summary, the MDEQ Biological Surveys state that many streams do not support a warmwater fishery due to poor macroinvertebrate communities and degraded habitats.

1.4.2 INDIGENOUS AQUATIC LIFE AND OTHER WILDLIFE

In addition to fish, other aquatic life and wildlife in the ecosystem should be considered in all management strategies. A stable and healthy habitat supports populations of wildlife that provide outdoor recreational opportunities like sport fishing, bird watching, and hunting. Healthy habitats have water conditions that are capable of supporting native plant and animal species. Near-shore habitats in the Great Lakes are extremely important to aquatic life and wildlife that depend on coastal habitat for feeding, spawning, and shelter. Many areas in the watershed have degraded habitats, which are not able to fully support healthy populations of native plant and animal species.

1.4.3 TOTAL AND PARTIAL BODY CONTACT RECREATION

Water quality must meet standards of less than 300 count/100 milliliter (ml) in a sample of *E. coli* for areas to be safe for total body contact recreation, such as swimming, from May 1 to October 31 (MDEQ, 1999). Water-related activities, like fishing and boating, that do not require full body immersion are referred to as partial body contact recreation. Water quality must meet standards of less than 1,000 count/100 ml of *E. coli* for this type of recreational use (MDEQ, 1999).

To meet this designated use, the MDEQ has developed and approved plans for Deer Creek and the Galien River in the vicinity of New Troy for acceptable levels of *E. coli.* A plan has also been developed for acceptable levels of *E. coli* in the St. Joseph River. Other streams in the Watershed are required to have determinations of acceptable levels, as further discussed in Section 1.6.

1.4.4 AGRICULTURAL USE

Surface waters used for irrigation, livestock watering, and produce spraying must be consistent and safe. Water resources should be free of pathogens and toxic substances that could pose a health risk to livestock and humans. Most agricultural water use in the watershed comes from groundwater sources, which have been known to be contaminated by Atrazine. This pollutant is discussed in detail in the SJRW Management Plan (DeGraves, 2005).

1.4.5 INDUSTRIAL WATER SUPPLY

Industry depends on large quantities of cool, clean water for material washing or as a coolant. No pollutants have been identified at this time that would cause this use as not being able to be met in any areas of the watershed.

1.4.6 NAVIGATION

Waterways and waterbodies that provide adequate depth and width for recreational boating, canoeing, and kayaking must maintain navigable conditions. The St. Joseph River is used frequently by canoeist and kayakers and, hence, the use of the St. Joseph River for navigation is being met. The use of navigation in the GRW is fully discussed in the Galien River WMP.

1.5 STATUS OF DESIGNATED USES

These designated uses provide a starting point for discussion about the goals for the watershed project. The Watershed Committee determined that the surface waters in the LSJ/GRW were not used as a public water supply. The Watershed Committee evaluated the remaining seven designated uses to determine if they are being impaired or threatened by pollutants. Designated uses are considered impaired if the water does not meet the State's WQS. Designated uses are considered threatened when WQS may not be met in the future. The St. Joseph River WMP notes that the lower portions of the St. Joseph River Watershed have the impaired or threatened designated uses outlined in Table 1.5a.

Table 1.5a - Status of Lower Portions of the St. Joseph River Watershed Designated Uses

Designated Use	Status and Location
Agricultural use	Threatened - (Dowagiac River)
Navigation	Threatened - (Saint Joseph River Mouth)
Warmwater fishery	Threatened - (Saint Joseph River Mouth)
Coldwater fisheries	Impaired - (Dowagiac River, Mckinzie, and Juday Creeks) Threatened - (Saint Joseph River Mouth and Main Stem, Pipestone, Hickory, McCoy, Brandywine, and Yellow Creeks)
Other indigenous aquatic life and wildlife	Impaired - (Dowagiac River)
Partial body contact recreation	Impaired - (Dowagiac River) Threatened - (Saint Joseph River Mouth and Main stem)
Total body contact recreation	Impaired - (Willow, and Juday Creeks)
Industrial water supply	Threatened - (Dowagiac River)
Public water supply	No information

The impairment status of each designated use of the GRW is listed in Table 1.5b.

Table 1.5b - Status of Galien River Watershed Designated Uses

Designated Use	Status
Agricultural use	Impaired by *E. coli* Deer Creek, from its confluence with the South Branch of the Galien River upstream to the vicinity of Three Oaks Galien River in the vicinity of New Troy, from Flynn Road upstream to Elm Valley Road
Navigation	Impaired by obstructions, trash, and debris (Galien River from confluence upstream through Warren Woods)
Warmwater and coldwater fisheries	Impaired by excess sediment and nutrients Threatened by chemicals, petroleum, and heavy metals Coldwater fisheries threatened by increased temperature
Other indigenous aquatic life and wildlife	Impaired by excess nutrients, degraded habitats, unstable hydrology Threatened by invasive species (Warren Woods), chemicals, petroleum, and heavy metals (urban runoff)
Partial body contact recreation	Impaired by *E. coli* (Deer Creek, from its confluence with the South Branch of the Galien River upstream to the vicinity of Three Oaks Galien River in the vicinity of New Troy, from Flynn Road upstream to Elm Valley Road), unstable hydrology
Total body contact recreation (between May 1 and October 31)	Impaired by *E. coli* (Deer Creek, from its confluence with the South Branch of the Galien River upstream to the vicinity of Three Oaks Galien River in the vicinity of New Troy, from Flynn Road upstream to Elm Valley Road), unstable hydrology
Industrial water supply	Met
Public water supply	Met

The status of related designated uses of the Lake Michigan Area Watershed is listed in Table 1.5c. The LaMP states that the water body segments in Michigan discharging into Lake Michigan are impaired due to critical pollutants as well as nutrients and pathogens.

Table 1.5c - Status of Lake Michigan Area Watershed Designated Uses

Subgoals of the LaMP (Related Designated Uses)	Status
We can eat any fish (Warmwater fisheries, coldwater fisheries)	Mixed in 2004
We can drink the water (Public water supply)	Good in 2004
We can swim in the water (Partial and total body contact recreation)	Mixed in 2004
All habitats are healthy, naturally diverse, and sufficient to sustain viable biological communities (Warmwater fisheries, coldwater fisheries, indigenous aquatic life and other wildlife)	Mixed in 2004
Public access to open space, shoreline, and natural areas is abundant and provides enhanced opportunities for human interaction with the Lake Michigan ecosystem (Navigation)	Mixed in 2004
Land use, recreation, and economic activities are sustainable and support a healthy ecosystem (Agricultural use, industrial water supply)	Mixed in 2004
Sediment, air, land, and water are not sources or pathways of contamination that affect the integrity of the ecosystem	Mixed in 2004
Exotic species are controlled and managed (Indigenous aquatic life and other wildlife)	Mixed in 2004, possible deterioration
Ecosystem stewardship activities are common and undertaken by public and private organizations in communities around the basin	Mixed in 2004
Collaborative ecosystem management is the basis for decision-making in the Lake Michigan Basin	Mixed in 2004
We have enough information/data/understanding/indicators to inform the decision-making process	Mixed in 2004

1.6 TOTAL MAXIMUM DAILY LOAD

When a lake or stream does not meet WQS, a study must be completed to determine the amount of a pollutant that can be put in a waterbody from point sources and nonpoint sources (NPS) and still meet WQS, including a margin of safety. A TMDL is developed by determining the maximum daily load of a pollutant that a waterbody can assimilate and meet WQS. This load is then allocated to point source discharges, NPS discharges, and a margin of safety reserve (to account for technical uncertainties). Table 1.6 lists all of the waterbodies that are not meeting water quality standards in the LSR/GRW. Category 4a includes the approved TMDLs, Category 4b includes the highly-modified waterbodies that are unlikely to change conditions, and Category 5 includes those waterbodies that require a TMDL.

Table 1.6 - State of Michigan List for Impaired Water Bodies

EPA TMDL Approved List for Water Bodies (Category 4a)

DEER CREEK (TRIBUTARY TO SOUTH BRANCH GALIEN RIVER) WBID No. 083301D
County: BERRIEN Size: 3 M
Location: South Branch Galien River confluence upstream (u/s) to the headwaters in vicinity of Three Oaks
HUC: 4040001 RF3RchID: 4040001 440
Problem: Untreated sewage discharge, pathogens (Rule 100)
TMDL Year(s): 2002 EPA Approval: 01-Sep-02

GALIEN RIVER WBID No. 083301A
County: BERRIEN Size: 8 M
Location: Galien River in the vicinity of New Troy (Flynn Road u/s to Elm Valley Road)
HUC: 4040001 RF3RchID: 4040001
Problem: WQS exceedances for *E. coli.*; pathogens (Rule 100)
TMDL Year(s): 2002 EPA Approval: 01-May-02

ST. JOSEPH RIVER WBID No.: 083204G
County: BERRIEN Size: 32 M
Location: Lake Michigan confluence in Morrison Channel u/s to Michigan/Indiana state line
NHD Reach 040500010030
Problem: CSO, pathogens (Rule 100)
TMDL Year(s): 2003 EPA Approval: 6-04

Water Quality Standards Non-attainment List for Highly Modified Water Bodies (Category 4c)

BIG MEADOW DRAIN WBID No. 083204K
County: BERRIEN Size: 4 M
HUC: 4050001 RF3RchID: 40500012697
Location: St. Joseph River confluence u/s to tributary 1/4 mile, u/s of John Beers

DOWAGIAC RIVER WBID No. 083205D
County: BERRIEN/CASS Size: 18 M
HUC: 4050001 RF3RchID: 4050001 64
Location: Frost Street u/s (excluding Dowagiac Creek) u/s to Decatur

EAU CLAIRE EXTENSION DRAIN WBID No. 083204D
County: BERRIEN Size: 5 M
HUC: 4050001 RF3RchID: 4050001
Location: Farmers Creek confluence u/s

GALIEN RIVER (INCLUDES EAST BRANCH GALIEN RIVER) WBID No. 083301F
County: BERRIEN Size: 25 M
HUC: 4040001 RF3RchID: 4040001 27
Location: East Branch Galien River u/s (Includes East Branch Galien River, Dowling Creek Beaverdam Creek and Blue Jay Creek

HICKORY CREEK WBID No. 083201A
County: BERRIEN Size: 7 M
HUC: 4050001 RF3RchID: 4050001 89
Location: St. Joseph River confluence u/s

KIRKTOWN CREEK WBID No. 083301I
County: BERRIEN Size: 3 M
HUC: 4040001 RF3RchID: 4040001 460
Location: Galien River confluence u/s

MCCOY CREEK WBID No. 083204O
County: BERRIEN Size: 5 M
HUC: 4050001 RF3RchID: 4050001 3
Location: St. Joseph River confluence u/s

MILL CREEK WBID No. 083202P
County: BERRIEN AND VAN BUREN Size: 11 M
HUC: 4050001 RF3RchID: 4050001
Location: Hill Avenue u/s

PAINTERVILLE DRAIN WBID No. 083301R
County: BERRIEN Size: 6 M
HUC: 4040001 RF3RchID: 4040001 614
Location: Lake Michigan confluence u/s to headwaters

PIPESTONE CREEK WBID No. 083203C
County: BERRIEN Size: 15 M
HUC: 4050001 RF3RchID: 4050001
Location: Old Pipestone Road u/s to headwaters including tributaries

TANNER'S CREEK WBID No. 083301S
County: BERRIEN Size: 1 M
HUC: 4040001 RF3RchID: 4040001 613
Location: Lake Michigan confluence u/s to headwaters

BRANDYWINE CREEK WBID No. 083204Q
County: CASS Size: 3 M
HUC: 4050001 RF3RchID: 4050001
Location: US-12 u/s

MCKINZIE CREEK WBID No. 083205L
County: CASS Size: 7 M
HUC: 4050001 RF3RchID: 4050001 91
Location: Hoyt Street u/s of Nieb Concrete u/s

OSBORN DRAIN WBID No. 083205I
County: CASS Size: 5 M
HUC: 4050001 RF3RchID: 40500011809
Location: Dowagiac River confluence u/s

PAW PAW RIVER, SOUTH BRANCH WBID No. 083207R
County: CASS Size: 18 M
HUC: 4050001 RF3RchID: 4050001
Location: Vicinity southwest of Paw Paw. 64th Avenue (u/s of Maple Lake, Ackley Lake and Ismons Pond) u/s to Mud Lake outlet. Includes Eagle Lake Drain

SILVER CREEK WBID No. 083205E
County: CASS Size: 5 M
HUC: 4050001 RF3RchID: 4050001 101
Location: Dowagiac River confluence u/s Magician Lake outlet

Water Quality Standards Non-attainment List for Water Bodies Requiring TMDLs (Category 5)

FARMERS CREEK WBID No: 083204E
County: BERRIEN Size: 1 M
Location: Pipestone Road (Park Road) u/s - Vicinity of Eau Claire wastewater sewage lagoon
HUC: 4050001 RF3RchID: 40500011762 1.08
Problem: Untreated sewage discharge, pathogens (Rule 100); Nuisance algal growths, phosphorus
TMDL Year(s): 2008

GALIEN RIVER WBID No.: 083301G
County: BERRIEN Size: 6 M
Location: Lake Michigan confluence u/s to the South Branch Galien River confluence
HUC: 4040001 RF3RchID: 4040001 22 0.00
Problem: FCA-PCBs, chlordane
TMDL Year(s): 2009

LAKE CHAPIN (ST. JOSEPH RIVER) WBID No.: 083204J
County: BERRIEN Size: 520 A
Location: Vicinity of Berrien Springs
HUC: 4050001 RF3RchID: 405000122186.00
Problem: FCA-PCBs
TMDL Year(s): 2010

LAKE MICHIGAN - SOUTH OF FRANKFORT WBID No.: 080000B
County: BENZIE/BERRIEN Size: 13825 MI2
Location: Lake Michigan waters under Michigan jurisdiction located south of Frankfort
HUC: 4060200 RF3RchID: 4060200
Problem: FCA-PCBs, chlordane, DDT, TCDD (dioxins); Fish Tissue-Mercury
TMDL Year(s): 2012

LAKE MICHIGAN - WARREN DUNES STATE PARK BEACH WBID No.: 083301P
County: BERRIEN Size: 2.5 M
Location: Warren Dunes at Bridgman, MI
HUC: 4040001 RF3RchID: 4040001 614 0.00
Problem: Pathogens (Rule 100)
TMDL Year(s): 2008

OX CREEK WBID No.: 083202H
County: BERRIEN Size: 3.5 M
Location: Paw Paw River confluence u/s to Napier Avenue in the vicinity of Benton Harbor
HUC: 4050001 RF3RchID: 4050001 94 0.00
Problem: Macroinvertebrate community rated poor
TMDL Year(s): 2008

SAWYER CREEK WBID No.: 083301E
County: BERRIEN Size: 2 M
Location: Lake Michigan confluence (vicinity of Sawyer) u/s to west of I-94
HUC: 4040001 RF3RchID: 4040001 406 0.00
Problem: Oil
TMDL Year(s): 2009

ST. JOSEPH RIVER WBID No.: 083204H
County: BERRIEN/CASS/ST. JOSEPH Size: 83 M
Location: Lake Michigan u/s to Indiana/Michigan state line and Indiana/Michigan state line u/s to Sturgis dam at Three Rivers. (Includes Lake Chapin and Constantine Impoundment)
HUC: 4050001 RF3RchID: 4050001 1 0.00
Problem: FCA-PCBs; WQS exceedances for PCB
TMDL Year(s): 2009

ST. JOSEPH RIVER WBID No.: 083204I
County: BERRIEN Size: 1 M
Location: Gaging station d/s of business loop (BL-94) located in the navigational channel east of Lake Michigan
at Benton Harbor (STORET Station No. 110628).
HUC: 4050001 RF3RchID: 4050001 406
Problem: WQS exceedances for mercury
TMDL Year(s): 2011

DOWAGIAC RIVER WBID No.: 083205J
County: CASS Size: 8 M
Location: St. Joseph River confluence u/s to Pucker Street Dam, thence, u/s to the community of Sumnerville
HUC: 4050001 RF3RchID: 4050001 62 0.00
Problem: FCA-PCBs
TMDL Year(s): 2010

MCKINZIE CREEK WBID No.: 083205H
County: CASS Size: 1.6 M
Location: Nieb Concrete settling ponds u/s of Barron Lake Road northeast of Niles
HUC: 4050001 RF3RchID: 4050001 91 0.00
Problem: Fish community rated poor
TMDL Year(s): 2006

While watershed planning efforts have been made to develop the Lower St. Joseph/Galien River WMP and the larger St. Joseph River WMP, there have also been planning and implementation efforts in the SJRW in the City of South Bend and surrounding urban areas. WMPs have been developed for smaller tributaries to the St. Joseph River, such as Juday Creek. A grant application has been submitted to develop a WMP for the Elkhart River. The Indiana Department of Environmental Management has recently completed an effort to sample water courses in the area to determine if Clean Water Act standards have been exceeded.

A TMDL has been approved for the St. Joseph River from the Lake Michigan confluence upstream to the Michigan/Indiana State line. This TMDL is addressing pathogen problems due to combined sewer overflows (CSOs), stormwater discharges, and agricultural inputs. The reasonable assurance activities identified in the approved TMDL for the St. Joseph River have been incorporated into this WMP and many of the strategies and BMPs identified will make significant impacts on the quality of this and other impaired waters.

TMDLs have been established for reaches of the St. Joseph River near the City of South Bend. CCOs for the Cities of South Bend, Mishawaka, Goshen, and Elkhart are a source of pollution in this area. These cities have developed long-term strategies to reduce this form of pollution by upgrading treatment plants, removing storm water inputs to the system, and constructing containment areas for overflows. The cost of these projects and funding limitations make them long-term goals.

Additionally, other communities in this region of Indiana are working to improve water quality through the Phase II NPDES permit requirements. The following five groups or communities are working separately to meet permit requirements:

- Communities in St. Joseph County, Indiana (such as Granger, Roseland, and Oseola)
- Communities in Elkhart County, Indiana (such as Bristol and Elkhart)
- The City of South Bend, Indiana
- The City of Mishawaka, Indiana
- The University of Notre Dame and St. Mary's College

Permitting efforts include locating and eliminating illicit discharges, developing storm water ordinances for new construction, regulating soil erosion and sedimentation control, improving department of public works housekeeping practices, and other efforts.

Coordination between Indiana and Michigan was established during the development of the St. Joseph River WMP. The Friends of the St. Joseph River Association are currently working with facilitators to sustain this coordinating and cooperative effort by creating a St. Joseph River Watershed Council.

1.7 POINT SOURCE POLLUTION

Point source pollution has been defined by 30 years of court litigation since the creation of the Clean Water Act of 1972. The best definition to date is provided by EPA as “any discernible, confined and discrete conveyance, such as a pipe, ditch, channel, tunnel, conduit, discrete fissure, or container and includes vessels or other floating craft from which pollutants are or may be discharged.” This definition includes any discharge from a confined animal feeding operation.

According to MDEQ regulations, anyone discharging, or proposing to discharge, waste or wastewater into the surface waters of the State is required by law to obtain an NPDES permit. The NPDES program is intended to control direct discharge into the surface waters of the State by imposing effluent limits and other conditions necessary to meet State and federal requirements.

The NPDES program regulates pollutants discharged directly into waterways from wastewater sources. Discharge to a storm sewer does not go to a municipal treatment facility, and is considered a direct discharge. The MDEQ Water Bureau staff determines the appropriate permit type for each surface water discharge.

Individual and general permits in the LSJ/GRW are listed in Appendix 4. An individual NPDES permit is site specific. The limitations and requirements in an individual permit are based on the permittee's discharge type, the amount of discharge, facility operations (if applicable), and receiving stream characteristics. A general permit is designed to cover permittees with similar operations and/or type of discharge. General permits contain effluent limitations protective of most surface waters statewide. Locations where more stringent requirements are necessary require an individual permit. Approximately 15 entities have standard, non-wastewater individual discharge permits and 17 entities have standard general discharge permits.

Facilities determined eligible to be covered under a general permit, which includes discharges from the 24 MS4s under the watershed plan requirements, have received a Certificate of Coverage (COC).

Industrial NPDES permits in the LSJ/GRW are listed in Appendix 5. Facilities listed have regulations for their discharge of industrial storm water.

1.8 NONPOINT SOURCE POLLUTION

Water quality is a measure of chemical and physical properties. The perception of water quality varies between groups of people depending upon their use of the water. The Clean Water Act (CWA) was designed to improve water quality by giving the EPA the authority to regulate pollution discharges through a permit compliance system. Early in the CWA's implementation, efforts focused primarily on direct discharges from point sources. The majority of point source pollution has been successfully eliminated from impairing Michigan's water resources; however, water quality impairments still exist. Unlike discharges from wastewater treatment plants and industrial wastewater discharge, these lingering impairments come from many diffuse sources called NPS pollution. NPS pollution results from rain or snowmelt moving over or through the ground and picking up pollutants and depositing them in lakes, rivers, streams, and groundwater. This WMP is focused on the NPS pollutants that can be managed through BMPs and educational efforts.

1.8.1 SWAT MODELING

Using SWAT Data from the St. Joseph River Watershed Management Plan

The St. Joseph River WMP includes a Soil and Water Assessment Tool (SWAT) model for the entire St. Joseph River Watershed. SWAT was developed to predict the impact of land management practices on water, sediment, and agricultural chemical yields in large complex watersheds. SWAT is a continuous time model giving average results over multi-year periods. The SWAT analysis involved sub-dividing the watershed into many sub-watersheds and assigning parameters that define soil types, land use, agricultural practices, and runoff characteristics. The primary output from the model is an estimate of the pollutant loadings from each sub-watershed as well as the accumulated loading at the outlet.

Table 1.7 shows the results for the 19 sub-watersheds that are part of the Lower St. Joseph Watershed. It gives the pollutant loadings from each sub-watershed as total pollutant (pounds or tons) per acre per year and total pollutant per year. The table also gives the Total Phosphorous (TP) and Total Nitrogen (TN) loads as a ratio of the sediment load (pound per pound). A universally accepted value of these ratios is 0.0005 for TP and 0.001 for TN. The SWAT results for the Lower St. Joseph River Watershed show a lower value (0.0014) for TP and a significantly higher value (0.00735) for TN. These locally revised nutrient-to-sediment ratios can be used to predict nutrient loads when using other sediment load calculation methods.

Table 1.7 - SWAT results for the Lower St. Joseph River

Basin Number	Land Use Code	Area [ac]	Area [mi^2]	County	Ag Manage-ment code	Water Course	Pollutant Loading			Total Pollutant [lb/yr]			Ratio	
							TP [lb/ac/yr]	Sediment [T/ac/yr]	TN [lb/ac/yr]	TP [lb/yr]	Sediment [T/yr]	TN [lb/yr]	TP/Sed	TN/Sed
209	AGRR	20796	32	Berrien	CS	Paw Paw	0.092	0.241	9.8	1913	5001	203801	0.00019	0.02037
210	AGRR	16131	25	Berrien	CS	Paw Paw	0.030	0.191	7.3	484	3081	117756	0.00008	0.01911
15	URLD	5987	9	Berrien		St Joseph	0.007	1.463	13.5	42	8759	80825	0.00000	0.00461
23	PAST	7779	12	Berrien		Pipestone Creek	0.005	1.002	9.8	39	7795	76234	0.00000	0.00489
211	AGRR	32180	50	Berrien	CS	Hickory Creek	0.247	0.728	13.5	7948	23427	434430	0.00017	0.00927
212	AGRR	9897	15	Berrien	CS	Big Meadow Drain	0.445	0.841	13.3	4404	8323	131630	0.00026	0.00791
22	PAST	15564	24	Berrien		St Joseph	0.005	0.995	9.7	78	15486	150971	0.00000	0.00487
122	PAST	13483	21	Berrien		St Joseph	0.005	1.217	11.2	67	16409	151010	0.00000	0.00460
123	PAST	15924	25	Berrien		St Joseph	0.006	1.511	13.0	96	24061	207012	0.00000	0.00430
52	AGRR	23977	37	Berrien	CS	St Joseph	0.452	1.571	20.6	10838	37656	493926	0.00014	0.00656
50	AGRR	13110	20	Cass	CS-m	Dowagiac River	0.811	1.212	18.1	10632	15889	237291	0.00033	0.00747
228	AGRR	8674	14	Cass	CS-m	Mudd Lake Exit Drain	0.361	0.244	9.9	3131	2112	85873	0.00074	0.02033
51	AGRR	14992	23	Berrien	CS	McCoy Creek	0.449	1.607	20.5	6731	24085	307336	0.00014	0.00638
181	AGRR	4548	7	Berrien	CS	St Joseph	0.341	0.959	14.3	1551	4362	65036	0.00018	0.00746
57	FRSD	4812	8	Berrien		St Joseph	0.001	0.006	0.8	5	26	3850	0.00009	0.07273
58	AGRR	15157	24	Cass	CS-m	Brandywine Creek	0.239	0.148	6.3	3623	2236	95489	0.00081	0.02136
125	AGRR	6851	11	Cass	CS-m	St Joseph	0.271	0.183	7.7	1856	1254	52749	0.00074	0.02104
73	AGRR	5716	9	Cass	CS-m	Juday Creek	0.159	0.126	4.3	909	720	24577	0.00063	0.01706
89	AGRR	11307	18	Cass	CS-m	Cobus Creek	0.178	0.146	4.9	2013	1651	55404	0.00061	0.01678
		246884	386				0.228	0.820	12.1	56,360	202,333	2,975,199	0.00014	0.00735
		Total values					Average values			Total Values			Average Values	

AGRR: Agricultural Row Crop
PAST: Pasture
URLD: Urban Low Density
CS: Corn and Soybean
CS-m: Corn and Soybean with manure
FRSD: Deciduous Forest
lb: pound
yr: year
Ag: Agriculture
mi^2: square mile
TP: Total Phosphorous
SWAT: Soil and Water Assessment Tool
ac: acre
Sed: Sediment
TN: Total Nitrogen

CHAPTER 2 - WATERSHED GOALS AND OBJECTIVES

2.0 LONG-TERM GOALS AND SHORT-TERM OBJECTIVES

The Lower St. Joseph/Galien River Watershed Committee (Watershed Committee) identified the long-term goals and short-term objectives that would address concerns raised by the public, restore and protect the designated uses set by the State of Michigan (State), and attain compliance with any total maximum daily loads (TMDLs) established for a parameter within the Lower St. Joseph/Galien River Watershed (Watershed). The Watershed Committee's process to develop the goals and objectives is described below.

Goals and strategies established in the Lake Michigan Lakewide Management Plan (LaMP), the Galien River Watershed Management Plan (Galien), and the St. Joseph River Watershed Management Plan (SJRW) were compared to identify those that were common or unique. The common goals were reviewed and combined to create an overall goal for the watershed. The unique goals were reviewed and summarized as an overall goal for the watershed. Some of the common goals sustained the watershed process and organizational capacity, and were therefore included in recommendations for sustainability, rather than separate goals for the watershed. The following outline summarizes the common and unique goals:

COMMON GOALS AND STRATEGIES NO. 1

SJRW - Establish and build the financial and institutional capacity of a stakeholder group that assumes responsibility for the fulfillment of the management plan and acts as the primary advocacy group, information clearinghouse, and planning partner for the watershed.

LaMP - Implement actions that provide data access and exchange, facilitate involvement, and build capacity.

- ***Sustainability Recommendation***

COMMON GOALS AND STRATEGIES NO. 2

SJRW - Reduce soil erosion and sedimentation so that surface water functions and uses are not impaired and aesthetics are improved.

LaMP - Implement actions that achieve substantial pollution reduction by remediation sites, controlling pathways, and preventing or minimizing sources.

Galien - Prevent excessive sediment loading.

- ***Overall Watershed Goal****: Reduce soil erosion and sedimentation by site remediation, controlling pathways, and preventing or minimizing sources so that surface water functions and uses are not impaired and aesthetics are improved.*

COMMON GOALS AND STRATEGIES NO. 3

SJRW - Reduce the amount of nutrient loading so that surface water functions and uses are not impaired and aesthetics are improved.

LaMP - Implement actions that achieve substantial pollution reduction by remediation sites, controlling pathways, and preventing or minimizing sources.

Galien - Prevent excessive nutrient loading.

- ***Overall Watershed Goal****: Reduce the amount of nutrient loading by site remediation, controlling pathways, and preventing or minimizing sources so that surface water functions and uses are not impaired and aesthetics are improved.*

COMMON GOALS AND STRATEGIES NO. 4

SJRW - Increase cooperation, coordination, and collaboration among stakeholders (both governmental and nongovernmental) on a regional basis to eliminate program duplication, reduce costs, find more effective solutions, and maximize human, financial, and institutional resources.

LaMP - Implement actions that concurrently sustain the health of the environment, the economy, and the communities of the ecosystem.

LaMP - Implement actions that monitor the ecosystems, reduce uncertainty, and inform our decisions.

- ***Sustainability Recommendation***

COMMON GOALS AND STRATEGIES NO. 5

SJRW - Increase preservation, restoration, protection, and appreciation of open space (a system of natural areas, corridors, farmland, open land, and parklands).

LaMP - Implement actions that restore, enhance, and sustain the health, biodiversity, and productivity of the ecosystem.

Galien - Maintain integrity of existing filter strips and conservation areas.

Galien - Maintain existing habitat and improve areas for habitat.

Galien - Maintain existing healthy ecosystems and improve areas for other wildlife habitats.

- ***Overall Watershed Goal****: Increase preservation, restoration, protection, and appreciation of open space and coastal zones, and implement actions that restore, enhance, and sustain the health, biodiversity, and productivity of the ecosystem (a system of natural areas, wildlife habitats, corridors, farmland, open land, and parklands).*

COMMON GOALS AND STRATEGIES NO. 6

SJRW - Assess the impact of sources (septic/sewer systems, livestock/wildlife) and eliminate/correct sources of disease-causing organisms that are harmful to public health and that limit the use of rivers, creeks, and lakes.

LaMP - Implement actions that prevent human exposure to pollutants in the ecosystem and prevent or minimize sources.

Galien - Prevent increases in *E. coli* levels to keep below Michigan water quality standards of 1,000 count/100 ml for fishing and boating.

- ***Overall Watershed Goal:*** *Eliminate/correct sources of disease-causing organisms, specifically E. coli, that are harmful to public health and that limit the use of rivers, creeks, and lakes.*

COMMON GOALS AND STRATEGIES NO. 7

SJRW - Reduce the levels of pesticides, and other toxins (including storm water runoff) that are harmful to public health and that degrade aquatic habitat.

Galien - Prevent chemical contamination.

Galien - Prevent heavy metals from entering surface waters.

Galien - Prevent petroleum products from entering surface waters.

- ***Overall Watershed Goal:*** *Reduce the levels of chemicals, pesticides, heavy metals, petroleum, and other toxins that are harmful to public health and that degrade aquatic habitat.*

UNIQUE GOALS NO. 1

Galien - Maintain management practices for controlling invasive and exotic species and prevent more from entering.

- ***Overall Watershed Goal:*** *Maintain management practices for controlling invasive and exotic species and prevent more from entering the Watershed.*

UNIQUE GOALS NO. 2

Galien - Remove obstructions and garbage in identified problem areas.

Galien - Restore open channels by selectively removing obstructions.

- ***Overall Watershed Goal:*** *Remove obstructions and garbage in identified problem areas and restore open channels to provide navigational uses by selectively removing obstructions.*

UNIQUE GOALS NO. 3

Galien - Restore natural hydrology.

Galien - Maintain water levels high enough for navigation.

Galien - Maintain stable temperatures.

Galien - Maintain coldwater temperatures.

Galien - Reduce flooding impacts.

- ***Overall Watershed Goal:*** *Minimize hydrologic impacts of development, maintain water levels high enough for navigation, protect streambanks from erosion, and reduce flooding impacts.*

Specific pollutant loading information was detailed for the SJRW. The St. Joseph River WMP (DeGraves, 2005) included a report, "Analysis of Urban Stormwater Best Management Practice (BMP) Options for the St. Joseph River Watershed." The report focused on the pollutant loadings from urbanized areas. The Nonpoint Source modeling work conducted by Kieser & Associates revealed that in the 19 subwatersheds with over 10 percent urban areas, urban land uses contributed more than one-third of the total phosphorus loading from these subwatersheds (Kieser, 2003). Therefore, while controlling pollutant loadings from agricultural lands in the watershed is central in managing the overall water quality of the watershed, it is critical to reduce storm water pollutant loadings from urban areas in order to protect and restore water quality in the streams draining urban subwatersheds.

To address additional concerns not recognized in the LaMP, a subgroup of the Watershed Committee focused on coastal issues. The subgroup members determined that the biggest immediate issue was the need for information and the defining and identifying of critical areas in the Lake Michigan watershed portion of Berrien County. The following issues were discussed:

- Identifying drains and drainage areas:
    - public, private, and natural
    - sources of pollution
- Wetlands management:
    - technical information about types of wetlands and acceptable management strategies
    - ordinances and consistency across jurisdictions
    - the need for good technical wetlands support at the local level
- Prime farmland:
    - hydric soils
- Critical dunes:
    - changes occurring
- Leaching of dry wells
- Properties not connected to sanitary sewer:
    - identify locations, require connections at time of sale
- Public education for the general public and developers
- Ordinances:
    - parking and impervious surface cover
- Great Lakes water diversions

The Watershed conducted a prioritization process to create a prioritized list of the long-term goals established for the LSJ/GRW:

- Goal 1: Eliminate/correct sources of **disease-causing organisms**, specifically *E. coli*, that are harmful to public health and that limit the use of rivers, creeks, and lakes.

- Goal 2: Reduce the levels of **chemicals, pesticides, heavy metals, petroleum, and other toxins** that are harmful to public health and that degrade aquatic habitat.

- Goal 3: Reduce **soil erosion and sedimentation** by site remediation, controlling pathways, and preventing or minimizing sources so that surface water functions and uses are not impaired and aesthetics are improved.

- Goal 4: Reduce the amount of **nutrient loading** by site remediation, controlling pathways, and preventing or minimizing sources so that surface water functions and uses are not impaired and aesthetics are improved.

- Goal 5: Increase preservation, restoration, protection, and appreciation of **open space and coastal zones**, and implement actions that restore, enhance, and sustain the health, biodiversity, and productivity of the ecosystem (a system of natural areas, wildlife habitats, corridors, farmland, open land, and parklands).

- Goal 6: Minimize **hydrologic impacts of development**, maintain water levels high enough for navigation, protect streambanks from erosion, and reduce flooding impacts.

- Goal 7: Maintain management practices for controlling **invasive and exotic species** and prevent more from entering the Watershed.

- Goal 8: Remove **obstructions and garbage** in identified problem areas, restore open channels to provide navigational uses by selectively removing obstructions.

The objectives for each overall watershed goal were developed from the existing objectives in the three management plans and the additional input from the Watershed Committee. Objectives are applicable to the overall watershed, unless specified for a certain subwatershed, waterbody, or community. The objectives are listed in Table 2.1.

The goals and objectives are intended to reduce and/or eliminate the impacts of the pollutants within the LSJ/GRW. They will lead not only to a reduction and/or elimination of the current impairments, but will also protect water quality and natural habitat in threatened areas.

The goals have been developed on a watershed-wide basis; therefore, no single community is responsible for achieving all of the goals on their own. Rather, communities and counties must work together to implement individual BMPs and collectively achieve objectives that will accomplish these long-term goals. The objectives associated with each of the goals are also developed on a watershed-wide basis and no single community or county is expected to accomplish all the listed objectives.

It is anticipated that the participating communities and counties within the watershed will continuously strive to meet the objectives for each goal through implementation of various BMPs within their jurisdiction and by working collectively with the other watershed entities. While many of the objectives are already being implemented, additional objectives will be implemented under this WMP and in conjunction with the National Pollutant Discharge Elimination System (NPDES) Phase II storm water permits.

For example, the Phase II communities are implementing the Illicit Discharge Elimination Plan as an intensive effort to locate and eliminate illegal connections to storm drain systems that could be contributing pollutants ultimately to Lake Michigan. The Galien River Watershed Steering Committee is working with the Berrien County Health Department to identify and eliminate sources of bacteria contamination in the waterways. The goal is to track down the sources of *E. coli* through systematic sampling and testing of the natural waterways, road ditches, and drains. The first step to eliminating these sources is to find the sources of bacteria, which could be agricultural runoff, illegal sanitary sewer connections, malfunctioning septic systems, and animal waste.

Progress toward meeting the goals will be submitted as part of the annual reports submitted to the Michigan Department of Environmental Quality under the NPDES Phase II storm water permits.

Table 2.1 presents the goals with the sources and causes of the pollutants and the short-term objectives to meet the long-term goals.

Table 2.1 - Potential Goals and Objectives

Long-Term Goals	Pollutants of Concern	Sources and Causes	Short-Term Objectives
No. 1 Eliminate/correct sources of **disease-causing organisms**, specifically *E. coli*, that are harmful to public health and that limit the use of rivers, creeks, and lakes	**Pathogens**	No enforcement of septic laws Older septic systems along South East Berrien Landfill Private septic system at the former Bob-A-Ron Campgrounds Excess density of septic systems in lots too small for soil types in Berrien Township Older failing septic systems around Dayton Lake Pet, wildlife, and agricultural wastes	• Increase the number of educated property owners who know about the value of properly designed, installed, and maintained septic systems, particularly in areas with high water tables, porous soils, and those near surface water or storm sewers • Improve source locating in residential areas, such as illegal sanitary hookups, and reduce discharges to surface waters; such as CSOs. • Increase the development of CNMP • Reduce the number of illicit discharges
No. 2 Reduce the levels of **chemicals, pesticides, heavy metals, petroleum, and other toxins** that are harmful to public health and that degrade aquatic habitat	**Pesticides, chlorides, and other toxins**	Pesticide over-application on residential and agricultural lands Road salt impacts in White Ditch, New Buffalo Township Major gas line through many communities in watershed Accidental highway and	• Increase the number of educated urban property owners who understand the importance of reducing volume and velocity of runoff • Increase citizen knowledge about benefits of integrated pest management and the safe use of pesticides among property owners • Increase the number of small and medium size producers who complete chemical storage and handling assessments, particularly in areas with high water tables, porous soils, and those near surface or sensitive water resources • Increase the effectiveness of existing hazardous waste collection

Table 2.1 - Potential Goals and Objectives

Long-Term Goals	Pollutants of Concern	Sources and Causes	Short-Term Objectives
		railway spills	programs and develop new ones if they don't exist • Increase the number of well-managed DPW waste, chemical, and salt storage areas • Increase the amount of pervious surfaces set aside to reduce the volume and velocity of storm water runoff entering surface waters in urban and developing areas • Reduce the number of illicit discharges • Increase the number of people who understand proper spill response procedures • Increase the number of government employees that apply the appropriate amount of road salts such that road commissions and DPWs, address surface water impacts of road salt runoff
No. 3 Reduce SESC by site remediation, controlling pathways, and preventing or minimizing sources so that surface water functions and uses are not impaired and aesthetics are improved	**Sediment**	Lack of stream buffers Indian Trail ravine erosion site Soil erosion on the banks of the St. Joseph River Road/stream crossings Conventional tillage practices Construction sites Increased impervious surfaces High velocity flows	• Increase training for planning departments, road commissions, building/permitting officials, consultants, and contractors so that soil erosion control BMPs are considered as an integrated part of the site planning and design process • Increase land owner knowledge and use of soil erosion reduction and runoff control techniques on agricultural land • Increase knowledge of sediment sources at crossings by inspecting road-stream crossings and calculating sediment loads to establish a baseline and prioritize sites for future improvement • Increase the number of educated urban property owners who understand the importance of reducing volume and velocity of runoff • Increase the number of shoreline protection and restoration educated riparian landowners (both private and public) in prioritized, targeted areas

Table 2.1 - Potential Goals and Objectives

Long-Term Goals	Pollutants of Concern	Sources and Causes	Short-Term Objectives
			• Increase the amount of pervious surfaces set aside to reduce the volume and velocity of storm water runoff entering surface waters in urban and developing areas • Reduce the number of log jams, according to woody debris management principles, that are causing flow diversions and streambank erosion • Increase the amount of state and local funding for enforcement of SESC
No. 4 Reduce the amount of **nutrient loading** by site remediation, controlling pathways, and preventing or minimizing sources so that surface water functions and uses are not impaired and aesthetics are improved	**Nutrients**	Lack of maintenance of septic systems Residential and agricultural fertilizer over-applications Golf course nutrient management	• Increase property owner awareness about the value of properly designed, installed, and maintained septic systems, particularly in areas with high water tables, porous soils, and those near surface water and storm sewers; upgrade or replace failing or faulty OSDS • Increase the number of educated urban property owners who understand the importance of reducing volume and velocity of runoff • Increase the number of small and medium size producers that have CNMPs • Increase the amount of pervious surfaces set aside to reduce the volume and velocity of storm water runoff entering surface waters in urban and developing areas • Increase knowledge and use of soil erosion reduction and runoff control techniques on agricultural land, such as filter strips and fencing • Increase the number of revised local weed and phosphorus limiting ordinances in urban areas to encourage phosphorus free fertilizers, the reduction of lawn areas, and the use of natural landscaping and native plants

Table 2.1 - Potential Goals and Objectives

Long-Term Goals	Pollutants of Concern	Sources and Causes	Short-Term Objectives
No. 5 Increase preservation, restoration, protection, and appreciation of **open space and coastal zones** and implement actions that restore, enhance, and sustain the health, biodiversity, and productivity of the ecosystem (a system of natural areas, wildlife habitats, corridors, farmland, open land, and parklands)	**Degradation of Habitat**	Development, urban sprawl Sediment and other pollutants Land use practices Mining and logging	• Increase the number of educated local planning officials about water quality issues, smart growth, and the protection of natural resources through coordinated planning, zoning, and ordinances • Increase public understanding about basic water quality issues, including the economic benefits of natural systems and open space (e.g. flood control, groundwater filtration, recreation, tourism, air purification, higher property values) • Increase public knowledge about land conservation/stewardship efforts and tools • Improve environmental education resources to K-12 teachers • Increase the number of shoreline protection and restoration educated riparian landowners (both private and public) in prioritized, targeted areas • Increase the use of drain maintenance techniques which maintain canopy on south and west sides of drains • Increase awareness of coastal area problems
No. 6 Minimize **hydrologic impacts of development**, maintain water levels high enough for navigation, and reduce flooding impacts	**Unstable hydrology**	Storm water overflow discharges High flows and flooding Unmanaged irrigation and withdrawals	• Improve river hydraulics by following recommendations from Galien River hydrologic and hydraulic model • Reduce irrigation in certain areas where flow must be maintained • Increase the number of delineated floodplains for communities to use in developing ordinances • Increase the number of communities with storm water management criteria for new developments or have county drain commissioner conduct review of new developments

Table 2.1 - Potential Goals and Objectives

Long-Term Goals	Pollutants of Concern	Sources and Causes	Short-Term Objectives
			• Increase the number of ordinances encouraging LID practices
No. 7 Maintain management practices for controlling **invasive and exotic species** and prevent more from entering the watershed	**Degradation of Habitat**	Recreational boating and vehicles Bailing water and bait buckets Wildlife transmission Ornamentals Farming practices	• Increase support of U.S. Coast Guard and other educational programs about invasive species • Increase invasive species control through biological, manual, and chemical measures • Increase the number of people aware of native plantings as a landscape alterative
No. 8 Remove **obstructions and garbage** in identified problem areas and restore open channels to navigational uses by selectively removing obstructions	**Obstructions**	Log jams Litter on the banks of the St. Joseph	• Increase the number of volunteer stream cleanups • Improve understanding of the public navigational needs • Reduce the number of log jams, according to woody debris management principles

DPW = Department of Public Works
SESC = Soil Erosion and Sedimentation Control
OSDS = Onsite Disposal System
CNMP = Comprehensive Nutrient Management Plan
CSO = Combined Sewer Overflow
CNMP = Comprehensive Nutrient Management Plans
BMP = Best Management Practice
LID = Low Impact Development

CHAPTER 3 - ACTIONS, EVALUATION, MILESTONES, AND COMMITTMENTS TO MEET GOALS AND OBJECTIVES

3.0 SELECTION OF BEST MANAGEMENT PRACTICES

The Watershed Committee identified many best management practices (BMPs) associated with the objectives as recommendations for communities and entities to implement. The Watershed Committee combined, categorized, and defined those BMPs to come up with a list of actions and BMPs that relate to each objective, thereby enabling communities and entities to more easily focus efforts on their priorities.

Pollutants identified in the earlier chapters are most often by-products of human impact on the land that makes up the Lower St. Joseph/Galien River Watershed (Watershed). In order to protect and restore the waterways, the impact of these human activities must be minimized; either by actions that result in changes in behavior or through the use of BMPs. Actions can include policy implementation and educational programs. BMPs are practices selected to address specific environmental issues and can be implemented individually or in a series to address impairments within the Watershed. Some BMPs are better suited to newly developing communities, while others are more applicable to established urban areas. Rural and agricultural BMPs are often dissimilar to urban BMPs, but rely on many of the same concepts.

3.1 BEST MANAGEMENT PRACTICES

Actions and BMPs can be structural, vegetative, or managerial practices, and educational programs that reduce sources of pollutants from both urban and rural areas. A list of actions and BMPs was prepared and reviewed by the Watershed Committee that included the characteristics to be considered in their selection as an appropriate practice for a particular site. The structural and vegetative BMPs listed in Table 3.1 include practices of pretreatment, detention/retention, vegetated treatment, infiltration, filtration, and agricultural. A similar spreadsheet was developed for managerial and educational actions (Table 3.2), which include practices of agricultural, zoning ordinances/land use policies, recycling/composting, turf management, operations and maintenance, education, and municipal operations.

Table 3.1 - Structural and Vegetative Best Management Practices

Best Management Practice	Description	Pollutant Addressed	Pollutant Removal Efficiency	Potential Sources of Pollutants	Additional BMPs to Complete Treatment Train	Expected Life Span	Maintenance Requirements	Training Requirements	Applicability to Site	Environmental Concerns	Hydrologic Effects to Consider	Installation Costs	Operation and Maintenance Costs	Special Considerations	MDEQ/NRCS Link
Pretreatment (e.g., sediment traps, drainage channels, water quality inlets)															
Catch Basin Inlet Devices	Devices that are inserted into the storm drain inlets to filter or absorb sediment, pollutants, and sometimes oil and grease. The capture of hydrocarbons can be enhanced with the use of absorbents.	Solids, sediments	Moderate to high; 70% of total suspended solids (5); <20% of total phosphorous. Assume same as Hydrodynamic Separators.	Storm water runoff	Catch basin cleaning program	2 - 5 years	High; Remove and dispose of sediment, trash and debris, and change filters as needed (approximately every 6 months)	Low/moderate	Needs less than 5 acres of drainage area	Proper disposal of sediment		$50 - 1,500 (5)	$300/Catch Basin/year (5)	Useful for retrofit	
Permanent Sediment Basin (including forebays)	Man-made depression in the ground where runoff water is collected and stored to allow suspended solids to settle out. May have inlet and outlet structures to regulate flow.	Sediments, solids	Moderate to high; 50% of Total Suspended Solids(4); <20% of Total Phosphorous (4)	Storm water runoff	Detention/Infiltration	50+ years	Moderate; Remove and dispose of sediment, trash and debris, and repair erosion.	Low	Use for large drainage areas (≥ 1 acre), at storm sewer outfalls, may be included with detention pond, and to collect overland flow.			Low; Capital Cost: $0.60/cft of storage volume excluding land purchase. (1)	7% of capital cost/year. (1)	Not always aesthetically pleasing	http://www.deq.state.mi.us/documents/deq-swq-nps-sb.pdf
Combination curb with water spreader and vegetated swale	Curb with cut outs. Storm water is directed off the street at the cut out areas (not spillways).	Sediments, water volumes	High; 80% of total suspended solids. 50% of total phosphorous.	Storm water runoff	Vegetated swale, detention pond	30+ years (6)	Moderate; Remove and dispose of sediment, trash and debris, and repair erosion.	Low			Capacity must be equal to swale or channel	Moderate	Low	Need to stabilize cut out sections behind curb to prohibit soil erosion. Requires a vegetated swale behind the curb and street sweeping.	
Check dams, Grade control structures (NRCS practice 410)	Stones, sandbags, or gravel generally used to stabilize grades in natural or artificial channels by carrying runoff from one grade to another. Designed to prevent banks from slumping, reduce runoff velocity, and prevent channel erosion from an excessive grade.	Sediment and attached pollutants, hydrologic flow	High (classic gully erosion) (12) Moderate (streambank erosion) (12) Low (runoff/ flooding) (12)	Streambank erosion, soil erosion, storm water runoff	Buffer/filter strips, grassed waterway, diversion, critical area planting	20+ years	Low. Periodic inspections. Repair/replace failing structures. Address any vegetation and erosion plems.	Moderate. Design and installation should be done by a registered professional engineer	Widely applicable to erosive areas with an excessive grade. Place in drainage channel.	Concentrated flows may cause erosion downstream - discharge point should be investigated.	Cause backwater effect; slows down water velocities; capacity equal to channel	Low to moderate. $3,500 - $4,500/structure or $1,300/vegetated chute (9) - EQIP, WHIP	Low. $26 - 90 structure (9)	Use native grasses when planting filter strip. Easements or permits may need to be obtained.	http://www.deq.state.mi.us/documents/deq-swq-nps-cd.pdf
Hydrodynamic Separator Units (Continuous Deflective Separation (CDS) Units, Stormceptors, Vortechnics, Downstream Defender)	Precast, flow-through, underground units that capture sediments, debris, and oils (in some units). The capture of oils can be enhanced with the use of absorbents. (CDS, Vortechs, Downstream Defender, Stormceptor)	Sediment, solids	Effective; 60% TSS Removal (1); <20% of total phosphorous (4)	Storm sewer system	Street sweeping, stream protection practices	50+	Moderate; Remove and dispose of sediment, trash and debris	Minimum	Use for small drainage areas (≤ 1 acre) with high pollutant loads, in line with storm sewer system, and to collect overland flow	Proper disposal of sediment	Catches first flush. High flows by-pass unit through pipe system	High. $15,000 per acre of impervious (2); 6,000/cfs capacity	$500 practice (2); $1,000/year (3)	Placed upstream of storm sewer discharge. Unit is below grade. Need to allow access for cleaning the chambers.	http://www.deq.state.mi.us/documents/deq-swq-nps-ogs.pdf

Table 3.1 - Structural and Vegetative Best Management Practices

Best Management Practice	Description	Pollutant Addressed	Pollutant Removal Efficiency	Potential Sources of Pollutants	Additional BMPs to Complete Treatment Train	Expected Life Span	Maintenance Requirements	Training Requirements	Applicability to Site	Environmental Concerns	Hydrologic Effects to Consider	Installation Costs	Operation and Maintenance Costs	Special Considerations	MDEQ/NRCS Link
Ponded Type Detention Basin (wet pond)	Small, man-made basin to maintain a permanent pool of water with emergent wetland vegetation around the bank. Designed to capture and remove particulate matter, nonsoluble metals, organic matter and nutrients through settling. It generally has inlet and outlet structures to regulate flow.	Sediment; nutrients; hydrologic flow	Moderate; 80% of total suspended solids (4) 50% of total phosphorous (4). Of the detention/ retention basins, this practice may be the most effective in removing pollutants.	Storm water runoff	Sediment forebay or other form of pretreatment, riprap, sediment basin, filter	50+ years (1,6)	Low; remove and dispose of sediment, trash and debris; repair erosion; and plant replacement vegetation as needed.	Low; design and installation should be done by a professional	Use for large drainage areas (≥ 10 acre), at storm sewer outfalls, and to collect overland flow. Ponds generally will not work in soils with high infiltration rates.	Possible downstream warming; low bacteria removal; West Nile Virus (aerator can remove threat of West Nile Virus)	Provides full control of peak discharges for large design storms.	Low to moderate; $1/cft of storage volume, excluding land purchase (1)	5% of capital cost/year. (1)	Need available land area, can include sediment forebay, requires more planning, maintenance and land to construct.	http://www.deq.state.mi.us/documents/deq-swq-nps-wdb.pdf
Dry Detention Basin	Small, man-made basin designed to capture and remove particulate matter. It generally has inlet and outlet structures to regulate flow, but is dry for most of the year.	Sediment; hydrologic flow	Moderate; 80% of total suspended solids (4) 50% of total phosphorous (4)	Storm water runoff	Sediment forebay or other form of pretreatment	50+ years	Low; remove and dispose of sediment, trash and debris; repair erosion.	Minimum	Needs land that will allow inlet at a higher elevation than outlet	Low bacteria and nutrient removal. If vegetation is not maintained, erosion and resuspension will occur.	Reduced peak flows and no standing water	Low to moderate	Low to moderate	Basin grading very important to prevent pools of standing water.	
Extended Detention Basin	Extended detention basins are designed to receive and detain storm water runoff for a prolonged period of time, typically up to 48 hours. Benefits include: receives and detains storm water runoff, minimizes downstream erosion, reduces flooding, and provides enhanced pollutant removal.	Sediment and attached pollutants, nonsoluble metals, nutrients, hydrologic flow	Moderate to high	Storm water runoff	Riprap, grassed waterways, sediment basins		Moderate to high	Mow buffer/filter strip, remove debris and inspect basin regularly during wet weather, and remove sediment from basin every 5-10 years.	Depends on infiltration rates and soil permeability	Can significantly warm the water in the marsh area over a short period of time	Designed to receive and detain storm water runoff for a prolonged period of time. Outlet device regulates the flow from the basin.			Determine site location of BMP through a hydrologic analysis. Designed as either single stage or two-stage. Need spill response plan.	http://www.deq.state.mi.us/documents/deq-swq-nps-edb.pdf
Parking lot storage	Storage of storm water on parking lots is used primarily to reduce the peak discharge of storm water from the surrounding area during moderate storms. Will reduce peak runoff from small sites and provide some flood storage. This helps reduce stream bank erosion and flooding.	Sediment and attached pollutants, hydrologic flow		Storm water runoff, soil erosion	Grassed waterway, porous or modular pavement, infiltration trench, buffer/filter strip, street sweeping		Low to moderate - sweep and clear debris from the parking lot after storms. Regularly inspect and clean the release drain.	Design and installation should be done by a professional	This BMP will work best in areas that do not have a steep slope. Parking lot slope should be 1% or less.	Because detention time is small, only some large solids will settle. Solids must be removed often to prevent resuspension.	Reduces peak runoff from small sites, provides some flood storage, and reduces flooding.			A spill response plan must be developed. BMP is most effective when used with other BMPs that allow for infiltration or sediment trapping.	http://www.deq.state.mi.us/documents/deq-swq-nps-pls.pdf

Table 3.1 - Structural and Vegetative Best Management Practices

Best Management Practice	Description	Pollutant Addressed	Pollutant Removal Efficiency	Potential Sources of Pollutants	Additional BMPs to Complete Treatment Train	Expected Life Span	Maintenance Requirements	Training Requirements	Applicability to Site	Environmental Concerns	Hydrologic Effects to Consider	Installation Costs	Operation and Maintenance Costs	Special Considerations	MDEQ/NRCS Link
Water and Sediment Control Basin (638)	An earth embankment or a combination ridge and channel generally constructed across the slope and minor watercourses to form a sediment trap and water detention basin. Improves water quality by trapping sediment on uplands and reducing gully erosion. Grass cover may provide wildlife habitat. Dissolved substances, such as nitrates, may be removed from discharge to downstream areas because of the increased infiltration.	Sediment and attached pollutants, nutrients, hydrologic flow	High (gully erosion) (12) Moderate (runoff/ flooding) (12) Low (streambank erosion) (12)	Soil erosion, agricultural runoff	Nutrient management, terraces, grassed waterways, contouring, conservation cropping system, conservation tillage, and crop residue management	10 years (9)	Reseed and fertilize as needed. Check basins after large storm events and make necessary repairs.	USDA Natural Resources Conservation Service (NRCS) available for assistance	Widely applicable.	Over application of fertilizer possible.	Traps storm water runoff and prevents it from reaching lowlands. Moderate decrease in runoff/flooding. Slight increase in excess subsurface water. (12)	$4,000 - $8,000/basin (11)	$80 - $160 per unit (11)	Basin must be large enough to control the runoff from a 10-year storm without overtopping.	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/638.pdf
Regional Detention	Large, man-made basin designed to capture and remove particulate matter. It generally has inlet and outlet structures to regulate flow from large drainage areas.	Sediment; nutrients; hydrologic flow	High	Storm water runoff	Sediment forebay or other form of pretreatment	50+ years	Low; remove and dispose of sediment, trash and debris; repair erosion.	Experienced Professional Engineer	Use for large drainage areas (≥ 1 acre)	Possible downstream warming; low bacteria removal; West Nile Virus	Reduced peak flows, storage	High	Low to Moderate	Need available land area, can include sediment forebay. Fishing concerns possibly	
Constructed Wetland	Excavated basin with irregular perimeters and undulating bottom contours into which wetland vegetation is placed to enhance pollutant removal from storm water runoff.	Sediment, nutrients, bacteria	Moderate to high depending on season; 80% of total suspended solids (4) 50% of total phosphorous (4)	Storm water runoff	Sediment forebay or other form of pretreatment	50+ years (1)	High; remove and dispose of sediment, trash and debris; repair erosion.	Moderate to High	Significant land use requirement; needs appropriate soils, slope, and hydrology	Potential for nutrient release in winter months	Slows flow and reduces peak flow	Moderate to High; $500 - $1000 excluding purchase of land (3)	2% of capital cost/year (1)	2% of drainage area needs to be wetland for efficient pollutant removal. Harvesting may be necessary if plants are taking up large amounts of toxics. Needs supplement water to maintain water level.	http://www.deq.state.mi.us/documents/deq-swq-nps-conw.pdf

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Restored Wetland (NRCS practice 657)	Rehabilitation of a drained or degraded wetland where hydrology and the vegetative community are returned to their natural condition to the extent practicable. Provides natural pollution control by removing pollutants, filtering and collecting sediment, reducing both soil erosion and downstream flooding, and recharging groundwater supplies.	Sediment and attached pollutants, nutrients, hydrologic flow, bacteria, chemicals	Moderate to high (depending on season); 80% of total suspended solids from sheet, rill, wind, or ephemeral gully erosion (4) 50% of total phosphorous (4).	Storm water runoff, soil erosion	Sediment forebay or other form of pretreatment. In agricultural areas cattle exclusion fencing, buffer/filter strip, grassed waterway	50+ years (1)	High; remove and dispose of sediment, trash and debris, and repair eroded areas.	Moderate to High Design and installation should be done by a professional	Site must have previously been a wetland	Can increase water temperature. Potential for nutrient release in winter months	Stores storm water and may reduce downstream runoff and flooding. Slows flow and reduces peak flow.	Low: $650 cost to landowner if wildlife organization involved. Break tile and build berm. $2,000/acre (scwmp)	13% - 40% of original cost (11)	Many wetlands release water slowly into the ground which recharges groundwater supplies. One acre of wetland can store up to 1.5 million gallons of floodwater (enough to fill 30 Olympic size swimming pools) (EPA, 2002)	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/657.pdf
Rain Gardens and other "Landscaping for Water Quality" techniques	Small, vegetated depressions used to promote infiltration and evapo-transpiration of storm water runoff. A rain garden combines shrubs, grasses, and flowering perennials in depressions that allow water to pool for only a few days after a rain. Landscaping for water quality involves planting native gardens in place of turf grass using native grasses, sedges, and wildflowers. Protects water quality, captures rainwater, reduces flooding, eases soil erosion, increases infiltration, and requires less fertilizer and water to thrive.	Sediment and attached pollutants, nutrients, thermal pollution, solids, chemicals, oils, salt, hydrologic flow	High; 75% - 90% of total suspended solids. (3) (8) 75% of total phosphorous. (8)	Storm water runoff, fertilizers	Mulching	Assume 25 years, based on rain gardens installed in the early 1990s in Prince George County, MD which are still functioning. Depends on plant types and owner maintenance.	Low to Medium; remove and dispose of sediment, trash, and debris, repair erosion, re-vegetate, and weed, water, and mulch, annually. Soil replacement and additional preparation are sometimes needed for success. A mulch of shredded hardwood is an integral part of the rain garden to keep the soil moist and ready to soak up rain, and low maintenance.	Moderate, initial work to establish plant community. Aesthetic maintenance after initial establishment of rain garden. Center for Environmental Study, Master Gardeners Program, West Michigan Environmental Action Council available for assistance.	Site specific, depends on soils. Use for drainage areas ≤ 5 acres (8), at storm sewer outfalls, and to collect overland flow. Highly suitable for residential areas, not on steep slopes	Introduction of exotic/invasive plant species possible. Landowner may treat vegetation with herbicides or pesticides which could be carried via runoff to surface waters.	Will reduce the velocity of storm water runoff and increase infiltration	$1,075 - $12,355/ rain garden (dependent on surrounding land use) $9,275 and $9,020 at (2) Michigan site in 2007 determine price per sq. ft.	Low. Assume $100/year; similar to yearly landscaping maintenance	Use native plant species. Soils adequate for infiltration are required. Cold climates may reduce evapotranspiration and infiltrative capacity. Practice not suitable for slopes greater than 20% (1). Pretreatment (sediment basin) needed in high sediment load areas. Not used in wellhead protection areas.	

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Vegetated Buffers or Filter Strips (NRCS Practice 393A)	A buffer/filter strip is a vegetated area adjacent to a water body. The buffer/filter area may be natural, undeveloped land where the existing vegetation is left intact, or it may be land planted with vegetation. Practice protects water bodies from pollutants such as sediment, nutrients and organic matter, prevents erosion, provides shade, leaf litter, and woody debris. Buffer/filter strips often provide several benefits to wildlife, such as travel corridors, nesting sites and food sources.	Sediment and attached pollutants, nutrients, thermal pollution	High to Moderate (streambank erosion) (12) Insignificant (runoff/ flooding) (12)	Runoff from parking lots, roof tops, and outflow from ponds, soil erosion, agricultural runoff	Conservation tillage in agricultural areas	10-20 years (9)	Low. Perform periodic inspections to identify concentrated flows and to verify that vegetative cover is maintaining its effectiveness. Address stream bank erosion if identified. Damaged areas should be repaired.	Low. NRCS available for assistance	Widely applicable		Will reduce the velocity of storm water runoff and increase infiltration.	Low. $120 - $240/acre (10). $250/ herbaceous acre (11) - Conservation Reserve Program (CRP), Environmental Quality Management Program (EQIP)	Low. $2.40 - $4.80/acre (9)	Several researchers have measured >90% reductions in sediment and nitrate concentrations; buffer/filter strips do a reasonably good job of removing phosphorus attached to sediment, but are relatively ineffective in removing dissolved phosphorus (Gilliam, 1994).	http://www.deq.state.mi.us/documents/deq-swq-nps-bfs.pdf ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/393.pdf
Forested or Wooded Riparian Buffer (NRCS practice 391)	Forested or wooded areas adjacent to stream	Sediment and attached pollutants, nutrients, thermal pollution	High (sheet, rill, wind, streambank, soil mass movement, road bank/ construction erosion; organics, fertilizers, pesticides, runoff/ flooding) (12)	Runoff from parking lots, roof tops, and outflow from ponds, soil erosion, storm water runoff	Filter strip	15 years (9)	Low. Perform periodic inspections to identify concentrated flows and to verify that vegetative cover is maintaining its effectiveness. Address stream bank erosion if identified. Damaged areas should be repaired.	Moderate to High. NRCS/Michigan Department of Agriculture (MDA) available for assistance	Widely applicable	Poor or lack of maintenance may cause increased erosion if trees fall into stream	Trees in the floodplain may catch debris and impede flow.	Low. $475/forrested acre (11) - CRP, EQIP $565	1% of original cost (11) $11.30 per acre	Keep south and west sides of streams wooded to provide shade. Several researchers have measured >90% reductions in sediment and nitrate concentrations; buffer/filter strips effectively remove phosphorus attached to sediment, but are relatively ineffective removing dissolved phosphorus (Gilliam, 1994).	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/390.pdf
Two-stage channel design	A practical procedure that can be used to correctly size the stream channel and minimum bench widths for stable, effective discharge in agricultural drainage ditches. The bench of a two-stage ditch acts as a floodplain within the ditch to dissipate energy, reduces the erosive potential of high	Sediment, hydrologic flow		Agricultural runoff	Filter/buffer strips		May require less maintenance then conventional ditches.	The Nature Conservancy has information available for assistance.	Widely applicable.		Two-stage ditches have improved conveyance capacity compared to conventional ditches and enhance drainage	In comparison to conventional ditches, additional costs are related to increased width and more initial earthwork.	May result in less annual Operation & Maintenance(O&M) costs then conventional ditches.	Evidence and theory both suggest that ditches prone to filling with accumulated sediment may require less frequent "dipping out" if constructed in a two-stage form.	

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	flow volumes, and reduces the shear stress on the bank toe. Two-stage ditches will have improved conveyance capacity, will be more self sustaining, will create and maintain better habitat, and will improve water quality.														
Infiltration Trench	An excavated trench (3 - 12 feet deep), backfilled with stone aggregate, and lined with filter fabric. Infiltration trenches remove fine sediment and the pollutants associated with them.	Nutrients, sediment, metals, hydrologic flow (soluble pollutants - dependent on holding time)	High; 100% of total suspended solids (4); 60% of total phosphorous.	Storm water runoff	Sediment basin, buffer/filter strips, oil/grit separators	Short; 10 years or less (1)	Low to Moderate - Annual; Remove and dispose of sediment, trash and debris. Eroding or barren areas must be re-vegetated.	Moderate. Design and installation should be done by a professional	Site specific; depends on soils. Soil infiltration rates must be greater than 0.52 inches per hour, with clay content less than 30%.	If storm water runoff contains high amounts of soluble contaminants, groundwater contamination can occur.	Provides full control of peak discharges for small sites, provides groundwater recharge, may augment base stream flow, and allow infiltration.	Moderate; average $8/cubic feet of storage (1)	9% of capital cost (1)	Avoid areas with potential hazardous material contamination. Soils with high infiltration rates required. Cold climates may hinder infiltrative capacity, fines will clog pore space in soil, and practice is not suitable for steep slopes. Use as part of a "treatment train," where soluble organic substances, oils, and coarse sediment are removed prior to storm water entering the trench. A very high failure rate occurs with infiltration trenches if they are not maintained.	http://www.deq.state.mi.us/documents/deq-swq-nps-it.pdf
Infiltration Pond	Water impoundment over permeable soils which receives storm water runoff and contains it until it infiltrates the soils.	Nutrients, sediment, metals	High	Storm water runoff	Sediment forebay or other form of pretreatment	25+ years	Annual	Moderate	Site specific depends on soils	Potential to contaminate groundwater	May recharge groundwater	Moderate	Moderate	Avoid areas with potential hazardous material contamination	http://www.deq.state.mi.us/documents/deq-swq-nps-ib.pdf
Porous or Modular Pavement	Permeable asphalt or interlocking paving blocks providing infiltration. When the brick or concrete is laid on a permeable base, water will be allowed to infiltrate. Benefits include: removal of fine particulates and soluble pollutants; attenuation	Nutrients, sediment, metals, hydrologic flow	High; 95% TSS removal rate (2)	Storm water runoff	Vacuum sweeping, subsurface drains, extended detention basin, infiltration basin.	10+ years	Moderate; Bi annual sweeping required. Periodically inspect, especially after large storms. If severe clogging occurs, may have to replace	Low. Design and installation should be done by a professional	This practice should only be used on sites with soils which are well or moderately well drained. Must use special materials for high traffic areas	Potential risk to groundwater due to oils, greases, and other substances that may leak onto the pavement and leach into the ground.	Provides soil infiltration, attenuation of peak flows, reduction in the volume of runoff leaving the site and entering storm sewers, and groundwater	Moderate	Low to Moderate	Pretreatment of storm water is recommended where oil and grease or other potential groundwater contaminants are expected. Avoid areas with potential hazardous material	http://www.deq.state.mi.us/documents/deq-swq-nps-pap.pdf

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	of peak flows; reduction in the volume of runoff; reduction in soil erosion; and groundwater recharge.						filtering material.				recharge.			contamination	
Vegetated Swale or Bio-filtration	A broad, shallow channel consisting of dense vegetation and designed to accommodate concentrated flows without erosion.	Sediment	High; 75% - 80% of total suspended solids (2)(4); 50% of total phosphorous (4)	Storm water runoff	Native vegetation	20-50 years	Moderate; remove and dispose of sediment, trash and debris, and repair erosion.	Moderate	Highly applicable to residential areas, not suited to steep slopes	Potential to contaminate groundwater	Slows flow, promotes sediment deposition	Low; $0.50/square foot of swale (7)	$0.03/square foot/year. (7)	Does not require a large land area. Should not be used in steep areas or well head areas. Soils adequate for infiltration required to discourage ponding on slopes less than 2%.	
Sand Filters	Area designed to hold and treat the first half inch of runoff discharging from an adjacent impervious area.	Sediment, bacteria, nutrients, metals	Moderate; 83% TSS removal rate (2)	Storm water runoff		Yet to be determined	Moderate to high depending on amount of sediment	Moderate	Suitable for individual developments; requires less land and can be placed underground.	Will not filter soluble nutrients and toxics		Low to moderate	5% of initial construction costs (1)	BMP performance is still experimental	
Cattle Exclusion (NRCS Practices: Use Exclusion (472), Fence (382))	Fencing to exclude cattle from waterbodies and protect streambanks. Fencing prevents cattle from trampling banks, destroying vegetation, depositing waste in the stream, and stirring up sediment in the streambed.	Sediment and attached pollutants, nutrients, pathogens	Moderate to High (12)	Livestock access, animal manure	Buffer/filter strip, alternative water sources for livestock, planned grazing system, stream crossing and livestock access	10 years (use exclusion) (15) 20 years (fence) (9)	Repair fence as needed. Remove off-stream watering systems in the winter, if needed.	NRCS available for assistance	Widely applicable	Increased grazing in confined areas may reduce vegetative cover	Fencing in floodplain may catch debris and restrict flow	$2.00/ft of fence (9) - EQIP (use exclusion) Wildlife Habitat Incentive Program (WHIP) (fence)	$0.05/ft of fence (9) $0.04/ft	Additional BMPs (e.g. Buffer/Filter Strips) are needed to prevent animal waste runoff from entering the stream.	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/472.pdf ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/382.pdf
Agricultural Waste Storage Facility (313)	A waste storage impoundment that protects water bodies from manure runoff by storing manure until conditions are appropriate for field application. Several options exist including an earthen storage pond, above or below ground tank, pit underneath a confinement facility, or a sheltered concrete slab area. Allows for field application when	Nutrients, pathogens	Moderate (organics (12), fertilizers (12), and polluted storm water runoff)	Animal manure	Cattle exclusion fencing, roof runoff management, diversion, Comprehensive Nutrient Management Plan (CNMP)	15 years (15)	Inspect storage structures for leaks or seepage periodically and make necessary repairs. Repair any damaged fences immediately. Empty storage structure twice a year.	NRCS available for assistance	Widely applicable	Leaks or seepage of the structure could add nutrients and bacteria to downstream water bodies via runoff. However, if building is according to specifications this would not occur.		Approximately $10,000 - 250,000 (14) - (12) - EQIP	$250 - 1,000 maximum (14)	Storage period should be 6 months unless winter applied risk index is completed	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/313.pdf

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	conditions are right. Field application cuts fertilizer costs and reduces nutrient losses.														
Alternative Water Sources (Watering Facility (614), Water Well (642))	A readily available source of clean drinking water for cattle located away from water bodies. Reduces the direct deposition of cattle waste into water bodies by changing animal behavior through providing alternate drinking water.	Sediment and attached pollutants, nutrients, pathogens		Livestock access, animal manure	Cattle exclusion fencing, buffer/filter strip, planned grazing system, stream crossing and livestock access	10 years / watering facility (15) 20 years / water well (15)	Watering facility: check for materials in the trough which may restrict the inflow or outflow system; check for leaks and repair immediately; check the automatic water level device to insure proper operation. Water well: create a maintenance plan including a log of identified problems, corrective actions taken, etc.	NRCS available for assistance	Widely applicable	Depending on the structure, it may not protect watercourse if contiguous with it	Diversion of water	$4,500/ water facility (11) - EQIP	$90 per unit	Areas adjacent to source that will be trampled by livestock should be graveled, paved, or otherwise treated to provide firm footing and reduce erosion.	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/614.pdf ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/642.pdf
Cover Crop (340)	A crop of close-growing, grasses, legumes, or small grain grown primarily for seasonal protection and soil improvement. It usually is grown for 1 year or less, except where there is permanent cover as in orchards. Temporarily protects ground from wind / water erosion, adds organic matter to the soil, recycles or holds nutrients, improves soil tilth, reduces weed competition, retained	Sediment and attached pollutants, nutrients, chemicals (pesticide), hydrologic flow, chloride (salt)	High (sheet, rill, wind, gully irrigation induced erosion, runoff/ flooding) (12) Moderate (salts, organics, fertilizers, pesticides) (12)	Soil erosion, agricultural runoff	Pest management, nutrient management, conservation crop rotation, crop residue management	1 year (9)	Plant cover crop annually, kill cover crop in the spring, restrict grazing if necessary	NRCS available for assistance	Widely applicable. Consider soil type, slopes, etc.	Requires pest management (IPM) to ensure that pesticide use is appropriate	Significant decrease in runoff/ flooding, moderate reduction in excess subsurface water	$20/acre (9) - EQIP	$0/acre (9)	Can be used for livestock feed or left alone to build soil organic matter.	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/340.pdf

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	soil moisture by acting as a mulch, and fixes atmospheric nitrogen (legumes).														
Windbreak/ Shelterbelt Establishment (380)	Rows of trees and shrubs that protect areas from wind and provide food and cover for wildlife. Reduces wind erosion, conserves energy, provides food and cover for wildlife, and beautifies a farmstead.	Sediment and attached pollutants	High (wind erosion only) (12)	Soil erosion	Cattle exclusion fencing	15 years (9)	Control competing vegetation, inspect regularly	NRCS available for assistance	Widely applicable	Over application of herbicides or pesticides possible	Will reduce storm water runoff and increase infiltration	$2.00 per ft	$0.40 per ft	Consider if the mature windbreak will cast a shadow over the driveway or nearby road, prolonging icy conditions.	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/380.pdf
Conservation Cover (327)	Establishing and maintaining perennial vegetative cover to protect soil and water resource on land retired from agricultural production. Reduces erosion and increases soil tilth due to perennial cover establishment of species adapted to site. Improves water quality when nutrients and sediments are retained on the field. Reduces weed sources. Wildlife food, cover, and water needs will be met.	Sediment and attached pollutants, hydrologic flow, nutrients	High (sheet, rill, wind, gully erosion; runoff/ flooding) Moderate (streambank erosion) (12)	Soil erosion, agricultural runoff	Upland wildlife habitat management, wildlife food plot, tree/shrub establishment	10 years (15)	If necessary, mow during the establishment period to reduce competition from annual weeds. Annual mowing of the conservation cover stand for general weed control is not recommended. Control noxious weeds.	NRCS available for assistance	Widely applicable	Application of herbicides or pesticides possible concern	Significant decrease in runoff/ flooding, moderate reduction in excess subsurface water	$260 - 460/acre (9) - CRP, EQIP $90 - $260 per acre	$2.40 - $2.80/acre (9)	Use of fertilizers, pesticides and other chemicals should not compromise the intended purpose. Maintenance practices and activities should not disturb cover during the primary nesting period for grassland species in each state.	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/327.pdf
Pasture and Hayland Planting (512)	Planting grass and legumes to reduce soil erosion and improve production in a low-producing pasture, hayfield, or eroding crop field. Reduces soil erosion by wind and/or water, extends length of the grazing season, provides cover and habitat for wildlife, protects water quality by filtering runoff and increasing filtration, and adds organic matter to the soil	Sediment and attached pollutants, nutrients, chemicals (pesticides), hydrologic flow	High (sheet, rill, wind ephemeral gully, irrigation inducted erosion; fertilizers, pesticides, runoff/ flooding) (12)	Soil erosion, agricultural runoff	Nutrient management, pest management, prescribed grazing	10 years (9)	Mow weeds, apply fertilizer and herbicide as needed	NRCS available for assistance	Widely applicable. Consider soil type	Application of herbicides or pesticides possible concern	Significant decrease in runoff/ flooding and excess subsurface water	$75/acre (11) - EQIP, CRP 15 - 240 per acre	5% of original cost per unit (11) .016 - 4.80 per acre	Do not mix warm and cool season grasses in the same pasture. Choose species that will help reduce the use of pesticides and herbicides.	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/512.pdf

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Best Management Practice	Description	Pollutant Addressed	Pollutant Removal Efficiency	Potential Sources of Pollutants	Additional BMPs to Complete Treatment Train	Expected Life Span	Maintenance Requirements	Training Requirements	Applicability to Site	Environmental Concerns	Hydrologic Effects to Consider	Installation Costs	Operation and Maintenance Costs	Special Considerations	MDEQ/NRCS Link
Critical Area Planting (342)	Establishing permanent vegetation on sites that have or are expected to have high erosion rates, and on sites that have physical, chemical or biological conditions that prevent the establishment of vegetation with normal practices. Stabilizes areas with existing or expected high rates of soil erosion by water and wind. Restores degraded sites that cannot be stabilized through normal methods.	Sediment and attached pollutants, salts	High (sheet, rill, wind, gully, streambank, soil mass movement, road bank/construction erosion) (12) Moderate (salts) (12)	Soil erosion, agricultural runoff	Diversions, riprap, grade stabilization structures, filter/buffer strips, subsurface drains, grassed waterways, nutrient management	10 years (9)	Periodic burning (if needed), prohibit grazing until year 2, prevent overgrazing, inspect after severe storms	NRCS available for assistance	Widely applicable. Consider soil type, slopes, etc. Apply on any area which is difficult to stabilize.	Use of non-native or invasive species is not recommended. Use by recreational users may degrade area.	Will reduce the velocity of storm water runoff and increase infiltration.	$460 - $550/acre (2001 and 2004) EQIP, WHIP, WRP	1% of original cost per unit (11) $11 per	Use native plants with low long term maintenance requirements. Soil tests should be done to determine the nutrient and pH content of the soil.	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/342.pdf
Grassed Waterway (412)	The establishment and shaping of grass in a natural drainage way to prevent gullies from forming. Vegetation filters runoff and provides cover for wildlife.	Sediment and attached pollutants, hydrologic flow	High (ephemeral gully erosion) (12) Low (reduction in classic gully erosion, runoff/ flooding) (12)	Soil erosion, agricultural runoff	Grade stabilization structure	10 years (9)	Yearly re-grading, reseeding, and inspection of subsurface drain and related outfall may be needed. Fertilize as needed and mow periodically.	Design and installation should be done by a professional. NRCS available for assistance.	Widely applicable	Better conveyance enhances storm water runoff velocities and possible contamination to surface waters, provides grass filter	Drainage way directs runoff to an outlet	$5,000/acre	$105/acre (9) $100/acre per year	A nurse crop, temporary cover or mulching may be necessary until permanent cover is established. Avoid planting end rows along the waterway.	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/412.pdf
Diversion (362)	Earthen embankment that directs runoff water from a specific area. Reduces soil erosion on lowlands. Vegetation filters runoff water and provides cover. Allows better crop growth on bottomland soils.	Sediment, nutrients, chemicals (pesticide), hydrologic flow	High (ephemeral gully erosion, runoff/ flooding) (12) Moderate (classic gully, soil mass movement, road bank/construction erosion) (12) Low (sheet, rill, streambank erosion, organics, fertilizers, pesticides) (12)	Soil erosion, agricultural runoff	Sediment basin or stabilized outlet, buffer/filter strip, nutrient management	10 years (9)	Clear outlet of debris, maintain vegetative cover on ridge, ridge repair, fertilize as needed	Design and installation should be done by a professional	Widely applicable. Do not build in high sediment producing areas unless other conservation measures are installed.	Over application of fertilizer possible	Catches storm water runoff and prevents it from reaching lowlands, reducing runoff velocity and increasing infiltration	$7/ft	$0.14/ft (9)	Important as Soil Erosion and Sediment Control (SESC) in developing sites. Each diversion must have an outlet.	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/362.pdf

Table 3.1 - Structural and Vegetative Best Management Practices

Best Management Practice	Description	Pollutant Addressed	Pollutant Removal Efficiency	Potential Sources of Pollutants	Additional BMPs to Complete Treatment Train	Expected Life Span	Maintenance Requirements	Training Requirements	Applicability to Site	Environmental Concerns	Hydrologic Effects to Consider	Installation Costs	Operation and Maintenance Costs	Special Considerations	MDEQ/NRCS Link
Abandoned Well Closures (Well decommissioning (351))	Well decommissioning seals an abandoned well. Abandoned wells are wells which are no longer in use or are in such disrepair that groundwater can no longer be obtained from them. Benefits include: a) Reduces the risk of groundwater contamination, b) Eliminates the risk of injury, c) Avoids liability under the Michigan Polluter Pay Law	Sediment and attached pollutants, chemicals, nutrients, chloride (salt), pathogens, hydrocarbons	High (13)	Agricultural runoff, hazardous waste spills	Stand alone practice	20 years (9)		High: professional required. A drilled, deep bedrock and artesian well should be closed by a licensed well driller. Farm*A*Syst available for assistance.	Widely applicable.	Groundwater contamination may already be present.	Will prevent surface water from reaching the groundwater supply via the abandoned well.	$1,000/ closure - Michigan groundwater stewardship program, MDA, EQIP	$20 per yr	Filling a well with rocks/gravel will not reduce the groundwater contamination risk. Technical assistance is required to properly close an abandoned well.	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/351.pdf
Streambank and Shoreline Protection (580)	Treatment(s) used to stabilize and protect banks of streams or constructed channels, and shorelines of lakes, reservoirs, or estuaries, such as bioengineering, rip rap, geotextile materials, and vegetative techniques.	Sediment and attached pollutants	High (streambank erosion, soil mass movement) (12)	Soil erosion	Livestock exclusion, prescribed grazing, buffer/filter strips, diversions, or additional sediment control measures.	20 years (9)	Site inspections conducted to ensure the stream bank structures are staying in place within the first few months of installation and following storm events.	Consult the MDEQ (Water Division or Land Division), local Conservation District, NRCS, or other agencies or consultants.	Widely applicable: site-specific practices will depend on soil type, slope of the bank, river gradient, flow, and uses of the watercourse.		Maintains the capacity of the stream channel.	$85/ft	10% of original cost (11) $1.70 per ft	Since each reach of a watercourse is unique, stream bank protection techniques must be selected on a site-by-site basis; the specifications for each technique differ. Utilize vegetative species that are native and/or compatible with local ecosystems.	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/580.pdf
Dam Removal	Releases made from dams commonly cause a decrease in summer temperatures and an increase in winter temperatures downstream. Dam removal benefits fish by: (a) removing obstructions to upstream and downstream migration; (b) restoring natural riverine habitat; (c) restoring natural seasonal flow variations; (d) eliminating siltation of spawning and feeding habitat above the dam;	Thermal pollution		Dam	Will depend on the effects of dam removal. Streambank stabilization may be necessary.	Permanent		Design and removal should be done by a professional	Widely applicable to unsafe dams and dams that no longer serve a purpose.	Recent studies show removal of small dams can have limited negative environmental impacts while restoring stream functions. Negative impacts include elevated sediment loads in addition to transformed channel morphology and hydrology. Dam removal may also wreak havoc on already	Dam removal will restore natural stream flow and natural seasonal flow variations.	A number of studies (River Alliance of Wisconsin 2003, American Rivers 2003) have found removal costs to be up to 1/3 to 1/5 the cost of repair, especially when the benefits of the dam are minor. Funding sources include: private or community foundation funding,	None	Many aging dams are no longer economically practical or cost effective to operate. Similarly, dam operation and maintenance costs tend to increase as a dam ages. These increased costs, combined with the potentially lower revenue, allow for removal to become the most cost effective alternative for the dam owner. Improves fish passage.	

Table 3.1 - Structural and Vegetative Best Management Practices

Best Management Practice	Description	Pollutant Addressed	Pollutant Removal Efficiency	Potential Sources of Pollutants	Additional BMPs to Complete Treatment Train	Expected Life Span	Maintenance Requirements	Training Requirements	Applicability to Site	Environmental Concerns	Hydrologic Effects to Consider	Installation Costs	Operation and Maintenance Costs	Special Considerations	MDEQ/NRCS Link
	(e) allowing debris, small rocks and nutrients to pass below the dam, creating healthy habitat; (f) eliminating unnatural temperature variations below the dam; and (g) removing turbines that kill fish.									highly disturbed ecosystems. Reservoirs that store high levels of contaminants may release them following dam removal, creating a contaminant plume.		environmental grants, and state or federal assistance programs.			
Stabilized Outlets	Outlets are areas which receive discharge water. Stabilized outlets are outlets which reduce the velocity of discharge water to non-erosive velocities. Stabilized outlets help reduce erosion in the area where water is released. Some outlets may also provide treatment of various types of pollutants. Types of outlets include: conveyance outlets (grassed waterway, stone filters, stormwater conveyance channel); water storage outlets (sediment basin, infiltration basin, detention/retention basin, oil/grit separators, Wet ponds and wetlands); conduits; and outlet protection.	Sediment and attached pollutants, hydrologic flow	Dependent on type of outlet used.	Storm water runoff, streambank erosion	Riprap, if needed	Dependent on type of outlet used.	Requires regular maintenance.	Stabilized outlets should be designed by a registered professional engineer.	Widely applicable.	If outlets are not maintained, excessive sediment may be introduced to surface waters downstream.	Stabilized outlets will reduce the velocity of discharge water to non-erosive levels.	Dependent on type of outlet used.	Dependent on type of outlet used.	If the outlet is a county or intercounty drain, permission to discharge must be obtained from the	http://www.deq.state.mi.us/documents/deq-swq-nps-so.pdf
Emergency Spill Kit	Kit materials capture oil, gasoline, and diesel spills on water.	Hydrocarbons		Boat spill					Applicable to lakes						

Table 3.1 - Structural and Vegetative Best Management Practices

Best Management Practice	Description	Pollutant Addressed	Pollutant Removal Efficiency	Potential Sources of Pollutants	Additional BMPs to Complete Treatment Train	Expected Life Span	Maintenance Requirements	Training Requirements	Applicability to Site	Environmental Concerns	Hydrologic Effects to Consider	Installation Costs	Operation and Maintenance Costs	Special Considerations	MDEQ/NRCS Link
Pond Construction and Management (378)	A water impoundment made by constructing an embankment or by excavating a pit or dugout. Excavated ponds are made for conditions which require a small supply of water such as a golf course hazard. Embankment ponds hold larger volumes of water. Ponds can be used for storm water management and to attract wildlife. Properly designed and maintained embankment ponds provide a safe, reliable means of water supply, and may become the settling area for sediment and contaminants in the drainage area. If water quantity is more critical than quality, runoff can be used to maintain higher pond levels of an excavated pond.	Sediment and attached pollutants, chemicals, nutrients, flooding	Low (gully erosion, streambank erosion, flooding) None (sheet and rill erosion) N/A (chemicals, nutrients)	Storm water runoff	Slope/Shore line Stabilization, Seeding, Mulching, Sodding, Pond Sealing or Lining	20 years (2004)	Moderate to High	Design and installation should be done by a professional	Depends on soil suitability. Build ponds in areas where the water supply is adequate for the intended use.	Purple loosestrife (Lythrum salicaria) is an undesirable, exotic perennial which often becomes established in disturbed sites.	Ponds can be used for storm water management.	$3,500	1% of original cost per unit (2001) 70 per unit	For excavated ponds, consider drainage characteristics, including depth to the water table. For embankment ponds, consider upstream drainage characteristics and how the pond will affect downstream flows, temperatures, etc.	
Composting Facility (317)	A facility for the biological stabilization of waste organic material. The purposed is to treat waste organic material biologically by producing a humus-like material that can be recycled as a soil amendment and fertilizer substitute or otherwise utilized in compliance with all laws, rules, and regulations. Keeps organic debris out of surface waters and away from floodplains, which helps prevent the depletion of oxygen in surface waters.	Nutrients, low dissolved oxygen (DO)		Upland source (yard trimmings and kitchen waste)	N/A	15 years/ composting facility (2004)	Composting requires proper aeration, watering and mixing in order to result in a useable end product. Product can be sold, delivered, and applied.	Design and installation should be done by a professional	Widely applicable to dense residential or riparian sites. Soils, topography and climate will all affect the types of composting options available.	Waste needs to be composted and correctly applied as fertilizer. Runoff from compost application may contaminate surface waters.	N/A	$50,000/ composting facility (2004)	Annual Maintenance $1,000/year composting facility (2004)	As of March 27, 1993, yard waste collected or generated in Michigan on public property is banned from land fills and incinerators.	

Table 3.1 - Structural and Vegetative Best Management Practices

Best Management Practice	Description	Pollutant Addressed	Pollutant Removal Efficiency	Potential Sources of Pollutants	Additional BMPs to Complete Treatment Train	Expected Life Span	Maintenance Requirements	Training Requirements	Applicability to Site	Environmental Concerns	Hydrologic Effects to Consider	Installation Costs	Operation and Maintenance Costs	Special Considerations	MDEQ/NRCS Link
Mulching (484)	The process of placing a uniform layer of straw, wood fiber, wood chips or other acceptable materials over a seeded or landscaped area. Helps keep soil particles and their associated attached chemicals (e.g. phosphorus and pesticides) from entering surface waters. Will suppress weed growth and provide a moist area for vegetative growth.	Sediment and attached pollutants	Low to moderate	Soil erosion	Seeding, soil management, fertilizer management, grading practices, diversions (if needed).	1 year (2004)	Low: inspect mulched areas following storm events to ensure mulch has stayed in place.	Low	Widely applicable	None known.	Seeded area will eventually reduce the velocity and increase infiltration of storm water runoff.	$350/acre (2001)	$0 unless damaged by extreme storm	Mulch should be applied immediately after seeding has occurred. Anchoring of the mulch should be done immediately after the mulch is applied.	
Riprap	A permanent cover of rock used to stabilize stream banks, provide in-stream channel stability, and provide a stabilized outlet below concentrated flows. The use of riprap protects stream banks and discharge channels from higher erosive flow velocities and decreases sediment input to a watercourse.	Sediment and attached pollutants	High	Soil erosion, agricultural runoff	Filters. (Riprap is often used in making stabilized outlets, in stream bank stabilization, etc.)	10 + years (SV)	Low: Periodically inspect underlying fabric, adjust and add riprap as needed.	Low: consult technical resources	Widely applicable: riprap is most often used in stream banks, on slopes, and at outlets.	Potential to cause additional erosion downstream.	Reduces down cutting and lateral cutting of erosive flow velocities. Typically not a significant velocity reducer.	$70/square yard (2003b) Including geotextile		MDEQ permit may be required if placed in waters of the state. Explore downstream impacts.	

*Criteria for Installation Costs and Operation and Maintenance Costs: Low <$500, Moderate $500 - $5,000, High >$5,000

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7. Rouge River National Wet Weather Demonstration Project. Planning and Cost Estimating Criteria for Best Management Practices. April 2001. TR-NPS25.00.
8. Rain Gardens of West Michigan. Beautiful Solutions for Water Pollution. [Online] 2003. Available at http://www.raingardens.org/Index.php
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11. USDA - Natural Resources Conservation Service. Sample County Practice and Maintenance Costs. 2001.
12. USDA - Natural Resources Conservation Service. Conservation Practice Physical Effect Worksheet[s]. 2004.
13. Personal Communication with Technical Committee of the Lower Grand River Watershed Project. 2004.
14. Personal Communication with District Conservationist of the NRCS Grand Rapids Service Center. 2004.
15. USDA - Natural Resources Conservation Service. FY04 Michigan EQIP Statewide Eligible Practice List, Land Management Practices (Incentive Payments). 2004.

See the end of Table 3.2 for acronyms.

Table 3.2 - Managerial Best Management Practices

Best Managerial Practices	Description	Benefit	Pollutant Addressed	Potential Sources of Pollutants	Environmental Impacts and Special Concerns	Comparative Costs	MDEQ/NRCS Link
Agricultural							
Crop Residue Management (329A-C, 344), includes no till, mulch till, ridge till, and seasonal	Leaving last year's crop residue on the surface before and during planting operations, providing soil cover at a critical time of the year. The residue is left on the surface by reducing tillage operations and turning the soil less. Pieces of crop residue shield soil particles from rain and wind until plants can produce a protective canopy.	Ground cover prevents soil erosion and protects water quality. Residue improves soil tilth and adds organic matter to the soil as it decomposes. Fewer trips and less tillage reduce soil compaction.	Sediment and attached pollutants	Agricultural runoff, soil erosion	Consider if crop will produce enough residue. Planning for residue cover should begin at harvest. Time, energy, and labor savings are possible with fewer tillage trips. Equipment for specialized tillage techniques needed. Additional chemical treatments may be necessary to control pests. Assistance available from USDA office or Conservation District. No local government controls in place. Crop reside reduces the velocity of storm water runoff and improves infiltration	$28-36/acre (includes no-till and strip till, ridge till) (11). Maintenance costs are 100% of original cost (11). Environmental Quality Incentive Program (EQIP) (for mulch till, ridge till, and seasonal residue management). Equipment rental or purchase $40+ per acre. Consider costs for pest control.	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/329a.pdf ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/329b.pdf ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/329c.pdf ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/344.pdf
Conservation Crop Rotation (328)	A sequence of crops designed to provide adequate organic residue for maintenance or improvement of soil tilth and fertility. Other BMPs to use include nutrient and pest management, buffer/filter strips, cover crops	Reduces sheet, rill, and wind erosion Maintains or improve soil organic matter content Manages the balance of plant nutrients Improves water use efficiency Manages saline seeps Manages plant pests (weeds, insects, and diseases) Provides food and cover for wildlife Reduces fertilizer needs and may reduce pesticide needs	Sediment and attached pollutants	Soil erosion, agricultural runoff	Rotations that include grains, such as corn, or meadow provide better erosion control. Where excess plant nutrients or soil contaminants are a concern, utilizing deep rooted crops or cover crops in the rotation can help recover or remove the nutrient or contaminant from the soil profile. Over application of fertilizer or pesticide is possible. Plants will reduce the velocity of storm water runoff and increase infiltration.	$4/acre (11) - EQIP	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/328.pdf
Planned Grazing System	Pasture is divided into two or more pastures or paddocks with fencing. Cattle are moved from paddock to paddock based on forage availability and livestock nutrition needs. Other BMPs to use include alternative water source, cattle exclusions, nutrient management, and soil testing	Improves vegetative cover, reduces erosion, and improves water quality by reducing sediment and nutrient runoff. Rotating also evenly distributes manure and nutrient resources.	Sediment and attached pollutants, nutrients, pathogens	Soil erosion, agricultural runoff	Keep fencing secure. Apply fertilizer and nutrients according to soil tests, mow or hay paddocks if needed and update rotation schedule if needed. Practice is widely applicable. Consider adequacy of the mix of grass and legumes to meet livestock needs. Sediment and nutrient runoff is not eliminated just reduced. This practice will increase harvest efficiently and help ensure adequate forage throughout the grazing season.	EQIP can fund establishment. $25/acre for maintenance (14)	
Irrigation Water Management (449)	Determining and controlling the rate, amount, and timing of irrigation water in a planned and efficient manner. Other BMPs to use include nutrient management, pest management, crop residue management, soil conservation measures	Management of the irrigation system should provide the control needed to minimize losses of water and discharge of sediment and sediment-attached and dissolved substances, such as plant nutrients and herbicides.	Sediment and attached pollutants, nutrients, hydrologic flow	Agricultural runoff	Poor management may allow the loss of dissolved substances from the irrigation system to surface or groundwater. There is an insignificant reduction in runoff/flooding and slight reduction in excess subsurface water. Consider the effects irrigation water has on wetlands, water related wildlife habitats, riparian areas, cultural resources, and recreation opportunities.	EQIP can fund establishment.	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/449.pdf
Contour Strip Cropping (585)	Crop rotation and contouring combined in equal-width strips of corn or soybeans planted on the contour and alternated with strips of oats, grass, or legumes. Other BMPs to use include field border, fertilizer management, grassed waterways.	Meadow slows runoff, increases infiltration, traps sediment and provides surface cover. Ridges formed by contoured rows slow water flow which reduces erosion. May reduce fertilizer costs.	Sediment and attached pollutants, hydrologic flow	Agricultural runoff, soil erosion	Keep strip widths consistent from year to year. Make adjustments in rotation schedule if needed. Over application of fertilizer possible, if used. Will reduce the velocity of storm water runoff and increase infiltration. Strip cropping is not as effective if crop strips become too wide, especially on steep slopes.	$10/acre (9) - EQIP	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/585.pdf
Contour Farming (330)	Hillsides are cultivated and planted in rows along the hillside contour, not up and down the hill. Crop row ridges on the contour create hundreds of small berms. Other BMPs to use include field border, grassed waterways, and terraces or strip cropping if needed.	Reduces sheet and rill erosion and transport of sediment and other water-borne contaminants. Ridges built by tilling and planting on the contour, slow water flow and increase infiltration, which reduces erosion by as much as 50% from up and down hill farming.	Sediment and attached pollutants, hydrologic flow	Agricultural runoff, soil erosion	To avoid having to lay out new contour lines every year, establish a narrow permanent strip of grass along each key contour line. All tillage and planting operations should be performed parallel to the key contour line. Contour farming will reduce the velocity of storm water runoff, increase infiltration, moderately decrease runoff/ flooding, and slightly increase excess subsurface water. Contouring is less effective in preventing soil erosion on steeper or longer slopes.	$10/acre (9)	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/330.pdf

Table 3.2 - Managerial Best Management Practices

Best Managerial Practices	Description	Benefit	Pollutant Addressed	Potential Sources of Pollutants	Environmental Impacts and Special Concerns	Comparative Costs	MDEQ/NRCS Link
Pest Management (595)	Crops are scouted to determine type of pests and the stage of development. The potential damage of the pest is then weighed against the cost of control. Finally, if pest control is economical, all alternatives are evaluated based on cost, results, and environmental impact. Precaution is taken to keep any chemicals from leaving the field by leaching, runoff, or drift. Other BMPs include buffer/filter strips, crop rotation, and erosion control measures.	Treatments tailored for specific pests on identified areas of a field prevent over-treatment of pests. Using fewer chemicals improves water quality.	Chemicals (Pesticide)	Agricultural runoff	Continual scouting to best identify pests and control methods. Keep records to track costs and chemical application. Calibrate spray equipment. Consider which soils on farm are likely to leach pesticides. Consider pest control alternatives.	100% of cost/unit (11) - EQIP	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/595.pdf
Nutrient Management (590) CNMP	Crop nutrient needs are determined after a soil test, setting realistic yield goals, and taking credit for contributions from previous years' crops and manure applications, crop nutrient needs are determined. Nutrients are then applied at the proper time by the proper application method. Nutrient sources include animal manure, sludge, and commercial fertilizers. Other BMPs include manure testing, soil testing, soil conservation measures, waste management system, waste storage facility, and waste utilization.	This practice properly budgets and supplies nutrients for plant production. It also reduces the potential for nutrients to infiltrate into water supplies by preventing over application. Correct manure and sludge application on all fields can improve soil tilth and organic matter. It is very applicable on CAFOs.	Nutrients	Agricultural runoff, over application of fertilizers.	Maintenance requirements: - Perform a periodic plan review to determine necessary adjustments - Protect nutrient storage facilities from weather and accidental leakage/spillage - Calibrate application equipment and document application rates - Spread wastes away from waterbodies on an adequate land base and incorporate ASAP - Analyze manure and other organic waste for nutrient content before field application and determine appropriate application rate - Test soils once every three years according to Extension recommendations - Establish a winter cover crop if nitrogen leaching is possible due to poor crop yield * Consider the Michigan Agriculture Environmental Assurance Program (MAEAP). The CNMP must be developed by a trained technical person (service provided by NRCS or Conservation District). Consider potential groundwater contamination - proximity to waterbodies critical.	$5/acre (9) - EQIP (Costs associated with waste water collection, soil testing, integrated crop management are low but have a high start up.)	ftp://ftp-fc.sc.egov.usda.gov/NHQ/practice-standards/standards/590.pdf
Organic Farming Practices	Organic farming differs from other farming systems in a number of ways. It favors renewable resources and recycling, returning to the soil the nutrients found in waste products. Where livestock is concerned, meat and poultry production is regulated with particular concern for animal welfare and by using natural foodstuffs. Organic farming respects the environment's own systems for controlling pests and disease in crops and livestock. Organic farmers use a range of techniques that help sustain ecosystems and reduce pollution. Other BMPs include filter/buffer strips, crop rotation, organic manuring, composting, limited chemical intervention, conservation of wildlife and natural habitats, management of livestock, recycling of organic materials.	Organic farming conserves biodiversity, provides a wide range of habitats, saves energy, improves soil fertility, and protects groundwater and surface waters from nitrates, phosphates, and pesticides. Organic food is grown without using any synthetic pesticides, herbicides, insecticides, fungicides, fertilizers, or hormones.	Nutrients, chemicals (pesticides)	Agricultural runoff	Organic farming methods are usually more labor intensive than conventional farming, so the cost of organic farming will usually be more.	EQIP funds supporting practices such as cover crops, conservation crop rotation, nutrient management, pest management.	
Soil Testing of Cropland	For proper management, a soil test for available nutrients should be made every 3-5 years. Use Integrated Crop Management (ICM)	Testing will help prevent over application of nutrients from fertilizers, manures and other sources.	Nutrients	Agricultural runoff	Soil should be tested to determine nutrient levels. Care should be taken to not add nutrients already present in adequate levels. Soil testing should be undertaken by lab or local MSUE office. Proper collection of a soil sample is important. Accuracy of analysis depends on the collection of a representative soil sample.	Costs associated with ICM. Typically a yearly expense. Low cost technique of monitoring soil. EQIP	
Agriculture Incentive Programs	Farm Bill programs that offer a rental payment to landowners that agree to take environmentally sensitive areas out of production. Continuous sign-ups for these programs are available to riparian and wetland areas. Rental rates are set by county boards.	Creates incentive for landowners to conserve riparian buffers, wetlands, and wildlife habitats.	Sediment, nutrients, hydrologic flow, pathogens, chemicals (pesticides)	Agricultural runoff	Property enrolled in Farm Bill programs are not protected in perpetuity. Fertilizer cannot be applied to areas under contract. In some cases, land values or crop yields may discourage landowners to use these incentive programs.	In some counties soil rental rates can be very high.	http://www.nrcs.usda.gov/programs

Table 3.2 - Managerial Best Management Practices

Best Managerial Practices	Description	Benefit	Pollutant Addressed	Potential Sources of Pollutants	Environmental Impacts and Special Concerns	Comparative Costs	MDEQ/NRCS Link
Zoning Ordinances/Land Use Policies							
Stronger County and State Regulatory Oversight of Over Application and Misapplication of Septage	Stronger regulatory oversight can ensure that septage is applied correctly and limited to those areas where it is appropriate. Septic system alternatives should be encouraged where such alternatives prove economical and technically sufficient in order to protect public health and the environment.	Stronger regulatory oversight will reduce the over application and misapplication of septage and help prevent nutrients and *E.coli* from entering waterbodies.	Nutrients, *E. coli*	Agricultural runoff	If existing and future regulations are not enforced, they will be useless in preventing over application and misapplication of septage		
Development/Enforcement of Storm Water Ordinance	An ordinance can provide for the regulation and control of storm water runoff; provide for storm water permits and the procedures and standards for the issuance; provide regulations for the inspection, sampling and monitoring of storm water and other discharges; establish performance and design standards for storm water management in specified zones of the township/municipality; and provide penalties for the violations of the ordinance.	Storm water runoff rates and volumes are controlled in order to protect floodways. Controls soil erosion and sedimentation; minimizes deterioration of existing watercourses, culverts, bridges, etc.; and encourages groundwater recharge.	Sediment and attached pollutants, hydrologic flow	Storm water runoff	Establishing storm water management control will minimize storm water runoff rates and volumes from identified new land development and encourage groundwater recharge.	$8,000/ordinance development (Grand Valley Community Survey)	
Development/Enforcement of Stream Buffer Ordinance	Ordinance protects a given area of buffer adjacent to stream systems. Protected buffers can provide numerous environmental protection and resource management benefits.	Reduces the risk of sediment and contaminants entering the stream. Provides long term solution to water quality concerns.	Sediment and attached pollutants, nutrients, thermal pollution	Storm water runoff from impervious surfaces (e.g. parking lots and roof tops) and outflow from ponds.	Lack of maintenance can increase erosion if trees fall into streams. At a minimum, keep south and west sides of streams wooded to provide shade. Trees in floodway can impede flow.	$8,000/ordinance development (Grand Valley Community Survey)	
Development/Enforcement of Wetland and Floodplain Ordinance	Ordinance promotes a policy to avoid or minimize damage to wetlands and floodplains, and coordinate the planning and zoning process with federal and state wetland programs.	Wetland and floodplain benefits are preserved. Wetlands provide natural pollution control by removing pollutants, filtering and collecting sediment, reducing both soil erosion and downstream flooding, and recharging groundwater supplies.	Sediment and attached pollutants, hydrologic flow, nutrients, pathogens, chemicals (pesticides), salts	Storm water runoff	Part 303, section 324.30307 authorizes local units of government to adopt and administer their own wetland regulations that address wetlands not protected by the state, provided they are at least as restrictive as state regulations. The MEQ must be notified if a community adopts a wetland ordinance, but it has no review or approval authority.	$8,000/ordinance development (Grand Valley Community Survey)	
Green Space Protection Ordinance	Ordinance preserves environmentally sensitive and open areas. Can also use filter strips and tree planting to enhance protection.	Provides protection of natural pollutant removal methods.	Thermal pollution, sediment, nutrients, hydrologic flow	Construction zones, developed parcels, agricultural land		$3/sq. ft. Land acquisition and management costs depend on site. Affected property may double as park/open space usage with related costs.	
Low Impact Design Practices	Land use planning to incorporate practices onsite. Examples include: bioretention, dry wells, filter strips, vegetated buffers, grass swales, rain barrels, cisterns, infiltration trenches. Involves careful site planning to reduce the impact to water resources by eliminating impervious surfaces and protecting infiltration areas.	Numerous water quality benefits. Long term solution to concerns.	Thermal pollution, solids, sediments, nutrients, metals	Rainfall, runoff, solar, fertilizers			http://www.lid-stormwater.net/
Illicit Discharge Ordinance (MDOT)	Program to seek out and prohibit illicit discharges and connections to municipal separate storm sewers	Eliminate hazardous and harmful discharges	Hazardous wastes	Industrial, residential, commercial		$2/ac (assuming 1 system monitored every 5 sq. miles). Maintenance program. $0.83/acre/year, $50/ac/yr (with TV inspection)	
Pet Waste Disposal Ordinance	Ordinance to require pet owners to clean up after their pets. Can be enhanced by installing signs and pet waste collection facilities in high traffic areas	Minimizes hazardous pathogens.	Nutrients, bacteria	Animals, dogs or other household pets			
Development/Enforcement of Septic System Ordinance	Ordinance abates water pollution caused by failing onsite sewage disposal systems, minimizes infiltration of seepage from systems into the storm water drainage system, and establishes penalties for its violation.	Ordinance can be used to enforce regular maintenance of disposal systems, which will minimize threats to public health and combat the degradation of surface and subsurface waters.	Bacteria	Septic systems	Lack of ordinance enforcement (regular inspection) can introduce pollution into groundwater reserves.	$8,000/ordinance development (Grand Valley Community Survey)	
Development/Enforcement of Yard and Kitchen Waste Ordinance	Ordinance prohibits the disposal of yard and kitchen waste on streambanks and outlines acceptable disposal methods, such as composting or disposal at a permitted disposal facility.	Proper disposal of yard and kitchen waste ensures that nutrients from these materials are not released into surface and groundwater supplies.	Nutrients	Upland source (yard/kitchen waste)	If yard and kitchen waste are composted on landowner's premises, nutrient runoff should not reach nearby surface water bodies.	$8,000/ordinance development (Grand Valley Community Survey)	

Table 3.2 - Managerial Best Management Practices

Best Managerial Practices	Description	Benefit	Pollutant Addressed	Potential Sources of Pollutants	Environmental Impacts and Special Concerns	Comparative Costs	MDEQ/NRCS Link
Development/Enforcement of Watercraft Control Ordinance	Ordinance prohibits the operator of a recreational watercraft to exceed a "slow - no wake" speed when within x feet of the shoreline.	Enforcing "no wake" zones will reduce streambank erosion.	Sediment and attached pollutants	Recreational watercraft	Issues concerning trespass, disorderly conduct, or damage caused to private property by the wake of vessels are not valid safety considerations for establishing a local ordinance.	$8,000/ordinance development (Grand Valley Community Survey)	
Public Access Ordinance	Ordinance controls access to a designated waterbody by limiting hours of access, number of users, etc.	By controlling public access to a waterbody, sediment pollution is reduced.	Sediment and attached pollutants	Public access, boat wakes	Consider using porous/ modular pavement at boat launches locations.	$8,000/ordinance development (Grand Valley Community Survey)	
Development/Enforcement of Fertilizer Ordinance	Ordinance prohibits the use of fertilizers containing more than 1% by weight of anhydric phosphoric acid.	Reduces phosphorus in the watershed.	Phosphorus	Fertilizers	Sources of low phosphorus fertilizers are few.	$8,000/ordinance development (Grand Valley Community Survey)	
Recycling/Composting							
Household Hazardous Waste Management	Proper buying, using, storing and disposal of Hazardous materials such as automotive waste, household cleaners and paint.	Eliminates disincentives and discourages illegal dumping of products into storm sewers and onto the ground	Hazardous wastes	Residents: Used oil, paints, cleaning products, etc.	Proper credentials needed for management. Typically consultant based.	Recycling station expenses.	http://www.deq.state.mi.us/documents/deq-swq-nps-hhhw.pdf
Composting	Converting plant debris, grass, leaves, pruned branches, etc. to compost. Use with lawn maintenance, pesticide and fertilizer management, and diversions (if needed)	Keeping organic debris out of surface waters and away from floodplains. Will help prevent the depletion of oxygen in surface waters. Widely applicable to dense residential or riparian sites.	Nutrients, chemicals, and pesticides, low dissolved oxygen, trash and debris	Neighborhoods, agricultural areas, yard, and kitchen waste	Compost piles placed near floodplains will contribute to the depletion of oxygen in surface waters. Composting requires proper aeration, watering, and mixing in order to result in a useable end-product. Soils, topography and climate will all affect the types of composting options available.	Recycling vs. garbage hauler costs. Establishment of large scale facility $190,000, land dependant. $70,000 annual maintenance.	
Yard Waste Collection and Disposal Program	Municipalities collect yard waste for compost.	Widely applicable to dense residential or riparian sites	Nutrients and organic sediment, trash and debris	Yard waste and leaf litter	Waste needs to be composted and correctly applied as fertilizer. Need large collection facility for compost operations.	Low	
Recycling Program (MDOT)	Collection of recyclable materials either by curb-side pick up or at drop off centers	Reduction in potential clogging and harmful discharge	Trash, used construction material reuse	Highways, travelers, vehicle debris	Some materials may require more energy to collect and recycle than using new products. However, recycling programs do build awareness	$200,000/year. $1.15/person/yr.	
Used Oil Recycling Program (MDOT)	Central collection facilities that allow residents to drop off used motor oil. Can be operated by local governments or businesses that recycle oil.	Reduces risk of surface water and groundwater contamination	Used oil and other transportation fluids reuse, hydrocarbons, metals, nutrients	Vehicle maintenance facilities. Vehicles or other equipment requiring lubrication.	Oil may easily become contaminated during collection making it a hazardous waste.	$79 - $179 recovery charge. Administrative costs to organize. Minimal personnel cost to collect and temporarily store oil. Opportunity to be paid by private business for waste material	
Turf Management							
Pesticide Management for Turf Grass and Ornamentals	Use of all available strategies (resistant turf, cultural controls, biological controls, mechanical controls and pesticides) to manage pests so that an acceptable yield and quality can be achieved economically with the least disruption to the environment. Used with lawn maintenance, fertilizer management, and soil management.		Harmful chemicals, pesticides, insecticides	Landscaping, storm water runoff	Must have proper training and credentials to commercially apply pesticides and manage turf.	Pesticide management should reduce application rates and related costs.	http://www.deq.state.mi.us/documents/deq-swq-nps-pm.pdf
Lawn Maintenance	Includes mowing, irrigating, pesticide and fertilizer management, soil management and the disposal of organic debris such as lawn clippings and leaves.		Phosphorus, nutrients, and sediments	Landscaping, storm water runoff	Consider minimizing lawn with more native species	Lawn alternatives may reduce mowing but still require regular maintenance of weed control and pest management.	http://www.deq.state.mi.us/documents/deq-swq-nps-lm.pdf
Fertilizer Management	Includes the proper selection, use, application, storage and disposal of fertilizers. Used with pesticide management, lawn maintenance, and nutrient management		Nutrients	Landscaping, storm water runoff	Consider consulting professional, such as MSUE	Material cost reduction may conflict with traditional aesthetic values. Fertilizer management should reduce chemical costs but may impact maintenance and watering.	http://www.deq.state.mi.us/documents/deq-swq-nps-fm.pdf
Soil Testing of Lawns and Gardens			Nutrients	Lawn and garden fertilizer	Testing should be done at qualified lab	Typically yearly testing required, contact local MSUE office. Test results may result in operations and maintenance costs. Low cost tool in management of lawns and gardens. $9.50 per test.	
Operations and Maintenance							
Operation and Maintenance Programs			Sediment, hydrocarbons, metals, nutrients	Erosion of road footprint and related infrastructure, leaking equipment, etc.		Labor intensive. Equipment required.	

Table 3.2 - Managerial Best Management Practices

Best Managerial Practices	Description	Benefit	Pollutant Addressed	Potential Sources of Pollutants	Environmental Impacts and Special Concerns	Comparative Costs	MDEQ/NRCS Link
BMP Inspection and Maintenance Plan for Roads (MDOT)		A regular inspection and maintenance program will maintain the effectiveness and structural integrity of the BMPs.	Sediment, hydrocarbons, metals, nutrients, etc.	Road related sediments/pollutants	Materials needed for emergency structural repairs may not be easily obtainable and may require stockpiling (MDOT). Should be designed and implemented by trained professional.	$150-$9,000 depending on the BMP. Specialized BMP installation involves planning, design, construction and maintenance costs.	
Material Management Plan (MDOT)	Identified hazardous and non-hazardous materials in the facility. Assures that all containers have labels. Identifies hazardous chemicals that require special handling, storage, and disposal.		Chemicals and other potentially hazardous materials.	Varies depending on type of material usage at specific facilities. Oil, salt, degreasers, solvents, antifreeze, etc. Industrial sites where chemicals are used.	Extensive training typically required to prepare and administer plan.	Plan preparation and updates. Inspections mandated. Plan development typically needs consultant or knowledgeable employee. Operation typically employee dependant.	
Clean and Maintain Storm Drain Channels (MDOT)		Prevent erosion in channels. Improve capacity by removing sediment. Remove debris toxic to wildlife.	Sediment, trash, woody debris	Development, natural erosion, vehicle remnants, road winter safety operations.	Should be implemented by trained professional.	$21/acre/year, $45-$60 per acre (rural). Channels are less expense to construct and easier to maintain than enclosed systems.	
Clean and Maintain Storm Inlets and Catch Basins (MDOT)	Catch basins are periodically inspected and cleaned out using a vacuum truck.	Reduces pollutant slugs during the first flush, prevents downstream clogging, and restores sediment trapping capacity of the catch basin.	Solids, sediments, metals, oils	Storm water runoff, automobiles	Requires continual maintenance every 1 - 3 years. General fund, Road Commission road maintenance budget - $250,000	Moderate to High; Total annual cost per catch basin = ($8/catch basin) + ($40/catch basin) = $48/catch basin. (Grand Rapids (GR) BMP Study). $21/acre/year maintenance.	
Annual Road/Stream Crossing Inspections	Inspections of stream crossings for evidence of erosion, debris, etc.		Sediment	Erosion of streambank		Moderate; regular inspection can prevent major expenditures for potential major points of erosion	
Municipal Operations							
Snow and Ice Control Operations	Removal of snow and ice from roadways, utilizing plows, salt, and sand.		Salts	Snow melt runoff	Moderate, all Road Commission equipment operators are trained. Training of road maintenance crew required.	Road commission winter maintenance budget - $3.5 million. Maintenance costs $1,000/lane/mile, dependant on severity of winter.	
Calibrated Salt Delivery			Salts	Over application of salt	Calibration does not guarantee efficient application of road salt. Annual training and calibration necessary.	Low upfront cost. Long term equipment maintenance vs. reduced salt. Equipment costs $1,500 per truck, minimal additional cost.	
Pre-wet Road Salt Application		Benefit if also used with environmentally friendly alternatives to salt	Salts	Road salt		Low to Moderate; $25/lane/mile, equipment maintenance costs - $5,000 per truck.	
Snow Removal Storage on Grassy Areas			Sediment, metals, hydrocarbons, salt	Snow melt runoff	Snow storage may damage vegetation and possibly cause soil erosion. Piled snow melts at a slower rate. Need ROW for snow removal. Need large grassed area adjacent to buildings and parking areas and properly spaced from waterbody.	Dependant on amount of trucking, distance to site, etc. Cleanup after melt	
Minimizing Effects from Road Deicing (MDOT)			Salts and chemicals	Maintaining agency, Snow melt runoff, spring rains		Varies	
Street Sweeping	The use of specialized equipment to remove litter, loose gravel, soil, vehicle debris and pollutants, dust, de-icing chemicals, and industrial debris from road surfaces. There are generally 2 types of sweepers: mechanical broom street sweepers and vacuum-type street sweepers.	60% TSS removal rate. Reduction in potential clogging of storm drains. Some oil and grease control (MDOT). When done regularly, can remove 50% - 90% of street pollutants (1), makes road surfaces less slippery in light rains, improves aesthetics by removing litter, and controls pollutants.	Sediment, metals, hydrocarbons	Atmosphere, construction, vehicles	Sweeping may wash sediments into catch basins if wash is not vacuumed. Disposal of collected materials must be handled by the governing agency (MDEQ, Public Health, Transportation). Sweeping schedules and timing critical - sweep after snow melt and before spring rains. Vehicle maintenance required.	Maintenance budget - $300,000/yr. Mechanical - $119.40/curb mile. Vacuum Assisted - $87.95/curb mile (GR BMP Study)	http://www.deq.state.mi.us/documents/deq-swq-nps-sw.pdf
Emergency Spill Response and Prevention Plan	Plans detail emergency procedures to respond to a release of hazardous materials. Also plans that describe procedures for proper handling and storage of chemical materials.	Can be highly effective at reducing the risk of surface and ground water contamination	Hazardous wastes	Equipment, poor training, accidents, Industrial, commercial, residential, and transportation related spills, chemical storage areas	Speed and containment are critical. Requires a well-planned and clearly defined plan, updated regularly. May require training, protective gear, containment and retrieval knowledge. Equipment must be readily available. (MDOT)	Management plan preparation with upgrades. Cost of simulations. In public sector, typically subcontracted to private contractor	
SESC Plans	Plans that specifies the actions that will be taken on a construction site to minimize erosion and sedimentation	Reduce erosion and sedimentation during construction project.	Sediment	Unvegetated areas, land development	State training, SESC and/or certified operator.	Act 91 mandated, ongoing local administrative costs. Fee based to landowner option.	
Dust Control (MDEQ)	Using measures such as watering, fencing, mulching and vegetation to prevent soil and attached pollutants from leaving a site and/or entering nearby waterways.		Sediment	Lack of vegetation typically associated with dirt or gravel roads	Salt and other potential pollutants are used in the dust control mixture. Rural, urbanizing, and transportation sites subject to wind erosion. Air pollution issue if neglected.	$100 to $500 per treatment. Employee administrative expense. Maintenance of water truck (minimal) - Roads 50-55 cents/gal, 1,500 gal/mile for a single pass	http://www.deq.state.mi.us/documents/deq-swq-nps-dc.pdf

Table 3.2 - Managerial Best Management Practices

Best Managerial Practices	Description	Benefit	Pollutant Addressed	Potential Sources of Pollutants	Environmental Impacts and Special Concerns	Comparative Costs	MDEQ/NRCS Link
Urban Forestry	Management of woods and trees in an urban setting.	Increases greenspace, reduces storm water runoff and thermal pollution. Long term solution to concerns.	Thermal pollution, solids, sediments	Rainfall, Solar	Woody debris and detritus may require annual maintenance. May eliminate original line of sight		
Other							
Invasive Plant Species Management	Invasive plant species are controlled using appropriate and effective removal methods for particular species.	Population and spread of invasive plant species is reduced or eliminated.	Invasive plant species	Accidental/purposeful introduction, natural dispersion	Invasive alien plants thrive in disturbed sites. Native plant communities fragmented by human disturbance are most vulnerable to invasion, but the most invasive species can infest even intact ecosystems. Invasive alien plants are free of natural controls such as insects and diseases that keep them in balance in their native habitats. Invasive species can also significantly reduce forest regeneration.		
Woody Debris Management							
Goose Management							
Information and Education							
Public Education Program (MDOT)		Can reduce improper disposal of hazardous waste	Potentially all			$200,000/year	
Grounds Maintenance Training			Nutrients and organic sediment	Leaf litter, grass clippings, fertilizer, and pesticides		Low	
Employee Training (MDOT)		Low cost and easy to implement storm water management BMPs	Potentially all				
Storm Drain Stenciling	Painting Storm Drain Inlets with "No Dumping" signs and symbols.	Educates the general public that the storm drain discharges into a natural waterbody. Can tie into hazardous waste collection, yard waste collection	Hazardous waste and nutrients	Household hazardous waste, motor oil, pet waste and yard waste	Volunteers need to take care with paint around storm drains. Permanent castings or decals may be more effective. Public education campaign is also needed for effective reduction in illegal dumping. Short term effectiveness.	$0.45/inch - Mylar stencils $5-$6 each - ceramic tiles $100 or more - metal stencils	

1. (MDOT) Tetra Tech, Evaluation of Best Management Practices for MDOT. 2002.
2. Michigan Department of Environmental Quality. Guidebook of Best Management Practices for Michigan. 1996.

Notes:

NRCS = USDA Natural Resources Conservation Service
BMP = Best Management Practice
MDEQ = Michigan Department of Environmental Quality
TSS = Total Suspended Solids
USDA = U.S. Department of Agriculture
MDA = Michigan Department of Agriculture
O&M = Operation and Maintenance
CNMP = Comprehensive Nutrient Management Plans
EQIP = Environmental Quality Incentive Program
DO = Dissolved Oxygen
CAFO = Concentrated Animal Feeding Operation
MSUE = Michigan State University Extension
E. Coli = *Escherichia Coli*
LID = Low Impact Development
MDOT = Michigan Department of Transportation
ROW = Right-of-Way
SESC = Soil Erosion and Sedimentation Control
MAEAP = Michigan Agriculture Environmental Assurance Program
ICM = Integrated Crop Management

Public educational programs are generally developed to encourage the reduction of pollutants in the environment. Most of the educational activities identified in Table 3.2 were created through the Galien River Watershed project and the St. Joseph River Watershed project, which were then coordinated into the National Pollutant Discharge Elimination System (NPDES) Phase II Public Education Plan (PEP). The PEP is included in Appendix 6.

3.2 ACTIONS NEEDED TO INITIATE ACHIEVEMENT OF LONG-TERM GOALS

The long-term goals are based on restoring and protecting the designated uses of the watershed. They outline the Watershed Committee's anticipation of the future state of the watershed. Table 3.5 lists each goal and associated actions required to initiate achievement of that goal. Although long-term action milestones were set to be achieved within thirteen years (2020), the long-term goals may take much longer to achieve. The Watershed Committee recognizes that when actions are taken and the impacts evaluated then future actions can be adjusted by what is learned from the evaluation process. These sustained future actions are critical to achieving long-term goals, yet this current step of planning and the actions that follow are critical to initiate this process.

3.3 ACTIONS NEEDED TO ACHIEVE SHORT-TERM MEASURABLE OBJECTIVES

Short-term measurable objectives, which outline how long-term goals will be achieved, include tasks such as implementing BMPs; conducting educational activities; and modifying existing projects, programs and ordinances. Table 3.5 lists each objective and associated actions required to achieve short-term objectives within three years (2010). The Watershed Committee recognizes that commitments from stakeholders will be critical to timely achievement of short-term objectives.

3.4 PREVENTIVE MEASURES FOR ILLICIT DISCHARGES

An Illicit Discharge Elimination Plan (IDEP) was prepared by the communities in compliance with their Certificate of Coverage for storm water discharges from Municipal Separate Storm Sewer Systems subject to watershed plan requirements. The IDEP outlines a process for investigating potential problem areas by screening dry weather flow from storm water outfalls, following the source of suspected illicit discharges to the source, and removing and correcting the illicit connections. The IDEP included a task entitled Preventive Measures which proposed that "Mechanisms will be put in place to prevent future illicit discharges and connections." A Preventive Measures Committee (Committee) of local government officials and representatives of public works and engineering departments met to review their current municipal operations and to identify available strategies and activities to prevent illicit discharges and prevent or minimize impacts on water quality. The Illicit Discharge Preventive Measures Report is included in Appendix 7, and following is a summary of the report.

Illicit discharges occur from four main sources:

Residential Neighborhoods

Illicit discharges which occur in residential neighborhoods often result from illegal dumping, inadequate septic system maintenance, improper disposal of hazardous materials such as vehicle fluids or household cleaning materials, swimming pool discharges, and car washing. These activities are often addressed through public education and enforcement of an Illicit Discharge Elimination Ordinance.

Industrial and Commercial Sites

Many industrial sites are also required to obtain a storm water discharge permit under the NPDES Phase II program. The Michigan Department of Environmental Quality (MDEQ) is responsible for issuing and enforcing the industrial permits. There are approximately 62 facilities with industrial storm water discharge authorizations in the Watershed. An additional 14 entities have standard storm water permits in the Watershed (Appendix 5).

Commercial businesses are not required to obtain storm water discharge permits under the NPDES Phase II program. However, there are a number of businesses that have the potential to impact storm water quality, such as automobile mechanical repair and mobile cleaning services.

Strategies which are recommended to prevent or minimize water quality impacts from industrial and commercial sites include education, effective spill prevention plans, municipal employee training, and site inspections. An Illicit Discharge Elimination Ordinance can provide the legal authority necessary to inspect industrial and commercial sites for potential illicit discharges and refer any violations for local or state enforcement.

Municipal Operations

Activities associated with street sweeping, snow removal, and maintenance of the storm water collection system are commonly identified as potentially contributing to a degradation in water quality. Other possible municipal operations that can impact water quality include vehicle/equipment maintenance and turf maintenance at city, township or county parks, golf courses, and cemeteries. Good housekeeping programs, such as recycling, careful waste management, spill cleanup, spill prevention (material storage), and collection of hazardous materials, can help prevent or minimize impacts from other sources.

Construction Activities

Construction activity disturbing 1 to 5 acres of land, with a point source discharge to waters of the State now must comply with the NPDES Phase II Storm Water Program. Construction activities of 5 acres or more, with a point source discharge to waters of the State are required to submit a Notice of Coverage (NOC) to obtain coverage under the Michigan Permit-by-Rule (Permit-by-Rule). Prior to submitting the NOC, a Soil Erosion and Sedimentation Control (SESC) permit must be obtained from the county or local agency. When the SESC permit is obtained, a completed NOC form along with the required attachments (location map, a copy of the SESC permit, and $400 fee) must be submitted to the MDEQ. Submittal of an NOC is not required for regulated construction activities that disturb 1 to 5 acres. These sites have automatic coverage under the Permit-by-Rule if they have obtained coverage under the SESC Program.

Waste management and spill containment/response are activities which focus on preventing illicit discharges from construction sites. SESC programs also require additional BMPs.

BMPs

BMPs can be applied to residential neighborhoods, construction activities, post construction (development and redevelopment), commercial and industrial sites, and to municipal operations.

BMPs to prevent illicit discharges from **construction** activities focus primarily on SESC. Other potential contaminants that originate from construction activities include construction waste, nutrients, metals, and other pollutants. Potential sources of illicit discharges include material storage and disposal areas, vehicle maintenance and fueling, and erosion from exposed soil.

Illicit connections of plumbing to storm water outlets can occur without proper inspection and enforcement. Managerial BMPs, including application of the requirements of the State's SESC program and local storm water management ordinances, is often the most effective way to control discharges from construction sites. Adequate financial guarantees, which allow local units to provide the necessary cleanup of poorly maintained construction sites, are important to assure that all developers and builders are held to the same standard of performance.

Post Construction (development and redevelopment) BMPs apply to incorporating water quality protection into the drainage and flood control facilities. State-of-the-art water quality protection measures emphasize maintaining predevelopment hydrologic conditions so there is not an increase in either the volume or the peak discharge rate of storm water runoff. They also recognize that the increase in impervious surfaces tend to increase the runoff from more frequent precipitation events. The potential for increased severity of streambank erosion is linked to the 1- to 2-year frequency events instead of the more extreme 10- or 25-year frequency floods. Maintaining predevelopment hydrology requires flood control facilities that encourage infiltration or provide extended storm water detention. Conventional detention basin design actually accelerates the rate of streambank erosion by increasing the frequency and duration of stream flows that had previously occurred on a 1- to 2-year schedule. Protection of small unregulated wetlands, flood plains, and riparian buffers are also important parts of an overall program to avoid detrimental impacts from new development. BMPs include both source control strategies through low-impact design techniques and treatment systems which include water quality protection in the design of flood control facilities. Structural treatment systems can help provide capture of spills and other illicit discharges as part of a preventive measures program. Source controls can provide trash storage facilities that prevent the discharge of contaminants from dumpsters.

Industrial and Commercial site BMPs also fall into the categories of source control and storm water treatment systems. Source control BMPs emphasize reducing the potential for storm water to transport contaminants from the site. Treatment systems are intended to capture the storm water and remove the contaminants before the runoff leaves the site. A similar situation exists with SESC. It is usually more effective and less costly to avoid the initial erosion (or transport of contaminants) than it is to capture the storm water and achieve effective sedimentation (or removal of contaminants). Source control BMPs include employee training and procedures to prevent spills. Material storage, equipment storage, waste disposal, and vehicle maintenance procedures are also important components of an effective Storm Water Pollution Preventive Initiative (SWPPI). Storm water treatment BMPs are similar to the strategies used to protect water quality in new development.

The NPDES Phase II permit requires the following activities for inclusion in the SWPPI under **Municipal Operations** (pollution prevention and good housekeeping):

- Employee training and inspection program
- Maintenance procedures for the storm water drainage facilities
- Controls for discharges from streets and maintenance garages
- Proper disposal of operation and maintenance waste from the storm water facilities
- Assessing water quality impacts from flood management projects
- Reduction in the discharges of fertilizers, pesticides, and herbicides

BMPs to prevent illicit discharges from municipal operations are also grouped into either source control or storm water treatment. Municipal garages and public works facilities deal with many of the same issues as industrial and commercial sites. Maintenance of streets and storm water systems are considered source controls and can be some of the most cost effective strategies to protect water quality. Treatment controls for storm water facilities are similar to the strategies used for new development.

The Committee evaluated various strategies that are available for municipalities for prevention associated with municipal operations, as well as activities on private property that are within the jurisdiction of the municipality. Industrial activities were discussed briefly, but set aside as beyond the scope of this Committee, except as part of the employee training program. Participants agreed that the best strategy involves both education and enforcement. The Committee identified the most feasible, cost effective approaches based on their experience and then prioritized the following BMPs in high, medium, and low priorities.

Table 3.3 - Priority BMPs

Priority	BMP
H	Adopt IDEP ordinance
H	Annual seminar (in-service training) with maintenance personnel - help them identify storm water issues and how to respond to them
H	Coordination with fire department on spills - need procedures for spill response, currently spread sand for oil spill without cleanup
H	County drain commissioner staff awareness
H	County emergency management awareness
H	Department of Public Works yard material storage - salt, sand, oils, waste, batteries, and tires
H	Dumpster use at municipal facilities
H	Hot line for reporting pollution and/or website
H	Municipal vehicle washing - street sweepers, school busses
H	Road salt application rate
H	Street sweeping, waste and catch basin cleaning, waste disposal
H	Time of sale septic system inspections or on 5- or 10-year frequency
MH	Construction site SESC (reporting poor practices)
M	County planning department - resource recovery
M	Dumpster use at commercial/private facilities
M	Information to farmers on services available
M	Marine division awareness on summer patrols
M	Parkland and municipal golf courses - educate on fertilizer and yard waste procedures
M	Private/agricultural fertilizer/pesticide/herbicide storage/use/disposal
M	Private landscaping residuals disposal
L	Cross train health department personnel in nonpoint source pollution issues - improve communication with local governments - identify where public sewers may be needed
L	Demolition waste/construction waste
L	Fertilizer ordinance
L	Frequency of street sweeping and catch basin cleaning - public roads, private roads, and parking lots
L	Snow removal and disposal

(H = High, M = Medium, L = Low)

Each community and county agency will have differing priorities for implementation of BMPs based on the characteristics of their community and their governmental responsibilities. BMPs should be selected based on both importance in preventing illicit discharges and ability to implement. A BMP with lower importance but higher chance of being implemented may be selected over one with higher importance but lower chance of being implemented.

3.5 ACTIVITIES DIRECTED WITHIN SPECIFIC GEOGRAPHIC AREAS

The Watershed is comprised of diverse local communities, from rural townships to urban city centers. Subsequently, a variety of actions and BMPs could be considered across the Watershed. Although each action and BMP will most likely apply to at least one of the communities in the Watershed, not all of them apply to every community. Therefore, it is important to note that each action or BMP is a unique solution to a specific pollution source or problem.

3.5.1 CLEARLY DEFINED WATERSHED

Three clearly defined watersheds are included in the Watershed and have been evaluated in the following planning documents:

Galien River Watershed - Galien River Watershed Management Plan (WMP)
Lake Michigan Watershed - Lake Michigan Lakewide Management Plan
St. Joseph River Watershed - St. Joseph River WMP

The goals and objectives outlined in these documents provided a basis for the Lower St. Joseph/Galien River WMP, and can be relied upon to gain a more in-depth understanding of each specific watershed and its associated impairments and goals.

3.6 METHODS FOR EVALUATING PROGRESS ON ACHIEVING GOALS

Watershed planning is a dynamic process that can be represented by the cycle depicted in Figure 2. The evaluation process is an important part of watershed planning that allows for a review of watershed conditions and impairments each time the evaluation is completed. It also establishes a mechanism for determining the success and usefulness of programs initiated within the watershed in response to problems defined in the planning process. A well-planned evaluation process measures the effectiveness of the WMP by showing changes in the public's awareness of water quality issues, changes in attitudes or behavior, changes in conditions of the watershed, and improvements in water quality.

Local counties, municipalities, and organizations within the watershed will do much of the evaluation. Certain environmental measurements, however, are best conducted by the MDEQ and/or the Michigan Department of Natural Resources.

The Watershed Committee will use the NPDES Phase II communities' annual reports to measure progress toward implementation of the WMP, since the communities must report progress on their pollution prevention activities to the MDEQ on an annual basis. A review of the implementation process, effectiveness of pollution prevention activities, and tracking of these activities will also be discussed in bi-annual (every 6 months) Watershed Committee meetings. These meetings will aide in the WMP update and evaluation process, allowing for any necessary midstream corrections. For non-Phase II communities, the Watershed Committee will request similar annual report cards and/or input into the evaluation process.

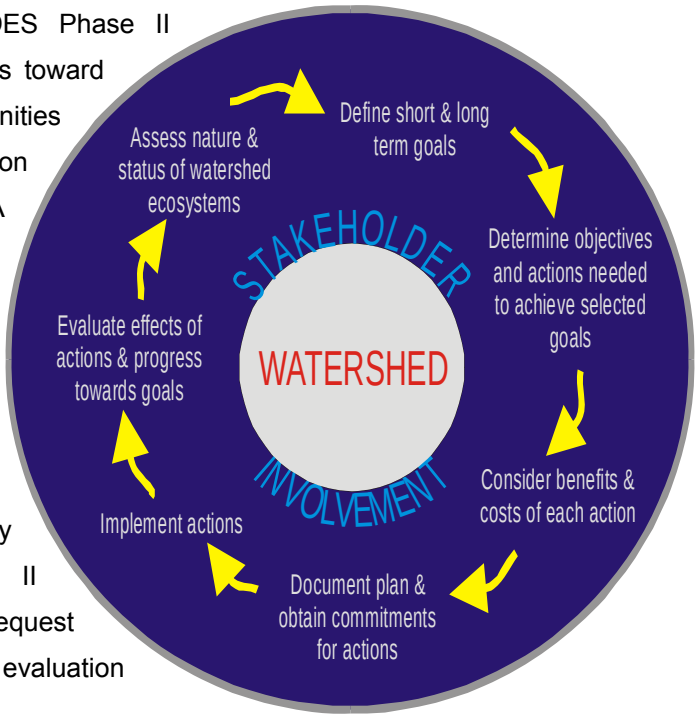

Figure 2 - Evaluation Process as part of the Watershed Management Planning Cycle

The parties responsible for working with the Watershed Committee in evaluating the achievement of the milestones are included in Table 3.5. The task of measuring progress is a necessary component of creating a dynamic and effective management plan.

The evaluation criteria provide an indication of how BMPs can be assessed to evaluate success. Some criteria are more appropriate for measuring progress on a watershed-basis, such as public awareness surveys and fishery surveys. Other criteria are more appropriate for specific sites or small tributaries, such as pollutant reduction calculations or student monitoring results. Through this evaluation process, communities and agencies will be better informed about public response and success of the project, what improvements are necessary to the project, and which BMPs to continue as part of the project. The success of the BMPs, collectively and over time, is assumed to have a positive impact on the water quality, even though these evaluation criteria may not be directly tied to water quality measurements.

Phase II municipalities, involved as members of the Watershed Committee, are required to update the WMP every two years. The evaluation methods presented in this chapter will assist the Watershed Committee in determining what parts of the WMP are in need of revision. The update ensures that the WMP remains relevant and is a working document that can be used effectively to guide the implementation of environment-related activities.

The goals of implementation should be revisited and compared with the BMPs that have been installed to make sure they are meeting the goals. Sites should be visited and landowners interviewed to determine what unforeseen problems or ancillary benefits were encountered. Table 3.5 lists the actions, evaluation methods, measurable milestones, and responsible parties for the evaluation.

3.7 SUMMARY OF MONITORING COMPONENTS

Many parameters are currently being monitored in the Watershed. Some are conducted at a local level, while others are administrated at the county and state level. Establishing monitoring targets, against which observed measurements are compared, help the Watershed group determine whether progress is being made toward targets and ultimately the Watershed goals. For some of the monitoring components, a firm target was set, such as "Inspect 90% of parks in critical *E. coli* areas twice a year," to compare what actual target is achieved to how close the implementation of the WMP is for that goal and objective. The targets set are not enforceable, just a measure that the Watershed Committee can use to gauge the implementation efforts. Table 3.1 identifies the specific monitoring component to measure the effectiveness and success of each BMP recommended for this Watershed. Those specific monitoring components are described below. The monitoring components that will be used to measure the overall improvement in the Watershed are described afterwards.

3.8 SPECIFIC MONITORING COMPONENTS FOR RECOMMENDED BMPS

3.8.1 UNITED STATES DEPARTMENT OF AGRICULTURE - NATURAL RESOURCES CONSERVATION SERVICE YEARLY STATUS REVIEWS

The Natural Resources Conservation Service (NRCS) District Offices are required to report annually on the agricultural practices installed in that county under all Farm Bill programs. The Watershed Committee will work with NRCS and the conservation districts to gather this information and track the practices and the resource concerns that they address to assess water quality impacts from agricultural operations.

3.8.2 NPDES PHASE II ANNUAL REPORTS

Communities regulated under the NPDES Phase II (Phase II) storm water program are required to submit a report on the implementation status of the NPDES storm water permit and the progress and effectiveness of pollution prevention in their community on an annual basis. The reports must cover all of the decisions, actions, and results performed as part of the permit during the previous year.

- The progress report provides information of the actions taken to eliminate illicit discharges and evaluate the effectiveness of the program, as outlined in the approved IDEP.
- The community must provide documentation of the public education efforts and a summary of the evaluation of its effectiveness, as outlined in the approved PEP.
- The community must describe the compliance status of the permittee-specific actions and implementation schedules for the regulated areas, as outlined in the approved SWPPI. The reporting of SWPPI compliance status in the annual reports is expected to begin in 2006.

3.8.3 PORTFOLIO OF BEFORE AND AFTER PHOTOGRAPHS

A portfolio of before and after photographs of specific BMPs not only allows different sites and practices to be assessed against one another, but is also a valuable information and education tool.

3.8.4 BERRIEN AND CASS COUNTY DRAIN COMMISSIONERS' OFFICES

The drain commissioners' offices conduct physical inventories and inspections of the county drains when necessary or requested. Problems associated with soil erosion and sedimentation, high flows, habitat degradation, and agricultural practices impairing water quality are investigated. The Berrien County Drain Commissioner (BCDC) is responsible for maintaining the drains in Berrien County, including those along the coastal regions, the Galien River Watershed, and the drains within the Lower St. Joseph River Watershed. The Cass County Drain Commissioner is responsible for the Drains within Cass County and the Lower St. Joseph River Watershed. Bank stability and nonpoint source (NPS) pollution entering the drains are concerns. Corrective action taken on the drains is the responsibility of the county drain commissioners and progress should be evaluated regularly.

3.8.5 SOIL EROSION AND SEDIMENTATION CONTROL PROGRAMS

The BCDC office is the County Enforcing Agency (CEA) for the SESC Act 451, Part 91. The CEA is responsible for enforcing their SESC ordinance and administering SESC programs. The Berrien County Road Commission is an Authorized Public Agency (APA).

The Cass County Information Systems Office is the CEA for Cass County and responsible for administering the SESC ordinance. The Cass County Road Commission is a registered APA. All of these programs monitor soil erosion controls on construction sites.

3.8.6 NPDES IDEP

The Phase II communities in Berrien and Cass Counties participating in the regional program hired Fishbeck, Thompson, Carr & Huber, Inc. (FTC&H) to complete an IDEP investigation, field screening all storm water outfalls and looking for failing onsite disposal systems, illegal dumping, and pollutants from municipal storm sewers. The IDEP initial screenings are complete and 26 outfalls have been identified that need further investigation in 2006. When that screening is completed, the next step will be to find any sources of pollutants in the storm sewer system and remove or correct illicit discharges.

3.8.7 WASTEWATER TREATMENT PLANT COMPLIANCE TESTING

Wastewater discharges are regulated under permits issued by the MDEQ. Approximately 16 wastewater point source discharges exist within the Watershed. The Andrews University Dairy is the only confined animal feeding operation with an NPDES permit in the Watershed. These permittees are generally in compliance with discharge permits. The number of treated domestic wastewater discharges to the Watershed is increasing as more development occurs outside of the established sewer service area. The Watershed Committee will review the reports submitted to the MDEQ and list the violations per year to assist in monitoring the improvements in the Watershed.

3.8.8 EMBEDDEDNESS STUDIES

The MDEQ proposed many methods to assess the amount of sedimentation in a stream, and a method for documenting changes in that amount of sediment. Volunteers through the Galien River Watershed project performed an embeddedness study with school children in 2005. The Watershed Committee could use a similar technique to conduct a future embeddedness study, which would measure the extent to which sediment covers objects and the changes to that coverage over time. This method can give information about the condition of a stream and whether sedimentation is increasing or decreasing over time. The MDEQ could continue to provide training to volunteers on this method, either through Surface Water Assessment Section or the NPS Unit.

3.8.9 REVIEW OF COMMUNITY MASTER PLANS AND ORDINANCES

Communities in Berrien and Cass Counties are working with land use planners to update their master plans and get ordinances in place that will support those plans. The Watershed Committee will conduct a follow-up with the counties and communities to track the enforcement and effectiveness of the ordinances.

3.8.10 HYDROLOGIC ANALYSIS

A stream morphology study and hydraulic model were developed by FTC&H, in 2002, to assess the stream stability and hydraulic conditions in the Galien River Watershed. The study intended to verify causes of flooding in certain areas and determine peak flows. The Watershed Committee could use this information to conduct studies in other areas of the Watershed when communities have implemented practices or adopted management strategies. The results would illustrate if the practices and management strategies adopted in the Watershed have reduced peak flows and addressed the high flow issues associated with water quality impairments. The communities can use this model as a tool to evaluate the effectiveness of actions protecting receiving waters from the effects of urbanization. The results will show the effectiveness of what the communities implement and evaluate overall implementation progress of the WMP.

3.9 OVERALL WATERSHED MONITORING EFFORTS

3.9.1 MDEQ BIOLOGICAL AND MACROINVERTEBRATE MONITORING (GLEAS NO. 51)

Ongoing and recurring physical and biological water quality monitoring is taking place. The MDEQ routinely conducts within the Watershed, assessing water quality and stream health.

The MDEQ has developed a system to estimate the health of the predicted fish and macroinvertebrate communities through the GLEAS No. 51 sampling protocol. The State of Michigan conducts this protocol every five years in major watersheds and includes an assessment of the benthic macroinvertebrates. Freshwater benthic macroinvertebrates are animals without backbones that are larger than 0.5 millimeter (the size of a pencil dot). These animals live on rocks, logs, sediment, debris, and aquatic plants during some period in their life.

There have been several studies regarding benthic macroinvertebrates in the LSJ/GRW; however, more recent studies that provide information on macroinvertebrates in the Watershed should be conducted.

The GLEAS No. 51 sampling protocol to establish a water quality rating can also include an embeddedness study to determine the amount of sediment. Establishing this protocol in the Watershed would enable the assessment of the improvement of the fish and macroinvertebrate communities. The criteria for evaluation would be a measurable increase in the water quality rating.

MDEQ has scheduled Biosurveys for the Lower St. Joseph River Watershed in 2006, in the Galien River Watershed in 2007, and in the coastal region in 2008. Subsequent surveys will be conducted every five years. The Watershed Committee will submit a monitoring request to the Water Bureau, Surface Water Assessment Section, in the fall of 2007 for the 2008 monitoring season. These submittals will include recommendations on where the assessment should be conducted to evaluate implementation of the WMP and possible other studies, such as an embeddedness study. These studies will be helpful in the evaluation of the effectiveness of specific BMPs implemented. The Watershed Committee will continue to make this request every five years.

3.9.2 MDEQ TOTAL MAXIMUM DAILY LOAD MONITORING

E. coli is measured by the MDEQ as part of the Total Maximum Daily Load (TMDL) process, and the health department tests various sites and beaches for this pollutant. The MDEQ also oversees the TMDL and has monitored *E. coli* levels in the Galien River and St. Joseph River Watersheds in known problem areas. Additional monitoring by MDEQ will be conducted once sufficient BMPs have been implemented to warrant the investigation.

The MDEQ has established TMDLs for many reaches in this Watershed. A loading allocation has been determined for the point source discharges in the Watershed. Reductions in inputs of *E. coli* and other pollutants to the Watershed can be determined by tracking load exceedances and the number of violations occurring.

3.9.3 COUNTY PROGRAMS FOR WATER QUALITY MONITORING

The Berrien County Health Department (BCHD) has water quality monitoring programs that measure pollutants in the Watershed. The BCHD performs surface water sampling at ten locations in the Watershed. Testing is for standard water quality parameters, in both wet and dry weather, including phosphorus and bacteria. In places where a source of *E. coli* contamination appears to be entering a watercourse, the BCHD has initiated a more extensive investigation that includes additional sampling. The BCHD also works with local municipalities to locate and eliminate pollution sources. The BCHD could expand this program to include potentially high risk areas in the rest of the Watershed. The testing results could be used to identify Water Quality Standards violations.

3.9.4 BERRIEN AND CASS COUNTY BEACH MONITORING PROGRAMS

Eighteen sites along the Lake Michigan shoreline and public beaches within the Watershed are currently being monitored by the BCHD. These sites are identified in Table 3.4 - Waterbody Links. The active hyperlink on the sample site is directed to the MDEQ Beach Monitoring website, where sampling results are reported.

Table 3.4 - Waterbody Links

Waterbody/Location Name	Description
Lake Michigan - Bethany Beach	Chikaming Township
Lake Michigan - Cherry Beach	Chikaming Township
Lake Michigan - Grand Beach	Village of Grand Beach
Lake Michigan - Hagar Township Park	Hagar Township
Lake Michigan - Harbert Beach	Chikaming Township
Lake Michigan - Jean Klock Park	Benton Harbor City
Lake Michigan - Lincoln Township Park	Lincoln Township
Lake Michigan - Lions Park	St. Joseph City
Lake Michigan - Michiana Village	New Buffalo City
Lake Michigan - New Buffalo City	New Buffalo City
Lake Michigan - Rocky Gap	Benton Township
Lake Michigan - Silver Beach	St. Joseph City
Lake Michigan - Tiscornia Park	St. Joseph City
Lake Michigan - Warren Dunes	Chikaming Township
Lake Michigan - Weko Beach	Bridgman City
St. Joseph River - Bertrand Park	Niles Township
St. Joseph River - Niles - French Paper	Niles Township
St. Joseph River - Niles - Marmont	Niles Township

3.9.5 MDEQ STREAM CROSSING SURVEYS

Historically, the MDEQ completed stream crossing surveys in major watersheds on a 5-year rotation depending on availability of staff and other resources. The MDEQ is no longer completing stream crossing surveys; however, trained volunteers may still conduct the surveys in accordance with MDEQ procedures. The MDEQ stream crossing survey procedure was developed as a quick screening tool to assess general water quality and possible pollutant sources, causes, and problems within the Watershed. The survey procedure provides standardized visual assessments that can be conducted by MDEQ staff or trained volunteers. Because this assessment is based on visual observations designed to be conducted quickly, the survey results are only qualitative in nature. In addition, each site was photo-documented with a digital photograph taken in the downstream direction, upstream direction, and of the stream crossing. Examples of information collected at a site include: weather and any event conditions, culvert/bridge conditions, channel conditions, stream appearance, substrate composition, instream cover, stream corridor, and potential pollutant sources. The Watershed Committee will continue to investigate the waterways in the Watershed and recommend to trained volunteers what stations need to be surveyed in the future. One use for the surveys is to prioritize areas in the Watershed where water quality problems may exist. Certain areas would be identified for further investigation, to assess habitat conditions and streambank erosion. Other stretches could be assessed for improvements where BMPs were implemented. Funds for instream assessment techniques are not readily available, but could provide a valuable means of evaluating the Watershed over time.

3.9.6 POLLUTANT REDUCTION CALCULATIONS

The MDEQ provides instructions to calculate and document pollutant reduction resulting from BMP treatment of sediment and nutrient pollutant sources. The tons of sediment and associated pounds of nitrogen and phosphorus reduced from an identified site are calculated. The methods have standardized the progress reporting to systematically represent water quality impacts and statewide achievements of the amount of pollutants prevented from entering the waterways. A three-year milestone includes prioritizing erosion sites through pollutant reduction calculations. A ten-year milestone is to implement BMPs at high-priority sites.

As BMPs are installed, the Watershed Committee could calculate pollutant reductions to estimate the amount of pollutants prevented from entering the stream and also compare the cost of BMPs to the amount of pollutants reduced.

3.10 COMMITMENTS TO IMPLEMENT LONG-TERM AND SHORT-TERM ACTIONS

Regulated Phase II communities involved in the development of this WMP are required to commit to implementing actions identified in the WMP. Actions and milestones have been established for short-term objectives and long-term goals by which to measure success. Actions vary for each community, but are connected by a common objective. Some objectives are only applicable to certain communities and certain watersheds, based on specific designated uses or TMDLs, thus only those communities have committed to implement that action.

Table 3.5 lists the recommended BMPs to be implemented by the years 2010 and 2020, including the involved parties. The Phase II BMPs identified in Table 3.5 correspond to the SWPPI commitments in Table 3.6. These SWPPI commitments identified in Table 3.6 are also included in Table IV of the SWPPI plan.

Table 3.5 - Action, Evaluation, and Milestones

Long-Term Goals	Short-Term Objectives	Evaluation Method	Best Management Practices - Actions		Involved Parties	Estimated Cost
			Within 3 Years - 2010	Within 13 Years - 2020		
No. 1 Eliminate/correct sources of disease-causing organisms, specifically *E. coli*, that are harmful to public health and that limit the use of rivers, creeks, and lakes	Increase the number of educated property owners who know about the value of properly designed, installed, and maintained septic systems, particularly in areas with high water tables, porous soils, and those near surface water or storm sewers.	Number of homeowners receiving packets that include a septic system video Number of realtors participating in workshops Reduction in number of OSDS failing inspections	Develop mailing list from tax bills, removing residents with water and sewer services Develop homeowner OSDS educational packets Hold workshops for realtors to introduce material and establish distribution networks Hold workshops for homeowners Distribute educational packets every year Develop time-of-sale septic system inspections or community-defined frequency **Phase II BMPs** - OSDS Education (14)*	*Wish List for the Future: County-wide ordinance to regulate septic systems, OSDS Maintenance*	Association of Realtors County Health Departments Communities St. Joseph River Watershed Steering Committee	PEP - Septic maintenance (to be determined)***
	Improve methods of locating pollutant sources in residential areas, such as illegal sanitary hookups, and reduce discharges to surface waters; such as CSOs	Calls from the public in response to articles (PEP activity) Status of IDEP implementation	Create article and distribute to potential partners for inclusion in existing newsletters about separate storm sewer systems (PEP activity) **Phase II BMPs** - Implement illicit discharge elimination plan (IDEP) (3)*, IDEP education (23)*	Remove CSOs (sanitary and storm)	Southwest Michigan Commission Non-MS4 Community Departments of Public Works	Illicit Discharge Ordinance ($2/acre, maintenance program $0.83/acre/year)***
	Increase the development of certified manure management plans	Number of producers with approved manure management plans Reduction in livestock access to waterways		*Wish List for the Future: Develop runoff reduction BMPs, Identify and prioritize areas in need of manure management plans, Develop manure management plans in high priority sites*	NRCS Conservation Districts MSUE MDA	Nutrient Management/CNMP ($5/acre)*** Cattle exclusion ($1.90/ft of fence)**
	Reduce the number of illicit discharges	Number of communities adopting ordinance Number of enforcement incidents	**Phase II BMPs** - IDEP (3)*, IDEP ordinance (24)*	Reduction of enforcement incidents	Other communities' DPW	Illicit Discharge Ordinance ($2/acre, maintenance program $0.83/acre/year)***

Table 3.5 - Action, Evaluation, and Milestones

Long-Term Goals	Short-Term Objectives	Evaluation Method	Best Management Practices - Actions		Involved Parties	Estimated Cost
			Within 3 Years - 2010	Within 13 Years - 2020		
No. 2 Reduce the levels of chemicals, pesticides, heavy metals, petroleum, and other toxins that are harmful to public health and that degrade aquatic habitat	Increase the number of educated urban property owners who understand the importance of reducing volume and velocity of runoff	Follow methods outlined in PEP for MS4s	Follow PEP short-term objectives Conduct regularly scheduled seminar (in-service training) with maintenance personnel **Phase II BMPs** - Storm water runoff education (29)*	*Wish List for the Future: Develop OSDS map and list* Follow PEP long-term objectives	Southwest Michigan Commission The Conservation Fund	PEP (to be determined)*** Employee training (Low cost)***
	Increase citizen knowledge about benefits of IPM and the safe use of pesticides among property owners	Number of attendees at workshops Number of IPM plans implemented	Create webpage and provide links to partners about IPM and pesticide use (PEP activity) **Phase II BMPs -** Watershed issue education (19)*	*Wish List for the Future: Hold workshops on IPM and landscape management, Increase in number of producers with IPM plans, Pesticide BMPs*	NRCS Conservation Districts MSUE St. Joseph River Watershed Steering Committee	Pesticide Management for Turf Grass and Ornamentals (low cost)*** PEP (to be determined)***
	Increase the number of small and medium size producers who complete chemical storage and handling assessments, particularly in areas with high water tables, porous soils, and those near surface or sensitive water resources	Number of farms completing assessments	Prioritize farms in need of chemical storage and handing assessments	*Wish List for the Future: Complete assessments on high priority farms*	MSUE Groundwater Technicians NRCS Conservation Districts St. Joseph River Watershed Steering Committee	
	Increase the effectiveness of existing hazardous waste collection programs and develop new ones if they don't exist	Amount of hazardous substances brought in on collection days before and after promotion/educational campaign	Create webpage and provide links to partners about waste disposal (PEP activity) Promote a clean-up day for property owners to properly dispose of harmful substances **Phase II BMPs -** Hazardous waste announcements (2)*	*Wish List for the Future: Hazardous waste collection* Encourage the monitoring of landfills	Southwest Michigan Commission Southeast Berrien County Landfill St. Joseph River Watershed Steering Committee	PEP (to be determined)***
	Increase the number of well managed DPW waste, chemical, and salt storage areas	Number of DPW yards with updated management techniques	Promote practices to address dumpsters, street sweeping waste, catch basin cleaning waste **Phase II BMPs -** Evaluate DPW procedures (13)*, Vehicle waste management (9)*, Develop new DPW procedures (22)*, Catch basin and street sweeping material disposal (30)*, Improve DPW yard material storage (33)*	*Wish List for the Future: Facility inspection checklist, Proper dumpster use, Salt storage*	Public works departments	Operation and Maintenance programs (to be determined)***

Table 3.5 - Action, Evaluation, and Milestones

Long-Term Goals	Short-Term Objectives	Evaluation Method	Best Management Practices - Actions		Involved Parties	Estimated Cost
			Within 3 Years - 2010	Within 13 Years - 2020		
	Increase the amount of pervious surfaces set aside to reduce the volume and velocity of storm water runoff entering surface waters in urban and developing areas	Amount of land set aside for pervious surfaces LID techniques accepted as standard development practice	Identify and prioritize reduction opportunities Identify natural areas that help control runoff Protect natural areas through ordinances and easements Develop ordinances to allow LID Implement LID techniques **Phase II BMPs -** Work with SWMPC on open space mapping (10)*	*Wish List for the Future: Riparian open space preservation, Open space preservation, Review model LID ordinance, Impervious limitation* Adopt regionally consistent ordinances for LID	St. Joseph River Watershed Steering Committee The Conservation Fund	Development/Enforcement of Storm Water Ordinance ($8,000/ordinance development)*** LID Practices (to be determined)***
	Reduce the number of illicit discharges	Number of communities adopting ordinance	Adopt and enforce ordinance **Phase II BMPs -** IDEP (3)*, IDEP ordinance (24)*	Reductions of enforcement incidents	Cities, Townships, and Villages in the Watershed	Illicit Discharge Ordinance ($2/acre, Maintenance program $0.83/acre/year)***
	Increase the number of people who understand proper spill response procedures	Number of departments with spill response procedures	Develop list of fire departments, emergency management offices, county sheriffs, and marine divisions to contact Obtain public education materials **Phase II BMPs -** Inspector storm water pollution training (18)*, Spill response procedures (28)*	Inclusion of spill response procedures in emergency plans	Marinas Local Police and/or Fire Departments	Emergency Spill Response and Prevention Plan (to be determined)*** Emergency Spill Kit (to be determined)**
	Increase the number of government employees that apply the appropriate amount of road salts such that road commissions and DPWs, address surface water impacts of road salt runoff	Number of trained employees and quantity of salt used per road mile per year with relative evaluation of annual snowfall	Calibrate salt application equipment **Phase II BMPs -** Salt application procedure training (26)*	*Wish List for the Future: Updated salt application equipment, Salt storage* Improved procedures in salt application	St. Joseph River Watershed Steering Committee	Snow and Ice Control Operations ($1,000/lane/mile)*** Calibrated Salt Delivery ($1,500/truck)*** Pre-wet Road Salt Application ($25/lane/mile, $5,000/truck)***

Table 3.5 - Action, Evaluation, and Milestones

Long-Term Goals	Short-Term Objectives	Evaluation Method	Best Management Practices - Actions		Involved Parties	Estimated Cost
			Within 3 Years - 2010	Within 13 Years - 2020		
No. 3 Reduce soil erosion and sedimentation by site remediation, controlling pathways, and preventing or minimizing sources so that surface water functions and uses are not impaired and aesthetics are improved	Increase training for planning departments, road commissions, building/permitting officials, consultants, and contractors so that soil erosion control BMPs are considered as an integrated part of the site planning and design process	Number of attendees at each training session Survey of attendees after the event to determine if practices have been integrated Number of communities adopting storm water ordinance Record of County Drain Commissioner's storm water standards	Develop materials for presentations Develop reporting system to call in violations to SESC office **Phase II BMPs** - Staff attend SESC Training (12)*, Adopt County storm water standards (21)*	*Wish List for the Future: SESC training list (of planning officials, building/permitting officials and contractors)* Hold workshops in each county	NRCS Conservation Districts MSUE St. Joseph River Watershed Steering Committee County Farm Bureau	SESC Plans (low cost)*** Employee training (Low cost)***
	Increase land owner knowledge and use of soil erosion reduction and runoff control techniques on agricultural land	Number of attendees at field walks and farmer meetings Record personal contacts made Number and locations of BMPs implemented Before and after photos of sites where BMPs installed Reduction in amount of sediment entering waterways using pollution reduction calculations	Identify and prioritize erosion sites using pollution reduction calculations Host field walks and farmer meetings Publish 1 article per quarter in agricultural newspapers Make personal contacts with producers **Phase II BMPs -** Storm water runoff education (29)*	*Wish List for the Future: Soil Erosion Controls*	NRCS Conservation Districts MSUE St. Joseph River Watershed Steering Committee	PEP -Soil erosion and agricultural BMPs (to be determined)***
	Increase knowledge of sediment sources at crossings by inspecting road-stream crossings and calculating sediment loads to establish a baseline and prioritize sites for future improvement	Number of staff and volunteers trained to complete assessments Number of road stream crossings surveyed Prioritized list of crossings for improvements Number of high priority sites improved	Train staff and volunteers to assess crossings Survey 10% of total crossings each year Develop a prioritization scheme, including cost-benefit comparisons) for future mitigation **Phase II BMPs** - Survey stream crossings and stream crossing maintenance (6)*	Implement improvements to high priority crossings Complete survey of crossings	MDEQ St. Joseph River Watershed Steering Committee	Annual Road/Stream Crossing Inspections (moderate cost)***

Table 3.5 - Action, Evaluation, and Milestones

Long-Term Goals	Short-Term Objectives	Evaluation Method	Best Management Practices - Actions		Involved Parties	Estimated Cost
			Within 3 Years - 2010	**Within 13 Years - 2020**		
	Increase the number of educated urban property owners who understand the importance of reducing volume and velocity of runoff	Follow methods outlined in PEP for MS4s Record of materials provided	Follow PEP short-term objectives Conduct regularly scheduled seminars (in-service training) with maintenance personnel **Phase II BMPs** - Storm water pollution reduction training for Staff, Contractors, and Planning officials (11)*, Watershed issue education (19)*, Storm water runoff education (29)*	Follow PEP long-term objectives	Southwest Michigan Commission The Conservation Fund	PEP (to be determined)*** Employee training (low cost)***
	Increase the number of shoreline protection and restoration educated riparian landowners (both private and public) in prioritized, targeted areas	Number of responses from articles (PEP activity) Number of "Landscaping for Water Quality" booklets distributed (PEP activity) Number of demonstration sites implemented	Create article about riparian management and send to potential partner for inclusion in existing newsletter (PEP activity) Create and distribute Galien River Watershed Fact Sheets on riparian management (PEP activity) Distribute "Landscaping for Water Quality" booklets to homeowners, retail nurseries, and garden centers at festivals and workshops (PEP activity) Prioritize riparian properties to be targeted by geography, hydrology, jurisdiction, natural features and sediment loading Create implementation schedule for demonstration sites based on prioritization Create mailing list of riparian property owners in targeted areas Create mailing list of garden centers, lawn care companies, and nurseries **Phase II BMPs** - Watershed issue education (19)*, Riparian education (25)*, Riparian workshop (31)*	*Wish List for the Future: Riparian open space preservation* Follow up with contacts made through mailings and technical assistance	Southwest Michigan Commission Conservation District MSUE St. Joseph River Watershed Steering Committee Galien River Watershed Steering Committee Nurseries Garden Centers	PEP – Shoreline protection and restoration (to be determined)***
	Increase the amount of pervious surfaces set aside to reduce the volume and velocity of storm water runoff entering surface waters in urban and developing areas	Amount of land set aside for pervious surfaces LID techniques accepted as standard development practice	Identify and prioritize reduction opportunities Identify natural areas that help control runoff Protect natural areas through ordinances and easements	*Wish List for the Future: Impervious limitations, Riparian open space preservation*	St. Joseph River Watershed Steering Committee Developers The Conservation Fund	Green Space Protection Ordinance ($3/sq ft.)***

Table 3.5 - Action, Evaluation, and Milestones

Long-Term Goals	Short-Term Objectives	Evaluation Method	Best Management Practices - Actions		Involved Parties	Estimated Cost
			Within 3 Years - 2010	Within 13 Years - 2020		
				Adopt regionally consistent ordinances for LID		
	Reduce the number of log jams, according to woody debris management principles, that are causing flow diversions and streambank erosion in the GRW	Number of problematic log jams removed	Identify areas where log jams are causing flow diversions and streambank erosion Educational materials regarding woody debris management and which agencies to go to for permits and approvals Identify sites to address and request funding **Phase II BMPs** - Maintenance plans (15)*	*Wish List for the Future: Implement BMPs – Identify log jams, Remove log jams* Secure funding Remove log jams according to woody debris management principles	MDNR, Fisheries Division (technical assistance) MDEQ (permits) Property Owners Conservation Organizations	Woody Debris Management (to be determined)***
	Increase the amount of state and local funding for enforcement of SESC	Amount of funding Proportion of problem sites addressed to problem sites identified	Review existing SESC fee structure **Phase II BMPs** - Evaluate SESC fee structure (17)*	*Wish List for the Future: Implement BMPs – SESC Reporting* Update SESC fee structure	MDEQ (technical assistance)	SESC Plans (to be determined)***

Table 3.5 - Action, Evaluation, and Milestones

Long-Term Goals	Short-Term Objectives	Evaluation Method	Best Management Practices - Actions		Involved Parties	Estimated Cost
			Within 3 Years - 2010	Within 13 Years - 2020		
No. 4 Reduce the amount of nutrient loading by site remediation, controlling pathways, and preventing or minimizing sources so that surface water functions and uses are not impaired and aesthetics are improved	Increase property owner awareness about the value of properly designed, installed, and maintained septic systems, particularly in areas with high water tables, porous soils, and those near surface water and storm sewers; upgrade or replace failing or faulty OSDS	Number of realtors participating in workshops Number of homeowners receiving packets Number of OSDS ordinances reviewed Number of OSDS ordinances needing revisions Number of new or revised ordinances adopted	Develop homeowner OSDS educational packets. Hold workshops for realtors to introduce material and establish distribution networks Hold workshops for homeowners Distribute educational packets every year Provide educational materials to officials and commissions **Phase II BMPs** - OSDS education (14)*, Sanitary sewer hook-up (27)*	*Wish List for the Future: Review City OSDS code, Adopt or revise OSDS ordinance that allows for inspection of systems and the assessment of fines for noncompliance, Implement accepted alternative technologies for treatment, Develop OSDS map and list, OSDS permit and review, OSDS maintenance* Reduction in number of OSDS failing inspections	Association of Realtors County Health Departments St. Joseph River Watershed Steering Committee MDEQ	PEP - Septic maintenance (to be determined)***
	Increase the number of educated urban property owners who understand the importance of reducing volume and velocity of runoff	Follow methods outlined in PEP for MS4s	Follow PEP short-term objectives Conduct regularly scheduled seminars (in-service training) with maintenance personnel **Phase II BMPs** - Storm water runoff education (29)*	Follow PEP long-term objectives	Southwest Michigan Commission The Conservation Fund	PEP (to be determined)***
	Increase the number of small and medium size producers that have CNMPs	Number of producers with approved CNMPs Reduction in amount of nutrients entering the waterways, based on pollution reduction calculations	Identify and prioritize agricultural operations in need of CNMPs	*Wish List for the Future: Develop CNMPs for high priority operations*	NRCS Conservation Districts MSUE MDA St. Joseph River Watershed Steering Committee	Nutrient Management/CNMP ($5/acre)***

Table 3.5 - Action, Evaluation, and Milestones

Long-Term Goals	Short-Term Objectives	Evaluation Method	Best Management Practices - Actions		Involved Parties	Estimated Cost
			Within 3 Years - 2010	**Within 13 Years - 2020**		
	Increase the amount of pervious surfaces set aside to reduce the volume and velocity of storm water runoff entering surface waters in urban and developing areas	Amount of land set aside for pervious surfaces LID techniques accepted as standard development practice	Review existing OSDS ordinances Develop model ordinance Work with health departments and MDEQ on expanding use of alternative technologies, such as constructed wetlands for treatment	*Wish List for the Future: Riparian open space preservation, Open space preservation, Review model LID ordinance*	Developers St. Joseph River Watershed Steering Committee	Development/Enforcement of Storm Water Ordinance ($8,000/ordinance development)*** Low Impact Design Practices (to be determined)***
			Identify and prioritize reduction opportunities Identify natural areas that help control runoff Protect natural areas through ordinances and easements Develop ordinances to allow LID Implement LID techniques **Phase II BMPs -** Work with SWMPC on open space mapping (10)*	Adopt regionally consistent ordinances for LID		
	Increase knowledge and use of soil erosion reduction and runoff control techniques on agricultural land, such as filter strips and fencing	Number of attendees at field walks and farmer meetings Record personal contacts made Number and locations of BMPs implemented Before and after photos of sites where BMPs installed waterway sediment pollution reduction calculations	Identify and prioritize erosion sites using pollution reduction calculations Host field walks and farmer meetings Publish one article per quarter in agricultural newspapers Make personal contacts with producers **Phase II BMPs -** Storm water runoff education (29)*	*Wish List for the Future: Implement BMPs in high priority areas*	NRCS Conservation Districts MSUE St. Joseph River Watershed Steering Committee	PEP – Soil erosion and agricultural BMPs (to be determined)***

Table 3.5 - Action, Evaluation, and Milestones

Long-Term Goals	Short-Term Objectives	Evaluation Method	Best Management Practices - Actions		Involved Parties	Estimated Cost
			Within 3 Years - 2010	**Within 13 Years - 2020**		
	Increase the number of revised local weed and phosphorus limiting ordinances in urban areas to encourage phosphorus free fertilizers, the reduction of lawn areas, and the use of natural landscaping and native plants	Number of ordinances reviewed Number of ordinances needing revision Number of planning officials and commissions receiving educational materials Number of ordinances adopted	Review existing ordinances Provide educational materials to planning officials and commissions **Phase II BMPs -** Storm water pollution reduction training for Staff, Contractors, and Planning officials (11)*, Watershed issue education (19)*, Riparian workshop (31)*, Phosphorus-free fertilizer education (34)*	Adopt ordinances	Cities, Villages, and Townships in the Watershed	Development/Enforcement of Fertilizer Ordinance ($8,000/ordinance development)*** Fertilizer Management (moderate cost)*** Rain Gardens and other "Landscaping for Water Quality" techniques ($1,075-$12,335/rain garden)**
No. 5 Increase preservation, restoration, protection, and appreciation of open space and coastal zones and implement actions that restore, enhance, and sustain the health, biodiversity, and productivity of the ecosystem (a system of natural areas, wildlife habitats, coastal areas, corridors, farmland, open land, and parklands)	Increase the number of educated local planning officials who understand water quality issues, smart growth, and the protection of natural resources through coordinated planning, zoning, and ordinances	Number of attendees at each training session Results of training session and workshop exit surveys gauging the change in knowledge before and after the event Follow-up sessions with attendees	Create list of planning officials and commissions Develop basic materials and a presentation Hold training workshops in each county **Phase II BMPs -** Storm water pollution reduction training for Staff, Contractors, and Planning officials (11)*, Staff attend SESC training (12)*	Hold follow-up sessions at local planning commission meetings to determine if practices had changes or if more training is needed	Coastal Communities attend workshops St. Joseph River Watershed Steering Committee St. Joseph River Basin Commission The Conservation Fund	Employee Training (to be determined)***
	Increase public understanding about basic water quality issues, including the economic benefits of natural systems and open space (e.g. flood control, groundwater filtration, recreation, tourism, air purification, higher property values)	Follow PEP methods Interest generated as a result of television program through responses received	Create displays and handout materials (PEP activity) Revise public service announcements for TV and radio (PEP activity) Create articles about general watershed issues and send to potential partners for inclusion in existing newsletters (PEP activity) **Phase II BMPs -** Watershed issue education (19)*, Riparian education (25)*, Storm water runoff education (29)*, Riparian workshop (31)*	*Wish List for the Future: Water Conservation* Produce and air television program related to water quality issues on public access stations serving largest populations centers and provide contact information to receive responses to program	Southwest Michigan Commission St. Joseph River Watershed Steering Committee Galien River Watershed Steering Committee St. Joseph River Basin Commission The Conservation Fund Conservation Districts	PEP – Water quality issues (to be determined)***

Table 3.5 - Action, Evaluation, and Milestones

Long-Term Goals	Short-Term Objectives	Evaluation Method	Best Management Practices - Actions		Involved Parties	Estimated Cost
			Within 3 Years - 2010	**Within 13 Years - 2020**		
	Increase public knowledge about land conservation/steward-ship efforts and tools	Number of attendees at public meetings Prioritized list of areas for protection Partnership agreements developed with organizations and agencies Acres protected	Hold public meeting to gauge areas of concern and interest of preserving open space Create resource maps based on public input Prioritize and rank identified areas for protection	*Wish List for the Future: Partner with existing organizations and agencies that specialize in conservation and stewardship efforts, Acquisition of land for conservation, Riparian open space preservation, Farmland preservation, Open space preservation*	Southwest Michigan Land Conservancy Southwest Michigan Commission St. Joseph River Watershed Steering Committee St. Joseph River Basin Commission The Conservation Fund Nature Centers	PEP – Land Conservation (to be determined)***
	Improve environmental education resources to K-12 teachers	Number of attendees at training sessions Results of follow-up meetings	Hold one Project WET, Project WILD, Project WILDAquatic, WOW!, or Project Learning Tree session in each county **Phase II BMPs -** Watershed issue education (19)*	*Wish List for the Future: Follow-up with attendees of sessions to see if information was incorporated into lessons, School environmental education*	Conservation Districts St. Joseph River Watershed Steering Committee MSUE	Employee Training (to be determined)***

Table 3.5 - Action, Evaluation, and Milestones

Long-Term Goals	Short-Term Objectives	Evaluation Method	Best Management Practices - Actions		Involved Parties	Estimated Cost
			Within 3 Years - 2010	**Within 13 Years - 2020**		
	Increase the number of shoreline protection and restoration educated riparian landowners (both private and public) in prioritized, targeted areas	Number of responses from articles (PEP activity) Number of "Landscaping for Water Quality" booklets distributed (PEP activity) Number of demonstration sites implemented	Create article about riparian management and send to potential partner for inclusion in existing newsletter (PEP activity) Create and distribute Galien River Watershed Fact Sheets on riparian management (PEP activity) Distribute "Landscaping for Water Quality" booklets to homeowners at festivals and workshops (PEP activity) Prioritize riparian properties to be targeted by geography, hydrology, jurisdiction, natural features and sediment loading Create implementation schedule for demonstration sites based on prioritization Create mailing list and develop registry of priority riparian property owners in targeted areas **Phase II BMPs -** Watershed issue education (19)*, Riparian education (25)*, Riparian workshop (31)*	*Wish List for the Future: Riparian open space preservation.* Follow-up with 1-on-1 meeting with contacts made through mailings and technical assistance	Southwest Michigan Commission Conservation District MSUE St. Joseph River Watershed Steering Committee	PEP – Shoreline Protection (to be determined)***
	Increase the use of drain maintenance techniques which maintain canopy on south and west sides of drains	Less clearing of trees documented in inspections	Create item in inspection reports to document presence of trees on north and east side of drains **Phase II BMPs -** Maintenance plans (15)*	*Wish List for the Future: Tree-Cutting Ordinance* Maintenance of stable vegetated waterways the are stable with no evidence of erosion	Drain Commissioners	Clean and Maintain Storm Drain Channels ($21/acre/year)***
	Increase awareness of coastal areas problems	Number of storm water controls installed Adoption of coastal zone management techniques	Inventory coastal areas to determine what problems exist **Phase II BMPs -** Critical dunes management (1)*, Stream/beach clean-up assistance (4)*, Adopt County storm water standards (21)*, Riparian education (25)*	*Wish List for the Future: Seek coastal funding.* Develop coastal zone management techniques to address runoff from parking lots and agricultural areas	MDEQ	Streambank and Shoreline Protection (EQIP, 50% cost share)** PEP – Shoreline Protection (to be determined)***

Table 3.5 - Action, Evaluation, and Milestones

Long-Term Goals	Short-Term Objectives	Evaluation Method	Best Management Practices - Actions		Involved Parties	Estimated Cost
			Within 3 Years - 2010	**Within 13 Years - 2020**		
No. 6 Minimize hydrologic impacts of development, maintain water levels high enough for navigation, protect streambanks from erosion, and reduce flooding impacts	Improve river hydraulics by following recommendations from Galien River hydrologic and hydraulic model	Number of storm water controls installed	Identify areas where storm water controls are needed **Phase II BMPs -** Adopt County storm water standards (21)*, Storm sewer maintenance and inspection (20)*	*Wish List for the Future: Review existing storm water runoff rules, Develop runoff reduction BMPs* Implement storm water controls in identified areas	Conservation Districts St. Joseph River Watershed Steering Committee	Water and Sediment Control Basin ($2,100-$3,150/basin)** Regional Detention (Moderate cost)** Stabilized outlets (to be determined)**
	Reduce irrigation in certain areas where flow must be maintained	Number of farms using irrigation scheduling	Contact and provide educational materials to agricultural producers using irrigation	*Wish List for the Future: Farms operating under irrigations schedules*	NRCS Conservation Districts	Irrigation Water Management (EQIP can fund establishment)***
	Increase the number of delineated floodplains for communities to use in developing ordinances	Adoption of new or revised floodplain ordinances	Inventory existing floodplain information **Phase II BMPs -** Utilize floodplain ordinance (7)*, Adopt floodplain maps (16)*	*Wish List for the Future: Review existing floodplain ordinances, Investigate floodplain mapping* Create/enhance floodplain ordinance to protect areas Complete floodplain delineations	FEMA County Planning Departments	Development/Enforcement of Floodplain Ordinance ($8,000/ordinance development)***
	Increase the number of communities with storm water management criteria for new developments or have county drain commissioner conduct review of new developments	Adoption of storm water management criteria	Draft storm water management criteria for new developments **Phase II BMPs -** Adopt County storm water standards (21)*,	*Wish List for the Future: Review site plans* Incorporation of storm water management criteria in new developments	Cities, Townships, and Villages in the Watershed	Development/Enforcement of Storm Water Ordinance ($8,000/ordinance development)***
	Increase the number of ordinances encouraging LID practices	Number of communities adopting LID standards	Develop model ordinance **Phase II BMPs -** Adopt County storm water standards (21)*	*Wish List for the Future: Review model LID ordinance* Adopt ordinance	Cities, Townships, and Villages in the Watershed	Development/Enforcement of Storm Water Ordinance ($8,000/ordinance development)*** Low Impact Design Practices (to be determined)***

Table 3.5 - Action, Evaluation, and Milestones

Long-Term Goals	Short-Term Objectives	Evaluation Method	Best Management Practices - Actions		Involved Parties	Estimated Cost
			Within 3 Years - 2010	**Within 13 Years - 2020**		
No. 7 Maintain management practices for controlling invasive and exotic species and prevent more from entering the watershed	Increase support of U.S. Coast Guard and other educational programs about invasive species	Number of participants in educational programs Number of contacts	Identify programs applicable to watershed	*Wish List for the Future: Support and promote invasive species educational programs*	St. Joseph River and Galien River Conservation District	Invasive Species Management (to be determined)***
	Increase invasive species control through biological, manual, and chemical measures	Pre- and post-implementation studies in areas to have controls implemented	Identify sites with high populations of invasive species and identify most effective method of control Conduct pre-implementation study for monitoring sites	*Wish List for the Future: Documentation of reduction in invasive species in identified areas, Conduct post-implementation study for monitoring sites, Boat launch educational signage*	Conservation Districts St. Joseph River Watershed Steering Committee MSUE MDNR St. Joseph Coast Guard marine Safety Officer Michigan Sea Grant Great Lake Commission	Invasive Species Management (to be determined)***
	Increase the number of people aware of native plantings as a landscape alterative	Number of "Landscaping for Water Quality" booklets distributed (PEP activity) Number of native plant sales through Conservation District	Distribute "Landscaping for Water Quality" booklets to homeowners at festivals and workshops (PEP activity) Distribute other materials available through Michigan Sea Grant and Great Lakes Commission **Phase II BMPs -** Riparian workshop (31)*	Follow-up with contacts made through mailings and technical assistance	Southwest Michigan Commission Conservation District MSUE St. Joseph River Watershed Steering Committee	Rain Gardens and other "Landscaping for Water Quality" techniques ($1,075-$12,335/rain garden)** Newsletter/Mailing ($400/each) – Appendix 8
No. 8 Remove obstructions and garbage in identified problem areas and restore open channels to provide navigational uses by selectively removing obstructions	Increase the number of volunteer stream cleanups	Number of volunteers participating in cleanups	Identify and prioritize areas in need of stream cleanup Identify groups willing to participate in stream cleanups Conduct 1 stream clean up/year in high priority areas **Phase II BMPs -** Stream/beach clean-up assistance (4)*,	*Wish List for the Future: Conduct stream cleanups in high priority areas, School environmental education, Earth Day announcements*	Conservation Districts St. Joseph River Watershed Steering Committee	PEP – Stream Protection (to be determined)***
	Improve understanding of the public navigational needs	Note completion of Recreational Plan containing navigational needs	Develop recreation plan for navigation on the Lower St. Joseph and Galien Rivers	*Wish List for the Future: Implement recreation plan in the Lower St. Joseph and Galien Rivers*	MDNR Conservation Districts St. Joseph River Watershed Steering Committee	PEP – Public Navigation (to be determined)***
	Reduce the number of log jams, according to woody debris management principles in the Galien River Watershed	Number and location of obstructions removed consistent with woody debris management techniques	Identify and prioritize areas eligible for obstruction removal	*Wish List for the Future: Identify/remove log jams* Remove obstructions in prioritized areas	Cities, Townships, and Villages in the Watershed	Woody Debris Management (to be determined)***

*** See Table 3.6 for Phase II SWPPI Commitments**

**** See Table 3.1 for Estimated Costs**

***** See Table 3.2 for Estimated Costs**

Table 3.5 - Action, Evaluation, and Milestones

Long-Term Goals	Short-Term Objectives	Evaluation Method	Best Management Practices - Actions		Involved Parties	Estimated Cost
			Within 3 Years - 2010	Within 13 Years - 2020		

Notes:

NRCS = USDA Natural Resources Conservation Service
MDEQ = Michigan Department of Environmental Quality
MDA = Michigan Department of Agriculture
CNMP = Comprehensive Nutrient Management Plans
MSUE = Michigan State University Extension
E. Coli = *Escherichia Coli*
LID = Low Impact Development
SESC = Soil Erosion and Sedimentation Control
OSDS = Onsite Sewage Disposal Systems
CSO = Combined Sewer Overflow
PEP = Public Education Plan
IDEP = Illicit Discharge Elimination Plan
MS4 = Municipal Separate Storm Sewer System
IPM = Integrated Pest Management
DPW = Department of Public Works
GRW = Galien River Watershed
BCDC = Berrien County Drain Commissioner
MDNR = Michigan Department of Natural Resources
FEMA = Federal Emergency Management Agency
BMP = Best Management Practice
SWMPC = Southwest Michigan Planning Commission

TABLE 3.6 - SWPPI COMMITMENTS, TIMELINES, AND EVALUATION METHODS FOR ASSESSING PROGRESS IN STORM WATER POLLUTION PREVENTION

				Counties			Cities					Villages		Townships						
BMP Number	Best Management Practice	Timeline	Evaluation Method	Berrien CDC	Berrien CRC	Cass CRC	Benton Harbor	Bridgman	Buchanan	Niles	St Joseph	Edwardsburg	Stevensville	Benton Twp	Bertrand Twp	Lincoln Twp	New Buffalo Twp	Niles Twp	Ontwa Twp	St Joseph Twp
01	**Critical Dunes Information** Inform developers, as appropriate, about the need to get a state permit through the critical dunes program as they apply for building permits.	Ongoing	Record of number of developers informed.		NA		C	C							NA	C	C			C
02	**Hazardous Waste Announcements** Provide County Hazardous Waste Cleanup day announcements.	Ongoing	Track number of handouts distributed.	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
03	**IDEP** Implement IDEP.	Ongoing	Number of illicit discharges eliminated, as reported in the Annual Report.	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
04	**Stream/Beach Clean-up Assistance** Assist with volunteer river/stream/lake/beach cleanups by disposing of trash collected.	When requested	Record of cleanup trash removal.	C	C	C	C	C	C	C	C			C						
05	**Street Sweeping** Sweep streets to reduce debris in drainage areas on a routine schedule.	Ongoing	Record of sweeping and amount of material collected.		C			C	C	C	C	C	C		NA					
06	**Survey Stream Crossings and Stream Crossing Maintenance** Survey at least 10% of total road-stream crossings each year to determine if each crossing is a source of sediment. Maintain crossings to minimize sediment load.	Ongoing	Number of surveys completed and total number of crossings.	C	C	C	C	C	C	C	C		C		NA					
07	**Utilize Floodplain Ordinance** Inform developers seeking permits of floodplain building limitations and extent of floodplain.	Ongoing	Record of information provided to developers.		NA			C	C	C	C		C	C	C	C	C	C	C	C
08	**Vehicle Washing Procedures** Wash vehicles indoors, at private car washes, or ensure wash water does not reach storm sewer or surface water.	Ongoing	Record of procedures.	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C
09	**Vehicle Waste Management** Service vehicles offsite at a professional service center that recycles or properly disposes of oils, waste, batteries, tires, fluids, and lubricants. Or ensure onsite service recycles and properly manages wastes.	Ongoing	Record of procedures.		C									C	C	C	C	C	C	C
10	**Work with SWMPC on Open Space Mapping** Attend SWMPC public meeting to provide input on areas of concern and interest in preserving open space.	March 2008	Record of input provided to SWMPC.	C	NA	C	C	C		C	C		C	C	C	C	C	C	C	C
11	**Storm Water Pollution Reduction Training for Staff, Contractors, and Planning Officials** Develop and implement training on storm water impacts, regulations, and best management practices, including inspection procedures for structural controls, reducing pollution from roads and municipal facilities, and proper dumpster use.	May 2008	Summary of Training and who attended.	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
12	**Staff Attend SESC Training** Provide a facilitated session to improve communication and understanding between Part 91 agency and municipal officials and inspectors.	May 2008	Survey of staff attending.	C	C	C	C	C	C	C	C		C	C		C	C	C	C	C
13	**Evaluate DPW Procedures** Study current DPW yard practices and evaluate potential impact on surface water quality (see BMP No. 22).	June 2008	Record of study.		C		C								NA					
14	**OSDS Education** Create article about OSDS and distribute to residents (PEP activity).	June 2008	Record of providing material.	C	C	C	C	C			C		C	C	C	C	C	C	C	C
15	**Maintenance Plans** Develop maintenance plans that maintain the canopy on the south and east sides of drains.	July 2008	Report of plan and work completed.	C	NA	C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16	**Adopt Floodplain Maps** Adopt new floodplain delineation maps.	December 2008	Record of review.	C		C		C	C	C	C			C	C	C	C	C	C	C
17	**Evaluate SESC Fee Structure** Review the existing SESC fee structure and determine if it is sufficient.	December 2008	Notification of updated fees.	C	NA	C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 3.6 - SWPPI COMMITMENTS, TIMELINES, AND EVALUATION METHODS FOR ASSESSING PROGRESS IN STORM WATER POLLUTION PREVENTION

				Counties			Cities					Villages		Townships						
BMP Number	Best Management Practice	Timeline	Evaluation Method	Berrien CDC	Berrien CRC	Cass CRC	Benton Harbor	Bridgman	Buchanan	Niles	St Joseph	Edwardsburg	Stevensville	Benton Twp	Bertrand Twp	Lincoln Twp	New Buffalo Twp	Niles Twp	Ontwa Twp	St Joseph Twp
18	**Inspector Storm Water Pollution Training** Training building inspectors, zoning enforcers, and public works employees to recognize potential illicit discharges.	December 2008	Record of training.	C	NA	NA	C	C	C	C	C	C	C	C	C	C	C	C	C	C
19	**Watershed Issue Education** Create articles about general watershed issues and distribute to property owners. Create displays and handout materials. Revise public service announcements for radio (PEP activity).	December 2008	Record of distribution.	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
20	**Storm Sewer Maintenance and Inspection** Conduct scheduled storm sewer inspections, including an outlet inventory. Conduct maintenance as needed, including vacuuming catch basins and clearing inlets and outlets. Establish a routine schedule for inspections.	January 2009	Record of inspection schedules, inspections and maintenance activity.	C	C	C	C	C	C	C	C	C	C	C	NA			C	C	
21	**Adopt County Storm Water Standards** Adopt County Drain Commissioner's storm water standards for new development and redevelopment that include a LID component. Appoint the County Drain Commissioner to review all new development plans. Alternately, adopt comparable enforceable standards.	June 2009	Record of storm water standards.	C*	C	C*	C		C	C	C	C	C	C	C	C	C	C	C	C
22	**Develop New DPW Procedures** If appropriate, develop new procedures that address pollution sources and polluting activities at DPW yard (see BMP No. 13).	June 2009	Summary of updated procedures.		C		C								NA					
23	**IDEP Education** Create IDEP article and distribute to residents (PEP activity).	June 2009	Record of providing material.	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
24	**IDEP Ordinance** Adopt and enforce IDEP ordinance.	June 2009	Record of passing ordinance.		NA		C	C	C	C	C	C	C	C	C		C	C	C	C
25	**Riparian Education** Create article about riparian management and distribute to property owners (PEP activity).	June 2009	Record of distribution.	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
26	**Salt Application Procedure Training** Train DPW staff to minimize salt application while providing safe driving conditions.	June 2009	Record of training.	NA	C	C	C		C	C	C	C	C	NA	NA	NA	NA	NA	NA	NA
27	**Sanitary Sewer Hookup** Require by ordinance, hookup to sanitary sewer if it is within 200 feet. Do not allow any subdivisions without sanitary sewer.	June 2009	Record of passing ordinance.		NA	C			C	C		C			NA	C				
28	**Spill Response Procedures** Evaluate Police Department, Fire Department, and DPW (as applicable) pollution control spill response procedures and update, if necessary.	June 2009	Record if spill response procedure is in place.	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
29	**Storm Water Runoff Education** Develop materials and educate residents about the importance of reducing volume and velocity of runoff (PEP activity).	June 2009	Record of providing material.	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
30	**Catch Basin And Street Sweeping Material Disposal** Review and improve (if appropriate) disposal of catch basin cleanings and street sweeping material. Consider MDEQ Guidance.	July 2009	Record of procedures and material disposal.	C	C	C	C	C	C	C	C	C	C		NA			C	C	
31	**Riparian Workshop** Sponsor workshop for homeowners based on *Landscaping for Water Quality* brochure and distribute brochure at workshop (PEP activity).	July 2009	Record of distribution.	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
32	**Groundskeeper Training** Ensure proper groundskeeper training in proper pesticide, herbicide, and fertilizer selection/storage/use/disposal on municipal property to reduce impacts on surface waters. Include proper training condition in groundskeeping contracts.	December 2009	Record of research and training.	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C

TABLE 3.6 - SWPPI COMMITMENTS, TIMELINES, AND EVALUATION METHODS FOR ASSESSING PROGRESS IN STORM WATER POLLUTION PREVENTION

				Counties			Cities					Villages		Townships						
BMP Number	Best Management Practice	Timeline	Evaluation Method	Berrien CDC	Berrien CRC	Cass CRC	Benton Harbor	Bridgman	Buchanan	Niles	St Joseph	Edwardsburg	Stevensville	Benton Twp	Bertrand Twp	Lincoln Twp	New Buffalo Twp	Niles Twp	Ontwa Twp	St Joseph Twp
33	**Improve DPW Yard Material Storage** Ensure that DPW yard material storage of salt, sand, oils, waste, batteries, tires, fluids, lubricants, gravel, and asphalt are properly managed to minimize storm water pollution potential.	June 2010	Items improved.	C	C	C	C	C	C	C	C	C	C		NA	C				
34	**Phosphorus-Free Fertilizer Education** Work with lake associations or others to educate property owners about the benefits of phosphorus-limited fertilizers.	June 2010	Record of providing material.		C	C						C				C				

Notes:
IDEP = Illicit Discharge Elimination Plan
SWMPC =
DPW = Department of Public Works
BMP = Best Management Practice
OSDS = Onsite Sewage Disposal Systems
PEP = Public Education Plan
CDC = County Drain Commission
CRC = County Road Commission
SESC = Soil Erosion Sedimentation Control
LID = Low Impact Development
MDEQ = Michigan Department of Environmental Quality

CHAPTER 4 - COSTS AND BENEFITS

4.1 ASSESSMENT OF BENEFITS AND COSTS OF THE ACTIONS

Many combinations of actions and Best Management Practices (BMPs) can be implemented to realize pollutant reduction goals. The most effective combination will be the one that is most feasible for the stakeholders based on cost, acceptability, and sustainability. Local and national efforts are continuing to identify pollutant removal effectiveness of actions and BMPs and estimated pollutant reductions expected. Not all of the answers to the question of which practices will meet the pollutant reduction goals are included in the Lower St. Joseph/Galien River Watershed Management Plan (WMP). However, the best available information has been referenced to estimate pollutant reduction predictions in the interest of determining a path to appropriate pollutant reductions.

Calculating pollutant reductions for each BMP helps assess the overall impact on the watershed and water quality. One way to assess their impact is to compare the cost of the BMPs to the amount of pollutant reduced.

Benefits and costs associated with the specific BMPs are included in Tables 3.1 and 3.2. The benefits of the BMPs are listed as pollutant removal efficiencies or environmental improvements. A portion of the costs were developed using informational documents created by neighboring watersheds, such as the St. Joseph River Watershed (Appendix 8, Table E), while the Lower St. Joseph/Galien River Watershed Committee developed the remaining costs. Costs of installation as well as operation and maintenance are considered. Tables 3.1 and 3.2 give communities a rough cost estimate for implementing various projects. Once a specific scope of work is developed for an activity, more accurate costs should be obtained.

Many of the BMPs are educational activities that are to be implemented through the National Pollutant Discharge Elimination System (NPDES) Phase II Public Education Plan (PEP), facilitated by the Southwestern Michigan Commission (SWMC). The Phase II communities participating in the regional PEP are under contract with SWMC for two years to implement activities that include newsletters, websites, brochures and outreach materials, television, and radio public service announcements. The cost of the first year of the program is $34,490 and $27,212 for the second year, for a total of $61,702. Communities are funding an average of $2,470. The benefits of having a regional program are many. Communities are able to share information and have a much larger effect on the watershed than they would have individually. The PEP is included in Appendix 6.

4.2 SUMMARY OF URBAN STORM WATER ANALYSIS

The WMP included a report, "Analysis of Urban Stormwater Best Management Practice Options for the St. Joseph River Watershed," (Kieser & Associates, 2005). The report offered some insight to the cost effectiveness of several selected urban BMPs.

From a regulatory perspective, the U.S. Environmental Protection Agency's NPDES Phase II Storm Water Program has put numerous urban communities in the watershed under regulatory obligation to develop storm water pollution control and monitoring programs. As a result of this regulation and the predicted high pollutant loadings from urban lands, it is essential for watershed management planning efforts to examine storm water pollutant loadings from urban subwatersheds. Planning must address solutions and associated costs of abating pollution from these urban sources.

Methods

Five widely-used urban storm water BMPs (wet retention ponds, dry detention ponds, vegetated swales, rain gardens, and constructed wetlands) were chosen in this study to evaluate pollution reduction opportunities and their cost-effectiveness in removing total phosphorus (TP) and total suspended solids (TSS) from urban storm water runoff. These BMPs were selected because of their general applicability and the readily available information from the State of Michigan Office of Regulatory Reform on their pollutant load reduction efficiencies and information on construction costs from the Rouge River National Wet Weather Demonstration Project.

Results

The general finding that can be drawn from the Kieser & Associates 2005 report is that urban lands contribute disproportional high loads of TP and TSS compared to the area they occupy in the subwatersheds, especially for TP loading. Treating storm water from the urban areas of these subwatersheds is critical to reduce TP and TSS loadings from these subwatersheds.

Conclusions

Urban storm water runoff is a significant source of TP and TSS loads in subwatersheds with the substantial presence of urban land uses. Controlling this source of loading is essential to improve water quality in local waterways. Among the five urban BMPs examined, (wet retention ponds, dry detention ponds, vegetated swales, rain gardens, and constructed wetlands) wet retention ponds and constructed wetlands provide the highest load reductions for TP and TSS, while vegetative swales show the highest cost-effectiveness (lowest per pound cost of load reduction). Cautions should be taken, however, in interpreting these results due to the uncertainties in design parameters of vegetative swales and rain gardens. This study has also provided some easy-to-use equations for calculating load reductions and cost-effectiveness of storm water ponds. Overall, site-specific engineering will be required in all cases to effectively apply urban storm water BMPs. Groundwater recharge and restored natural flow regimes should be the ultimate goal of any BMP strategy.

CHAPTER 5 - SUSTAINABILITY

The implementation of watershed management plans is often met by many obstacles. The Lower St. Joseph/Galien River Watershed Committee (Watershed Committee) desires this project to be sustained by continued actions and planning to improve water quality and the management of the water resources.

One obstacle to continuity is the frequency of new local officials in decision-making roles. New officials need to understand the goals of the programs and be able to step in and participate in the plan revisions. To resolve this problem the Watershed Committee had the following suggestions:

- Keep relationships and partnerships and network with other groups and organizations
- Add Phase II and Watershed Committee duties in job descriptions of local officials
- Encourage board or agency supervisors to support staff involvement in the program

Bringing in and recruiting new members for the Watershed Committee is also crucial for continuity and communication throughout the Watershed. Realtors and riparian property owners are valuable resources for promoting the goals and objectives of the Watershed Committee. Realtors and property owners can be educated about riparian concerns on those properties.

Keeping the lines of communication open is essential for any program to be successful and sustainable. Several areas groups and organizations are conducting efforts of their own. The Watershed Committee suggested continued communications with the following organizations as important to achieve the common goals.

- Friends of the St. Joe River Association to spread the word of the development of a watershed council:
    - Use list-serves and websites
    - Use Southwestern Michigan Commission for contacting organizations and communities
    - Participate in the formation of the Friends of the St. Joe River Watershed Council
- Agencies involved with the South Bend Combined Sewer Overflows
- Michiana Watershed Group
- State of Michigan Department of Environmental Quality or Federal Environmental Protection Agency Public Education staff
- Potawatomi United States Department of Agriculture Resource, Conservation, and Development
- Galien River Watershed Steering Committee:
    - Expand Galien Implementation projects into Lower St. Joseph River
- U.S. Coast Guard

5.1 REVIEW AND UPDATE PROCESS

National Pollutant Discharge Elimination System Phase II regulations require this watershed management plan (WMP) to be updated and resubmitted to the Michigan Department of Environmental Quality (MDEQ) by December 1, 2007. The WMP will be revised by the due date set forth in the final Certificate of Coverage, or as the Watershed Committee sees fit.

The creation of a watershed office, council, or organization could provide oversight of all activities in the watershed. This would enable just one agency or office to be responsible for the activities and events of the watershed. The Watershed Committee suggested that this agency could be within a county agency and have a dedicated staff person for improving communication among the stakeholders and being a resource person for the Lower St. Joseph/Galien River Watershed.

Funding is also a concern, whether funds are needed for actually implementing the recommendations of the plan or for creating a sustainable watershed organization. The Watershed Committees offered these sources as places to start researching funding opportunities:

- Communities' general funds
- Establishing a storm water utility
- Federal, State, County, and local grants and foundations
- Local universities for conducting research, providing grants, and performing public service

LEGEND

URBANIZED AREA

LOWER ST. JOSEPH/GALIEN RIVER WATERSHED

NORTH

0 20,000 Feet

COLOMA TWP
HAGAR TWP
WATERVLIET TWP
Paw Paw River
Mill Creek
Blue Creek
BENTON HARBOR
BENTON TWP
BAINBRIDGE TWP
ST JOSEPH
Saint Joseph River
ST JOSEPH TWP
Pipestone Creek
PIPESTONE TWP
BERRIEN COUNTY
CASS COUNTY
SILVER CREEK TWP
Dowagiac River
Bunker Lake
MARCELLUS TWP
MARCELLUS
Rocky River
LINCOLN TWP
SODUS TWP
WAYNE TWP
VOLINIA TWP
STEVENSVILLE
ROYALTON TWP
Farmers Creek
Indian Lake
DOWAGIAC
Dowagiac Creek
EAU CLAIRE
Smith Lake
BARODA
BERRIEN SPRINGS
BRIDGMAN
BARODA TWP
ORONOKO TWP
BERRIEN TWP
Riggins Lake
POKAGON TWP
LAGRANGE TWP
PENN TWP
NEWBERG TWP
LAKE TWP
Lake Chapin
Little Indian Lake
CASSOPOLIS
VANDALIA
Fox Lake
Lake Michigan
North Clarks Lake
Saint Joseph River
Pokagon Creek
Mc Kinzie Creek
Christiana Creek
NILES TWP
NILES
Dowagiac River
HOWARD TWP
CHIKAMING TWP
WEESAW TWP
BUCHANAN TWP
JEFFERSON TWP
CALVIN TWP
PORTER TWP
Galien River
Dowling Creek
Branch Creek
BUCHANAN
NILES
Pine Lake
Mud Creek
THREE OAKS TWP
THREE OAKS
Christiana Lake
NEW BUFFALO
GALIEN
EDWARDSBURG
Brandywine Creek
Goose Lake
Eagle Lake
South Spring Creek
GRAND BEACH
GALIEN TWP
BERTRAND TWP
MILTON TWP
MASON TWP
Saint Joseph River
Geyer Ditch
Cobus Creek
ONTWA TWP
NEW BUFFALO TWP
MICHIANA

LOWER ST. JOSEPH / GALIEN RIVER WATERSHED

Fishbeck, Thompson, Carr & Huber
Engineers • Scientists • Architects
Grand Rapids, Michigan (616) 575-3824

Berrien/Cass Counties
Michigan

Lower Saint Joseph River/Galien River Watershed Management Plan

PROJECT NO.
G03185

FIGURE NO.
1

PLOT INFO: D:\WORK\03185\MAP_DOCUMENT\LSJGR_WATERSHED.MXD DATE: 11/11/2005 USER: MB2

Appendix 1

South Bend Tribune

October 28, 2004

Watershed group seeks local input

Volunteers sought to plan strategies for protecting natural resources

By KATE SHERIDAN
Tribune Correspondent

BERRIEN SPRINGS -- Without a doubt, tens of thousands of southwestern Michigan residents love to drink it, splash it, paint it, photograph it, and swim, boat and fish in it, all year, every year.

But how many of those residents are willing to work as volunteers to monitor, protect and preserve southern Berrien County's vast and resource-rich watershed?

Armed with that question and a lofty mission -- to write a plan for the long-term sustainability of the area's natural water resources -- a group of planners have put out the call for more public help to plan the future of the area's waterway networks.

In a sprawling watershed affecting nearly 30 communities in two Michigan counties, the newly formed Lower St. Joseph-Galien River Watershed Planning Committee is looking for civic-minded volunteers to help devise strategies to protect, preserve and balance competing needs and uses for the numerous lakes, streams, creeks, rivers and floodplains in the group's charge.

Exploring the possibilities

Gary Schrader, of Niles Township, from left, Dick Chubb, of Buchanan Township, and Dave Zilke, of Bridgman, ponder the significance of their communities' respective water bodies in the new Lower St. Joseph-Galien River Watershed Planning Committee meeting recently at Andrews University.

Tribune Photo/KATE SHERIDAN

To get involved

The Lower St. Joseph-Galien River Watershed Planning Committee is planning to meet quarterly to work on a variety of issues affecting the region's water bodies. For more information or to participate, volunteers should contact

The natural resources of the vast local watershed are "abundant and often overlooked," said Brian Berndt, manager of the Berrien County Road Commission and acting chair of the new planning group.

Brian Berndt, acting chair, at (269) 925-1196 or toll-free at (800) 442-0734.

Berndt brought about 15 members from nearly a dozen communities and organizations together to Andrews University recently to explore "the possibilities of working together" to plan, manage and care for diverse elements of the watershed.

Geographically, the targeted watershed is extensive, said planner-engineer Michael Townley, a Grand Rapids-based watershed consultant.

In Berrien County, it begins south of St. Joseph-Benton Harbor, and spreads south and west along the Lake Michigan coastline to the New Buffalo area.

South and east, it follows the St. Joseph and Galien rivers, and headwaters, feeder streams and creeks, well into Cass County.

Part of the planning effort, he said, will involve identifying, tracking, and preventing pollution that impacts the waterways through stormwater drainage, agricultural runoff, septic-field seepage, leakage from gas-and-oil powered motorboats and dozens of similar opportunities for water pollution.

Alliances formed

Other watershed protection and planning groups operate along Lake Michigan, as well as the St. Joseph and Galien rivers, Townley noted. The Chikaming Open Lands group from Chikaming Township recently received a state grant of more than $590,000 to plan and implement protection strategies for that portion of the watershed.

The Galien River Watershed Council recently completed its own proposed plan for that specific watershed, developed in conjunction with the Berrien County Drain Commission. Other resources include the Lakewide Management Plan, focusing on swimming, fishing and recreational influences in and around Lake Michigan, and the St. Joseph River Watershed Project, coordinated by the Friends of the St. Joseph River.

Bringing in stakeholders

The focus of the new watershed group, beyond helping communities file mandated federal and state pollution-management paperwork, is to bring "stakeholders" -- residents and users in the watershed communities -- into the planning process, Townley said.

That's more easily said than done, said Dick Chubb, Buchanan Township supervisor who is one of the regulars at watershed and conservation meetings. He said attracting participants to watershed planning is difficult, even when discussions center around local concerns.

"It's like pulling teeth to get people involved, especially if it's a voluntary effort," he said. "I'm appointed by my trustees, so I'm required to be here. But most people have other things they'd rather be doing than going to meetings. And they don't see why or how it affects them."

Representing rural Bertrand Township was private citizen Tom Fox, a minister from Portage Prairie. He said local concerns for the watershed could range from the potential impact of high-speed trains carrying toxic chemicals through the area to the struggle to balance waterway clean-up efforts.

In some efforts to open waterways to canoeing or improve the viewshed for new residential developments, fish and wildlife habitats are necessarily destroyed when dams and logjams are removed, Chubb said.

Rural communities such as Buchanan, Bertrand and Weesaw townships sent representatives to the brainstorming session primarily because their rich water and wetland resources feed through and mingle with urban stormwater drainage systems.

Under new legislation, that coincidence of geography subjects these small communities to the more stringent monitoring and reporting requirements usually reserved for urbanized areas -- another good reason to work together, Christina Bauer of the Michigan Department of Environmental Quality said.

The group hopes to build from -- and in some cases, incorporate -- successful ideas and activities implemented by other groups currently involved in monitoring, planning and conservation, Townley said.

"We won't be reinventing anything. We do hope to get people working together so that their plans look at the continuum of what's happening in the watershed and their activities aren't being developed in a vacuum. Then we'll set goals and actions to be in sync with the plan," he said.

Appendix 2

LOWER ST.JOSEPH/GALIEN RIVER WATERSHED
PUBLIC MEETING EXIT SURVEY

August 24, 2005

Name:_____ (optional)

	Pleased				Displeased
The room set up was adequate for the meeting	1	2	3	4	5
The time of the meeting was convenient.	1	2	3	4	5
The day of the week was favorable.	1	2	3	4	5
The location was easily accessible.	1	2	3	4	5
The format of the meeting was well organized.	1	2	3	4	5

How did you hear about this meeting?

Would you suggest any changes for the next meeting?

Do you have any questions you would like answered?

Are there any organizations or agencies not represented here today that should be contacted about this project? If so, what is an effective way to reach them?

Any other comments? (Please write on back if necessary.)

Appendix 3

Lower St. Joseph/Galien River Watershed

Watershed Management Planning Survey

Please Complete and Return in the Enclosed Envelope by September 30, 2004
Additional comments may be written on the back of the survey.

Community or Agency Name: _____

Waterbody Name: _____**Galien River**
_____**Lower St. Joseph River**
_____**Lake Michigan Shoreline Tributary:**_____
_____**Other:**_____

I. Existing Environmental and Water Quality Data

Do you collect environmental and/or water quality data? Describe the types of data and where they are collected. Where can the data be obtained? Also, are you aware of any other environmental studies conducted in the watershed? Examples of desired data include water quality monitoring, groundwater monitoring, stream flow and rainfall gauges, stream surveys, biota monitoring, etc.

II. Issues of Concern in Your Watershed

What areas in your watershed have been degraded or are being threatened? Possible issues of concern are soil erosion, failing septic systems, impaired fisheries, litter and trash, overuse of fertilizers and pesticides, excessive vegetation in surface waters, chemical releases to surface water and groundwater, flooding, degradation of wildlife habitat, loss of natural areas, and poorly functioning storm sewer systems.

III. Existing Plans and Ordinances

Does your community have any plans, ordinances, or standards that guide future land development and protect the natural resources in the watershed? Please describe. Examples include a township Master Plan, local wetland ordinance, subdivision design standards, and a soil erosion and sedimentation control ordinance.

IV. Storm Water Management

How does your community actively regulate and manage storm water?

Appendix 4

NPDES Individual and General Discharge Permits (current as of 10-19-2005)

Designated Name	Permit No.	Effective Date	Expiration Date	County	Facility Type	Facility Ownership	Permittee Name	Permittee State	Facility Location 1	Location Address 1	City	Zip Code	Hydrologic Unit Code
American Elec Power-Cook Plt	MI0005827	1/1/2005	10/1/2008	Berrien	GW-Commercial	Private	Indiana Michigan Power Company	MI	American Electric Power Company - Cook Nuclear Plant	One Cook Place	Bridgman	49106	4040001
Lake Twp MS4-Berrien	MIG610237	11/17/2003	4/1/2008	Berrien	MS4	Public	Lake Charter Township	MI	Lake Charter Township		Bridgman	49106	4040001
South Shore Power Plt	MI0057218	10/1/2003	10/1/2008	Berrien	Standard (All others)	Private	South Shore Power, LLC	CA	South Shore Power Plant	3835 Lemon Creek Road	Bridgman	49106	4040001
Weldun International-Bridgman	MIG250400	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Weldun International	MI	Weldun International Limited	9850 Red Arrow Highway	Bridgman	49106	4040001
Berrien Co Station-Galien	MIG080210	5/12/2005	4/1/2010	Berrien	Standard (All others)	Public	BC Department of County Properties	MI	Berrien County Station	George Street	Galien	49113	4040001
Galien WWSL	MIG580299	4/1/2004	4/1/2009	Berrien	Non-Industrial Sanitary Wastewater	Public	Village of Galien	MI	Village of Galien	Holden Road	Galien	49113	4040001
Grand Beach MS4-Berrien	MIG610230	12/2/2003	4/1/2008	Berrien	MS4	Public	Village of Grand Beach	MI	Village of Grand Beach	48200 Perkins Boulevard	Grand Beach	49117	4040001
Michiana MS4-Berrien	MIG610240	11/17/2003	4/1/2008	Berrien	MS4	Public	Village of Michiana	MI	Village of Michiana	4000 Cherokee	Michiana	49117	4040001
Galien River SD Auth WWTP	MI0027987	12/1/2004	10/1/2008	Berrien	Non-Industrial Sanitary Wastewater	Public	Galien River Sanitary District Auth.	MI	Galien River Sanitary District Authority - WWTP	10831 Kruger Road	New Buffalo	49117	4040001
New Buffalo Plaza WWSL	MIG580304	4/1/2004	4/1/2009	Berrien	Non-Industrial Sanitary Wastewater	Private	Plaza One Management	MI	Plaza One Management - New Buffalo Plaza WWSL	19250 M-239	New Buffalo	49117	4040001
New Buffalo Twp MS4-Berrien	MIG610239	11/17/2003	4/1/2008	Berrien	MS4	Public	New Buffalo Township	MI	New Buffalo Township	17425 Red Arrow Hwy	New Buffalo	49117	4040001
New Buffalo WFP	MIG640208	4/1/2005	4/1/2010	Berrien	Standard (All others)	Public	City of New Buffalo	MI	New Buffalo Water Filtration Plant	300 Marx Drive	New Buffalo	49117	4040001
Forest Lawn LF	MI0048631	11/1/2004	10/1/2008	Berrien	Standard (All others)	Private	Forest Lawn Landfill, Incorporated	MI	Forest Lawn Landfill, Incorporated	8230 W. Forest Lawn Rd	Three Oaks	49128	4040001
Three Oaks WWSL	MIG580294	4/1/2004	4/1/2009	Berrien	Non-Industrial Sanitary Wastewater	Public	Village of Three Oaks	MI	Village of Three Oaks WWSL	Schwark Road	Three Oaks	49128	4040001
Baroda WWSL	MIG580108	4/1/2004	4/1/2009	Berrien	Non-Industrial Sanitary Wastewater	Public	Village of Baroda	MI	Village of Baroda	9091 First Street	Baroda	49101	4050001
Shawnee MHP WWSL	MIG580309	4/1/2004	4/1/2009	Berrien	Non-Industrial Sanitary Wastewater	Private	Shawnee Mobile Home Park	MI	Shawnee Mobile Home Park	1558 W. Shawnee Rd	Baroda	49101	4050001
Benton Harbor MS4-Berrien	MIG610243	11/17/2003	4/1/2008	Berrien	MS4	Public	City of Benton Harbor	MI	City of Benton Harbor		Benton Harbor	49022	4050001
Benton Twp MS4-Berrien	MIG610225	12/2/2003	4/1/2008	Berrien	MS4	Public	Benton Charter Township	MI	Benton Charter Township	1725 Territorial Road	Benton Harbor	49022	4050001
Berrien CRC MS4	MIG610228	12/2/2003	4/1/2008	Berrien	MS4	Public	Berrien County Road Commission	MI	Berrien County Road Commission		Benton Harbor	49023	4050001
Bowater NuWay Inc	MIG250285	4/16/2003	4/1/2008	Berrien	Standard (All others)	Private	Bowater NuWay, Incorporated	MI	Bowater NuWay, Incorporated	1320 Paw Paw Avenue	Benton Harbor	49022	4050001
Gast Mfg Inc-Benton Harbor	MI0045551	1/1/2004	10/1/2007	Berrien	Standard (All others)	Private	Gast Manufacturing Incorporated	MI	Gast Manufacturing Incorporated	2300 Highway M-139 S	Benton Harbor	49022	4050001
Hanson Cold Storage-Sodus	MI0057315	9/30/2003	10/1/2007	Berrien	Standard (All others)	Private	Hanson Cold Storage Company	MI	Hanson Cold Storage Company	2875 S. Pipestone Rd	Benton Harbor	49022	4050001
Nat Zinc Processors	MIG250393	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	National Zinc Processors, Inc.	MI	National Zinc Processors, Incorporated	1256 Milton Street	Benton Harbor	49022	4050001
New Products Corp	MIG250368	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	New Products Corporation	MI	New Products Corporation	448 North Shore Drive	Benton Harbor	49022	4050001
Sumitec Inc-Benton Harbor	MIG250362	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Sumitec, Incorporated	MI	Sumitec Incorporated	470 Paw Paw Avenue	Benton Harbor	49022	4050001
Whirlpool-Benton Harbor Div	MIG250369	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Whirlpool Corporation	MI	Whirlpool Corporation	151 N. Riverview Drive	Benton Harbor	49022	4050001
Andrews University Dairy-CAFO	MIG440030	12/1/2004	12/31/2007	Berrien	Confined Animal Feed Operation	Private	Andrews University	MI	Andrews University Dairy Farm	Andrews University	Berrien Springs	49104	4050001
Andrews University WWTP	MIG960031	4/1/2005	4/1/2010	Berrien	Standard (All others)	Private	Andrews University	MI	Andrews University	US 31	Berrien Springs	49103	4050001
Berrien Springs WWTP	MIG570204	4/1/2005	4/1/2010	Berrien	Non-Industrial Sanitary Wastewater	Public	Village of Berrien Springs	MI	Village of Berrien Springs	9383 US 31 South	Berrien Springs	49103	4050001
Bridgman MS4-Berrien	MIG610242	11/17/2003	4/1/2008	Berrien	MS4	Public	City of Bridgman	MI	City of Bridgman		Bridgman	49106	4050001
Bertrand Twp MS4-Berrien	MIG610248	11/17/2003	4/1/2008	Berrien	MS4	Public	Bertrand Township	MI	Bertrand Township	3835 Buffalo Road	Buchanan	49107	4050001
Buchanan Metal Forming Inc	MIG250340	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Buchanan Metal Forming, Inc.	MI	Buchanan Metal Forming, Incorporated	103 West Smith Street	Buchanan	49107	4050001
Buchanan MS4-Berrien	MIG610244	11/17/2003	4/1/2008	Berrien	MS4	Public	City of Buchanan	MI	City of Buchanan	302 North Redbud Trail	Buchanan	49107	4050001
Buchanan Twp MS4-Berrien	MIG610247	11/17/2003	4/1/2008	Berrien	MS4	Public	Buchanan Township	MI	Buchanan Township	15235 Main Street	Buchanan	49107	4050001
Buchanan WWTP	MI0022489	4/1/2003	10/1/2007	Berrien	Non-Industrial Sanitary	Public	City of Buchanan	MI	Buchanan Wastewater Treatment Plant	502 River Street	Buchanan	49107	4050001

NPDES Individual and General Discharge Permits (current as of 10-19-2005)

Designated Name	Permit No.	Effective Date	Expiration Date	County	Facility Type	Facility Ownership	Permittee Name	Permittee State	Facility Location 1	Location Address 1	City	Zip Code	Hydrologic Unit Code
					Wastewater								
Clark Engineering Services	MIG250354	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Clark Engineering Services, L.L.C	MI	Clark Engineering Services, LLC	821 East Front Street	Buchanan	49107	4050001
Hills Haven MHP WWTP	MIG570104	4/1/2005	4/1/2010	Berrien	Non-Industrial Sanitary Wastewater	Private	Hills Haven Mobile Home Park	MI	Hills Haven WWTP	4205 Hills Haven Rd #94	Buchanan	49107	4050001
Jack-Post Corp	MIG250364	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Jack-Post Corporation	MI	Jack-Post Corporation	800 East Third Street	Buchanan	49107	4050001
Riverside Estates MHC	MIG570106	4/1/2005	4/1/2010	Berrien	Non-Industrial Sanitary Wastewater	Private	Propvest Limited	NC	Riverside Estates	14566 N. Red Bud Trail	Buchanan	49107	4050001
Southeast Berrien Co Landfill	MI0052329	11/1/2003	10/1/2007	Berrien	Standard (All others)	Public	Southeast BC Landfill Authority	MI	Southeast Berrien County Landfill	3200 Chamberlain Road	Buchanan	49107	4050001
Alcoa Inc	MI0056626	10/23/2001	10/1/2005	Berrien	Standard (All others)	Private	Alcoa, Incorporated	PA	Alcoa, Incorporated - formerly Berrien Tool and Die Site	7259 Maple Street	Eau Claire	49111	4050001
Eau Claire WWSL	MIG580386	4/1/2004	4/1/2009	Berrien	Non-Industrial Sanitary Wastewater	Public	Village of Eau Claire	MI	Eau Claire Wastewater Stabilization Lagoon	6625 Main Street	Eau Claire	49111	4050001
Hermel Die Casting Corp	MIG250475	8/27/2004	4/1/2008	Berrien	Standard (All others)	Private	Hermel Die Casting Corporation	MI	Hermel Die Casting Corporation	7240 First Street	Eau Claire	49111	4050001
French Paper Co	MI0003093	10/1/2003	10/1/2007	Berrien	Standard (All others)	Private	French Paper Company	MI	French Paper Company	100 French Street	Niles	49120	4050001
Marathon Ashland-Niles	MIG670281	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Marathon Ashland Petroleum LLC	OH	Marathon Ashland Petroleum LLC	2216 South Third Street	Niles	49120	4050001
Nat Standard-City Complex	MI0039179	6/1/2003	10/1/2007	Berrien	Standard (All others)	Private	Heico Holdings LLC	IL	National-Standard Company - City Complex	601 North 8th Street	Niles	49120	4050001
Nat Standard-Lake St	MI0027596	8/1/2003	10/1/2007	Berrien	Standard (All others)	Private	Heico Holdings LLC	IL	National-Standard Company - Lake Street Plant	1631 Lake Street	Niles	49120	4050001
Niles MS4-Berrien	MIG610246	11/17/2003	4/1/2008	Berrien	MS4	Public	City of Niles	MI	City of Niles		Niles	49120	4050001
Niles Precision Co	MIG250149	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Niles Precision Company	MI	Niles Precision Company Incorporated	1308 Fort Street	Niles	49120	4050001
Niles Twp MS4-Berrien	MIG610275	11/17/2003	4/1/2008	Berrien	MS4	Public	Niles Township	MI	Niles Township	320 Bell Road	Niles	49120	4050001
Niles WWTP	MI0023701	1/1/2004	10/1/2007	Berrien	Non-Industrial Sanitary Wastewater	Public	City of Niles	MI	City of Niles WWTP	21 Marmont Street	Niles	49120	4050001
Shell Oil Products-Niles	MIG670280	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Equilon Enterprises LLC	TX	Shell Oil Products US - Niles Terminal	2303 South Third Street	Niles	49120	4050001
Simplicity Pattern Co Inc	MI0000833	12/1/2003	10/1/2007	Berrien	Standard (All others)	Private	Simplicity Pattern Company, Inc.	NY	Simplicity Pattern Company, Incorporated	901 Wayne Street	Niles	49121	4050001
Benton Harbor-St Joseph WWTP	MI0022322	12/1/2003	10/1/2007	Berrien	Non-Industrial Sanitary Wastewater	Public	BH-St. Joseph Joint Board of Comm.	MI	Benton Harbor-St Joseph WWTP	269 Anchors Way	Saint Joseph	49085	4050001
Berrien CDC MS4	MIG610229	12/2/2003	4/1/2008	Berrien	MS4	Public	BC Drain Comm. and Admin.	MI	Berrien County Drain Commissioner and Administration	701 Main Street	Saint Joseph	49085	4050001
Robert Bosch Corp-St Joseph	MIG250345	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Robert Bosch Corporation	MI	Robert Bosch Corporation - Chassis Division	3737 Red Arrow Hwy	Saint Joseph	49085	4050001
Royalton Twp MS4-Berrien	MIG610226	12/2/2003	4/1/2008	Berrien	MS4	Public	Royalton Township	MI	Royalton Township	980 Miners Road	Saint Joseph	49085	4050001
St Joseph CSO	MI0026735	2/1/2003	10/1/2007	Berrien	Non-Industrial Sanitary Wastewater	Public	City of St. Joseph	MI	St. Joseph CSO	throughout St. Joseph	Saint Joseph	49085	4050001
St Joseph MS4-Berrien	MIG610245	11/17/2003	4/1/2008	Berrien	MS4	Public	City of St. Joseph	MI	City of St. Joseph	700 Broad Street	Saint Joseph	49085	4050001
St Joseph Twp MS4-Berrien	MIG610227	12/2/2003	4/1/2008	Berrien	MS4	Public	St. Joseph Charter Township	MI	St. Joseph Charter Township		Saint Joseph	49085	4050001
Vail Rubber Works Inc	MIG250366	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Vail Rubber Works Incorporated	MI	Vail Rubber Works Incorporated	521 Langley Avenue	Saint Joseph	49085	4050001
Meadow Streams Estates MHP	MIG580109	4/1/2004	4/1/2009	Berrien	Standard (All others)	Private	Park Meadow Estates, LLC	IL	Meadow Streams Estates Mobile Home Park	3101 River Road	Sodus	49126	4050001
Sodus Hard Chrome Co	MIG250353	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Sodus Hard Chrome, Incorporated	MI	Sodus Hard Chrome, Incorporated	3085 Yore Avenue	Sodus	49126	4050001
Sodus Twp MS4-Berrien	MIG610238	11/17/2003	4/1/2008	Berrien	MS4	Public	Sodus Township	MI	Sodus Township		Sodus	49126	4050001
Lincoln Twp MS4-Berrien	MIG610241	11/17/2003	4/1/2008	Berrien	MS4	Public	Lincoln Charter Township	MI	Lincoln Charter Township		Stevensville	49127	4050001
Stevensville MS4-Berrien	MIG610224	12/2/2003	4/1/2008	Berrien	MS4	Public	Village of Stevensville	MI	Village of Stevensville	5768 St. Joseph Avenue	Stevensville	49127	4050001
Edwardsburg MS4-Cass	MIG610236	12/2/2003	4/1/2008	Cass	MS4	Public	Village of Edwardsburg	MI	Village of Edwardsburg	26296 US 12 E, Y 0625	Edwardsburg	49112	4050001

NPDES Individual and General Discharge Permits (current as of 10-19-2005)

Designated Name	Permit No.	Effective Date	Expiration Date	County	Facility Type	Facility Ownership	Permittee Name	Permittee State	Facility Location 1	Location Address 1	City	Zip Code	Hydrologic Unit Code
MDEQ-RRD-Edwardsburg	MI0051764	2/1/2002	10/1/2006	Cass	Standard (All others)	State	MDEQ	MI	MDEQ - Remediation & Redevelopment Division	Elkhart Road near M-62	Edwardsburg	49112	4050001
Ontwa Twp MS4-Cass	MIG610234	12/2/2003	4/1/2008	Cass	MS4	Public	Ontwa Township	MI	Ontwa Township		Edwardsburg	49112	4050001
Howard Twp MS4-Cass	MIG610231	12/2/2003	4/1/2008	Cass	MS4	Public	Howard Township	MI	Howard Township	1345 Barron Lake Road	Niles	49120	4050001
MDEQ-RRD-Aviex SF	MI0043141	3/1/2003	10/1/2007	Cass	Standard (All others)	State	MDEQ	MI	US Aviex Superfund Site	1056 Huntly Road	Niles	49120	4050001
MDEQ-RRD-Former Henco Ent	MI0057618	11/24/2004	10/1/2009	Cass	Standard (All others)	Private	MDEQ	MI	MDEQ-RRD-Former Henco Enterprises	2241 Lake Street	Niles	49120	4050001
Milton Twp MS4-Cass	MIG610235	12/2/2003	4/1/2008	Cass	MS4	Public	Milton Township	MI	Milton Township	2576 East Bertrand Road	Niles	49120	4050001

Appendix 5

NPDES Industrial Storm Water Permits (current as of 10-19-2005)

Designated Name	Permit No.	Effective Date	Expiration Date	County	Facility Type	Facility Ownership	Permittee Name	Facility Location 1	Location Address 1	City	Zip Code	Hydrologic Unit Code
ABC Precision Machining	MIS310109	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	ABC Precision Machining	ABC Precision Machining	2077 Yore Avenue	Benton Harbor	49022	4050001
Alloy Foundry-Benton Harbor	MIS310443	6/24/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	The Alloy Foundry Company	The Alloy Foundry Company	1617 Territorial Road	Benton Harbor	49022	4050001
Atlantic Auto-Territorial	MIS310119	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Atlantic Automotive Components	Atlantic Automotive Components	359 Territorial Road	Benton Harbor	49022	4050001
Atlantic Automotive Components	MIS310127	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Atlantic Automotive Components	Atlantic Automotive Components	1285 N. Crystal Avenue	Benton Harbor	49022	4050001
August Pohl Auto Wreckers	MIS310266	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	August Pohl Auto Wreckers	August Pohl Auto Wreckers	2670 Territorial Road	Benton Harbor	49022	4050001
Ausco Products-St Joseph	MIS310333	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Ausco Products	Ausco Products	2245 Pipestone Road	Benton Harbor	49022	4050001
Brutsche Concrete-Benton Hbr	MIS310009	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Brutsche Concrete	Brutsche Concrete	1108 South Crystal	Benton Harbor	49022	4050001
Certified Metal Finishing	MIS310329	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Certified Metal Finishing, Incorporated	Certified Metal Finishing, Inc.	424 West Main Street	Benton Harbor	49023	4050001
Consumers Asphalt Co	MIS310027	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Consumers Asphalt Company	Consumers Asphalt Company	1589 Townline Road	Benton Harbor	49022	4050001
Dawson Mfg-Benton Harbor	MIS310519	4/15/2004	4/1/2008	Berrien	Industrial Storm Water Only	Private	Dawson Manufacturing Company	Dawson Manufacturing Company	1042 N. Crystal Avenue	Benton Harbor	49023	4050001
GM-Brass-Aluminum Foundry-BH	MIS310106	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	GM Brass & Aluminum Foundry, Inc.	GM Brass & Aluminum Foundry, Inc.	200 West Wall Street	Benton Harbor	49023	4050001
J L French Automotive	MIS310545	5/31/2005	4/1/2008	Berrien	Industrial Storm Water Only	Private	J L French Automotive	J L French Automotive	1500 E. Empire Avenue	Benton Harbor	49022	4050001
K-O Products Co	MIS310131	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	K-O Products Company	K-O Products Company	1225 Milton Street	Benton Harbor	49022	4050001
Leco-Michigan Ceramics Div	MIS310062	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Leco-Michigan Ceramics Division	Leco-Michigan Ceramics Division	1920 Yore Avenue	Benton Harbor	49022	4050001
Max Casting Co-Benton Harbor	MIS310242	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Max Casting Company, Incorporated	Max Casting Company, Inc.	116 Paw Paw Avenue	Benton Harbor	49022	4050001
Modern Plastics Corp	MIS310343	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Modern Plastics Corporation	Modern Plastics Corporation	489 North Shore Drive	Benton Harbor	49022	4050001
Mono Ceramics-Benton Harbor	MIS310114	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Mono Ceramics, Incorporated	Mono Ceramics, Incorporated	2235 Pipestone Road	Benton Harbor	49022	4050001
Nat Zinc Processors	MIS310069	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	National Zinc Processors, Inc.	National Zinc Processors, Inc.	1256 Milton Street	Benton Harbor	49022	4050001
New Products Corp	MIS320001	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	New Products Corporation	New Products Corporation	448 North Shore Drive	Benton Harbor	49022	4050001
Old Europe Cheese Inc	MIS310204	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Old Europe Cheese, Incorporated	Old Europe Cheese, Incorporated	1330 Empire Avenue	Benton Harbor	49022	4050001
Pier 1000 Marina LLC	MIS310111	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Pier 1000 Marina, LLC	Pier 1000 Marina, LLC	1000 Riverview Drive	Benton Harbor	49023	4050001
Sandvik Materials Tech	MIS310255	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Sandvik Materials Technology	Sandvik Materials Technology	2235 Dewey Avenue	Benton Harbor	49022	4050001
Southwest Michigan Regional Airport	MIS310078	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Public	SW MI Regional Airport Authority	SW MI Regional Airport Authority	1123 Territorial Road	Benton Harbor	49022	4050001
Spence Tech Inc-Benton Harbor	MIS410490	5/20/2004	4/1/2009	Berrien	Industrial Storm Water Only	Private	Spence Technology Incorporated	Spence Technology Incorporated	121 Graham Avenue	Benton Harbor	49022	4050002
Square Deal Auto-Benton Harbor	MIS310520	6/24/2004	4/1/2008	Berrien	Industrial Storm Water Only	Private	Square Deal Auto Salvage	Square Deal Auto Salvage	1091 Territorial Road	Benton Harbor	49022	4050001
Sumitec Inc-Benton Harbor	MIS310396	5/8/2003	4/1/2008	Berrien	Standard (All others)	Private	Voest-Alpine Services & Tech., Corp.	Sumitec Incorporated	470 Paw Paw Avenue	Benton Harbor	49022	4050001
Whirlpool-Benton Harbor Div	MIS310150	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Whirlpool Corporation	Whirlpool Corporation	151 North Riverview Drive	Benton Harbor	49022	4050001
Worthington Armstrong Venture	MIS310118	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Worthington Armstrong Venture	Worthington Armstrong Venture	745 Enterprise Way	Benton Harbor	49022	4050001
Andrews University Airport	MIS310203	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Public	Andrews University Airport	Andrews University Airport	Griggs Drive	Berrien Springs	49103	4050001
Premier Tool Die Cast	MIS310444	6/24/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Premier Tool Die Cast	Premier Tool Die Cast	9886 Tudor Road	Berrien Springs	49103	4050001
Rays Auto Sales-Berrien Springs	MIS310433	6/24/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Ray's Auto Sales	Ray's Auto Sales	10359 Old US 31	Berrien Springs	49103	4050001
ADCO Die Cast-Bridgman	MIS410127	4/1/2004	4/1/2009	Berrien	Industrial Storm Water Only	Private	ADCO Die Cast Corporation	ADCO Die Cast Corporation	Rambo Road	Bridgman	49106	4040001
ICG Berrien Inc-Bridgman	MIS410231	6/24/2004	4/1/2009	Berrien	Industrial Storm Water Only	Private	ICG Castings, Incorporated	ICG Berrien, Incorporated	9864 Church Street	Bridgman	49106	4040001
St Joe Tool Co-Bridgman	MIS510545	4/1/2005	4/1/2010	Berrien	Industrial Storm Water Only	Private	St. Joe Tool Company	St. Joe Tool Company	11521 Red Arrow Highway	Bridgman	49106	4050001
Technisand Inc-Bridgman	MIS310446	6/24/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Fairmount Minerals, Limited	Technisand Incorporated	3840 Livingston Road	Bridgman	49106	4050001
Weldun International-Bridgman	MIS410233	4/1/2004	4/1/2009	Berrien	Standard (All others)	Private	PIA Properties	Weldun International Limited	9850 Red Arrow Highway	Bridgman	49106	4040001
Buchanan Metal Forming Inc	MIS310382	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Buchanan Metal Forming, Inc.	Buchanan Metal Forming, Inc.	103 West Smith Street	Buchanan	49107	4050001
Five Corners Garage Inc	MIS310124	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Five Corners Garage Incorporated	Five Corners Garage Incorporated	7247 Pipestone Road	Eau Claire	49111	4050001
Hermel Die Casting Corp	MIS310529	8/27/2004	4/1/2008	Berrien	Standard (All others)	Private	Hermel Die Casting Corporation	Hermel Die Casting Corporation	7240 First Street	Eau Claire	49111	4050001

NPDES Industrial Storm Water Permits (current as of 10-19-2005)

Hofmann Ind-Mich Tube Div	MIS310391	4/22/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Hofmann Industries	Hofmann Industries	100 Love Road	Eau Claire	49111	4050001
Shawnee Specialties Inc	MIS310154	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Shawnee Specialties Incorporated	Shawnee Specialties Incorporated	7100 3rd Street	Eau Claire	49111	4050001
Independent Steel Castings Co	MIS410448	4/1/2004	4/1/2009	Berrien	Industrial Storm Water Only	Private	Independent Steel Castings Co.	Independent Steel Castings Co.	13899 Grand Avenue	New Buffalo	49117	4040001
Ozinga Indiana RMC-New Buffalo	MIS410447	4/1/2004	4/1/2009	Berrien	Industrial Storm Water Only	Private	Ozinga Indiana RMC, Incorporated	Ozinga Indiana RMC, Incorporated	825 S. Whittaker Street	New Buffalo	49117	4040001
B&R Oil Co Inc	MIS310530	2/24/2005	4/1/2008	Berrien	Industrial Storm Water Only	Private	B & R Oil Company Incorporated	B & R Oil Company Incorporated	1001 Fulkerson Road	Niles	49120	4050001
Brenner Transportation-Niles	MIS310337	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Brenner Transportation Company	Brenner Transportation Company	1001 Fulkerson Road	Niles	49120	4050001
Citgo Corp-Niles	MIS320004	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Citgo Petroleum Corporation	Citgo Petroleum Corporation	2233 South 3rd Street	Niles	49120	4050001
Consumers Concrete-Niles	MIS310348	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Consumers Concrete Corporation	Consumers Concrete Corporation	1523 Lake Street	Niles	49120	4050001
Jerry Tyler Memorial-Niles	MIS310006	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Jerry Tyler Memorial Airport	Jerry Tyler Memorial Airport	2018 Lake Street	Niles	49120	4050001
Marathon Ashland-Niles	MIS320012	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Marathon Ashland Petroleum LLC	Marathon Ashland Petroleum LLC	2216 South Third Street	Niles	49120	4050001
Michiana Aggregate	MIS310548	6/28/2005	4/1/2008	Berrien	Industrial Storm Water Only	Private	Michiana Aggregate, Incorporated	Michiana Aggregate	3265 U.S. 12 West	Niles	49120	4050001
Michiana Box & Crate Inc-Niles	MIS410516	4/1/2004	4/1/2009	Berrien	Industrial Storm Water Only	Private	Michiana Box & Crate, Inc.	Michiana Box & Crate, Inc.	2193 Industrial Drive	Niles	49120	4040001
Niles Precision Co	MIS310055	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Niles Precision Company	Niles Precision Company Inc.	1308 Fort Street	Niles	49120	4050001
Pilkington-Niles	MIS310227	5/8/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Pilkington	Pilkington	2121 West Chicago Road	Niles	49120	4050001
Shell Oil Products-Niles	MIS320013	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Equilon Enterprises LLC	Shell Oil Products US	2303 South Third Street	Niles	49120	4050001
United Fixtures Co-Niles	MIS310060	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	United Fixtures Company	United Fixtures Company	901 Howard Street	Niles	49120	4050001
Vertis-Printco Incorporated	MIS310174	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Vertis, Incorporated	Printco Incorporated	2101 Industrial Drive	Niles	49120	4050001
Brians Marine Service	MIS310330	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Brian's Marine Service, Inc.	Brian's Marine Service, Inc.	285 Anchors Court	Saint Joseph	49085	4050001
Dock 63 Inc-St Joesph	MIS310521	6/9/2004	4/1/2008	Berrien	Industrial Storm Water Only	Private	Dock 63 Incorporated	Dock 63 Incorporated	220 North Wayne Street	Saint Joseph	49085	4050001
Eagle Point Harbor-St Joseph	MIS310325	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Eagle Point Harbor	Eagle Point Harbor	2351 Niles Avenue	Saint Joseph	49085	4050001
Harbor Isle Marina-St Joseph	MIS320021	9/9/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Harbor Isle Marina	Harbor Isle Marina	143 Industrial Avenue	Saint Joseph	49085	4050001
Leco Corp-St Joseph-Lakeview	MIS310021	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Leco Corporation	Leco Corp.-St Joseph-Lakeview	3000 Lakeview	Saint Joseph	49085	4040001
Leco-Pier 33-St Joseph	MIS310035	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Leco-Pier 33	Leco-Pier 33-St Joseph	250 Anchors Way	Saint Joseph	49085	4050001
Robert Bosch Corp-St Joseph	MIS310248	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Robert Bosch Corporation	Robert Bosch Corporation	3737 Red Arrow Highway	Saint Joseph	49085	4050001
Shepherd Caster Corp-St Joseph	MIS310265	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Shepherd Caster Corporation	Shepherd Caster Corporation	203 Kerth Street	Saint Joseph	49085	4050001
Shoreham MS4-Berrien	MIS040039	11/17/2003	4/1/2008	Berrien	MS4	Public	Village of Shoreham	Village of Shoreham	2862 West Garden Lane	Saint Joseph	49085	4050001
UPS-St Joseph	MIS310484	8/4/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	United Parcel Service, Inc.	United Parcel Service	320 Palladium Drive	Saint Joseph	49085	4050001
Vail Rubber Works Inc	MIS310128	4/1/2003	4/1/2008	Berrien	Standard (All others)	Private	Vail Rubber Works Incorporated	Vail Rubber Works Incorporated	521 Langley Avenue	Saint Joseph	49085	4050001
Whirlpool Tech Center	MIS310005	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Whirlpool Corporation	Whirlpool Corporation	303 Upton Drive	Saint Joseph	49085	4050001
Corvette Central-Sawyer	MIS410155	4/1/2004	4/1/2009	Berrien	Industrial Storm Water Only	Private	Corvette Central	Corvette Central	5852 Sawyer Road	Sawyer	49125	4040001
Intermet Corp-Stevensville	MIS310362	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Intermet Corporation	Intermet Corporation	2800 Yasdick Drive	Stevensville	49127	4050001
Reliable Disposal-Stevensville	MIS310071	4/1/2003	4/1/2008	Berrien	Industrial Storm Water Only	Private	Republic Waste Services, Inc.	Reliable Disposal, Incorporated	7227 Reliable Path	Stevensville	49127	4050001
Vickers Engineering-Three Oaks	MIS410232	4/15/2004	4/1/2009	Berrien	Industrial Storm Water Only	Private	Vickers Engineering	Vickers Engineering	16860 Three Oaks Road	Three Oaks	49128	4040001
Zabel Auto Parts	MIS410569	3/24/2005	4/1/2009	Berrien	Industrial Storm Water Only	Private	Zabel Auto Parts	Zabel Auto Parts	6288 Kruger Road	Three Oaks	49128	4040001
Georgie Boy Mfg-Plt 1-Edwardsb	MIS210119	4/1/2002	4/1/2007	Cass	Industrial Storm Water Only	Private	Georgie Boy Manufacturing, LLC	Georgie Boy Manufacturing, LLC	27437 May Street	Edwardsburg	49112	4050001
Georgie Boy Mfg-Plt 2-3-Edward	MIS210120	4/1/2002	4/1/2007	Cass	Industrial Storm Water Only	Private	Georgie Boy Manufacturing, LLC	Georgie Boy Manufacturing, LLC	69815 Brizandine	Edwardsburg	49112	4050001
North American Forest Prod	MIS210121	4/1/2002	4/1/2007	Cass	Industrial Storm Water Only	Private	North American Forest Products, Inc.	North American Forest Products, Inc.	69708 Kraus Road	Edwardsburg	49112	4050001

Appendix 6

STORM WATER

PUBLIC EDUCATION PLAN

BERRIEN AND CASS COUNTIES

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

PHASE II

DECEMBER 2004

FISHBECK, THOMPSON, CARR & HUBER, INC. **Engineers • Scientists • Architects**
1515 Arboretum Drive, SE, Grand Rapids, MI 49546 Telephone: 616-575-3824

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INTRODUCTION

The State of Michigan's National Pollutant Discharge Elimination System (NPDES) Phase II Storm Water Regulations allows compliance through a regional watershed-based initiative. This Public Education Plan (PEP) takes advantage of the watershed-based permit structure by combining available resources in the Lower St. Joseph/Galien River Watershed (Watershed) to reach a greater audience more efficiently. The PEP created for the participating communities will educate and empower the public about ways they can reduce storm water pollution. Outreach activities will reach diverse audiences with a variety of viewpoints and concerns. Successful implementation of the PEP will form partnerships with local agencies and organizations, and use educational materials and strategies that are familiar and relevant to the area residents.

One purpose of a public education and outreach strategy is to gain community support by educating the public about the importance of water quality initiatives and how the community will benefit from the resulting programs and regulations. Compliance with the NPDES Phase II regulations requires residents to be informed, thus they will be more aware of their responsibilities for improving water quality. Changing the way they manage their lawns, household hazardous wastes, refuse, and septic systems, area residents can have a considerable influence on improving water quality.

The unique purpose of the public education portion of the NPDES Phase II permit is to increase the awareness of watershed residents about how their everyday activities contribute pollutants to their community's water resources. Most citizens recognize the recreational and aesthetic benefits they receive from water, and most even recognize that water quality degradation is a serious concern in the Great Lakes Region. However, most people have not made the connection that the majority of this pollution is generated from their normal everyday actions and not simply from large commercial and industrial sources.

The advantage of the watershed-based permit is the cooperation and resource sharing that develops between the participating communities. Implementing a successful PEP would take funding and preparation time that one community may find impossible to do alone. If coordination develops between many communities in the Watershed, these resources can be shared and a larger audience can be reached at a smaller cost. In this manner, duplication of efforts in neighboring communities, which increases cost of development, will be reduced and the need to hire additional staff to implement the PEP will be minimized.

AVAILABLE RESOURCES

By developing a cooperative effort for implementing the PEP, the participating communities will be able to utilize many of the programs and methods of communication that already exist throughout the Watershed and educational media that has previously been successfully used throughout the State of Michigan. Building on existing programs allows each community to share their knowledge and experience with previous and ongoing outreach programs.

The Berrien County and Cass County area is home to a number of environmental organizations that have environmental education as a mission statement. Cooperation between these organizations will benefit both parties since they will be able to unite their messages to a common theme in the communities to improve water quality. A joint effort between these organizations and the participating communities will accomplish larger projects that would have been impossible alone.

An abundance of public education materials have already been published throughout the State of Michigan by various organizations, such as conservation districts, Rouge River Wet Weather Demonstration project, Clinton River Watershed Council, Huron River Watershed Council, the Michigan Department of Environmental Quality (MDEQ), the Michigan Groundwater Stewardship Program, Natural Resources Conservation Service, and various county drain commissioners. Information and examples of the most successful of these programs and activities have been assembled into the Storm Water Savvy Campaign, currently being showcased around the State of Michigan. The participating communities submitted details of existing public education programs and activities in Berrien and Cass Counties that could be used for promoting storm water education. All of the programs and activities were assessed as to how storm water management could be incorporated.

The PEP defines target audiences, develops specific messages, and selects delivery mechanisms to promote the goals and objectives of reducing pollutants in storm water runoff. The PEP includes a mechanism for evaluating the success and effectiveness of the plan. The measurable goals include realistic data collection and milestones that the participating communities can quantify and compare. A schedule was prepared for the implementation of the various components of the PEP, indicating the dates for distribution of educational materials and the completion of slated activities.

PUBLIC EDUCATION PLAN OVERVIEW

The PEP is designed to promote, publicize, and facilitate watershed education by encouraging the public to reduce the discharge of pollutants in storm water to the maximum extent practicable. Educating the public about a project that may affect the way they go about their daily lives is an important step in the planning process. Open communication and the availability of informational material will demonstrate to the public the community's commitment to meaningful involvement from its citizens. The PEP shall be coordinated with other programs and projects that involve public stewardship of water resources in Berrien and Cass Counties. Input from the public will ensure that the community will make environmental decisions with an understanding of the interest and concerns of affected people and entities. This type of cooperation between those making the decisions and those affected by the decisions will bring about a more effective change in public behavior.

GOALS AND OBJECTIVES

Stewardship and responsibility in the Watershed will increase as awareness increases, resulting in an overall improvement in water quality. Greater awareness and pride in local natural resources at the grass roots level will create a bottom up policy change. More understanding on the relationships between storm water pollution and local problems will result in a public desire for change. The following goals will direct the implementation of the program and produce public support for storm water regulations:

- To encourage prevention of pollution over treatment of pollution.

- To increase community involvement by promoting watershed education for the purpose of reducing discharge of pollutants in storm water.

- To coordinate with existing programs for public stewardship of water resources.

The overall goal to encourage pollution prevention, which is more cost effective than the treatment of pollution, will be accomplished by addressing the following objectives:

- Education of the general public about personal watershed stewardship.

- Education of residents concerning the ultimate storm water discharge location and the potential impacts of pollution from the separate storm water drainage system.

- Encourage the public reporting of the presence of illicit discharges or improper disposal of materials into the community's separate storm water drainage system.

- Education of residents concerning personal actions that can impact the Watershed, such as cleaning materials, procedures for residential or community organization car washing, application and disposal of pesticides and fertilizers, and regulations for small business and residential waste haulers.

- Education of the residents in the community of the availability, location, and requirements of facilities for disposal or drop-off of household hazardous waste, travel trailer sanitary wastes, chemicals, grass clippings, leaf litter, animal wastes, and motor vehicle fluids.

- Education of the management of riparian lands and the importance of stream buffers.

PUBLIC EDUCATION STRATEGY

The development and implementation of a public education program offers the Berrien County and Cass County communities an opportunity to meet the basic requirements outlined in the NPDES Phase II watershed-based permit. This unified and coordinated effort will accomplish the goals of the watershed-based permit to promote, publicize, and facilitate watershed education for encouraging the public to reduce the discharge of pollutants in storm water.

The PEP requirements can be broken down into six broad education categories:

- Personal watershed stewardship
- Ultimate storm water discharge locations and potential impacts
- Public reporting of illicit discharges
- Personal actions that can impact the Watershed
- Waste management assistance
- Management of riparian lands

Table 1 connects the education categories with target audiences, key messages, and delivery mechanisms that would be effective in the Berrien County and Cass County area. The table identifies the specific target audiences, selected from all persons who potentially could affect the quality of storm water discharges. The audiences include, but are not limited to; residents, local officials, visitors to the area, businesses, commercial operations, and contractors and developers. Messages were developed that convey the importance of the educational category to the target audiences. Delivery mechanisms were

selected, such as flyers, newsletters, local media, workshops, and demonstrations that have been or would be effective for delivering messages to the target audiences.

The categories were prioritized and the responsible parties for implementation were identified.

TARGET AUDIENCE

The target audiences are groups that affect, or are affected by, storm water pollution in their everyday actions. Not every person in these groups, however, contributes to storm water pollution equally. The population segments listed below will be targeted by different messages and delivery mechanisms as outlined in Table 1.

- **All watershed residents**, including renters, landowners, and homeowners need to be targeted with broad informational outreach programs. Programs should not be too specific, instead just general information to raise awareness and knowledge of watersheds and storm water is needed at this level.

- **City and township officials** need to be educated about water quality issues and storm water regulations that are important for the community's health and economy. This group will be implementing the Storm Water Pollution Prevention Initiatives and setting an example to those living in their communities. Changing the way communities are zoned and developed has huge effects on water quality and the amount of storm water runoff. Therefore, educating local officials about why storm water pollution should be a high priority concern may be the most effective method for increasing a community's water quality.

- **Businesses** in the Watershed will be directly affected by storm water regulations. Therefore, it will be important to educate business owners on why these programs are needed.

- **Industries** that hold NPDES permits within the community have their permits continually reviewed and evaluated. Education efforts aimed at these industries should focus on stewardship of the water resources and technical assistance available to improve pollutant control measures.

- **Riparian landowners** can have a direct affect on water quality by establishing and protecting buffers on their property. Information sent to these landowners should outline the importance of buffers and methods that reduce runoff pollution.

- **Homeowners** should protect water resources by making sure septic and plumbing systems are operating correctly, maintaining their lawn and gardens in a sound manner, and properly disposing of household hazardous waste. Educational materials should highlight how failing septic systems, poor lawn care practices, and illegal dumping of waste affect water quality and how to perform these activities properly.

- **Employees** are a very broad group of individuals that will be targeted using a variety of media to persuade them to become more responsible stewards in the way they conduct business practices. Carpet cleaning companies should properly dispose of waste water. Other subjects for educational campaigns will include company recycling programs, car-pooling, oil recycling, availability, and proper fleet and grounds maintenance.

- **Backyard mechanics** need to be aware of the proper disposal of automobile fluids and cleaning compounds. Educating these individuals about the impacts of these wastes on waterways is important. Educational information about proper waste disposal and oil recycling centers can be distributed at local automotive stores, printed on petroleum products, and discussed at student driver training.

- **Students** need to be educated about what they can do to improve the quality of storm water. Materials incorporated into the school curriculum can have a permanent effect on water quality since today's students are tomorrow's leaders. To reach students year after year, teachers should be educated in ways they can incorporate storm water education into their curriculum.

- **Community groups** can be influential components of a public outreach program. Once the groups have become knowledgeable about storm water management, they can pass this information on to others in their neighborhoods.

- **Developers, contractors, and architects** in the building and landscaping industry need to be aware of the impacts that soil disturbance and impervious surface runoff has on water quality. Architects and planners who communicate between the contractor and the client have opportunities to design innovative storm water management into their sites.

- **Lawn and garden centers** need to accept responsibility for the products they sell. Brochures available at checkout and in the pesticide and fertilizer aisles must be visible and provide accurate information about the products consumers are buying. Cooperation with these businesses to provide workshops can be a great outreach tool for homeowners and gardeners who apply their own fertilizers and pesticides.

- **Public maintenance managers**, park and recreation officials, and public building property managers should be good examples of watershed stewards in the way they maintain their properties. Information dissemination about composting, the importance of buffers, and the proper use of pesticides and fertilizers will be sent to the appropriate individuals. Those who visit these sites, that are responsibly maintained, will appreciate how the property is maintained through educational tools such as signs and nature trails.

- **Marinas** can help protect water quality by educating their clients on what illicit discharges are and how they can be prevented by using caution in choosing boat cleaning methods and products. If marinas supply customers with facts about their cleaning compound choices and alternative cleaning products, they could reduce the potential impacts from marinas.

- **Car washers** should be conscious of where the wash water is going. Commercial car washes must send wash water to a treatment plant. Individuals should wash cars on the lawn and avoid storm drains. Educational materials should focus on these alternatives. Commercial car washes could capitalize on their requirement for treating or recycling wash water by offering customers facts on car washing and how they are protecting water quality.

DEVELOPING MESSAGES ABOUT STORM WATER MANAGEMENT

The PEP will provide clear and understandable information throughout the Watershed management process. To achieve maximum effectiveness, the program needs an overarching approach that provides consistent verbal and visual cues to the target audience. This way the relayed messages will be short and to the point, thus retaining the reader or listener's attention. Benefits of a common theme approach are:

- Creates a distinct identity and is recognizable by the public
- Sends clear and concise message
- Makes the program more personal for the recipient
- Creates unity between all pollution prevention programs
- Increases efficiency in cost and production of educational materials

The messages that need to be conveyed for each educational category are in Table 1.

DELIVERY MECHANISMS

The following mechanisms are examples of informational and public outreach strategies that could be used at various stages in the PEP. A successful PEP must incorporate storm water education to the maximum extent possible using all feasible means and reaching the most people with effective mechanisms. Therefore, a successful PEP should use delivery mechanisms that are cost effective and reach a maximum number of residents with persuasive behavior changing messages. The delivery mechanisms included in the PEP are building on existing programs where possible and can feasibly be implemented by the participating communities to reach the maximum number of people with effective results. Table 1 illustrates how the delivery mechanisms address each educational category of the PEP.

SCHEDULE OF IMPLEMENTATION

The first year of the PEP implementation will focus on developing the storm water education components to add to the existing programs and activities. Partnerships with the potential partners listed in Table 1 will be formed in the first year.

Table 2 describes the timetable for developing, implementing, and evaluating each delivery mechanism. The vision of the PEP is to be incorporated into other public education programs, such as the Galien River Watershed Management Plan (WMP), the St. Joseph River Watershed Management Plan, and other county and local educational programs.

EVALUATION METHODS

A determination of the methods of evaluation and measurable goals is necessary to establish the level of permit compliance and program effectiveness. Methods of evaluation and measurable goals have been developed for each delivery mechanism and are presented in Table 2. Public education efforts found to be cost effective for reaching a wide and varied audience through the evaluation will be used in future community outreach programs. The programs that did not reach their goals will be studied to find the reasons why they did not work and be either changed to increase their effectiveness or discarded from future implementation. The PEP coordinator will be responsible for ensuring that the information to be evaluated is tracked or that the responsible party will be tracking the information and reporting it to the PEP coordinator. The PEP coordinator will develop and distribute an evaluation/tracking form for each responsible party delivering educational messages. This form could be part of a “partnership agreement” as a requirement to implement the PEP.

SUMMARY

The sharing of information, time, expertise, and programs allow the PEP to efficiently reach all economic and ethnic groups in Berrien and Cass Counties. Since increased awareness by all residents in the Watershed will help improve water quality and protect water resources, the watershed-based initiative effectively meets the NPDES Phase II requirements with the greatest benefit for the participating municipalities. A number of public education and outreach programs already exist and will be expanded and enhanced to include the educational categories detailed in this plan. The regional approach to public education shares responsibilities, communicates the messages to greater audiences, and provides consistent and repetitive information to the communities.

Many of the activities in the PEP have a "PEP coordinator" listed in the "Responsible Party for Implementation" column in Table 1. The intent of the participating communities is to collectively hire an agency or consultant to coordinate the implementation of the PEP. The agency or consultant will prepare an annual work plan that will be approved by the participating communities. An education committee will advise the agency or consultant on a regular basis to ensure the work plan is being implemented on schedule and to provide information on local events and opportunities. In addition, individual communities will work closely with this coordinator to ensure that their portion of the PEP is implemented. The PEP coordinator will develop a tracking/evaluation form to be used for each participating municipality and partner to effectively communicate their efforts in the education program. The PEP coordinator will compile the information and complete the necessary evaluation measures to satisfy MDEQ reporting requirements for the education component.

Table 1 - Educational Categories of the Public Education Plan
BERRIEN COUNTY/CASS COUNTY PHASE II

Education Category 1 - Personal watershed stewardship

The importance of this category is to educate the public about their responsibility and stewardship in the watershed.

Message

A watershed is an area of land, defined by hills and ridges, that drains to a common outlet. You live in the Lower St. Joseph/Galien River Watershed, which includes some Lake Michigan coastal areas. Water quality in lakes and streams is greatly affected by our everyday activities. Changes in simple activities can protect our watershed, improving water quality and the quality of life.

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
Educational programs that include materials about watershed stewardship	Watershed residents, homeowners, and local officials	Watershed Short Course	Kellogg Biological Station, SWMC, MSUE	The Conservation Fund
	Students, youth groups, environmental clubs, and watershed residents	Fernwood offers classes ranging from canoeing to wildflower walks	MSUE, school districts, Conservation Districts, Berrien County Parks Department	PEP Coordinator - Contact: Fernwood Environmental Studies Program - Wendy Jones, Naturalist 269-695-6491
	Students, youth groups, environmental clubs, and watershed residents	Berrien County Parks Department offers a wide variety of activities and programs that relate to watershed management and water quality issues: • Galien River County Park Preserve, New Buffalo Township - Interpretive Center, observation platforms, and boardwalk trails in the wetlands and to the river¹s edge. • Love Creek Nature Center Spring Activities - Journey to a Frog Pond, River exploration in 34' Voyageur canoe to explore the St. Joseph River, Galien River Marsh Exploration	MSUE, school districts, Conservation Districts, Berrien County Parks Department, Sarett Nature Center, Love Creek Nature Center, Galien River County Park, Madeline Bertrand County Park, Rocky Gap County Park, Silver Beach County Park	PEP Coordinator – Contact: Berrien County Parks Department

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
	Watershed residents, homeowners, employees, business associations, industries, construction contractors, and developers, local and county officials and employees	Educational program presentations to community groups	Harbert Community Church Service Group, Berrien County Board, River Valley Garden Club, New Buffalo Lions Club, BCRC meetings of Three Oaks/Buchanan/Galien garages, and the Sunshine Garden Club, MSUE Master Gardener/Composting Program volunteers	The Conservation Fund
Newsletter articles about watershed stewardship	Employees, business associations, industries, construction contractors, and developers, homeowners, watershed residents, and visitors to the area	Community groups' and Municipal newsletters	League of Women Voters, Republican Party, Fraternal Order of Police, Elks, Kiwanis Club, Rotary Club, American Legion, Municipalities with newsletters, Homebuilders' Association, Chambers of Commerce	PEP Coordinator
Newsletters that include information about watershed stewardship	Homeowners, watershed residents, and visitors to the area	The Galien River Watershed Project Steering Committee will write, print, and distribute newsletters about the efforts of the project. Sent to local papers as insert	Local newspapers, BCDC	Galien River Watershed Steering Committee
	General public	Periodic newsletters of Conservation Districts featuring watershed and water quality related materials	NRCS, Drain Commissioners, Southwest Michigan Land Conservancy, The Conservation Fund, Farm Bureau	Conservation Districts
	Community groups, students, and teachers	Berrien County Resource Recovery sends out 4 newsletters a year to schools	Teachers Associations, Berrien County and Cass County Public Schools, and Conservation Districts	PEP Coordinator - Contacts: BCRR - Resource Recovery Coordinator: John Gruchot Ph: (269) 983-7111 ext. 8350 Email: jgruchot@berriencounty.org Resource Recovery Educator: Jill Cooley Ph: (269) 983-7111 ext. 8234 Email: jcooley@berriencounty.org

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
Radio and Television	Homeowners, watershed residents, and visitors to the area	Materials and short stories for local radio and television. Includes Public Service Announcements	Local radio and television stations, BCDC	PEP Coordinator
Websites	Homeowners, watershed residents, and visitors to the area	Galien River Watershed project newsletter posted on the BCDC website.	BCDC, SWMC, communities with websites for links	Galien River Watershed Steering Committee
	All	The St. Joseph River Basin Commission Website is dedicated to events in the St. Joseph River Basin that directly impact the River Basin, or provide education and information opportunities related to water quality or watershed issues.	SJRBC, communities with websites for links	PEP Coordinator - Contacts: http://www.sjrbc.com/index.htm
	All	St. Joseph Watershed Project www.stjoeriver.net Friends of the St. Joe River www.fotsjr.org Provide access to the Galien River Watershed Management Plan	Friends of the St. Joe River, Kieser & Associates, St. Joe River Steering Committee, Galien River Watershed steering Committee, BCDC, SWMC, communities with websites for links	PEP Coordinator
Meetings to discuss how Low Impact Development can promote watershed stewardship	Local officials and planning boards	Individual meetings with township, city, and village officials	Weesaw, Chikaming, and Three Oaks Townships, Planning and Zoning Center, SWMPC	The Conservation Fund
Agenda item could include presentation about watershed stewardship at meetings	Local officials	Regular meetings of the Michigan Township Association	Michigan Township Association	PEP Coordinator
	Watershed residents, boat owners, marinas, commercial and industrial businesses	Monthly meetings of the St. Joseph River Harbor Authority	Drain Commissioner, Berrien County Community Development, Berrien County Economic Development, Army Corps of Engineers	PEP Coordinator - Contacts: St. Joseph River Harbor Authority, Virginia Adams, Administrative Assistant, 269-983-7111 ext. 8617

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
Presentations about watershed stewardship	Community groups, students, and teachers	Annual 5th grade Conservation Days	School Districts, local businesses, Farm Bureau	Conservation Districts
	Local officials and planning boards, general public	Indiana/Michigan St. Joseph River Basin Annual Symposium	St. Joseph River Basin Commission, environmental organizations	PEP Coordinator – Contact: St. Joseph River Basin Commission 227 W. Jefferson Blvd. County-City Building--#1120 South Bend, Indiana 46601-1830 PHONE: 574-287-1829 FAX: 574-287-1840
Festivals and community celebrations where booths can promote watershed stewardship	All	Silver Beach hosts the Venetian Festival Carnival	Venetian Festival on the St. Joseph River, MSUE Master Gardener/Composting Program volunteers	PEP Coordinator – Contact: Vendor Information Venetian Festival on the St. Joseph River P.O. Box 51 St Joseph, MI 49085
	All	The City of Niles sponsors a festival in the summer "River Front Days"	Watershed residents, Cass Conservation District, MSU Extension, Southwest Michigan Land Conservancy, City of Niles, MSUE Master Gardener/Composting Program volunteers	PEP Committee
	Community groups, students, and teachers	BCRR sets up display booths at youth fairs	Berrien County Public Schools, Conservation Districts, MSU Extension	PEP Coordinator - Contacts: BCRR - Resource Recovery Coordinator: John Gruchot Ph: (269) 983-7111 ext. 8350 Email: jgruchot@berriencounty.org Resource Recovery Educator: Jill Cooley Ph: (269) 983-7111 ext. 8234 Email: jcooley@berriencounty.org
The Galien River Watershed project created and installed watershed signs at four prominent locations at the watershed boundary.	Local officials, riparian landowners, homeowners, watershed residents, and visitors to the area	Watershed Signs	County Parks and Recreation Department, County Road Commissions, Municipalities, and landowners	County Road Commissions

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
Website with information about watershed management	General public	All communities provided information to add to their website or links to get more information	Local governments, organization, agencies, and groups that have websites	PEP Coordinator

Table 1 - Educational Categories of the Public Education Plan
BERRIEN COUNTY/CASS COUNTY PHASE II

Education Category 2 - Personal actions that can impact the watershed

The importance of this category is to educate the public about available programs for household waste disposal and preferred cleaning materials, including car washing, pavement cleaning, and power washing. This category should also contain activities to educate the public about proper pesticide and fertilizer application and disposal and the effects of grass clipping, yard waste, and animal waste when they are allowed to enter the waterways.

Message

Most household and automotive cleaners contain harsh chemicals that are dangerous for young children and toxic to aquatic wildlife. Natural cleaning products are readily available and less expensive than traditional cleaners. Pesticides and fertilizers should be used only as necessary. Strive for "low-input" lawns that require less maintenance. If you do use fertilizers, utilize the MSU Extension soil testing program. When using or disposing fertilizers or pesticides always follow the label recommendations. Dumping yard waste into streams adds nutrients to streams, which produces excessive algae and aquatic plant growth, thus causing impairments to our water resources. Composting is a viable alternative to dumping yard waste and provides a safer alternative to lawn fertilizers.

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
Public Service ads about personal actions that can impact the watershed	Homeowners, watershed residents, and areas not serviced by sanitary sewers	Public Service ads in two publications about rain gardens, stream/ditch buffer strips, and fertilizer applications	South Bend Tribune, Harbor Country News, Berrien County Record, Herald-Palladium, Niles Daily Star, Townships, Friends of the St. Joe, Michigan Townships Association, Conservation Districts, and Drain Commissioners	The Conservation Fund
Field days to demonstrate agricultural best management practices	Farmers and agricultural businesses	Hold 3 field days focused on buffer strips, farmland preservation, and the Wetland Reserve Program	Galien River Conservation District, USDA-NRCS, MSU Extension, MDEQ Wetlands specialist, Farm Bureau, MSUE Master Gardener/Composting Program volunteers	The Conservation Fund
Presentations about Low Impact Development techniques	Watershed residents, local officials, and planning boards	Individual meetings with township, city, and village officials	Weesaw, Chikaming, and Three Oaks Townships, Planning and Zoning Center, SWMPC, Galien River Watershed Steering Committee	The Conservation Fund

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
Educational Programs about personal actions that can impact the watershed	Watershed residents, homeowners, and riparian landowners	Promote the MSUE Master Gardener/Composting Program for yard waste management	Home improvement retailers, Michigan Groundwater Stewardship Program, greenhouses, and nurseries	MSUE
	Berrien County schools, students, and teachers	BCRR School Grant Program focusing on yard waste, pet waste, and general household waste disposal	Berrien County School Districts, home improvement retailers, school supply retailers, MSUE Master Gardener/Composting Program volunteers	PEP Coordinator - Contact: BCRR - Resource Recovery Coordinator: John Gruchot Ph: (269) 983-7111 ext. 8350 Email: jgruchot@berriencounty.org Resource Recovery Educator: Jill Cooley Ph: (269) 983-7111 ext. 8234 Email: jcooley@berriencounty.org
	Farmers and agricultural businesses, landscapers, lawn care personnel, landscape architects, and grounds maintenance managers	MSUE Pesticide Education Programs	Lawn and Garden Supply Centers, Groundwater Stewardship Program, Conservation Districts, MSUE Master Gardener/Composting Program volunteers, Farm Bureau	MSUE
Festivals and community celebrations that can include booths about personal actions that can impact the watershed	All	Brochures about preferred car washing and power washing materials at a booth at the Venetian Festival Carnival	MSUE Master Gardener/Composting Program volunteers	PEP Coordinator - Contact: Vendor Information Venetian Festival on the St. Joseph River P.O. Box 51 St Joseph, MI 49085
Agricultural assistance programs that connect actions with impacts on the watershed	Riparian and agricultural landowners	Farm-A-Syst, and Orchard-A-Syst	Groundwater Stewardship Program, Conservation Districts, MSUE, Farm Bureau	Conservation Districts
	Riparian and agricultural landowners	Farm Bill programs to install BMPs for water quality	USDA (NRCS and FSA), MSU Extension, Farm Bureau	Cass Conservation District, Galien River Conservation District, St; Joseph River Conservation District
Homeowner assistance programs that connect actions with impacts on the watershed	Homeowners and lake front property owners	Americorps programs of Home-A-Syst and Lake-A-Syst focusing on preferred cleaning, car washing, and power washing techniques and materials	Local officials, Lake Associations, MSUE	PEP Coordinator

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
Demonstration sites of innovative BMPs, such as porous pavement	Watershed residents, local officials, developer, contractors, landscape architects, and grounds maintenance managers	Innovative BMPs for storm water control, possibly in Berrien County Galien River Park, using Low Impact Development techniques	Developers, Berrien County Planning Department, Berrien County Parks Department MSUE Master Gardener/Composting Program volunteers, Wightman & Associates	PEP Coordinator
	Developers, watershed residents, and local officials	Possible grant funding for urban storm water BMP demonstration site	Southwest Michigan Commission, Conservation Districts, MSUE	PEP Coordinator – Contact: City of Watervliet
Newsletter about Low Impact Development techniques	Watershed residents, local officials, developer, contractors, landscape architects, and grounds maintenance managers	Possible grant funding for six editions of newsletter published about Low Impact Development techniques	MDEQ, watershed planning groups, developers	Southwest Michigan Commission
Monthly meetings where agenda item could include presentations that connect actions with impacts on the watershed	Township officials and planning boards	Monthly meetings of the Michigan Township Association	MTA, Townships, environmental organizations	PEP Coordinator
Website with information about personal actions that impact the watershed	General public	All communities provided information to add to their website or links about programs available for household/yard waste disposal and preferred cleaning materials	Local governments, organization, agencies, and groups that have websites	PEP Coordinator
Newsletter article about personal actions that can impact the watershed	Employees, business associations, industries, construction contractors, and developers, homeowners, watershed residents, and visitors to the area	Community groups' and Municipal newsletters	League of Women Voters, Republican Party, Fraternal Order of Police, Elks, Kiwanis Club, Rotary Club, American Legion, Municipalities with newsletters, Homebuilders' Association, Chambers of Commerce	PEP Coordinator

Table 1 - Educational Categories of the Public Education Plan
BERRIEN COUNTY/CASS COUNTY PHASE II

Education Category 3 - Separate Storm Sewer System

The importance of this category is to educate the public about the location of the residential separate storm water drainage system, including catch basins, the water body into which the storm drains ultimately discharge, and the potential impacts from pollutants from the separate storm drainage system.

Message

Storm sewers drain directly to rivers, lakes, and streams without treatment. Dumping auto fluids or other household hazardous waste in storm sewers contributes pollutants directly to streams and lakes. Knowing where the storm sewer system is located and the ultimate discharge point influences peoples' behavior since they can connect their activities with impacts on the water body.

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
Public Notices about source of contaminants being tested	Watershed residents, visitors to the area, and backyard mechanics	BCHD Beach Testing Program	South Bend Tribune, Harbor Country News, Berrien County Record, Herald-Palladium, Niles Daily Star, Townships, Friends of the St. Joe, and Conservation Districts	BCHD
Storm Drain Marking	Watershed residents, visitors to the area, and backyard mechanics	Storm Drain Marking Program	Department of Public Works, School Districts, Volunteer organizations, youth groups, Village of Three Oaks	The Conservation Fund
Public Service ads about the ultimate discharge point of storm water drain	Homeowners, watershed residents, areas not serviced by sanitary sewers	Public Service ads in two publications about storm water drain functions	South Bend Tribune, Harbor Country News, Berrien County Record, Herald-Palladium, Niles Daily Star, Townships, Friends of the St. Joe, Michigan Townships Association, Conservation Districts, and Drain Commissioners	The Conservation Fund
Homeowner assistance programs that connect actions with impacts on the watershed	Homeowners and lake front property owners	AmeriCorps programs of Home-A-Syst and Lake-A-Syst	Local officials, Lake Associations, MSUE, Conservation Districts	PEP Coordinator

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
School presentation and programs concerning environmental control technology	Students 7th grade and older	Yearly school tours of the Wastewater Treatment Plant	School Districts, Benton Harbor/St. Joseph Joint Wastewater Treatment Plant	PEP Coordinator
Agenda item about storm water drain functions at meetings	Local officials	Regular meetings of the Michigan Township Association	Michigan Township Association	PEP Coordinator
	Local officials	Benton Harbor/St. Joseph Joint Wastewater Treatment Plant Annual Meeting	Benton Harbor/St. Joseph Joint Wastewater Treatment Plant	PEP Coordinator
Agenda item about possible storm water projects to fund at the monthly meetings of the Berrien County Board of Public Works	Municipal employees	Monthly meetings of the Berrien County Board of Public Works	Conservation Districts, Planning Department, Drain Commissioner, Berrien County Board of Public Works	PEP Coordinator
Tours at the St. Joseph Water Plant	3rd Grade Students	Yearly school tours at the St. Joseph Water Plant	City of St. Joseph, St. Joseph Water plant, school districts	PEP Coordinator - Contact: Mike O'Malley
Website with information about storm drain functions	General public	All communities provided information to add to their website or links to get more information	Local governments, organization, agencies, and groups that have websites	PEP Coordinator
Newsletter article about separate storm sewer systems	Employees, business associations, industries, construction contractors, and developers, homeowners, watershed residents, and visitors to the area	Community groups' and Municipal newsletters	League of Women Voters, Republican Party, Fraternal Order of Police, Elks, Kiwanis Club, Rotary Club, American Legion, Municipalities with newsletters, Homebuilders' Association, Chambers of Commerce	PEP Coordinator

Table 1 - Educational Categories of the Public Education Plan
BERRIEN COUNTY/CASS COUNTY PHASE II

Education Category 4 - Illicit Discharges

The importance of this category is to encourage the public to report illicit discharges or improper disposal of materials into the communities' separate storm sewer system.

Message

Any discharge to the storm sewer other than rainwater is an illicit discharge. Illicit discharges transport pollution directly to lakes and streams without being treated in a sewage treatment facility. These outflows may contain harmful bacteria and hazardous chemicals that lead to beach closures and unsightly water conditions. Take personal responsibility to report illicit discharges. Prevent your household from contributing to the problem by budgeting for septic maintenance and using the county recycling center.

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
Distribute brochures and videos at Berrien County Health Department workshops relating water quality to septic system maintenance	Homeowners, watershed residents, and areas where sanitary service not available	Brochures and video about proper septic system maintenance. The St. Joseph River Basin Commission and the Michiana Area Council of Governments produced a video "The Use and Maintenance of a Residential Onsite Wastewater Treatment System"	BCHD, St. Joseph River Basin Commission (SJRBC), local governments, septic system companies, Michiana Area Council of Governments	PEP Coordinator, SJRBC Contact: http://www.sjrbc.com/index.htm
Develop fact sheet for each community to handle questions from individuals reporting illicit discharges	Watershed residents, schools, and businesses	Advertising in community newsletters, websites, BCRR and Cass County Health Department (CCHD) newsletters about reporting illicit discharges	Berrien County Resource Recovery, CCHD, Emergency Management, County Health and Public Works Departments, Drain Commissioner, County Sheriffs	PEP coordinator
Public Service ads about septic system maintenance	Homeowners, watershed residents, and areas where sanitary service not available	Public Service ads in two publications about septic system maintenance	South Bend Tribune, Harbor Country News, Berrien County Record, Herald-Palladium, Niles Daily Star, Townships, Friends of the St. Joe, Michigan Townships Association, Conservation Districts, and Drain Commissioners	The Conservation Fund

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
Emphasis on impact to storm water quality at training sessions required under the NPDES Phase II program for implementation of the Illicit Discharge Elimination Plan	Local officials and storm water operators	Training sessions on field testing techniques and outfall screening procedures	FTC&H, Phase II Communities	PEP Coordinator
	Local government employees and local officials	Training sessions for municipal employees on the basics of the storm water program and their role in its success	FTC&H, Phase II Communities	PEP Coordinator
Website with information about illicit discharges including form for public to use to report observations of illicit discharges	General public	All communities provided information to add to their website or links to get more information	Local governments, organization, agencies, and groups that have websites	PEP Coordinator
Distribution of Pollution Emergency Alerting System (PEAS) literature to alert the public about environmental releases and emergency reporting	Local, state, federal agencies and jurisdictions	Toll-free statewide 24 hours/day hotline	MDEQ	PEP Coordinator
Newsletter article about illicit discharge	Employees, business associations, industries, construction contractors, and developers, homeowners, watershed residents, and visitors to the area	Community groups' and Municipal newsletters	League of Women Voters, Republican Party, Fraternal Order of Police, Elks, Kiwanis Club, Rotary Club, American Legion, Municipalities with newsletters, Homebuilders' Association, Chambers of Commerce	PEP Coordinator

Table 1 - Educational Categories of the Public Education Plan
BERRIEN COUNTY/CASS COUNTY PHASE II

Education Category 5 - Management of Riparian Lands

The importance of this category is to educate the public about the importance of the management of riparian lands to protect water quality.

Message

The land adjacent to lakes and streams requires special protection to improve or protect water quality and aesthetics. Vegetated buffer zones and filter strips, which physically separate the water from other land uses, provide wildlife habitat and water quality protection. These areas should be planted with native vegetation and protected from development.

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
The Galien River Watershed Project Steering Committee wrote, printed, and distributed fact sheets about riparian management. These are available for distribution at other events.	Homeowners, watershed residents, and visitors to the area	Fact sheets available for distribution, posted on County website	BCDC, Galien River Watershed Steering Committee	PEP Coordinator
MSUE sponsors land use planning courses for master plan revisions and site plan reviews	Engineers, architects, landscapers, contractors, developers, local officials, and planning boards	Citizen planner workshops	Berrien County and Cass County, Tri-County Planners Group, MSUE Master Gardener/Composting Program volunteers	MSUE
Presentations about low impact development techniques and revisions to master plans and ordinances for riparian management	Watershed residents, local officials, and planning boards	Individual meetings with township, city, and village officials	Galien, New Buffalo, Weesaw, Chikaming, and Three Oaks Townships, Planning and Zoning Center, SWMPC, Galien River Watershed Steering Committee	The Conservation Fund
Homeowner assistance programs that connect actions with impacts on the watershed, workshops on creating riparian buffers	Homeowners and lake front property owners	AmeriCorps programs of Home-A-Syst and Lake-A-Syst, workshops	Local officials, Lake Associations, MSUE, Conservation Districts	PEP Coordinator

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
Publication about the benefits of riparian vegetation and native plantings	Homeowners and lake front property owners	Distribution of publication "Landscaping for Water Quality", articles from Southwest Michigan Land Conservancy to distribute in newsletters and post on websites	MDEQ, local officials, lake associations, Conservation Districts, Southwest Michigan Land Conservancy	PEP Coordinator
Website with information about riparian management	General public	All communities provided information to add to their website or links to get more information	Local governments, organization, agencies, and groups that have websites	PEP Coordinator
Newsletter article about the management of riparian lands	Employees, business associations, industries, construction contractors, and developers, homeowners, watershed residents, and visitors to the area	Community groups' and Municipal newsletters	League of Women Voters, Republican Party, Fraternal Order of Police, Elks, Kiwanis Club, Rotary Club, American Legion, Municipalities with newsletters, Homebuilders' Association, Chambers of Commerce	PEP Coordinator

Table 1 - Educational Categories of the Public Education Plan
BERRIEN COUNTY/CASS COUNTY PHASE II

Education Category 6 - Waste Management

The importance of this category is to educate the public about the availability, location, and requirements of facilities and programs for disposal or drop-off of household hazardous waste, travel trailer wastes, chemicals, yard wastes, and motor vehicle fluids.

Message

Household hazardous waste and other chemicals are toxic to aquatic life. Natural cleaning products are readily available and less expensive than traditional cleaners. Waste from travel trailers, recreational boats, and motor vehicles must be disposed of properly so they are not allowed to enter and pollute the waterways. Always follow the label recommendations when disposing of fertilizers or pesticides. Composting yard waste is a viable alternative to dumping along waterways and provides a safer alternative to lawn fertilizers.

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
MSUE conducts a free and non-regulatory program, Clean Sweep, to safely dispose of banned or unusable pesticides	Farmers, other agricultural businesses, watershed residents, homeowners, Employees, business associations, industries, construction contractors, and developers	Public Service Announcements for Clean Sweep program	Berrien, Cass, and Van Buren Counties, Michigan Groundwater Stewardship Program, Michigan Department of Agriculture, Farm Bureau	MSUE - Berrien County: Joanne Davidhizer 269-944-4126 Cass County: Dan Rajzer 269-445-4438
BCRR distribute brochures at the 9 hazardous waste collection sites that include information about the impact that dumping waste has on water quality. Cass County MSUE promotes hazardous waste collection	Watershed residents, visitors to the area, local officials, employees, business associations, industries, construction contractors, and developers	Distribution of brochures, with information about where chemicals, yard wastes, and motor vehicle fluids can be disposed at the Berrien and Cass County Household Hazardous Waste Collections Days	BCRR, local governments, BCHD, Benton Township, Southeast Berrien County Landfill, Bertrand Township, Lakeshore High School, Forest Lawn Landfill, Three Oaks Township, Watervliet High School, Apple Valley Market, New Buffalo City Fire Department	PEP Coordinator - Contact: Jill Cooley 269-983-7111 Ext. 8234 jcooley@berriencounty.org Cass County MSUE (269) 445-4438
Festivals and community celebrations where booths can promote waste management	Community groups, students, teachers, charities	BCRR sets up display booths at youth fairs	BCRR, Berrien County Public Schools, Conservation Districts, MSU Extension, MSUE Master Gardener/Composting Program volunteers	PEP Coordinator

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
Flyers or brochures explaining proper disposal of travel trailer wastes	Tourists, campers, recreational users	Distribution and display of flyers or brochures about where travel trailer wastes can be disposed	Campgrounds and recreational facilities, sporting goods stores	PEP Coordinator
Berrien County Resource Recovery sends out 4 newsletters a year to schools that could include information about the proper disposal of wastes	Community groups, students, teachers, charities	Newsletters	Berrien County Resource Recovery, Teachers Associations, Berrien County and Cass County Public Schools, and Conservation Districts	PEP Coordinator
Brochures explaining the connection between boating and water pollution	Recreational boaters	Distribute brochures to marinas. Brochures available at www.boatus.com/foundation/brochure/start.htm	Michigan Lake and Stream Association, yacht and power boat clubs, marinas	PEP Coordinator
Educational programs that include information about proper disposal of wastes	Farmers and agricultural businesses	MSUE Pesticide Education Programs	Lawn and Garden Supply Centers, Groundwater Stewardship Program, Conservation Districts, Farm Bureau	MSUE
	Berrien County students, teachers	BCRR Trash Class - Composting with Worms	Berrien County School Districts, home improvement retailers	Resource Recovery Educator Jill: 983-7111 ext. 8234, jcooley@berriencounty.org
	Berrien County students, teachers	BCRR School Grant Program that teaches about recycling and waste disposal	Berrien County School Districts, home improvement retailers, school supply retailers	BCRR
River clean-up in high profile areas with informational displays	Watershed residents, local officials, riparian landowners	Host clean ups similar to the MEANDRS River Clean Up Days	MDNR, BCDC, School Districts, volunteer organizations, youth groups, community organizations, City of Benton Harbor, Friends of the St. Joe River Association, the Volunteer Center of Southwest Michigan, Harbert Community Church Service Group	The Conservation Fund

Existing or Future Effort	Target Audience	Delivery Mechanisms	Potential Partners	Responsible Party for Implementation
The Berrien and Cass County Road Commissions distribute newsletters and post information on their websites about the Adopt-a-Road Programs for the county roads in Berrien and Cass Counties that could include the connection of trash to water quality	Watershed residents, members of the Adopt-a-Road program	County newsletters and websites about Adopt-a-Road	BCRC, CCRC	PEP Coordinator
Website with information about waste management	General public	All communities provided information to add to their website or links about waste disposal sites	Local governments, organizations, agencies, and groups that have websites	PEP Coordinator
Newsletter article about waste management	Employees, business associations, industries, construction contractors, and developers, homeowners, watershed residents, and visitors to the area	Community groups' and Municipal newsletters	League of Women Voters, Republican Party, Fraternal Order of Police, Elks, Kiwanis Club, Rotary Club, American Legion, Municipalities with newsletters, Homebuilders' Association, Chambers of Commerce	PEP Coordinator

Table 2 - Evaluation Methods and Measurable Goals
BERRIEN COUNTY/CASS COUNTY PHASE II

Education Category 1 – Personal watershed stewardship

Delivery Mechanisms	Timetable			Evaluation Method	Measurable Goals
	Development	Begin Implementation	Evaluation		
Watershed Short Course	Year 1	March 2005	At end of course	Comments received from evaluation forms at end of course	Majority of positive comments
Fernwood offers classes ranging from canoeing to wildflower walks	Year 1	According to County Park Department schedule	Bi-annually	Number of request from participants for additional information	Increase in number of requests for presentations and programs about water quality issues
Berrien County Parks Department offers a wide variety of activities and programs that relate to watershed management and water quality issues	Year 1	According to County Park Department schedule	Bi-annually	Number of request from participants for additional information	Increase in number of requests for presentations and programs about water quality issues
Educational program presentations by The Conservation Fund to community groups	Already developed	Year 1	Annually	Number of people attending meetings and exit surveys	Qualitative assessment of workshop/meeting through exit survey of attendees
Community groups' newsletters	Year 1	According to schedules of publications	After each publication	Space allocated for topic in publication	Maintenance or increase of space allocated for topic
Newsletters from the Galien River Watershed project about watershed stewardship	Year 1 and 2	Bi-annually	Bi-annually	Number of calls for additional information as a result of reading newsletter	Increased number of calls after each newsletter is distributed
The Galien River Watershed Project Steering Committee will write, print, and distribute newsletters about the efforts of the project. Sent to local papers as insert	Year 1 and 2	Bi-annually	Bi-annually	Number of calls for additional information as a result of reading newsletter	Increased number of calls after each newsletter is distributed

Delivery Mechanisms	Timetable			Evaluation Method	Measurable Goals
	Development	Begin Implementation	Evaluation		
Periodic newsletters of conservation districts featuring watershed and water quality related materials	Year 1 and 2	Periodically	After distribution	Number of calls for additional information as a result of reading newsletter	Increased number of calls after each newsletter is distributed
Berrien County Resource Recovery sends out 4 newsletters a year to schools	Quarterly	Quarterly	Quarterly	Number of newsletters requested by schools	Newsletters reordered and delivered to all participating schools
Materials and short stories for local radio and television. Includes Public service announcements	Year 2	Year 2	After broadcasts	Number of calls for additional information as a result of hearing stories	Increased number of calls after each story is broadcast
Galien River Watershed project newsletter posted on the BCDC website	Year 1	Year 2	Monthly	Number of hits and links on website	Increase number of hits and links on website
The St. Joseph River Basin Commission Website is dedicated to events in the St. Joseph River Basin that directly impact the River Basin, or provide education and information opportunities related to water quality or watershed issues.	Year 1	Year 2	Monthly	Number of hits and links on website	Increase number of hits and links on website
Provide access to the Galien River Watershed Management Plan	Year 1	Year 1	Bi-annually	Tracking requests for copies of plan	Wide distribution of plan: who, where, why, when
Individual meetings with township, city, and village officials	Year 1	Year 1	Annually	Number of people attending meetings and exit surveys	Qualitative assessment of meeting through exit survey of attendees
Regular meetings of the Michigan Township Association	Year 1	Monthly	Bi-annually	Comments received from exit surveys	Increase in attendance at meetings
Monthly meetings of the St. Joseph River Harbor Authority	Year 1	Monthly	Bi-annually	Comments received from exit surveys	Increase in attendance at meetings
Annual 5th grade Conservation Days	Year 1	Annually	Annually	Number of schools participating	Consistent or increased participation every year
Indiana/Michigan St. Joseph River Basin Annual Symposium	Year 1	Annually	Annually	Number of people attending meetings and exit surveys	Qualitative assessment of meeting through exit survey of attendees

Delivery Mechanisms	Timetable			Evaluation Method	Measurable Goals
	Development	Begin Implementation	Evaluation		
Silver Beach hosts the Venetian Festival Carnival	Year 1	Annually	Annually	Number of people stopping to view display or collect information	Increase in number of flyers, brochures, publications, and requests for information each year
The City of Niles sponsors a festival in the summer "River Front Days"	Year 1	Annually	Annually	Number of people stopping to view display or collect information	Increase in number of flyers, brochures, publications, and requests for information each year
BCRR sets up display booths at youth fairs	Year 1	Annually	Annually	Number of people stopping to view display	Increase in number of flyers, brochures, publications, and requests for information each year
Watershed Signs	Already developed	Year 2	Bi-annually	Number of calls for additional information as a result of seeing sign	Increase in calls after signs are installed.
All communities provided information to add to their website or links to get more information	Year 2	Year 2	Monthly	Number of hits and links on website	Increase number of hits and links on website

Table 2 - Evaluation Methods and Measurable Goals
BERRIEN COUNTY/CASS COUNTY PHASE II

Education Category 2 - Personal actions that can impact the watershed

Delivery Mechanisms	Timetable			Evaluation Method	Measurable Goals
	Development	Begin Implementation	Evaluation		
Public service ads in two publications about rain gardens, stream/ditch buffer strips, and fertilizer applications	Year 1 and 2	Year 2	After publication	Number of calls for additional information as a result of reading ads	Increased number of calls after each ad is published
Hold 3 field days focused on buffer strips, farmland preservation, and the Wetland Reserve Program	Year 2	Year 2	After each field day	Number of attendees	Consistent or increased participation every year
Individual meetings with township, city, and village officials	Year 1	Year 1	Annually	Number of people attending meetings and exit surveys	Qualitative assessment of meeting through exit survey of attendees
Promote the MSUE Master Gardener/Composting Program	Year 1	Spring	Annually	Number of participants	Increase in participants
BCRR School Grant Program	Year 1	Year 1	Annually	Meeting goals of project	Increase in application received every year
MSUE Pesticide Education Programs	Year 1	On-going	Annually	MDA/MSUE project status reports	Increase in participants
Brochures about preferred car washing materials at a booth at the Venetian Festival Carnival	Year 1	Annually	Annually	Number of people stopping to view booth or collect information	Increase in number of brochures requested each year
Farm-A-Syst, and Orchard-A-Syst	Year 1	On-going	Annually	MDA/MSUE project status reports	Increase in participants
Farm Bill programs to install BMPs for water quality	Year 1	Continuous sign ups	Annually	Number of cooperators signing up	Increase over the years of cooperators signing up for programs
AmeriCorps programs of Home-A-Syst and Lake-A-Syst	Year 1	Year 2	Annually	MDA/MSUE project status reports	Increase in participants

Delivery Mechanisms	Timetable			Evaluation Method	Measurable Goals
	Development	Begin Implementation	Evaluation		
Innovative BMPs for storm water control, possibly in Berrien County Galien River Park, using Low Impact Development techniques	Year 2	Year 2	Annually	Number of requests for tour of Park	Increased exposure of BMP used in Park
Possible grant funding for urban storm water BMP demonstration site	Year 1	Year 2	After each visit to site	Number of participants	Requests for additional sites
Possible grant funding for six editions of newsletter published about Low Impact Development techniques	Year 1 and 2	Quarterly	Quarterly	Number of calls for additional information as a result of reading newsletter	Increased number of calls after each newsletter is distributed
Monthly meetings of the Michigan Township Association	Year 1	Monthly	Bi-annually	Comments received from exit surveys	Increase in attendance at meetings
All communities provided information to add to their website or links to get more information	Year 2	Year 2	Monthly	Number of hits and links on website	Increase number of hits and links on website

Table 2 - Evaluation Methods and Measurable Goals
BERRIEN COUNTY/CASS COUNTY PHASE II

Education Category 3 - Separate Storm Sewer System

Delivery Mechanisms	Timetable			Evaluation Method	Measurable Goals
	Development	Begin Implementation	Evaluation		
BCHD Beach Testing Program	Already occurring	Year 1	Annually	Compliance with QA/QC documents	Results used by environmental and watershed groups to focus efforts
Storm Drain Marking Program	Already occurring	Annually	Annually	Number of volunteers	Consistent or increased participation every year
Public service ads in two publications about storm water drain functions	Year 1 and 2	Year 2	After publication	Number of calls for additional information as a result of reading ads	Increased number of calls after each ad is published
AmeriCorps programs of Home-A-Syst and Lake-A-Syst	Year 2	Year 2	Annually	MDA/MSUE project status reports	Increase in participants
Yearly school tours of the Wastewater Treatment Plant	Year 1	Annually	Annually	Number of requests from and offers to schools for presentations and field trips	Increase in number of requests from and offers to school presentations and field trip to meet school needs
Regular meetings of the Michigan Township Association	Year 1	Monthly	Bi-annually	Comments received from exit surveys	Increase in attendance at meetings
Benton Harbor/St. Joseph Joint Wastewater Treatment Plant Annual Meeting	Year 1	Annually	Annually	Comments received from exit surveys	Increase in attendance at meetings
Monthly meetings of the Berrien County Board of Public Works	Year 1	Monthly	Bi-annually	Comments received from exit surveys	Increase in attendance at meetings
Yearly school tours at the St. Joseph Water Plant	Year 1	Annually	Annually	Number of requests from and offers to schools for presentations and field trips	Increase in number of requests from and offers to school presentations and field trip to meet school needs

Delivery Mechanisms	Timetable			Evaluation Method	Measurable Goals
	Development	Begin Implementation	Evaluation		
All communities provided information to add to their website or links to get more information	Year 2	Year 2	Monthly	Number of hits and links on website	Increase number of hits and links on website

Table 2 - Evaluation Methods and Measurable Goals
BERRIEN COUNTY/CASS COUNTY PHASE II

Education Category 4 - Illicit Discharges

Delivery Mechanisms	Timetable			Evaluation Method	Measurable Goals
	Development	Begin Implementation	Evaluation		
Distribute brochures and video about proper septic system maintenance at workshops	Year 1	Year 2	Annually	Number of people attending meetings and exit surveys	Qualitative assessment of workshop/meeting through exit survey of attendees
Fact sheet for communities to handle telephone calls from individuals reporting illicit discharges	Year 1	Year 2	Bi-annually	Record number and types of calls on log sheet to track amount of reporting	Increase number of telephone calls and response of the reporting
Public Service ads in two publications about septic system maintenance	Year 1	Year 2	After publication	Number of calls for additional information as a result of reading ads	Increased number of calls after each ad is published
Training sessions on field testing techniques and outfall screening procedures	Already developed	Year 1	Annually	Number of people attending sessions and exit surveys	Qualitative assessment of meeting through exit survey of attendees
Training sessions for municipal employees on the basics of the storm water program and their role in its success	Already developed	Year 1	Annually	Number of people attending sessions and exit surveys	Qualitative assessment of meeting through exit survey of attendees
All communities provided information to add to their website or links to get more information	Year 1	Year 2	Monthly	Number of hits and links on website	Increase number of hits and links on website

Table 2 - Evaluation Methods and Measurable Goals
BERRIEN COUNTY/CASS COUNTY PHASE II

Education Category 5 - Management of Riparian Lands

Delivery Mechanisms	Timetable			Evaluation Method	Measurable Goals
	Development	Begin Implementation	Evaluation		
Fact sheets available for distribution	Already developed	Year 1 and 2	After each distribution	Number of calls as a response from the distribution	Increase in number of calls as each Fact Sheet is distributed
Citizen Planner Workshops	Year 1	Year 2	Annually	Number of people attending meetings and exit surveys	Qualitative assessment of workshop/meeting through exit survey of attendees
Individual meetings with township, city, and village officials	Year 1	Year 1	Annually	Number of people attending meetings and exit surveys	Qualitative assessment of meeting through exit survey of attendees
AmeriCorps programs of Home-A-Syst and Lake-A-Syst	Year 1	Year 2	Annually	MDA/MSUE project status reports	Increase in participants
Distribution of publication “Landscaping for Water Quality”	Year 1	Year 1 and 2	After each distribution	Number of calls as a response from the distribution, number of requests for additional brochures	Increase in number of calls and number of brochures printed
All communities provided information to add to their website or links to get more information	Year 2	Year 2	Monthly	Number of hits and links on website	Increase number of hits and links on website

Table 2 - Evaluation Methods and Measurable Goals
BERRIEN COUNTY/CASS COUNTY PHASE II

Education Category 6 - Waste Management

Delivery Mechanisms	Timetable			Evaluation Method	Measurable Goals
	Development	Begin Implementation	Evaluation		
Public Service Announcements for Clean Sweep Program	Year 1	Annually in April	Annually	Number of farmers participating and amount of pesticides collected	Consistent or increased participation every year
Distribution of brochures with information about impacts of waste on water quality at the Berrien County Household Hazardous Waste Collections Days	Year 1	Annually, April - October	After each collection day	Number of brochures distributed or requested, number of households participating and amount of waste collected	Reorder frequency for brochures, consistent or increased participation every year
BCRR sets up display booths at youth fairs	Year 1	Annually	Annually	Number of people stopping to view display	Increase in number of flyers, brochures, publications, and requests for information each year
MSUE Pesticide Education Programs	Year 1	On-going	Annually	MDA/MSUE project status reports	Increase in participants
BCRR Trash Class - Composting with Worms	Year 1	Year 1	After each class	Number of schools participating	Increase in number of requests from and offers to school presentations and field trip to meet school needs
BCRR School Grant Program that teaches about recycling and waste disposal	Year 1	Year 1	Annually	Meeting goals of project	Increase in application received every year
Host clean ups similar to the MEANDRS River Clean Up Days	Year 2	Annually in summer	Annually	Number of volunteers	Increase in number of volunteers each year until stable participation is reached
County newsletters and websites about Adopt-a-Road	Year 1	On-going spring clean ups	Annually	Number of participants and amount of trash collected	Addition of one group or community per year

Delivery Mechanisms	Timetable			Evaluation Method	Measurable Goals
	Development	Begin Implementation	Evaluation		
All communities provided information to add to their website or links to get more information	Year 2	Year 2	Monthly	Number of hits and links on website	Increase number of hits and links on website

Appendix 7

Illicit Discharge Preventive Measures

A Preventive Measures Committee (Committee) of local government officials and representatives of public works and engineering departments met to review their current municipal operations and to identify available strategies and activities to prevent illicit discharges and prevent or minimize impacts on water quality. The findings of the Committee and other documents are compiled in this report as a resource for the participating communities during preparation of their Storm Water Pollution Prevention Initiative (SWPPI).

An Illicit Discharge Elimination Plan (IDEP) has been prepared by the communities in compliance with their Certificate of Coverage for storm water discharges from Municipal Separate Storm Sewer Systems subject to watershed plan requirements. The IDEP outlines a process for investigating potential problem areas by screening dry weather flow from storm water outfalls, following the source of suspected illicit discharges to the source and removing and correcting the illicit connections. The IDEP included a task entitled Preventive Measures which proposed that "Mechanisms will be put in place to prevent future illicit discharges and connections." The IDEP activities and responsibilities will be incorporated in the SWPPI including illicit discharge preventive measures.

Investigating, locating, and removing existing illicit connections is only one component of an effective IDEP. Other illicit discharges are intermittent or result from illegal dumping. New illicit connections can occur during development or redevelopment. Illicit discharge prevention programs should be implemented in conjunction with the Public Education Plan, the Public Participation Plan, and the municipal operations/good housekeeping elements of the SWPPI.

Illicit discharges occur from four main sources:

- Residential neighborhoods
- Industrial and commercial operations
- Municipal operations
- Construction activities

There are common activities that cause illicit discharges from these sources and various educational and enforcement strategies to target these activities.

Residential Neighborhoods

Illicit discharges which occur in residential neighborhoods often result from illegal dumping, inadequate septic system maintenance, improper disposal of hazardous materials such as vehicle fluids or household cleaning materials, swimming pool discharges, and car washing. These activities are often addressed through public education and enforcement of an Illicit Discharge Elimination Ordinance.

Industrial and Commercial Sites

Many industrial sites are also required to obtain a storm water discharge permit under the National Pollutant Discharge Elimination System (NPDES) Phase II program. The Michigan Department of Environmental Quality (MDEQ) is responsible for issuing and enforcing the industrial permits. There are approximately 4,000 industrial facilities with storm water discharge authorizations in Michigan.

Information on the MDEQ Industrial Program is available at:
http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3716-24018--,00.html

The list of active storm water permits is available at:
http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3713-10780--,00.html

Information included in the file is: designated name, facility name, permit number, mailing address, contact person, facility location, issued date, effective date, expiration date, Standard Industrial Classification code, receiving water, and corresponding basin year.

Commercial businesses are not required to obtain storm water discharge permits under the NPDES Phase II program. However, there are a number of businesses that have the potential to impact storm water quality. Examples of high priority businesses include:

- Automobile mechanical repair, maintenance, fueling, or cleaning
- Airplane mechanical repair, maintenance, fueling, or cleaning
- Boat mechanical repair, maintenance, fueling, or cleaning
- Equipment repair, maintenance, fueling, or cleaning
- Automobile and other vehicle body repair or painting
- Mobile automobile or other vehicle washing
- Automobile (or other vehicle) parking lots and storage facilities
- Retail or wholesale fueling
- Pest control services
- Eating or drinking establishments
- Mobile carpet, drape, or furniture cleaning
- Cement mixing or cutting
- Masonry
- Painting and coating
- Botanical or zoological gardens and exhibits
- Landscaping
- Nurseries and greenhouses
- Golf courses, parks, and other recreational areas/facilities
- Cemeteries

- Pool and fountain cleaning
- Marinas
- Port-a-Potty servicing
- Other commercial activities contributing significant pollutant loads

Strategies which are recommended to prevent or minimize water quality impacts from industrial and commercial sites include education, effective spill prevention plans, municipal employee training, and site inspections. An Illicit Discharge Elimination Ordinance can provide the legal authority necessary to inspect industrial and commercial sites for potential illicit discharges and refer any violations for local or state enforcement.

Municipal Operations

Activities associated with street sweeping, snow removal, and maintenance of the storm water collection system are commonly identified as potentially contributing to a degradation in water quality. Other possible municipal operations that can impact water quality include vehicle/equipment maintenance and turf maintenance at city, township or county parks, golf courses, and cemeteries. Good housekeeping programs, such as recycling, careful waste management, spill cleanup, spill prevention (material storage), and collection of hazardous materials can help prevent or minimize impacts from other sources.

Construction Activities

Construction activity disturbing 1 to 5 acres of land, with a point source discharge to waters of the State now must comply with the NPDES Phase II Storm Water Program. Construction activities of 5 acres or more, with a point source discharge to waters of the State are required to submit a Notice of Coverage (NOC) to obtain coverage under the Michigan Permit-by-Rule (Permit-by-Rule). Prior to submitting the NOC, a Soil Erosion and Sedimentation Control (SESC) permit must be obtained from the county or local agency. Then a completed NOC form along with the required attachments (location map, a copy of the SESC permit, and $400 fee) must be submitted to the MDEQ. Submittal of an NOC is not required for regulated construction activities that disturb 1 to 5 acres. These sites have automatic coverage under the Permit-by-Rule if they have obtained coverage under the SESC Program.

Waste management and spill containment and response are activities which focus on preventing illicit discharges from construction sites. This is in addition to the best management practices (BMPs) required by the SESC Program.

BMPs

BMPs can be applied to residential neighborhoods, construction activities, post construction (development and redevelopment), commercial and industrial sites, and to municipal operations.

BMPs to prevent illicit discharges from **construction** activities focus primarily on SESC. Other potential contaminants that originate from construction activities include construction waste, nutrients, metals, and other pollutants. Potential sources of illicit discharges include material storage and disposal areas, vehicle maintenance and fueling, and erosion from exposed soil.

Illicit connections of plumbing to storm water outlets can occur without proper inspection and enforcement. Managerial BMPs, including application of the requirements of the State's SESC program and local storm water management ordinances, is often the most effective way to control discharges from construction sites. Adequate financial guarantees, which allow local units to provide the necessary cleanup of poorly maintained construction sites, are important to assure that all developers and builders are held to the same standard of performance.

Post Construction (development and redevelopment) BMPs apply to incorporating water quality protection into the drainage and flood control facilities. State-of-the-art water quality protection measures emphasize maintaining predevelopment hydrologic conditions so there is not an increase in either the volume or the peak discharge rate of storm water runoff. They also recognize that the increase in impervious surfaces tend to increase the runoff from more frequent precipitation events. The potential for increased severity of stream bank erosion is linked to the 1- to 2-year frequency events instead of the more extreme 10- or 25-year frequency floods. Maintaining predevelopment hydrology requires flood control facilities that encourage infiltration or provide extended storm water detention. Conventional detention basin design actually accelerates the rate of streambank erosion by increasing the frequency and duration of stream flows that had previously occurred on a 1- to 2-year schedule. Protection of small unregulated wetlands, flood plains, and riparian buffers are also important parts of an overall program to avoid detrimental impacts from new development. BMPs include both source control strategies through low-impact design techniques and treatment systems which include water quality protection in the design of flood control facilities. Structural treatment systems can help provide capture of spills and other illicit discharges as part of a preventive measures program. Source controls can provide trash storage facilities that prevent the discharge of contaminants from dumpsters.

Industrial and Commercial site BMPs also fall into the categories of source control and storm water treatment systems. Source control BMPs emphasize reducing the potential for storm water to transport contaminants from the site. Treatment systems are intended to capture the storm water and remove the contaminants before the runoff leaves the site. A similar situation exists with SESC. It is usually more effective and less costly to avoid the initial erosion (or transport of contaminants) than it is to capture the storm water and achieve effective sedimentation (or removal of contaminants). Source control BMPs include employee training and procedures to prevent spills. Material storage, equipment storage, waste disposal, and vehicle maintenance procedures are also important components of an effective SWPPI. Storm water treatment BMPs are similar to the strategies used to protect water quality in new development.

The NPDES Phase II permit requires the following activities for inclusion in the SWPPI under **Municipal Operations** (pollution prevention and good housekeeping):

- Employee training and inspection program
- Maintenance procedures for the storm water drainage facilities
- Controls for discharges from streets and maintenance garages
- Proper disposal of operation and maintenance waste from the storm water facilities
- Assessing water quality impacts from flood management projects
- Reduction in the discharges of fertilizers, pesticides, and herbicides

BMPs to prevent illicit discharges from municipal operations are also grouped into either source control or storm water treatment. Municipal garages and public works facilities deal with many of the same issues as industrial and commercial sites. Maintenance of streets and storm water systems are considered source controls and can be some of the most cost effective strategies to protect water quality. Treatment controls for storm water facilities are similar to the strategies used for new development.

The following table contains the BMPs and typical illicit discharge focus areas that were discussed by the Committee. The illicit discharge source area which would be targeted by these BMPs is identified for each focus area.

Illicit Discharge Source				
	Residential Neighborhoods	Industrial/ Commercial	Municipal Operations	Construction
BMPs/Illicit Discharge Focus Areas				
Hot Line for Reporting Pollution				
Municipal Staff Training in Recognizing Storm Water Pollution Sources				
Department of Public Works Yard Material Storage - Salt, Sand, Oils, Waste, Batteries, Tires				
Storm Sewer Maintenance Activities - Catch Basin Cleaning				
Gravel Road and Shoulder Design and Maintenance				
Landscaping Residuals Disposal				
Fertilizer/Pesticide/Herbicide Storage/Use/Disposal				
Dumpster Use at Municipal Facilities				
Dumpster Use at Commercial/Private Facilities				
Demolition Waste/Construction Waste				

Illicit Discharge Source				
	Residential Neighborhoods	Industrial/ Commercial	Municipal Operations	Construction
SESC				
Street Sweeping Material Disposal				
Municipal Vehicle Washing				
Street Sweeping Frequency				
Training Building Inspectors, Zoning Enforcers, Public Works Workers				
Salt/Sand Issues (Pre-wetted Salt, Rate of Travel Sensors, Storage, Loading, etc)				

Links to resource information on the BMPs include:

http://www.cabmphandbooks.com/

http://www.ci.knoxville.tn.us/engineering/bmp_manual/

http://www.gvsu.edu/wri/isc/lowgrand/wit/

The NPDES Phase II Storm Water Regulations **Tool Box** (Grand Valley Metro Council/Fishbeck, Thompson, Carr & Huber, Inc.) was prepared to provide information and guidance on compliance alternatives and issues for the participating communities in the Lower Grand River Watershed and contains information in Chapter 6 on Pollution Prevention/Good Housekeeping for Municipal Operations. A Focus Committee conducted a questionnaire of NPDES Phase II municipalities to determine current activities and appropriate categories for municipal operations. The following categories were included in the questionnaire:

- Street Sweeping
- Snow Removal and Deicing
- Leaf and Yard Waste
- Hazardous Waste Spill Response
- Pesticide, Herbicide, and Fertilizer Applications
- Road/Stream Crossings
- Storm Sewer Maintenance
- Equipment and Vehicle Maintenance
- Facilities Management
- Employee Training

Information was also provided for the categories of Storm Sewer Structural Components, Roadway Maintenance, Leaf and Yard Waste Collection, and Flood Control Projects. Information for Material Management is summarized for Pesticides and Fertilizers, Facilities Maintenance, and Hazardous Waste Collection. The following categories of information are included for each topic.

- Introduction
- Category Description
- Responsibilities
- Water Quality Concerns
- Recommendations of BMPs
- Measurable Goals
- Estimated Budget and Costs of Implementation

The Committee evaluated various strategies that are available for municipalities for prevention associated with municipal operations, as well as activities on private property that are within the jurisdiction of the municipality. Industrial activities were discussed briefly but set aside as beyond the scope of this Committee, except as part of the employee training program. Participants agreed that the best strategy involves both education and enforcement. The Committee identified the most feasible, cost effective approaches based on their experience and then prioritized the following BMPs in high, medium, and low priorities.

Priority	**BMP**
H	Adopt IDEP ordinance
H	Annual Seminar (in-service training) with maintenance personnel Help them identify storm water issues and how to respond to them
H	Coordination with fire department on spills Need procedures for spill response - currently spread sand for oil spill without cleanup
H	County Drain Commissioner staff awareness
H	County emergency management awareness
H	DPW Yard Material Storage - salt, sand, oils, waste, batteries, tires
H	Dumpster use at municipal facilities
H	Hot line for reporting pollution and/or website
H	Municipal vehicle washing - street sweepers, school busses
H	Road salt application rate
H	Street sweeping, waste and catch basin cleaning, waste disposal
H	Time of sale septic system inspections or on 5 or 10 year frequency
MH	Construction site SESC (reporting poor practices)

Priority	BMP
M	County Planning Department - resource recovery
M	Dumpster use at commercial/private facilities
M	Information to farmers on services available
M	Marine division awareness on summer patrols
M	Parkland and municipal golf courses - educate on fertilizer and yard waste procedures
M	Private/agricultural fertilizer/pesticide/herbicide storage/use/disposal
M	Private landscaping residuals disposal
L	Cross train health department personnel in nonpoint source pollution issues Improve communication with local governments Identify where public sewers may be needed
L	Demolition waste/construction waste
L	Fertilizer ordinance
L	Frequency of street sweeping and catch basin cleaning Public roads, private roads, and parking lots
L	Snow removal and disposal

(L = Low, M = Medium, H = High)

Each community and county agency will have differing priorities for implementation of BMPs based on the characteristics of their community and their governmental responsibilities. BMPs should be selected based on both importance in preventing illicit discharges and implementability. A BMP with lower importance but higher implementability may be selected over one with higher importance but low implementability.

Appendix 8

table e

bmp costs

INFORMATION AND EDUCATION BMPS		
Typical BMP/ Delivery Mechanism	**Estimated Cost**	**Notes**
Information meeting/training session/workshop	$500.00 each	Based on a educational workshop for 25 people at free facility with lunch provided and paid speaker. Costs are highly variable depending on size, scope, and location of meeting.
Newsletter/Mailing	$400.00 each	4 page newsletter sent to 200 addresses. First class postage used, rather than bulk rate which requires a permit. Includes 10 hours of newsletter preparation and the copying costs. Highly variable depending on size and scope of mailing
Newspaper article	Free	Plus staff/volunteer preparation time
Newspaper Ad	$40.00 to $55.00 per column inch	Kalamazoo Gazette; Rate depends on day of placement
	$44.00 to $62.00 per column inch	South Bend Tribune; Rate depends on day of placement
Newspaper Insert	$0.05 each	Cost of service only; reproduction is not included; 1 sheet maximum
Public service announcement	Free	Plus staff/volunteer preparation time; Less control of placement and timing but items provided well in advance are usually printed or read on-air multiple times before the event
Educational signage	N/A	Highly variable
OSDS education packets	$25 each	Include VHS cassette, copy of ordinance, and brochure on maintenance
Ordinance review/ development	$1,200 - $1,500 per township/municipality to work with a consultant to review, develop, and adopt an ordinance	Assumes minimal consultant oversight and the majority of the work being done by local government

Typical BMP/ Delivery Mechanism	Estimated Cost	Notes
Audubon International Cooperative Sanctuary Program certification	$150.00/yr membership fee plus cost of implementing BMPs	
Volunteer water quality monitoring program	$15,000 per year	Includes part-time staff person and cost of test kits
Watershed Management Short Course	$10,000 each	Includes materials, speaker fees, meals, and staff coordination time
Display Board	$500.00	Based on 3 panel display with overhead lights. Does not include cost of preparing materials for display.
PHYSICAL BMPS		
Nutrient management	$2.64 per acre annually	Source: US EPA
Chemical management	$5.00 per acre	Primarily costs related to technical assistance
Conservation tillage	3.08 per acre annually	
Filter strips	$190.00 per acre	Includes establishment and maintenance
Riparian Forested Buffer	$500.00 per acre	Includes establishment and maintenance
Riparian Herbaceous Buffer	$225.00 per acre	Includes establishment and maintenance
Wetland Creation/ Restoration/Enhancement	$1,000.00 to $2,000.00 per acre	Depends on site requirements and size
Critical area planting	$1,300.00 per acre	Includes grading, planting, herbicides, mulch, and labor
Water and sediment control basin	$1,700.00 each	
Grade stabilization structure	$1,000.00 each	
Grassed waterway/ vegetated swale	$2.00 to $3.50 per linear foot	Depends on width and depth
Stripcropping	$12.00 per acre	

Typical BMP/ Delivery Mechanism	Estimated Cost	Notes
Detention ponds	$35,000.00 to $110,000.00 per acre	Cost includes engineering, excavation, fill, compaction, inlet and outlet installation, landscaping, and legal fees
Field windbreaks, shelterbelts, and hedgerows	$1.50 per linear foot	
Cover crops	$14.00 per acre	
Pasture/Hay Planting	$120.00 to $150.00 per acre	Depends on type of grasses used
Livestock exclusion	$1.60 per foot	Cost of fencing
Other conversion of crop land to habitat	N/A	Highly variable depending on cost of conversion, type of habitat, and incentive payments
Rain garden/Bioretention cell	$5.00 - $40.00 per square foot	Cost depends on site requirements: some industrial and commercial sites may require professional engineering and control structures
Rain barrel	$75 to $200 each	Depends on size and features. Includes root repellant/waterproof membranes and irrigation; costs vary depending on site requirements
Green roof	$12 to $24 per square foot	Depends on site and methods used
Stream bank stabilization	$22.00 to $32.00 per linear foot	Depends on size and species of tree; cost includes collar guards, staking, and mulch
Tree planting	$50.00 to $300.00 per tree	Costs are comparable to traditional structures; Costs depend on site conditions and are based on seeding rather than plugging in plants
Check dams	$15.00 per linear foot	
Bioretention parking lot islands/Bioswales	$0.04 to $2.50 per square foot	Assumes a trench 2 feet wide; Costs are highly variable depending on site requirements
Downspout disconnections	$15.00 to $25.00 per downspout	Depends on material type
Infiltration trench	$4.00 per linear foot	Costs depend on site conditions and are based on seeding rather than plugging in plants

Typical BMP/ Delivery Mechanism	Estimated Cost	Notes
Permeable surfaces	$1.00 to $5.00 per square foot	Depends on material type
Retrofit detention basin	$0.05 to $3.00 per square foot	Costs depend on site conditions and are based on seeding rather than plugging in plants
Cistern	$225	200 gallon galvanized steel; degree of water treatment and location affect costs
	$160	165 gallon polyethylene; degree of water treatment and location affect costs
	$660	350 gallon fiberglass; degree of water treatment and location affect costs