Galien River
Watershed Management Plan
Addendum

Prepared for
The Conservation Fund

November 2005

MDEQ Tracking Code 2003-0022

GALIEN RIVER

WATERSHED MANAGEMENT PLAN

ADDENDUM

PREPARED FOR
THE CONSERVATION FUND

PROJECT NO. G03594

NOVEMBER 2005

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Michigan's Nonpoint Source Program

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INTRODUCTION

This document is an addendum to the Galien River Watershed Management Plan approved in July 2003 (2003 WMP) with respect to the criteria specified in the Clean Michigan Initiative Nonpoint Source Pollution Control Grant Program.

The 112,222-acre Galien River Watershed (Watershed) is located in Berrien County, Michigan, and Indiana. In Michigan, this watershed contains 62% rural land, 23% forest land, and 5% urban land, with the remainder being streams and lakes. Contaminants in certain water bodies within the Watershed exceed the Michigan Department of Environmental Quality's (MDEQ) Total Maximum Daily Load requirements, making water quality standards sub par. Initial findings of inventory and water sampling, conducted during development of the 2003 Galien River WMP, indicate impaired water quality at high enough levels to classify *E. coli*, sediment, nutrients, and possibly pesticides as high-priority concerns in the watershed.

MDEQ awarded The Conservation Fund (TCF) funds available through the U.S. Environmental Protection Agency (EPA) 319 Nonpoint Source Program for a Galien River Transition/Implementation Project to carry out some of the recommendations in the 2003 WMP. The grant was approved and instituted in 2004 to improve water quality through upgrading three township master plans and ordinances, building the community's understanding of the water quality challenges, continuing the Galien River Steering Committee, and holding workshops for farmers. An additional task was to update the 2003 WMP to include the EPA's nine required watershed planning elements.

TCF contracted with Fishbeck, Thompson, Carr & Huber (FTC&H) to complete the update of the WMP to meet the EPA's nine elements. The Galien River Steering Committee organized quarterly meetings to review and comment on the revised Galien River WMP, as well as increase understanding of the *E. coli* and sedimentation problems.

The information provided in this addendum follows the guidelines in the EPA's document entitled *Supplemental Guidelines for the Award of Section 319 Nonpoint Source Grants to States and Territories in FY 2003.* Chapter and Section numbers follow the 2003 WMP and are included only if updates or additions were made to that section; thus, the numbering is not always sequential.

This addendum is to be used in conjunction with the 2003 WMP to maintain a complete watershed management strategy that addresses the concerns and water quality issues in the Watershed. The 2003 WMP is available to download at the Southwestern Michigan Commission's (SWMC's) website: **http://swmicomm.org.** A hard copy may also be requested from Ms. Peg Kohring of TCF at 269-426-8825 or **pkohring@aol.com**.

EXECUTIVE SUMMARY

The Galien River Watershed (Watershed) 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 Watershed 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 agricultural areas in the Watershed have experienced more frequent flooding in the past decade. Changes in the land use, including increased channelization of agricultural drains, loss of wetlands, excessive amounts of log jams, and lack of maintenance on private drains, have raised concerns within the Watershed.

A detailed Watershed inventory was conducted to identify the sources and causes of nonpoint source pollution in the Watershed. A sampling regime was also initiated in the Watershed through the Michigan Department of Environmental Quality's (MDEQ) Total Maximum Daily Load requirements to sample streams and reaches not meeting water quality standards. Initial findings of the inventory and water sampling indicate impaired water quality at levels high enough to classify sediment, *E. coli,* nutrients, and possibly pesticides as high-priority concerns for the Watershed. The known sources of sediment were found to be streambank erosion, rill and gully erosion, and unstable tile outlets. The suspected sources of *E. coli* include manure runoff and failing septic systems. The possible sources of nutrients include manure runoff, fertilizer runoff, and failing septic systems.

The Watershed exhibits unique hydrologic problems in addition to water quality, habitat, and soil erosion issues. The primary goal of the 2003 WMP was to improve cooperation between local residents and local and state agencies in an effort to protect, restore, and enhance the natural resources of the Watershed and Lake Michigan.

The results of the investigation completed for the Watershed Management Plan (WMP), taken together with the hydrologic analysis and historical information, lead to the following general conclusions and recommendations regarding water quality, wetlands restoration, land use policies, and hydrology issues in the Watershed:

WATER QUALITY

- Prevent E. coli from entering surface waters and meet Michigan Water Quality Standards of 1,000 count/100 million gallons (mg) for partial body contact recreation and 300 count/100 mg for total body contact recreation.
- Reduce phosphorus loading to meet EPA guidance level of 0.1 mg/l P for flowing water and possibly set a standard of 50 micrograms/l P for lakes as a bench mark in setting criteria for wetlands.
- Monitor and reduce nitrogen levels, where necessary, to meet water quality standards.
- Reduce Total Suspended Solids in areas identified in the MDEQ water quality monitoring studies and volunteer monitoring programs by preventing soil erosion and reducing sedimentation.
- Meet warm water minimum for dissolved oxygen of 4 to 5 mg/l by maintaining cool temperatures and limiting nutrient loading.
- Monitor pH levels for extremes.
- Preserve or restore wetlands and create buffers to filter out excess nutrients before they enter rivers and streams.

WETLANDS PRESERVATION AND RESTORATION

- Locate areas for potential wetlands restoration to increase storage capacity in rapidly developing subcatchments, based on Geographic Information System (GIS) information.
- Restore wetlands in other areas of the Watershed to improve water quality, increase groundwater recharges, and provide habitat, based on GIS information.

LAND USE POLICIES

- Enforcement of septic site ordinances.
- Require filter strips and buffers in new developments and agricultural areas.

- Require soil testing for new developments.
- Change set back ordinances to allow for cluster development.
- Adopt open space ordinances that protect forests and wetlands.
- Create conservation ordinances and tax incentives with options for the purchase of development rights (PDRs).
- Change ordinances to include design criteria for driveways, roof area, parking requirements, and road widths.
- Create a watershed master plan that considers areas where development will occur and what types will be allowed.
- Revise the floodplain ordinance so no future development will occur within the 100-year floodplain.
- Adopt a soil erosion and sedimentation control (SESC) inspection and enforcement ordinance.
- Adopt a native landscaping ordinance.
- Adopt wetland protection ordinances.
- Adopt a planning ordinance that limits amounts of impervious surfaces and requires onsite detention of storm water runoff.

HYDROLOGY

- Remove selected obstructions and garbage.
- Restore the wetlands in upper reaches of Dowling Creek and Blue Jay Drain.
- Require onsite retention for developments within or upstream of Elm Valley.
- Cut out centers of log jams and attach selected limbs to banks, especially on the downstream end of the outer bank of a meander.
- Maintain private drainage systems.
- Improve conveyance at selected sites by removing obstructions or replacing culverts.

- Consider Rosgen's stream classification and characteristics of stream reaches when planning and designing Best Management Practices (BMPs).

All of these recommendations will work toward meeting the goals of the 2003 WMP, which are to meet water quality standards for partial body contact recreation, meet water quality standards for warmwater and coldwater fisheries, provide habitats for other indigenous aquatic life and wildlife, enable navigation on partial reaches of the Galien River, maintain water quality and water quantity needs for agricultural use, meet water quality standards for total body contact recreation in areas of public beaches, and provide an adequate water source for an industrial water supply when needed. Table 3.10 in the 2003 WMP prioritized these goals according to the impairments of the designated uses, creating a comprehensive management strategy to address water quality concerns.

The Galien River Watershed Steering Committee (Steering Committee) provided continued support and direction for the development of the WMP addendum. Several subcommittees were formed to direct specific tasks to be accomplished during the process, namely the Sediment and Nutrient Subcommittee, the Farmer's Incentive Subcommittee, and the *E. coli* Subcommittee.

CHAPTER 1 - DESCRIPTION OF THE WATERSHED

<u>Addendum Summary</u> - This Chapter, in Section 1.2A, includes names of additional stakeholders that were involved in updating the WMP and those that participated in the various Subcommittees that were formed. Further information about the fisheries was provided by the Michigan Department of Natural Resources in Section 1.9A.

1.2A FORMATION OF STEERING COMMITTEE

The continuation of the Galien River Watershed project with the Transition Grant brought additional stakeholders into the decision-making process for the implementation of water quality improvements. Subcommittees were formed to review material and prioritize implementation efforts. The following list includes the 2005 Galien River Watershed Steering Committee members and the members who served on the various subcommittees:

Table 1A - Galien River Watershed Steering Committee Members - 2005

Ms. Peg Kohring	The Conservation Fund
Ms. Lauri Lindquist	The Conservation Fund
Ms. Wanda Green	Weesaw Township
Ms. Kate McIlwee	Berrien County Planning Department
Ms. Gayle Porterfield	Landowner
Ms. Diane Daniels	Harbor Country News
Mr. Paul Merideth	Landowner
Mr. Dennis Smedley	Landowner
Ms. Christina Bauer	Michigan Department of Environmental Quality
Mr. John Gast	Lake Charter Township
Mr. William Wagner	Landowner
Mr. Ken Priest	Berrien County Health Department
Mr. Tom Fox	Bertrand Township
Ms. Maryellen Schutze	Galien River Conservation District
Mr. Pat Underwood	Berrien County Parks
Mr. Scott Aiken	Herald Palladium News
Mr. John Burt	Berrien County Planning Department
Mr. Peter Van Nice	Chikaming Open Lands
Mrs. Jean Van Nice	Chikaming Open Lands
Mr. Mark Parrish	Pokagon Band of Potawatomi Indians
Ms. Jeanne Dudeck	Chikaming Township
Ms. Merrill Clark	League of Women Voters
Mr. Jack Erwin	Village of Three Oaks
Mr. Bob Baetsen	Sauk Trails RC&D Council
Ms. Anne Hendrix	Berrien County Drain Commissioner
Ms. Carole Svebakken	League of Women Voters
Mr. Gene Kowert	Chikaming Park Board
Ms. Neva Bailey	League of Women Voters
Mr. Raymond Rustem	Michigan Department of Natural Resources
Mr. Jay Wesley	Michigan Department of Natural Resources

Table 1A - Galien River Watershed Steering Committee Members - 2005

Mr. Greg Danneffel	Michigan Department of Environmental Quality
Ms. Kay English	Weesaw Township
Mr. Michael Pregont	Landowner
Mr. Terry Hanover	Landowner
Ms. Dawn Frasieur	Berrien County Record
Mr. Ron Cave	Gazette News
Mr. Mark Anderson	Herald Palladium News
Mr. Fred Lighthall	Landowner
Mr. Geoffrey Gilbert	Landowner
Ms. Sioux McLane	Landowner
Mr. Joe Margol	Berrien County Road Commission
Mr. Rich Tamborski	Landowner
Ms. Sue Petterson	Chikaming Park Board
Mr. Tom Hackley	Chikaming Township
Ms. Agnes Conway	New Buffalo Township
Mr. Chris Siebenmark	Senator Jelinek's Office
Ms. Megan Wheaton	Michigan Farm Bureau
Mr. Chris Cox	South Bend Tribune
Mr. Matt Davis	Wightman and Associates
Mr. Bruce Green	Natural Resource Conservation Service
Mr. Karl Hausler	Michigan Department of Agriculture
Mr. Dave Johnson	Harbor Country News
Ms. Barbara Kuene	League of Women Voters
Mr. Mike Henry	Berrien County Administration
Representative Neal Nitz	State Representative
Ms. Keila Perez	Wightman and Associates
Mr. Gary Soper	Benton Charter Township
Mr. Warren Strefling	Galien River Conservation District
Ms. Marcy Colclough	Southwestern Michigan Commission
Mr. Ben Schmidt	Natural Resource Conservation Service
Mr. Dave Heiniger	Weesaw Township
Ms. Gaye Blind	Galien River/St. Joseph Conservation District
Mr. John Byrdak	Galien River Conservation District
Mr. John Cassidy	Landowner
Senator Ron Jelinek	State Senator
Mr. Joe Rathbun	Michigan Department of Environmental Quality
Mr. Don Ryman	Berrien County Board of Commissioners
Mr. Mike Terrell	Warren Dunes State Park - MDNR
Mr. Nick Young	Farmer/Landowner
Mr. Chuck Braje	Landowner
Mr. David Zilke	Landowner
Mr. Roger Zilke	Berrien County Drain Commissioner
Ms. Jean Brokish	Chikaming Open Lands
Ms. Katie Kissel	Harbor Country News
Ms. Theresa Rahn	Landowner
Mr. Terry Walsh	Landowner
Ms. Mary McPherson	Landowner
Mr. Mike Staton	MSU Extension
Mr. Mike Metz	Weesaw Township
Ms. Ellen Tropp	Berrien County Farm Bureau
Mr. Bruce Hauch	Three Oaks Public Works
Mr. Ed Kretchman	Berrien County Farm Bureau

Table 1A - Galien River Watershed Steering Committee Members - 2005

Ms. Wendy Ogilvie	Fishbeck, Thompson, Carr & Huber, Inc.
Mr. Mike Townley	Fishbeck, Thompson, Carr & Huber, Inc.
Mr. Rod Clute	Michigan Department of Natural Resources
Mr. Carl Anderson	Chikaming Township
Mr. Anthony Mrozek	Galien River Sanitation District
Mr. Charles Sittig	Three Oaks Township
Mr. Steve and Ms. Jean Smith	Chikaming Open Lands
Mr. Laird Willard	Berrien County Health Department
Mr. Dick Schinkel	Berrien County Parks & Recreation Board
Mr. Kevin Daugherty	Pokagon Band of Potawatomi Indians
Mr. John Mefford	Bertrand Township
Mr. Richard Chubb	Buchanan Township
Mr. Rich Hill	Warren Dunes State Park
Sediment and Nutrient Subcommittee:	
Mr. Ben Schmidt	Natural Resources Conservation Service
Ms. Gaye Blind	Galien River/St. Joseph Conservation District
Mr. Nick Young	Farmer
Mr. Joe Rathbun	Michigan Department of Environmental Quality
Ms. Christina Bauer	Michigan Department of Environmental Quality
Mr. Bruce Green	Natural Resource Conservation Service
Farmer's Incentive Subcommittee	
Mr. Ben Schmidt	Natural Resources Conservation Service
Ms. Gaye Blind	Galien River/St. Joseph Conservation District
Mr. Charles Braje	Farmer
Ms. Jean Brokish	Chikaming Open Lands
Mr. Bruce Green	Natural Resources Conservation Service
Ms. Peg Kohring	The Conservation Fund
Mr. Chris Siebenmark	Assistant to Senator Ron Jelinek
Mr. Nick Young	Farmer
Ms. Elise Priest	Landowner
Mr. John Byrdak	Farmer
***E. coli* Subcommittee**	
Mr. Laird Willard	Berrien County Health Department
Ms. Gaye Blind	Galien River/St. Joseph Conservation District
Ms. Jean Brokish	Chikaming Open Lands

1.9A NATURAL RESOURCES

The Michigan Department of Natural Resources (MDNR), according to Mr. Kregg Smith, Fisheries Management Biologist for the Southern Lake Michigan Management Unit of the MDNR, is planning to conduct a river assessment for the Galien River from 2007 to 2010 to collect information on fish species distribution, abundance, and community structure to meet resource objectives.

The United States Fish and Wildlife Service is installing a sea lamprey barrier upstream of Highway 12 on the South Branch of the Galien River. The structure is a low head barrier, so high flows will be able to flow and the barrier will be open 70% of the time, allowing for fish passage.

CHAPTER 2 - POLITICAL LANDSCAPE

Addendum Summary - This Chapter provides an update to the elected and local officials that have jurisdiction in the Galien River Watershed, as listed in Section 2.3A.

2.3A OFFICIALS

The Galien River Watershed (Watershed) is represented by a variety of appointed and elected officials. An updated list of some of the key stakeholders in the Watershed is provided in Table 2.4. This list will be continually updated in future revisions of this document.

Table 2.4A - Representatives and Officials

Officials	Jurisdiction	Title
United States Senators		
Ms. Deborah Stabenow	U.S. Senate	Senator
Mr. Carl Levin	U.S. Senate	Senator
United States Representative		
Mr. Fred Upton	U.S. Congressional District 6th	Congressman
Tribal Representatives		
Mr. Michael Zimmeran	Pokagon Band of Potawatomi Indians	Acting Tribal Chairman
Mr. Mark Parrish	Pokagon Band of Potawatomi Indians	Environmental Coordinator
Mr. Kevin Dougherty	Pokagon Band of Potawatomi Indians	Resource Developer
State of Michigan Representatives		
Mr. Ron Jelinek	State Senate District 20th	Senator
Mr. John Proos	State Representative District 9th	Representative
Mr. Neal Nitz	State Representative District 78th	Representative
Berrien County Representatives		
Mr. William Wolf	County Administration	County Coordinator
Mr. L. Paul Bailey	County Sheriff	
Ms. M. Louise Stine	County Clerk	
Ms. Lori D. Jarvis	County Register of Deeds	
Mr. Bret Witkowski	County Treasurer	
Mr. Roger Zilke	County Drain Commissioner's Office	Drain Commissioner
Ms. Anne Hendrix	County Drain Commissioner's Office	Deputy Drain Commissioner
Mr. Gary Witkowski	County Health Department	Environmental Health Director
Mr. Randy Rood	County Parks and Recreation Commission	Director
Mr. Kip Miller	County Parks and Recreation Commission	Chief Naturalist
Mr. John Burt	County Planning and GIS Mapping	Director
Ms. Catherine McIlwee	County Planning and GIS Mapping	Planner

Table 2.4A - Representatives and Officials

Officials	Jurisdiction	Title
Ms. Jill Cooley	County Planning and GIS Mapping	Resource Recovery Educator
Mr. Brian Berndt	County Road Commission	Engineer, Manager
Local Representatives		
Mr. Tom Johnson	New Buffalo	City Manager
Mr. Jack Kennedy	New Buffalo	Mayor
Mr. Jim Brow	Baroda Township	Supervisor
Mr. John Mefford	Bertrand Township	Supervisor
Mr. Richard Chubb	Buchanan Township	Supervisor
Mr. Ivan Zimmerman	Chikaming Township	Supervisor
Mr. Bruce Williams	Galien Township	Supervisor
Mr. John Gast	Lake Township	Supervisor
Ms. Agnes Conway	New Buffalo Township	Supervisor
Mr. Ernest Hildebrand	Oronoko Township	Supervisor
Mr. Charles Sittig	Three Oaks Township	Supervisor
Mr. David Heiniger	Weesaw Township	Supervisor
Mr. Clarence Marsh, Jr.	Galien Village	President
Mr. Phillip Smith	Three Oaks Village	President

CHAPTER 3 - WATER QUALITY GOALS AND OBJECTIVES

Addendum Summary - The updated 2004 U.S. EPA Clean Water Act Section 303(d) Non-attainment List of waterbodies is included in this Chapter, in Section 3.2A. The pollutant loadings, as required by EPA, and updated sampling results for E. coli are included in Section 3.5A. The progress being made toward meeting the stated goals and objectives is reported in Section 3.6A.

3.2A CURRENT STUDIES

TOTAL MAXIMUM DAILY LOADS STUDIES

The Michigan Department of Environmental Quality (MDEQ) updated the water quality non-attainment list with results from water quality testing and a reassignment of the categories within the list. Table 3.1A provides information about the current status of the Total Maximum Daily Load (TMDL) reaches in the Galien River Watershed (Watershed).

Table 3.1A - 2004 US EPA Clean Water Act Section 303(d) Non-attainment List

2004 US EPA Clean Water Act Section 303(d) TMDL Approved List for Water Bodies (Category 4a)							
Water Body	**Deer Creek (Tributary to S. Branch Galien River)**						
WBID#	083301D						
County	Berrien						
RF3RchID	4040001 4400.00						
Size (miles)	3 miles						
Location	S. Branch of Galien River confluence upstream to the vicinity of Three Oaks						
Problem	Untreated sewage discharge, pathogens (Rule 100)						
TMDL Year	2002						
EPA Approval	September 1, 2002						
Changes from 2002 list:	Approved *E. coli* TMDL Creek reassessed - no nuisance plants, biota removed because portion of reach changed to Category 4c type						
Water Body	**Galien River**						
WBID#	083301A						
County	Berrien						
RF3RchID	4040001 2213.84						
Size	8 miles						
Location	Galien River in the vicinity of New Troy - Flynn Road upstream to Elm Valley Road						
Problem	Water quality standard exceedances for *E. coli*; pathogens (Rule 100)						
TMDL Year	2002						
EPA Approval	May 1, 2002						
Changes from 2002 list:	Approved *E. coli* TMDL						

Table 3.1A - 2004 US EPA Clean Water Act Section 303(d) Non-attainment List

2004 US EPA Clean Water Act Section 303(d) Water Quality Standards Non-attainment List for Highly Modified Water Bodies (Category 4c)							
Water Body	**Galien River, including the East Branch of the Galien River**						
WBID#	083301F						
County	Berrien						
RF3RchID	4040001 270.00						
Size	25 miles						
Location	Galien River confluence with E. Branch of Galien River upstream, including Dowling Creek, Beaverdam Creek, and Blue Jay Creek						
Changes from 2002 list:	Changed to Category 4c type Added tributaries Nuisance algal growths absent						
Water Body	**Kirktown Creek**						
WBID#	083301I						
County	Berrien						
RF3RchID	4040001 460.00						
Size	3 miles						
Location	Galien River confluence upstream						
Changes from 2002 list:	Added to 2004 list						
2004 US EPA Clean Water Act Section 303(d) Water Quality Standards Non-attainment List for Water Bodies Requiring TMDLs (Category 5)							
Water Body	**Galien River**						
WBID#	083301G						
County	Berrien						
RF3RchID	4040001 220.00						
Size	6 miles						
Location	Lake Michigan confluence upstream to the S. Br. Galien River confluence						
Problem	Fish consumption advisory for PCBs, chlordane						
TMDL Year	2009						

ROAD STREAM CROSSING SURVEYS

According to the MDEQ, the Watershed is scheduled to have road stream crossing surveys conducted in 2006, depending on the MDEQ having sufficient student assistant staff in the Kalamazoo District to do the surveys.

3.5A DESIGNATED USES AND POLLUTANTS

POLLUTANT LOADINGS AND IMPAIRMENTS TO DESIGNATED USES

The following pollutants and impairments have had the greatest impact on the designated uses in the Watershed. The linkages between the designated uses, impairments, sources, and causes are summarized in the Water Quality Summary in Appendix 8 of the 2003 WMP. Sources of pollutants that need to be controlled were identified through the watershed inventory and the loadings or existing conditions were calculated using methods recommended and approved by the MDEQ.

E. COLI

E. coli is impairing the designated uses of partial and total body contact recreation and agriculture for livestock watering. High *E. coli* levels close beaches and reduce recreational opportunities and tourism. High *E. coli* levels can be harmful to livestock if ingested.

E. coli bacteria are an indicator of other pathogens in the water. *E. coli* can be present in surface water and drinking water primarily through contamination from animal or human wastes. Current TMDL studies and investigations in the Watershed concluded that failing septic systems, illicit sewage connections, livestock operations, and pet and wildlife waste are potential sources of *E. coli*. Storm water runoff could also be a source in the more urbanized areas.

Levels of *E. coli*

The Michigan Department of Environmental Quality (MDEQ) reassigned the waterways included on the TMDL list in 2004 to focus efforts on those waterways that could be addressed most efficiently. The categories relevant to waterways in the Watershed include: waterways with approved TMDLs, highly modified waterways, and waterways requiring determination of TMDLs for *E. coli*. The waterways are identified within those categories, as shown in Table 3.1A.

In 2001, the MDEQ sampled Deer Creek, from its confluence with the South Branch of the Galien River upstream to the vicinity of Three Oaks. Sampling locations exceeding water quality standards of 130 *E. coli* per 100 millimeters (ml), based on a 30-day geometric mean, were:

- Deer Creek at Basswood Road (≤ 1,273 *E. coli* per 100 ml)
- Deer Creek at US-12 (≤ 1,188 *E. coli* per 100 ml)
- Chestnut Drain in Three Oaks (≤ 5,794 *E. coli* per 100 ml)

The approved Deer Creek TMDL report stated that the dominant sources of *E. coli* most likely were illicit connections from the Village of Three Oaks, storm water runoff, agricultural inputs, and sewage overflows. The sewage overflow problems in the Village of Three Oaks were corrected in 2003.

In 2001, the MDEQ sampled the Galien River in the vicinity of New Troy, from Flynn Road upstream to Elm Valley Road. The sampling locations exceeding water quality standards of 130 *E. coli* per 100 ml, based on a 30-day geometric mean, were:

- Avery/Mill Road (≤ 2,900 *E. coli* per 100 ml)
- Minnich Road (≤ 4,300 *E. coli* per 100 ml)
- East branch of the Galien River at Glendora Road (≤ 5,066 *E. coli* per 100 ml)
- Samples collected at all eight MDEQ sampling sites (> 1000 *E. coli* per 100 ml)

The approved TMDL report on this portion of the Galien River suggested the dominant sources of *E. coli* to be illicit connections to storm drains, mainly failing septic systems in the Villages of New Troy and Galien, and agricultural runoff. To date, most, if not all, agricultural sources have been addressed. In the approved TMDL, secondary sources of *E. coli* were identified as storm water runoff and seasonal discharge from the Galien Wastewater Treatment Plant (WWTP). Currently, the WWTP is a permitted discharge and not considered a significant source of *E. coli.*

The Berrien County Health Department has continued to sample in various locations in the Watershed. The results of that sampling are shown in Table 3.3A.

Table 3.3A - Berrien County Health Department *E. Coli* Sampling Results

	11/27/01 (ct/100 ml)	12/04/01 (ct/100 ml)	05/29/02 (ct/100 ml)	08/27/04 (ct/100 ml)	05/11/05 (ct/100 ml)	07/20/05 (ct/100ml)	08/09/05 (ct/100 ml)	08/17/05 (ct/100 ml)
Deer Creek @ Schwark Road, Three Oaks Twp Sec. 3		480						
Deer Creek - Bridge								280
Deer Creek - By Dunes								380
Deer Creek - Mouth of Lake Michigan								190
Deer Creek - By Bethany Oak Park Road								43
Dowling Creek @ Cleveland Road, Galien Twp Sec. 22		70						
Dowling Creek @ Hampton Road, Galien Twp Sec. 8	103		173					
Dowling Creek @ Olive Branch Road, Galien Twp, Sec. 22		210						
Dowling Creek @ US 12, Galien Twp, Sec. 5	120		147					

Table 3.3A - Berrien County Health Department *E. Coli* Sampling Results

	11/27/01 (ct/100 ml)	12/04/01 (ct/100 ml)	05/29/02 (ct/100 ml)	08/27/04 (ct/100 ml)	05/11/05 (ct/100 ml)	07/20/05 (ct/100ml)	08/09/05 (ct/100 ml)	08/17/05 (ct/100 ml)
E. Br. Galien River @ Cleveland Rd, Weesaw Twp Sec. 15		100						
E. Br. Galien River @ Glendora Rd, Weesaw Twp Sec. 6		330						
E. Br. Galien River @ Holden Rd, Weesaw Twp Sec. 4		140						
Galien River @ Dayton Lake Outlet, Bertrand Twp. Sec. 7		10						
Galien River @ Kaiser Road, Weesaw Twp Sec. 17		4300						
Galien River @ Mill Road, Weesaw Twp Sec. 7	227		250					
Galien River @ Gardner Road, Galien Twp Sec. 1		150						
Galien River - New Troy				3,800				
Galien River - Pardee Bridge, New Troy				3,000		550		
Galien River @ Glassman Road, New Buffalo Twp Sec. 31	77		183					
Galien River @ Lake Michigan, New Buffalo Twp Sec. 4		150		2,300	10			
Galien River @ New Buffalo Public Access, New Buffalo Twp Sec. 4								80
Galien River @ Beach Duck Feed Area, New Buffalo Twp Sec					500			
Galien River @ Red Arrow Hwy, New Buffalo Twp Sec. 2	90		100		50			
Galien River - New Buffalo Bridge						120		
Log Cabin - Galien River Site								340
South Branch Galien River @ Forest Lawn Road	157							
South Branch Galien River @ Kruger Road		160						
South Branch Galien River @ Lakeside Road	210		187					
South Branch Galien River @ Martin Road			437					
Tributary to Galien River @ Log Cabin Road	230		230					
Tributary to Galien River @ US 12		300						
New Bethany Pond								<2
New Troy Drains - Wee Chik Road, Weesaw Twp - Station 1							700	

Table 3.3A - Berrien County Health Department *E. Coli* Sampling Results

	11/27/01 (ct/100 ml)	12/04/01 (ct/100 ml)	05/29/02 (ct/100 ml)	08/27/04 (ct/100 ml)	05/11/05 (ct/100 ml)	07/20/05 (ct/100ml)	08/09/05 (ct/100 ml)	08/17/05 (ct/100 ml)
New Troy Drains - Wee Chik Road, Weesaw Twp - Station 2							230	
New Troy Drains - Wee Chik Road, Weesaw Twp - Station 3							140	

SEDIMENT

Sediment is impairing the warmwater and coldwater fisheries by covering the substrate and degrading the spawning habitat. Sediment is a minor impairment to agriculture for irrigation, since excessive sediment can clog intake pipes and reduce efficiency.

Sediment originates from streambank erosion, cropland runoff, and runoff from unimproved roads. Log jams may cause streambank erosion, which results in more trees falling in the river. In other places, log jams are a natural part of the river ecology. Unlimited livestock access at numerous sites was adding to the sedimentation of the stream, and all known sites have been fixed. The Watershed inventory identified many road/stream crossings that were eroding and adding sediment to the stream. The Berrien County Road Commission has funding through the Chikaming Open Lands Implementation project to fix 39 road/stream crossings identified in the original Galien River Watershed Plan.

Sediment Loadings

The Galien River Sediment and Nutrient Subcommittee met on January 6, 2005, to discuss the sediment loading calculation methods and results. The members reviewed the methods and suggested revisions to make the calculations more accurate. The Galien River Watershed Farmer Incentive Agricultural Subcommittee (Agricultural Subcommittee) met on March 22, 2005, to review the revised sediment loading calculations and the location of the potential hot spots of soil erosion. Figure 1A illustrates the areas of highly erodible soils.

Sediment originates from various types of erosion. Amounts of sedimentation from each of these erosion types can be estimated by accepted methods to determine total erosion. The Revised Universal Soil Loss Equation (RUSLE), the Gully Erosion Equation (GEE), and the Channel Erosion Equation (CEE) are used to calculate total erosion.

Soil loss, or erosion, is a naturally occurring process, which is defined as the wearing away or disintegration of earth material by the physical forces of moving water and wind. Using these calculations, the total sediment loss in the Watershed before implementation of BMPs, or treatment, was estimated to be 68,356 tons per year. The details of the calculations are included in Appendix 1. Table 3.4A represents the soil loss from the various sources by subdistrict, as illustrated in Figure 1A.

Table 3.4A - Summary of Sediment Loadings

Sub District	Contributing Area of Cropland (acres)	Soil Loss on Cropland Before Treatment (tons/yr)	Streambank Erosion (tons/yr)	Rill & Gully Erosion (tons/yr)	Tile Outlet (tons/yr)	Road/Stream Crossing (tons/yr)	Livestock Access (tons/yr)	Total (tons/yr)
East Galien River	11,038	18,631	0.0	1.3	0.2	20.2	12.5	18,665
Galien River A	11,219	12,845	1.8	0.5	0.2	2.3	2.5	12,852
Galien River B	7,176	9,154	157.0	0.7	0.3	67.1	1.8	9,381
Galien River C	0	0	0.9	0.9	0.2	7.6	0.0	10
South Galien River	4,758	9,510	2.0	1.7	0.2	16.5	0.0	9,531
Spring Creek	5,525	6,236	0.4	0.6	0.3	1.5	20.0	6,259
Dowling Creek	9,192	11,655	0.0	0.0	0.0	2.5	0.0	11,657
Total	**48,908**	**68,032**	**162.2**	**5.8**	**1.4**	**117.8**	**36.8**	**68,356**

Controlling sediment loading requires the knowledge of the soil erosion and sedimentation. The difference between “soil loss”, as measured by these erosion equations, and the sediment delivery to water bodies is important to recognize. A number of factors such as drainage area size, basin slope, climate, and land use/land cover may affect sediment delivery processes. The accurate prediction of a sediment delivery ratio is an important and effective approach to predicting sediment loading. Sediment delivery is the amount or fraction of soil that is actually delivered to a water body. For the purposes of this report, sediment delivery is estimated to be 50 percent, which results in a sediment loading of 34,178 tons per year.

NUTRIENTS

The presence of excess nutrients and algae impairs partial body contact recreation by creating unsightly conditions of the waterways. Excess nutrients impair warmwater and coldwater fisheries by decreasing the dissolved oxygen in the water when oxygen is consumed to aid in the decomposition of the plants. An overabundance of exotic aquatic plant species crowds out other indigenous species, changing the balance of the system.

Elevated nutrients in surface waters result in the overpopulation of aquatic plant species that are able to absorb nutrients, grow quickly, and adapt to changing conditions.

NUTRIENT LOADINGS

The Galien River Sediment and Nutrient Subcommittee met on January 6, 2005, to discuss the nutrient calculation methods and results. The members reviewed the methods and suggested revisions to make the calculations more accurate. The Agricultural Subcommittee met on March 22, 2005, to review the revised nutrient delivery calculations.

Nutrient loading is estimated by calculating total erosion at a site, then estimating the amount of nutrients attached to the amount of sediment. Sediment-borne nutrients originate from various types of erosion. Each of these erosion types can be estimated by accepted methods to determine total erosion. The RUSLE, GEE, and CEE are used to calculate total erosion, which enables an estimate of attached nutrients to be calculated.

Using these calculations, the total phosphorus content before treatment was estimated to be 49,755 pounds per year. The total nitrogen content before treatment was estimated to be 99,509 pounds per year. Table 3.5A lists the nutrient loadings by subdistrict. The methods and assumptions used for the calculations are described in Appendix 1. The subdistricts are illustrated in Figure 1A.

Table 3.5A - Summary of Nutrient Loadings

Sub District	Contributing Area of Cropland (acres)	Before Phosphorus Content Agricultural Fields (lbs/yr)	Before Nitrogen Content Agricultural Fields (lbs/yr)	Before Phosphorus Content NPS Sites (lbs/yr)	Before Nitrogen Content NPS Sites (lbs/yr)	Total Phosphorus Loading (lbs/yr)	Total Nitrogen Loading (lbs/yr)
East Galien River	11,038	13,117	26,234	29	58	13146	26,292
Galien River A	11,219	9,726	19,453	6	13	9,733	19,465
Galien River B	7,176	6,784	13,569	193	386	6,977	13,955
Galien River C	0	0	0	8	16	8	16
South Galien River	4,758	6,468	12,935	17	35	6,485	12,970
Spring Creek	5,525	4,736	9,473	19	39	4,756	9,512
Dowling Creek	9,192	8,647	17,295	2	4	8,650	17,299
Total	**48,908**	**49,479**	**98958**	**162.2**	**5.8**	**49,755**	**99,509**

DEGRADED HABITAT/AESTHETICS

Degraded habitat is impairing the populations of other indigenous aquatic life and wildlife through loss of wetlands, lack of riparian corridors, and fragmentation of critical habitats. The presettlement map, Figure 8 of the 2003 WMP, illustrates the expanse of wetlands that previously was Elm Valley. Over time, much of this area was converted to agricultural land, resulting in a loss of over 85% of the wetlands.

OBSTRUCTIONS, TRASH, AND DEBRIS

Many stretches of the River are clogged with log jams and debris, which can cause streambank erosion and an impassible navigational course. The number and extent of log jams has been a long-term concern of local and county officials.

A few properties that traverse the River are delineated by cables strung across the River. These cables often catch debris floating down the River and create an obstruction. Instances of illegal dumping were recorded in the inventory. Tires, appliances, trash, and other debris are not only unsightly, detracting from recreational enjoyment, but are also often a hazard to recreationists and can potentially leach contaminants into rivers and streams.

HYDROLOGY

The fluctuations in hydrology affect recreation, such as fishing, boating, and swimming, occasionally creating treacherous or unmanageable conditions.

Changes in flow patterns, especially increased peak flows and decreased attenuation, have caused multiple problems in the lower reaches of the Watershed. Development and wetland destruction increase the amount of impervious surfaces in the Watershed. Storm water runoff reaches the streams faster and with greater volume than if allowed to seep into the ground. A greater amount of water enters the stream, eroding the banks and causing flooding. Fluctuations in water levels and velocities damage fish and wildlife habitats by changing the physical characteristics of the stream.

INVASIVE SPECIES

A few species have been identified in the Watershed that are considered invasive and a threat to the indigenous aquatic life and the unique ecosystems. Invasive species, such as garlic mustard, are found in most of the forested areas of the Watershed, including Warren Woods State Park. Road fill is often trucked from sites that contain garlic mustard seeds and are spread when the fill is used in other areas. Boats and bait buckets can transfer species from water body to water body, such as the Rusty Crayfish, which is a nonnative crayfish that out-competes native species. The extensive drainage network that exists in the Watershed also acts as a conduit for many of these species.

TEMPERATURE

Increased temperatures can quickly degrade a coldwater fishery by creating temperatures above the limits of what the species can endure to be productive.

The removal of riparian vegetation for agricultural and rural residential land use is evident in the Watershed. When cover vegetation is removed, sunlight can warm stream water significantly.

CHEMICALS, PETROLEUM, AND HEAVY METALS FROM URBAN RUNOFF

The abundance of orchards and crops in the area increase the potential for chemicals to impair the designated uses of supporting indigenous aquatic life and other wildlife, warmwater fisheries, and coldwater fisheries. Petroleum and heavy metals can become bound to sediment and absorbed by macroinvertebrates and other aquatic organisms, causing them harm.

Chemicals from pesticides and fertilizers used on lawns and crops are often captured in rainwater and washed into streams. Indigenous aquatic species are affected, as well as other wildlife. Urban storm water runoff, especially from roads with heavy traffic, often contains heavy metals. The metals may have toxic effects on these organisms, especially in industrialized areas. Mercury bioaccumulates in fatty tissue, and fish may contain such high levels of mercury that they become toxic to predators or are unfit for human consumption.

Berrien County is working with Vickers Engineering to reduce polychlorinated biphenyls (PCBs) at the former Stanley Knight factory, which was once a tire manufacturing site. This brownfield work should reduce the PCBs in the River, as the factory site is on the edge of a ravine on the River.

3.6A GOALS AND OBJECTIVES

GOALS AND OBJECTIVES FOR *E. COLI*

The Steering Committee had previously stated one of the goals for the Watershed as meeting *E. coli* water quality standards for total body contact recreation in all water bodies in the Watershed.

The objectives from the WMP and Steering Committee discussions were to:

- Encourage continual testing and selective monitoring in high-risk areas.
- Create a volunteer monitoring program.
- Limit livestock access in high risk areas.
- Form a committee to lead and coordinate the TMDL implementation.
- Encourage proper management of manure storage areas.
- Encourage proper installation and maintenance of septic systems.
- Upgrade to municipal sewer service and separate from sanitary sewers.

The following structural and vegetative Best Management Practices (BMPs) were recommended to achieve those objectives:

- Septic system inspection and maintenance.
- Installation of municipal sanitary sewer system.
- Stream buffers/filter strips.
- Livestock exclusion fencing.
- Correct or repair illicit connections.
- Pet waste disposal and information stations.
- Discourage water fowl and geese feeding.

The following managerial BMPs were also recommended:

- Development of a County or State point-of-sale ordinance requiring septic system inspection on all home and business sales and new regulations to enforce septic system maintenance on existing homes.

- Develop manure management plans.

PROGRESS TOWARD MEETING THE GOALS

The Berrien County Environmental Health Department (BCHD) has authority to test and evaluate water quality for bathing beaches in Berrien County. The Berrien County Beach Monitoring program tests water quality at 19 beaches within the county. The results of the sampling have recorded only one reading above the daily geometric mean, in June 2003, at the New Buffalo City boat launch area, which is the only sampling site in the Watershed. Sampling results have been recorded from June 21, 1999, to August 18, 2004.

The *E. coli* Subcommittee discussed the objectives necessary to meet the goals of reducing *E. coli* in the Watershed. The New Troy Village area is currently planning a sewer system that will essentially eliminate septic systems in the downtown area. Weesaw Township is planning for 2.63 miles and 136 new users to be hooked up. However, the New Troy Village is still looking for financing to proceed with the project.

In Three Oaks Township, a 1,500-foot sewer extension from the Village of Three Oaks into Three Oaks Township to Kruger Road has been installed by Vickers Engineering, but is not yet functioning. An additional 15 new hookups will be added when the extension line is completed. Three Oaks Township and the BCHD have been encouraging residents to hookup along Kruger Road. The separation of sanitary and storm sewers in the Village of Three Oaks is almost completed.

Activities that have been completed through the Community Outreach Program include volunteer water quality monitoring and newspaper ads that featured a "*Scoop Your Poop"* message created by the Tip of the Mitt Watershed Council.

The Coast Guard has been distributing brochures and videos about waste disposal at the waste receiving stations at marinas. Back-flow valves on vessels are no longer permitted in the Great Lakes.

GOALS AND OBJECTIVES FOR SEDIMENT

One goal in the WMP is to prevent soil erosion and reduce sedimentation in rivers and streams. The Army Corps of Engineers listed details of their dredging projects in their 2003 Annual Report. From 1983 to 2003, a total of 112,436 cubic yards of sediment were dredged from the New Buffalo Harbor for a total cost of $688,516. The reduction of sediment entering the waterways through BMPs and improved management practices would reduce the costs of the annual dredging required by the Army Corps of Engineers and, ultimately, the taxpayer.

The USDA Natural Resources Conservation Service (NRCS) conducted tillage surveys within Berrien County to approximate the amount of acres using no-till and mulch-till practices. In the 2003 survey, 17,805 acres were observed in no-till, and 5,120 acres were in mulch-till. In 2004, 14,283 acres of no-till were observed and 5,468 acres of mulch-till were observed. The Watershed is assumed to have half of the land in the county survey.

The goals for sediment reduction were discussed with the Steering Committee to attempt to quantify the goals and recommend practices to promote the reduction of sediment and nutrients and methods to implement those practices. The final recommendations were made to the Steering Committee at the May 9, 2005, meeting.

The objectives to reduce soil erosion are to:

- Increase use and quality of filter strips and windbreaks.
- Encourage wheat production.
- Promote no-till farming.
- Review soil erosion and sedimentation control inspection and enforcement.

PROGRESS TOWARD MEETING THE GOALS

The elimination of livestock access areas has resolved the issue of sediment entering the stream from these sites. Farmers are using no-till and conservation tillage practices, as recorded through the survey, but further promotion and education will continue to reduce soil erosion. Additional information about load reductions is included in Chapter 4.

GOALS AND OBJECTIVES FOR NUTRIENTS

The goals for nutrient reduction were discussed with the Steering Committee to attempt to quantify the goals and recommend practices to promote the reduction of nutrients and methods to implement those practices. The final recommendations were made to the Steering Committee at the May 9, 2005, meeting.

The goal to reduce nutrient (especially phosphorus) loading has the following objectives to accomplish that goal:

- Encourage Comprehensive Nutrient Management Plans and increase the use of filter strips and cattle exclusion fencing.
- Use integrated crop management.
- Practice better manure utilization.
- Address residential septic systems.

- Provide educational brochures to agricultural landowners.

PROGRESS TOWARD MEETING THE GOALS

The NRCS is currently working with producers to manage nutrients on their farms. Five plans have already been written, and two more plans are in development. The elimination of livestock access areas, through fencing livestock out of the stream and/or providing alternative watering sources, has resolved the issue of nutrients entering the stream from these sites. Further information about load reductions is included in Chapter 4.

GOALS AND OBJECTIVES FOR HABITAT PROTECTION

Preventing fragmentation of habitat was listed as a high-level priority to warmwater fisheries, indigenous aquatic life, and wildlife. The goal of minimizing habitat fragmentation was to be accomplished through the use of buffer and filter strips and to discourage the clearing of the stream canopies on county drains. The objectives to meet those goals were to:

- Encourage riparian buffers.
- Encourage townships to adopt reasonable land-use planning ordinances.
- Create tax incentives for conservation easements.

The Michigan Department of Natural Resources (MDNR) provided additional recommendations to improve habitat protection:

- Survey fish species distributions, population abundance, and current fish communities. Fisheries data is not up to date and insufficient for proper management. Updated information is needed, particularly in relation to providing consistent resource objectives.

- Survey all road and stream crossings and work with Road Commission to correct problems of sedimentation and barriers to movement of fish and aquatic invertebrates. Develop a clear strategy and stream crossing designs for remediation of the passage problems.

- Protect the riparian zone by encouraging building setbacks, greenbelts through local zoning, and state and federal statutes, along with purchasing conservation easements and buffer strips.

- Protect existing connectivity of streams by opposing construction of new dams and use of undersized or improperly placed culverts. Rehabilitate free-flowing river conditions and rehabilitate high-gradient habitat by encouraging dam owners to consider dam removal now or in the future. Work with owners to explore funding options, including escrowing money for future dam removal.

- Protect undeveloped properties from intensive development though property tax incentives, conservation easements, transportation policies, zoning, and public purchase of open space. Protect sensitive areas such as wetlands, floodplains, steep slopes, and riparian zones through the application of existing environmental laws and existing zoning.

PROGRESS TOWARD MEETING THE GOALS

The Berrien County Road Commission has improved many crossings to reduce sedimentation. Funds were also included in the Galien River Implementation Grant, awarded to Chikaming Open Lands, to improve road/stream crossings.

The United States Fish and Wildlife Service is constructing a lamprey barrier on the South Branch of the Galien River and has continued maintenance for lamprey management.

The Michigan Farm Bureau and local townships have sponsored several workshops in the county to promote the Purchase of Development Rights program to farmers and landowners to educate them about land preservation opportunities.

GOALS AND OBJECTIVES FOR HYDROLOGY

Fluctuations in the hydrology are caused by the establishment and maintenance of county drains, elimination of wetlands, and increases of impervious surfaces. The goals of stabilizing the stream flows to moderate the hydrology and increase base flows were to be accomplished by meeting the following objectives:

- Restrict or limit irrigation in areas where flow must be maintained.
- Establish irrigation scheduling.
- Work with townships to create planning ordinances that limit impervious surfaces.
- Encourage wetland restoration programs and conservation easements.

The MDNR provided additional recommendations to stabilize hydrology:

- Protect the river corridor through development of a plan for stream fluvial geomorphology by educating and working with drain commissioners, landowners, and developers on stable stream characteristics.

- Protect flow stability of streams from effects of land use changes (increase in impervious surfaces from development practices), channelization, irrigation, and construction of dams and other activities that may disrupt the hydrologic cycle by educating and working with planners, zoning boards, developers, drain commissioners, and landowners.

- Protect flow stability by developing a hydrologic routing model for the entire river system that describes both ground and surface water routes in response to changes on the landscape. Such a model would allow various planning alternatives to be examined and drive future planning processes by providing fundamental information critical for proactive landscape and storm water management planning. It could also be used to identify critical tributary watersheds.

PROGRESS TOWARD MEETING THE GOALS

The Southwestern Michigan Commission (SWMC) has been working with Townships to develop their Master Plans and model ordinances, which support the recommendations for stabilizing flows. In addition, SWMC hosted a watershed short course that included local and county government officials from the Watershed.

Two programs are being initiated as part of the Chikaming Open Lands Administered Galien River Implementation Grant that focus on improving hydrology. The first is an agricultural buffer program implemented by the Galien River Conservation District to encourage farmers on highly erodible lands to sell conservation easements on buffer strips along the Galien River. The second is a conservation easement purchase and donation program administered by Chikaming Open Lands that is focused on the highest quality headwater streams and the low-water quality areas. The specific areas are outlined in Section 4.2A.

GOALS AND OBJECTIVES FOR INVASIVE SPECIES

To minimize the spread of invasive species, the recommendations were to:

- Increase public awareness about invasive species transport and its effects.
- Encourage planting native vegetation.
- Distribute educational brochures.
- Identify sites of highly-invasive populations and physically remove them.

PROGRESS TOWARD MEETING THE GOALS

The St. Joseph Coast Guard administers a program through their Marine Safety Officers to educate the public about the transport of invasive species and to control the spread of those species.

GOALS AND OBJECTIVES FOR TEMPERATURE

Some areas of the Watershed need to be protected for their coldwater fishery characteristics. The recommendations to maintain a coldwater fishery will be accomplished through the habitat protection and hydrology objectives. No activities to specifically maintain temperatures have been recorded.

GOALS AND OBJECTIVES FOR URBAN RUNOFF

Hydrocarbons, chemicals, and heavy metals can enter surface water through storm water runoff. Minimizing runoff from these impervious surfaces is a goal of the Watershed. The implementation of storm water management practices will reduce these pollutants entering water bodies. The activities implemented under the National Pollutant Discharge Elimination System (NPDES) Phase II Storm Water regulations will work toward that goal. SWMC's work with the townships is also focused on reducing impervious surfaces through ordinances.

CHAPTER 4 - IMPLEMENTATION STRATEGY

Addendum Summary - The critical areas of the Watershed were revised according to the recent water quality information and additional inventory and are described in Section 4.2A. Pollutant reductions that would be achieved through the implementation of the recommended best management practices are presented in Section 4.3A. Existing land preservation and land use policies are discussed in Section 4.5A, which also includes recommendations for future management strategies. Estimates of technical and financial assistance required for implementation are listed in Tables 4.2A to 4.7A and 4.9A.

4.2A CRITICAL AREAS

The 2003 Galien River Watershed (Watershed) critical areas focused on the Total Maximum Daily Load (TMDL) areas, the river and tributary corridors, locations of large agricultural operations, and preservation areas. Additional areas have been identified as priority areas for water quality benefits and challenged areas under development pressure. The MDEQ has approved two areas for *E. coli* TMDLs: Deer Creek and the main branch of the Galien River. The following are priority areas that need land protection to retain high water quality:

- East Branch upstream from Gardner Road
- South Branch upstream from Deer Creek
- Dowling Creek headwaters
- Spring Creek
- Dayton Lake Branch upstream from Gardner Road

The following areas are challenged and need land protection measures to increase water quality:

- Blue Jay Drain and Dowling Creek in the Elm Valley Region where tiled and channelized
- Main branch Galien River upstream from Elm Valley Road and downstream from New Troy to Kaiser Road as part of the TMDL area
- Main branch Galien River from Red Arrow Highway to Lake Michigan where high *E. coli* has been detected in the river and development pressures identified
- Deer Creek from Three Oaks to the South Branch of the Galien River in the TMDL area
- Kirktown Creek, where extensive soil erosion exists south of Sawyer Road

- East Branch of the Galien River between Browntown Road and New Troy

Table 4.1A describes the critical areas in which practices and management measures need to be applied to meet the associated water-quality goals.

Table 4.1A - Updated Critical Areas

Goals	Objectives	Critical Areas
Reduce *E. coli* levels to below 130 count/100 ml	Find sources from residential areas	Galien River in the New Troy area (2002 TMDL study area) Deer Creek (2002 TMDL study area)
	Find sources from agricultural areas	Large livestock operations
Reduce excessive nutrient loading	Increase use of filter strips and fencing	1/4-mile-wide riparian corridors Priority Areas for Water Quality Benefits identified by Chikaming Open Lands for conservation easements
	Encourage nutrient management planning	Large livestock operations
Remove obstructions and garbage	Establish volunteer clean up days	Stream corridors
Prevent excessive sediment loading	Improve SESC BMPs of BCRC	Severely eroded road crossings as identified in inventory
	Remove obstructions causing streambank erosion	Stream corridors
	Promote riparian buffers and conservation farming practices	Areas of highly erodible soils and intense land use activities Priority Areas for Water Quality Benefits identified by Chikaming Open Lands for conservation easements
Maintain coldwater temperatures	Maintain or increase canopy	Riparian corridors
Maintain management practices for controlling invasive and exotic species	Identify sites of invasive species and control their spread	Warren Woods and Robinson Woods Preserve (preservation area)
Prevent heavy metals from entering surface waters	Implement storm water management practices	New Buffalo and other urbanizing areas in the Watershed
Reduce flooding impacts	Identify floodplain delineations for municipalities to use in creating ordinances	100-year floodplain delineations for main branches of the Galien River

Chikaming Open Lands established conservation easement priorities as lands within the TMDL areas as first priority, and those lands outside of the TMDL areas, where easements would provide water quality benefits, as a second priority.

CONSERVATION EASEMENT PRIORITIES

The following is a list of priority criteria to focus landowner contacts.

I. TMDL areas

II. Coldwater streams and other areas of high water quality

III. Highly erodible lands

IV. Wetland restoration opportunities - pre-settlement emergent and forested wetlands

Within the identified areas, parcels will be further prioritized by:

a. Distance to stream - riparian lands being higher priority

b. Size - starting with larger parcels for that area, realizing that in some areas the largest parcels may be less than 40 acres

c. Groundwater recharge areas

d. Present vegetation - wetlands, wooded and other natural areas contributing more to water quality benefits

e. Proximity to protected areas - larger blocks of protected lands create a synergistic effect for water quality and wildlife habitat benefits. The following protected areas have been identified within the project area: Boyle Lake Wildlife Management Area (DNR); Warren Woods State Park (DNR); Chikaming Township Park and Preserve; Galien River Marsh (Chikaming Open Lands and Berrien County); Three Oaks Township Property; Kesling Preserve (Southwest Michigan Land Conservancy); The Robinson Preserve (The Nature Conservancy); Bley Conservation Easement (Southwest Michigan Land Conservancy); and Platz Conservation Easement (Chikaming Open Lands).

4.3A POLLUTANT REDUCTIONS FROM BEST MANAGEMENT PRACTICES

REDUCTIONS OF *E. COLI*

In recreation areas where full-body contact to surface water (swimming) occurs, water samples should not exceed:

- 130 *E. coli* per 100 ml, as a 30-day geometric mean.
- 300 *E. coli* per 100 ml, as a daily geometric mean or single sample.

The extension and installation of sanitary sewers in critical areas will replace failing septic systems and reduce the amount of *E. coli* entering the water bodies.

The New Buffalo Parks Director is aware that the New Buffalo channel has had high *E. coli* sampling results and that the police try to patrol the area to enforce ordinances and explain the no swimming warning. The Park Department is looking into creative duck and geese reduction programs and signage that could be used to address the problem. Some of the programs can be seen at:

http://www.metrocouncil.org/environment/Watershed/BMP/CH3_RPPHousAnimal.pdf

Proper enforcement of pet waste ordinances can dramatically decrease dog waste left near water bodies and storm water conveyances. Educational signs on the impacts of pet waste have also been used. Some areas have provided "baggie" dispensers for owners to collect and dispose their pet waste in the trash. Wild geese are a more difficult issue to handle. Some of the creative programs that are being considered include:

- No-feeding wildlife ordinances.
- Scare tactics.
- Habitat modifications, such as increasing the height of the shoreline vegetation, planting dense shrubs, or establishing a 20- to 100-foot strip of herbaceous vegetation at least 3 feet high.
- Goose barriers, such as wooden snow fences or a fine mesh plastic fence at least 30 inches high.
- Repellents.
- Use of trained dogs (making sure that dog waste does not add to the problem).
- Relocating geese.
- Lethal techniques such as addling eggs, sterilizing geese, hunting birds, and euthanizing geese (federal, state, and local permits may be required for some of these control methods).

REDUCTION OF SEDIMENT

The Agricultural Subcommittee of the Galien River Steering Committee (Steering Committee) met to discuss an approach to the sediment levels in the River. The Subcommittee reviewed the work to reduce soil erosion on new developments, the road/stream crossing repairs by the Berrien County Road Commission, and the educational activities of the Steering Committee. The following approach is being recommended by the Steering Committee to find the fields that are sediment hot spots:

1. Focus on sections within the Galien River Watershed where 50% or more of the section is highly-erodible soils.

2. Obtain aerial photos of these sections and determine probable areas of high erosion.

3. Conduct a field investigation from the road to determine if there is a problem.

4. Develop a list of landowners with a suspected erosion problem and focus on these landowners. The Subcommittee stressed that landowner contact should be with the owner, rather than the farmer leasing the ground.

5. Review the list of landowners with NRCS to determine which landowners are most approachable to begin the landowner contact. Start with a landowner who is seen as respectable and whose example will be followed.

6. As part of the Galien River Implementation Grant, the Galien River Conservation District will take responsibility for landowner contact and presenting options for the landowners.

7. If there are situations where the agricultural land value for programs such as the Wetland Reserve Program or buffer strips is not competitive because of high land prices, work with funding from the Galien River Implementation Grant to pay the amount above the agricultural value to the landowner for a permanent conservation easement.

8. Publicize the program through the Galien River Conservation District newsletter and press releases in case there are landowners interested in participating. The press release should go to the *Berrien County Record, Farmers Exchange, Harbor Country News, Herald Palladium, South Bend Tribune*, and the *South County Gazette* to ensure that the entire service area is covered.

9. Contact Mr. Roger Zilke at the Berrien County Drain Commissioner to discuss the possibility of working with the Drain Commissioner to put in buffer strips after drain cleanouts have been completed. Investigate the possibility of putting a conservation easement on top of the drain easement to ensure that the buffer strips would never be developed or farmed.

The Agricultural Subcommittee members also brainstormed ideas of incentives for farmers and landowners to reduce the sediment leaving their land. They explored what is acceptable and what farmers will sign up to do if payments were available.

The Farmer's Subcommittee prioritized existing information about highly-erodible soils and other soil characteristics to establish a ranking system for purchasing conservation easements. All water bodies were considered, including agricultural ditches. Properties considered for conservation easements will first be screened for water quality benefits. When possible, these properties will also be submitted for Berrien County Purchase of Development Right and Federal Farm and Ranch Protection funding.

	Priority
Soil Type:	
Floodplain soil - fluventic suborder, great group, or subgroup	High
Hydric soil - aquic suborder, great group, or subgroup and Histosols	High
Surface Soil Texture:	
High clay soil - clay, silty clay, silty clay loam, clay loam, sandy clay	High
Loam or silt loam soil - loam, sandy clay loam, silt loam, silt	Medium
Sandy soil - sand, loamy sand, sandy loam	Low
Slope Trend:	
Toward stream or ditch - greater than or equal to 30-foot buffer	High
Away from stream or ditch - greater than or equal to 20-foot buffer	Medium
Slope Percent:	
Greater than 2%	High
Less than or equal to 2%	Medium
Less than or equal to 2% with slope trend toward stream	High
Land Use:	
Agricultural	High
Residential	Medium
Commercial	H,M,L
Recreational	H,M,L
Other environmentally sensitive areas/development	High
Stream Order:	
1st order	High
2nd order	Medium
2nd order with floodplain soils	High
3rd order or higher	Low
3rd order or higher with floodplain soils	High
Locality and Scope:	
Adjacent to another easement	H,M,L
Number of landowners involved	H,M,L
Scope and impact toward improving water quality	H,M,L

SEDIMENT REDUCTION CALCULATIONS

Sediment reduction is estimated by first calculating total erosion at a site, then calculating the amount of soil transported to the surface waters. Sediment originates from various types of erosion. The Revised Universal Soil Loss Equation (RUSLE1), the Gully Erosion Equation (GEE), and the Channel Erosion Equation (CEE) are used to calculate total erosion.

Using these calculations, the total sediment loss before implementation of Best Management Practices, or treatment, was estimated to be 68,356 tons per year, 68,032 tons from cropland and 324 tons from other nonpoint source (NPS) sites. The total soil loss after treatment of conservation tillage practices on cropland was estimated to be 44,221 tons per year. Soil loss reductions were therefore 23,811 tons per year. The delivery ratio on cropland was assumed to be 50 percent for this watershed, thus 11,905 tons were delivered to the waterways. An assumption for the other NPS site calculations is that when a practice is installed, erosion is completely reduced. Therefore, an additional 324 tons per year would be reduced, resulting in a total reduction of 12,229 tons per year. All of the calculations are included in Appendix 1 and summarized by subdistrict in Table 4.1.1A.

The following assumptions are made when calculating sediment reductions with the RUSLE1 equations:

- Used RUSLE1 as opposed to RUSLE2, since the details of the parameters are not known, and the RUSLE2 was not yet available as an online tool through Michigan State University Extension (MSUE).

- Slope Length - 600 feet (NRCS uses a default of 150 feet when slope length is not known for an individual field, but agreed that might not be representative of an entire subwatershed).

- Percent slope: 2% (NRCS uses a default of 6% slope, which was considered too high an average for entire subwatershed).

- The point of deposition at the edge of field will be the basis for the sediment reduction estimates. Sediment can be deposited into a stream, lake, ditch, or a wetland or floodplain adjacent to a stream, lake, or ditch. All of these water bodies are important and warrant pollutant protection. Therefore, sediment reduction is represented at the boundary where the agricultural field or site joins these bodies.

- Once the system of BMPs is established, the stabilized condition is assumed to control all of the erosion. Therefore, the “before” condition is measured in average annual tons of sediment generated (i.e., without treatment), and the “after” condition is assumed to be negligible.

Table 4.1.1A - Summary of Sediment Reductions

Sub District	Soil Loss Before Treatment Agricultural Fields (tons/yr)	Soil Loss After Treatment Agricultural Fields (tons/yr)	Delivery Ratio (lbs/yr)	Sediment Reduction Agricultural Fields (tons/yr)	Sediment Reduction NPS Sites (lbs/yr)	Total Sediment Reduction (lbs/yr)
East Galien River	18,631	12,110	50%	3,260.5	34.1	3,295
Galien River A	12,845	8,349	50%	2,248	7.4	2,255
Galien River B	9,154	5,950	50%	1,602	227.0	1,829
Galien River C	0	0	50%	0	9.6	10
South Galien River	9,510	6,182	50%	1,664	20.4	1,685
Spring Creek	6,236	4,054	50%	1,091	22.9	1,114
Dowling Creek	11,655	7,576	50%	2,039.5	2.5	2,042
Total	**68,032**	**44,221**		**11,905**	**324**	**12,229**

Table 4.1.2A - Summary of Nutrient Reductions

Sub District	Before Phosphorus Content Agricultural Fields and NPS sites (lbs/yr)	After Phosphorus Content Agricultural Fields and NPS sites (lbs/yr)	Total Phosphorus Reduction Agricultural Fields and NPS sites (lbs/yr)	Before Nitrogen Content Agricultural Fields and NPS sites (lbs/yr)	After Nitrogen Content Agricultural Fields and NPS Sites (lbs/yr)	Total Nitrogen Reduction Agricultural Fields and NPS Sites (lbs/yr)
East Galien River	13,146	9,253	3,893	26,292	18,506	7,786
Galien River A	9,733	6,885	2,847	19,465	13,771	5,694
Galien River B	6,977	4,801	2,177	13,955	9,601	4,353
Galien River C	8	00	8	16	0	16
South Galien River	6,485	4,565	1,920	12,970	9,131	3,839
Spring Creek	4,756	3,353	1,403	9,512	6,706	2,805
Dowling Creek	8,650	6,119	2,530	17,299	12,238	5,061
Total	**49,755**	**34,977**	**14,778**	**99,509**	**69,954**	**29,555**

NUTRIENT REDUCTION CALCULATIONS

Nutrient reduction is estimated by first calculating total erosion at a site, then calculating the amount of nutrients attached to sediment that are transported to the surface waters. Sediment-borne nutrients originate from various types of erosion. Each of these erosion types can be estimated by accepted methods to determine total erosion. The RUSLE, GEE, and CEE are used to calculate total erosion.

Using these calculations, the total phosphorus content before implementation of BMPs, or treatment, was estimated to be 49,755 pounds per year, 49,479 pounds from cropland and 275 pounds from other nonpoint source (NPS) sites. The total phosphorus content after treatment of conservation tillage practices on cropland was estimated to be 34,977 pounds per year, for a reduction of 14,502. The same assumption for the other NPS site calculations, that when a practice is installed, erosion is completely reduced, is also applied to nutrient reductions. Therefore, an additional 275 pounds per year would be reduced, resulting in a total phosphorus reduction of 14,778 pounds per year.

The total nitrogen content before implementation of BMPs was estimated to be 99,509 pounds per year, 98,958 pounds from cropland and 551 pounds from other NPS sites. The total nitrogen content after treatment of conservation tillage practices on cropland was estimated to be 69,954 pounds per year, for a reduction of 29,004 pounds per year. An additional 551 pounds per year would be reduced from other NPS sites, resulting in a total nitrogen reduction of 29,555 tons per year. All calculations are included in Appendix 1 and summarized by subdistrict in Table 4.1.2A.

The following additional assumption is made when calculating nutrient reductions:

- Phosphorus and nitrogen reductions are assumed to come from reduction in sediment-borne nutrients. Nutrients that are dissolved and carried by runoff waters are not included.

Tables 4.2A to 4.7A summarize the recommendations first presented in Tables 4.2 to 4.7 of the original WMP. These updated tables list the BMPs that will need to be implemented to achieve the estimated load reductions stated above. Estimates of the technical and financial assistance are included that are required for implementing each BMP, listed by pollutant. The Unit Costs are consistent with those in the original tables. The Amount and Total Cost columns are summaries of the number of sites and costs for that particular BMP, as listed in the original table. The implementation schedule was originally submitted based on the severity of individual nonpoint source sites, as high (within 5 years), medium (within 5 to 10 years), or low priority (within 10 to 20 years). The updated schedule, in Chapter 6, includes BMPs of education and policy, and sets milestones of 2 years (high priority) and 7 years (medium priority) in which to accomplish the tasks (Table 6.3A). The original WMP must still be referenced for prioritizing site specific remediation.

Table 4.2A - BMP Implementation Detail
Trash and Debris Sites

BMPs	Responsible Party and Technical Assistance	Unit Costs	Amount	Total Cost	Financial Assistance
Recommendations from Obstruction Flowchart	**Responsible Party** Drain Commissioner **Technical Assistance** Adopt-A-Stream Program Trout Unlimited Michigan DNR Conservation District NRCS 650 hours	$60/day - trash removal by volunteers $10/ft. - obstruction removal $10/yd and $125/hr - tree revetment	8 High Priority 50 Medium Priority 7 Low Priority	$27,170	Drainage Districts MDEQ Volunteer Stream Cleanup Program St. Joe Fly Fishers USDA Programs

Table 4.3A - BMP Implementation Detail
Streambank Erosion

BMPs	Responsible Party and Technical Assistance	Unit Costs	Amount	Total Cost	Financial Assistance
Spillway	**Responsible Party** NRCS **Technical Assistance** Conservation District Drain Commissioner MDNR, MDEQ, Townships and Villages 30 hours	$70/square yard	3 sites	$2,100	USDA programs
Riprap toe or slope protection	**Responsible Party** NRCS **Technical Assistance** Conservation District Drain Commissioner 10 hours	$70/square yard	1 site	$230	Drainage districts
Seeding	**Responsible Party** NRCS **Technical Assistance** Conservation District Drain Commissioner 30 hours	$5/linear foot	3 sites	$90	USDA programs

Table 4.3A - BMP Implementation Detail
Streambank Erosion

BMPs	Responsible Party and Technical Assistance	Unit Costs	Amount	Total Cost	Financial Assistance
Soil Bioengineering	**Responsible Party** NRCS **Technical Assistance** Conservation District Drain Commissioner 10 hours	$5/square yard	1 site	$3,000	USDA programs
Seeding/regrading bank	**Responsible Party** NRCS **Technical Assistance** Conservation District Drain Commissioner 20 hours	$70/square yard	2 sites	$980	USDA programs

Table 4.4A - BMP Implementation Detail
Rill and Gully Erosion

BMPs	Responsible Party and Technical Assistance	Unit Costs	Amount	Total Cost	Financial Assistance
Berm and tube with filter strip	**Responsible Party** NRCS **Technical Assistance** Conservation District Drain Commissioner landowners 40 hours	$1,500 - berm and tube $190-$350/acre - filter strip	4 sites	$6,760-$7,020	USDA programs
Filter Strip	**Responsible Party** NRCS **Technical Assistance** Conservation District Drain Commissioner 60 hours	$190-$350/acre	6 sites	$1,140-$2,100	USDA programs
Bioengineering	**Responsible Party** NRCS **Technical Assistance** Conservation District Drain Commissioner 20 hours	$12/yard	2 sites	$150	USDA programs

Table 4.5A - BMP Implementation Detail
Road/Stream Crossing Sites

BMPs	Responsible Party and Technical Assistance	Unit Costs	Amount	Total Cost	Financial Assistance
Bioengineering and riprap (repair)	**Responsible Party** Road Commission **Technical Assistance** NRCS, Conservation District Drain Commissioner 150 hours	$10/yard - tree revetment $70/square yard - riprap	15 sites	$12,690	Road Commission
Work with BCRC	**Responsible Party** Road Commission 30 hours	Lump sums	3 sites	$3,000	Road Commission
Riprap	**Responsible Party** Road Commission **Technical Assistance** NRCS, Conservation District Drain Commissioner 20 hours	$70/square yard	2 sites	$2,100	Road Commission
SESC and riprap	**Responsible Party** SESC Enforcing Agent **Technical Assistance** Road Commission NRCS, Conservation District Drain Commissioner 10 hours	$70/square yard	1 site	$2,100	Road Commission

Table 4.5A - BMP Implementation Detail
Road/Stream Crossing Sites

BMPs	Responsible Party and Technical Assistance	Unit Costs	Amount	Total Cost	Financial Assistance
Pull back bank	**Responsible Party** Road Commission **Technical Assistance** NRCS, Conservation District Drain Commissioner 10 hours	$6/square yard - grading	1 site	$300	Road Commission
Bioengineering	**Responsible Party** Road Commission **Technical Assistance** NRCS, Conservation District Drain Commissioner 60 hours	$10/yard	6 sites	$7,350	Road Commission
Bioengineering and remove sediment	**Responsible Party** Road Commission **Technical Assistance** NRCS, Conservation District Drain Commissioner 10 hours	$10/yard – tree revetment	1 site	$200	Road Commission
Replace outlet protection, remove obstruction	**Responsible Party** Road Commission **Technical Assistance** NRCS, Conservation District Drain Commissioner	$70/square yard	1 site	$1,250	Road Commission

Table 4.5A - BMP Implementation Detail
Road/Stream Crossing Sites

BMPs	Responsible Party and Technical Assistance	Unit Costs	Amount	Total Cost	Financial Assistance
	10 hours				
Riprap culvert, riprap outlet protection	**Responsible Party** Road Commission 10 hours	$70/square yard $50/linear foot of culvert	1 site	$2,280	Road Commission
Riprap outlet protection	**Responsible Party** Road Commission **Technical Assistance** NRCS, Conservation District Drain Commissioner 160 hours	$70/square yard	16 sites	$13,230	Road Commission
Remove logs, outlet riprap protection	**Responsible Party** Road Commission **Technical Assistance** NRCS, Conservation District Drain Commissioner 10 hours	$70/square yard	1 site	$640	Road Commission
Replace culvert	**Responsible Party** Road Commission 20 hours	Variable	2 sites	$4,760 (estimate)	Road Commission

Table 4.5A - BMP Implementation Detail
Road/Stream Crossing Sites

BMPs	Responsible Party and Technical Assistance	Unit Costs	Amount	Total Cost	Financial Assistance
Remove sediment	**Responsible Party** Road Commission **Technical Assistance** NRCS, Conservation District Drain Commissioner 10 hours	$20/cubic yard	1 site	$100	Road Commission
Remove logs, tire, object blocking culvert	**Responsible Party** Road Commission **Technical Assistance** NRCS, Conservation District Drain Commissioner 50 hours	Lump sums	5 sites	$3,750	Road Commission
Cleanout culvert	**Responsible Party** Road Commission 30 hours	Lump sums	3 sites	$1,500	Road Commission
Remove obstruction/ replace tile	**Responsible Party** Drain Commissioner **Technical Assistance** Road Commission NRCS, Conservation District 10 hours	$40/linear foot of tile	1 site	$1,000	USDA programs Drainage Districts

Table 4.6A - BMP Implementation Detail
Tile Outlets

BMPs	Responsible Party and Technical Assistance	Unit Costs	Amount	Total Cost	Financial Assistance
Outlet stabilization	**Responsible Party** NRCS **Technical Assistance** Conservation District Drain Commissioner 80 hours	$70/square yard	8 sites	$527	USDA programs
Filter Strip	**Responsible Party** NRCS **Technical Assistance** Conservation District Drain Commissioner 30 hours	$190-$350/acre	3 sites	$316-$577	USDA program
Outlet stabilization and filter strip	**Responsible Party** NRCS **Technical Assistance** Conservation District Drain Commissioner 30 hours	$150/acre – filter strip $70/square yard – riprap	3 sites	$533	USDA programs
Outlet stabilization and check inlet	**Responsible Party** NRCS **Technical Assistance** Conservation District Drain Commissioner 10 hours	$70/square yard	1 site	$31	USDA programs

Table 4.7A - BMP Implementation Detail
Other Sites

BMPs	Responsible Party and Technical Assistance	Unit Costs	Amount	Total Cost	Financial Assistance
Turf Management BMPs	**Responsible Party** NRCS **Technical Assistance** Conservation District Drain Commissioner 40 hours	To be determined (site specific)	4 sites	To be determined (site specific)	USDA Programs

4.5A EXISTING MANAGEMENT STRATEGIES

FARMLAND AND OPEN SPACE PRESERVATION

Land protection through the purchase of development rights programs for farmland, open space, and natural areas along with the Wetland Reserve Program are key components to increasing the Galien River water quality. The farmland purchase of development rights program will focus on prime and unique agricultural land as identified by the Natural Resources Conservation Service. At the present time, there is no agricultural land preserved through the purchase of development rights easements, and models are needed to show that this is a viable program. In the next seven years, Berrien County Planning Department along with Chikaming Open Lands, The Conservation Fund, and SWMC will focus on completing the purchase of development right easements that will serve as models for agricultural landowners to consider an easement on their property as well.

In fall of 2005, applications for the Berrien County Purchase of Development Rights Program were available for owners of farmland in Bainbridge and Sodus Townships. The purpose of this program is to apply for state funding to purchase the development rights on farm property from property owners. Twelve townships in the county have passed farmland protection ordinances with a Purchase of Development Rights Resolution. The Berrien County Farm Bureau facilitated a workshop for landowners to educate them about the program. The flyer announcing the workshop is included in Appendix 2. The application process was very competitive, due to the limited amount of state funding. The Land Preservation Board acts as the body that recommends development rights purchases to the county board. A copy of the application form is included in Appendix 2. The SWMC is working with Three Oaks, Weesaw, and Chikaming Townships to revise their master plans and ordinances so that landowners in these townships can also apply for the state's Purchase of Development Rights Program.

Open and natural area purchase and donation of development rights, as well as outright gifts of land, will be the focus of Chikaming Open Lands and Southwest Michigan Land Conservancy programs. In addition, the Galien River Watershed (Watershed) will be part of Berrien County's Green Infrastructure planning. Just as growing communities need to upgrade and expand their built infrastructure (roads, sewers, utilities, etc.), they also need to upgrade and expand their green infrastructure. Green Infrastructure Planning is a way for these communities to think about their network of open space, woodlands, wildlife habitat, parks, and other natural areas that sustain clean air, water, and natural resources that enrich the quality of life. According to Mr. Ed McMahon of the Urban Land Institute, "the concept of green infrastructure repositions open space from a community amenity to a community necessity." This effort will build on Southwestern Michigan's information and green infrastructure plan to include a public process and new information based on water quality planning.

The Wetland Reserve Program would be most beneficial in the Elm Valley area, which includes the Blue Jay Drain and Dowling Creek. These drainage areas have an extensive tile drainage and are exhibiting unstable channel characteristics.

POLICY RECOMMENDATIONS

During the Galien River Transition Grant, the SWMC worked with Three Oaks, Chikaming, and Weesaw Townships to update their master plan and zoning ordinances to improve water quality. The ordinances adopted by these townships may serve as models for the other Watershed communities.

Additional ordinances have been identified that are needed to meet the goals of the WMP.

- Point-of-sale septic system ordinance for Berrien County.
    - The Conservation Fund gave a presentation to the Berrien County Board of Commissioners proposing a county ordinance for point-of-sale septic system inspections. The County Administrator stated that he would like to see a statewide ordinance as the county might not have the authority to enforce a point-of-sale ordinance. Another approach that The Conservation Fund is pursuing is to determine if the lending institutions are requiring septic systems to be checked at the time of sale.
- Change of master plans and zoning ordinances to allow landowners to apply for federal and state farmland preservation programs.
- Adopt Water Quality Overlay Districts or Natural Features Setback Ordinance requiring building setbacks and native vegetation buffers along streams, rivers, lakes, and wetlands.
    - Suggest 100-foot setbacks from rivers and streams and 25-foot setbacks from wetlands.
- Ensure adequate septic field setbacks from streams, rivers, lakes, and wetlands.
- Improve site plan review standards to better address water quality and natural resource protection.
- Ensure adequate floodplain development regulations.
- Improve lot coverage restrictions by expanding the definition of lot coverage to include all impervious surfaces.
- Encourage community water and wastewater systems in developments without municipal services available.

- In areas with soils not conducive to septic systems, ensure the allowed density of the area will not contribute to water pollution problems.

- Require a minimum amount of open space to be preserved in all Planned Unit Developments.

- Utilize incentives to encourage landowners to develop conservation developments with preserved open spaces that protect natural features.

- Encourage low-impact development techniques to be utilized (limit grading, preserve natural features, encourage infiltration of storm water runoff, etc.) by adopting storm water management or impervious surface mitigation ordinances.

- Adopt farmland preservation zoning methods such as sliding scale zoning, quarter/quarter zoning, and Purchase of Development Rights programs.

- Adopt ordinances requiring buffers between existing agricultural operations and new residential development to minimize land use conflicts.

- In the long term, evaluate designating the Galien River as a Natural River with the MDNR to ensure adequate and consistent development setbacks from the Galien River and its tributaries for watershed communities.

Other ideas that watershed communities should be doing in supporting the implementation of the recommendations in the WMP:

- Develop sustainable funding for The Galien River Conservation District to assume responsibility for coordinating the implementation of the Galien River WMP.

- Work with land conservancies to continue identifying and mapping areas for preservation and management.

- Assist land conservancies in providing assistance to landowners to preserve and manage sensitive lands to best protect water quality and natural features.

Additional considerations for the Berrien County Board of Commissioners:

- Increased funding to address erosion control through the Drain Commissioner.

- Continued support of the current hazardous waste program.

ESTIMATED COSTS AND ASSISTANCE

Estimates of the amounts of technical and financial assistance needed, associated costs, and the partners that will be involved in the implementation of the above recommended BMPs and policies are included in Table 4.9A.

Table 4.9A - BMP Implementation Detail
Policy and Educational Recommendations

BMP	Responsible Party and Technical Assistance	Cost/Unit	Amount	Total	Financial Assistance
Establish and sustain the financial and institutional capacity of the Galien River Conservation District to assume responsibility for coordinating the implementation of the Galien River WMP to act as the primary advocacy group, information clearing house, grant writing, and implementation of farm and volunteer focused projects	**Responsible Party** Galien River Conservation District **Technical Assistance** Steering Committee Michigan Department of Agriculture	$150,000/year	7 years of operating funds	$1,050,000	Michigan Department of Agriculture, MDEQ, Berrien County Board, Berrien Community Foundation, Membership
Provide riparian landowners with information regarding shoreline protection and restoration (non-agricultural owners) using workshops and door hangers	**Responsible Party** Galien River Conservation District **Technical Assistance** Steering Committee Michigan Department of Agriculture	$500/workshop, $100/year for door hangers	6 workshops and 300 door hangers	$3,600	AEP, MDEQ, Berrien Community Foundation

Table 4.9A - BMP Implementation Detail
Policy and Educational Recommendations

BMP	Responsible Party and Technical Assistance	Cost/Unit	Amount	Total	Financial Assistance
Develop a volunteer water quality monitoring program	**Responsible Party** Galien River Conservation District **Technical Assistance** MDEQ Steering Committee Michigan Department of Agriculture	$15,000/year	3 workshops and yearly program	$105,000	AEP, MDEQ, Berrien Community Foundation
Educate local planning officials about water quality, smart growth, and protection of natural resources through coordinated planning, zoning, and ordinances	**Responsible Party** Southwestern Michigan Commission **Technical Assistance** Chikaming Open Lands Galien River Conservation District	$1,500/ordinance in technical assistance	15 ordinances	$22,500	MDEQ, People and Lands (PALS), MSU Extension, Southwest Michigan Commission
Increase public understanding about basic water quality issues, including the economic benefits of natural systems and open space through Community Profile surveys, signs, and door hangers	**Responsible Party** Chikaming Open Lands **Technical Assistance** Chikaming Open Lands Galien River Conservation District	$25,000/survey	2 Community Profile surveys	$50,000	AEP, MDEQ, Berrien County Community Foundation
	Responsible Party Berrien County Road Commission	$1,000/sign	7 signs	$7,000	Berrien County Highway Department

Table 4.9A - BMP Implementation Detail
Policy and Educational Recommendations

BMP	Responsible Party and Technical Assistance	Cost/Unit	Amount	Total	Financial Assistance
	Technical Assistance Chikaming Open Lands Galien River Conservation District	$3,800/year	7 years to distribute door hangers to all households in watershed (2,400/year)	$26,600	Berrien Community Foundation, MDEQ, AEP, EPA, Gateway Foundation, Whirlpool Foundation, Harbor Country Chamber of Commerce
Increase community understanding of flood control, groundwater filtration, recreation, higher property values and tourism linked to increased water quality through articles and television	**Responsible Party** Galien River Conservation District **Technical Assistance** Chikaming Open Lands Galien River Conservation District The Conservation Fund	$500/year	7 years, publishing 300 articles	$3,500	MDEQ, AEP, Whirlpool, Gateway Foundation
	Responsible Party Galien River Conservation District	$1,000/year	7 years, showing 24 ads	$7,000	Television and cable stations playing ads produced by "Stormwater Savvy Kit"
Engaging school children in the watershed to educate both them and the community	**Responsible Party** Galien River Conservation District	$10,000/year	Over 7 years, 3 sessions with 2 high schools, and 3 sessions with 10 4th or 5th grades	$70,000	School districts, MDEQ, Project Wet, Project Wild, MDEQ Curriculum, EPA Curriculum
Increase amount of Nutrient Management Systems in watershed improving water quality	**Responsible Party** Galien River Conservation District **Technical Assistance** NRCS	$2.64/acre/year	$1,000 for 2 years and $23,100 for 5 years	$24,100	USDA, Conservation District and agricultural landowners

Table 4.9A - BMP Implementation Detail
Policy and Educational Recommendations

BMP	Responsible Party and Technical Assistance	Cost/Unit	Amount	Total	Financial Assistance
Increase amount of Comprehensive Nutrient Management Waste Storage Systems in watershed improving water quality	**Responsible Party** Galien River Conservation District **Technical Assistance** NRCS	$18,167	5	$90,835	USDA, Conservation District and agricultural landowners
Increase amount of Waste Treatment Composting Systems in watershed improving water quality	**Responsible Party** Galien River Conservation District **Technical Assistance** NRCS	To be determined	To be determined	To be determined	USDA, Conservation District and agricultural landowners
Increase amount of Waste Utilization in watershed improving water quality	**Responsible Party** Galien River Conservation District **Technical Assistance** NRCS	To be determined	To be determined	To be determined	USDA, Conservation District and agricultural landowners
Increase amount of Grassed Waterways in watershed improving water quality	**Responsible Party** Galien River Conservation District **Technical Assistance** NRCS	$2.00 to $3.50/linear foot	To be determined	To be determined	USDA, Conservation District and agricultural landowners
Increase amount of Filter Strips using CRP in watershed improving water quality	**Responsible Party** Galien River Conservation District **Technical Assistance** NRCS	$190 to $350/acre	16 sites @ 2ac/site 32 acres	$6,080-$11,200	USDA, Conservation District and agricultural landowners

Table 4.9A - BMP Implementation Detail
Policy and Educational Recommendations

BMP	Responsible Party and Technical Assistance	Cost/Unit	Amount	Total	Financial Assistance
Increase amount of Filter Strips using conservation easements and CRP in watershed improving water quality	**Responsible Party** Galien River Conservation District **Technical Assistance** NRCS	$5,000/acre	20 acres	$100,000	USDA, Conservation District and agricultural landowners
Increase amount of no-till in watershed improving water quality	**Responsible Party** Galien River Conservation District **Technical Assistance** NRCS	$3.08/acre	44,643 acres	$177,290	USDA, Conservation District and agricultural landowners
Increase amount of conservation tillage (mulch-till) in watershed improving water quality	**Responsible Party** Galien River Conservation District **Technical Assistance** NRCS	$10/acre	$48,908	$480,908	USDA, Conservation District and agricultural landowners
Use Green Infrastructure techniques to develop a plan for watersheds in Berrien County	**Responsible Party** Berrien County Parks **Technical Assistance** Southwestern Michigan Commission	$50,000 to complete 1 plan - implementation costs dependent upon plan	1 plan	$50,000	Berrien County Parks
Livestock exclusion fencing-maintaining existing exclusions and additional exclusions for new operations	**Responsible Party** Galien River Conservation District **Technical Assistance** NRCS	Maintain the existing livestock exclusions and add new ones as needed	To be determined	To be determined	USDA, Conservation District and agricultural landowners

Table 4.9A - BMP Implementation Detail
Policy and Educational Recommendations

BMP	Responsible Party and Technical Assistance	Cost/Unit	Amount	Total	Financial Assistance
Wetland Reserve Program for wetland restoration	**Responsible Party** Galien River Conservation District **Technical Assistance** NRCS MDEQ	$2,900/acre, 40 acre average	5,000 acres	$14,500,000	USDA Program
Installation of municipal sanitary sewer system in New Troy	**Responsible Party** Weesaw Township **Technical Assistance** MDEQ	$11,029 average/ homeowner	1 system for approximately 140 homeowners	$1,500,000	Weesaw Township taxpayers and landowners
Berrien County enforcement of Time-of-Sale septic system inspection and maintenance	**Responsible Party** Berrien County Health Department	$2000 to meet with County Commission, Health Dept and Planning Commission to review barriers for ordinance	10 meetings	$2000	Berrien County, MDEQ
Increase non-agricultural riparian landowner knowledge and implementation of watershed friendly practices	**Responsible Party** Galien River Conservation District **Technical Assistance** NRCS	$500/workshop	5 workshops	$2,500	Galien River Conservation District, 2 garden clubs
Complete purchase of development rights easements on prime agricultural land	**Responsible Party** Berrien County Planning **Technical Assistance** Southwestern Michigan Commission	$5,000/acre	400 acres	$2,000,000	Berrien County, Farm and Ranch Protection Program, Michigan Department of Agriculture, Farmland Program

Table 4.9A - BMP Implementation Detail
Policy and Educational Recommendations

BMP	Responsible Party and Technical Assistance	Cost/Unit	Amount	Total	Financial Assistance
Complete purchase of development rights easements on priority water quality areas	**Responsible Party** Chikaming Open Lands **Technical Assistance** Southwestern Michigan Commission	$7,000/acre	40 acres	$2,800,000	Chikaming Open Lands, Michigan Trust Fund, MDEQ, landowner donations
Eliminate New Buffalo beach closings due to *E. coli*	**Responsible Party** Berrien County Health Department	See above actions for point of sale ordinance	To be determined	To be determined	Berrien County Health Department
Complete fish survey of Galien River and develop plan to improve fisheries resources linked to water quality	**Responsible Party** MDNR	To be determined	To be determined	To be determined	MDNR
Increase the use of the revised Galien River WMP	**Responsible Party** Southwestern Michigan Commission, townships and county planning commissions and boards **Technical Assistance** MDEQ	To be determined	To be determined	To be determined	All levels of government
Improve SESC programs through training	**Responsible Party** Galien River Conservation District **Technical Assistance** MDEQ	Hold a workshop for the county and 6 townships on sediment reduction for new construction	1 workshop	$5000	MDEQ

Table 4.9A - BMP Implementation Detail
Policy and Educational Recommendations

BMP	Responsible Party and Technical Assistance	Cost/Unit	Amount	Total	Financial Assistance
Improve SESC programs through development and enforcement of ordinance	**Responsible Party** Southwestern Michigan Commission **Technical Assistance** Local Planners and developers MDEQ	$2,000/training program	1 program	$2,000	All levels of government
Manage pet waste and wildlife populations in watershed and duck feeding regulations for the Village of New Buffalo	**Responsible Party** County and community parks and recreation departments	$500 for pet waste station and $500 for yearly campaign	$500 one time and $500/yr for 7 years	$4000	All levels of government

CHAPTER 5 - COMMUNITY OUTREACH PROGRAM

Addendum Summary - The Community Outreach Program was updated and a summary of the activities that have occurred to date is included in this Chapter. Additional maps, provided by the Southwestern Michigan Commission and Chikaming Open Lands are in the appendicies to further the understanding of the issues in the Watershed.

5.3A GOALS AND OBJECTIVES

The main goal of the Information and Education strategy, as stated in the Galien River Watershed Management Plan, is building and retaining high levels of stakeholder awareness and involvement in the Watershed project so that community values related to stewardship for the Watershed can be sustained. Public consciousness about the relationship between daily activities and water quality is a typical gap in watershed management.

5.6A INFORMATION AND EDUCATION ACTIVITIES

Many activities have been completed as part of the Galien River Watershed Transition Grant. The activities are described below, according to the target audience for which they were intended.

HOMEOWNERS

OBJECTIVES:

- To increase awareness and adoption of water quality, protective lawn care, landscaping, yard maintenance practices, and refuse accumulation and disposal.
- To increase awareness of the Galien River and its tributaries' values to local quality of life.
- To increase awareness of invasive species, dangers of failing septic systems, and conservation easement options.

ACTIVITIES:

Event Participation: Develop a display and public information material to be available at community events such as the county fair and township celebrations.

- The Conservation Fund participated in Chikaming Township's "Chikamingling" in 2004 with a display about the Galien River Watershed and storm water in particular.
- The Coast Guard Auxiliary passed out educational pamphlets to boaters in New Buffalo about the importance of pumping out their boats and using the closed valve system.
- Chikaming Open Lands attended the 2005 "Chikamingling" with a display, which illustrated land protection methods available to landowners for preserving the Galien River.
- The Galien River Conservation District had a booth in the 2004 and 2005 Berrien County Fairs about agricultural land management activities that improve water quality.
- The Conservation Fund had a float in the Three Oaks Flag Day Parade entitled "Pump it, don't dump it" urging landowners to pump their septic tanks.
- Mrs. Ringler's 5th grade class in 2004, and 4th grade class in 2005, distributed door hangers to all the Three Oaks homes north of Three Oaks Elementary and east of the Three Oaks Road discussing storm water systems' functions and helpful landowner actions.
- Southwestern Michigan Commission (SWMC) is implementing an education plan for the Phase II communities. Buchanan, Lake, Bertrand, and New Buffalo Townships are contributing to this plan. SWMC is working with Chikaming, Three Oaks and Weesaw Townships to discuss ways of contributing to the plan to have storm water education available in every township in the Watershed.

Newsletters: *History of the Galien River.* Continue providing newsletters and fact sheets to demonstrate the importance of the Galien River and its tributaries to the community and raise awareness of the value of the Watershed to local quality of life. Newsletters will also inform residents of activities and water quality issues directing them to information and assistance.

- The Conservation Fund ran a series of 12 public service ads in 6 local newspapers on lawn care, storm water runoff, picking up after pets, and automotive care.
- The Conservation Fund has given 15 talks on the Watershed to civic groups in the last two years.

Volunteer Projects: Develop and encourage programs that enable the landowner to get more involved with land conservation and water quality.

- Harbert Community Church, Berrien County Young Republicans, and Chikaming Open Lands participated in three Galien River cleanups.

SCHOOLS AND YOUTH GROUPS

OBJECTIVES:

- To increase awareness of water quality and watershed ecology.
- To increase awareness of the value of the Galien River to local quality of life.

ACTIVITIES:

Presentations/Field Days: Coordinate with Berrien County Parks and other conservation organizations such as land trusts, the MDNR, etc., to provide presentations regarding conservation and watershed management at grade-appropriate levels to local schools and youth organizations. Coordinate with Berrien County Parks and others to design field days with conservation messages that school-age appropriate classes could participate in.

- The Conservation Fund presented 6 sessions on the Galien River to Mrs. Ringler's 4th grade class in 2005, and Mrs. Ringler's 5th grade class in 2004. The students learned about the Galien River, mapped the water quality near their home, and participated in drain stenciling. In Mrs. Ringler's 5th grade class, the students did a macroinvertebrate study of a clean and polluted stretch of the Galien River. In Mrs. Ringler's 4th grade class, the students used a brick to determine the amount of sediment in a stretch of the Galien River.

AGRICULTURAL PRODUCERS

OBJECTIVES:

- To increase the number of agricultural producers and acreage in filter strips, grassed waterways, and other stewardship and conservation farming practices.
- To encourage conversion of marginal farmland back to permanent cover or natural vegetation.
- To increase the number of producers using a comprehensive nutrient management plan and to decrease the number of producers that allow their livestock access to surface water.

- To increase the attendance of agricultural producers at workshops, presentations, and training sessions on land use practices that benefit water quality.

- To increase awareness and use of conservation easements and Purchase of Development Rights (PDR).

ACTIVITIES:

Articles in Specialty Publications: Educational and informational articles to appear in county specific publications in the *Conservation District Newsletter*, *Southwest Michigan Land Conservancy Newsletter*, *Chikaming Open Lands Newsletter,* and in agricultural organization newsletters/circulars that target this audience. Articles would highlight services to agricultural producers to assist them in implementing BMPs.

- The Galien River Conservation District is reprinting Galien River articles developed for the Galien River Transition Grant in their newsletter.

Show Participation: Display conservation information at agricultural events and trade shows. Invite speakers to events with first-hand experience in conservation farming, current nutrient management practices, and opportunities for assistance. Recognizable signage on lands using conservation farming methods or other conservation-related activities along with conservation awards programs. Target activities for Galien River Days.

- A Farm Subcommittee formed as part of the Galien River Transition/Implementation Grant and developed a program to contact landowners with highly-erodible soils on their property. The Buffer Program will be administered by the Galien River Conservation District to review all the sections with highly-erodible lands, drive by the sites, and then follow-up with landowners in person.

Field Days: To demonstrate conservation farming methods and results.

- The Galien River Conservation District held two field days for farmers on the Wetland Reserve Program and buffer strips.

CONSERVATION ORGANIZATIONS

OBJECTIVES:

- To ensure continued encouragement and support in assistance with implementation of the WMP.

ACTIVITIES:

Publications: Circulate newsletters and regular progress reports. Prepare letters of encouragement and support/appreciation for involvement.

- Sixty-nine articles have been published in local and state newspapers in the last two years about the Galien River challenges.

GOVERNMENT

LOCAL

OBJECTIVES:

- To foster a sense of ownership and investment in the Watershed project among area officials and planning commissions.
- To increase coordination between agencies to maximize benefits of available programs and protect water quality.
- To raise awareness of BMPs that could be implemented to reduce erosion, reduce pollution, and encourage conservation.

ACTIVITIES:

Develop appropriate technical information in a useable format (maps, newsletters, reports, etc.) to support water quality protective ordinances and for future land-use planning strategies.

- The Southwestern Michigan Commission is creating map sets for the Watershed's six townships with information on wetlands, prime farmland, presettlement vegetation, and other layers that will be useful in land use planning.
- The Conservation Fund presented a PowerPoint ® presentation on the Watershed and asked the county to consider a point-of- sale ordinance for septic systems.

Demonstration Sites: Develop demonstration sites that highlight the effectiveness of BMPs in protecting water quality and the benefits of these practices in reducing costs to the agency in decreased maintenance.

- Chikaming Open Lands has provided technical assistance to the Chikaming Township Open Space Committee in developing that portion of their Master Plan Revision.

- Southwestern Michigan Commission is providing technical assistance to Weesaw, Chikaming, and Three Oaks Townships on water quality ordinances and master plan revisions that can be considered.

Watershed Tour: Host a watershed tour to highlight project activities and progress.

- As part of the Watershed Short Course, a watershed tour highlighted watershed sensitive development, buffer programs, erosion challenges, and the preservation of unique areas in the watershed.

STATE AND FEDERAL AGENCIES

OBJECTIVES:

- To increase awareness of the Watershed progress.

- To increase support to implement water quality initiatives.

ACTIVITIES:

Publications: Keep government officials and agencies informed of the Watershed project progress and issues with progress reports, newsletters, news releases, and by personal contact.

- Sauk Trails RC&D presented a BMP Workshop to the Berrien County Road Commission's garage staff on road/stream crossings.

- The Conservation Fund presented a Galien River slide show to the Three Oaks, Buchanan, and Bertrand garages of the Berrien County Road Commission.

CORPORATE GROUPS

OBJECTIVES:

- To increase awareness of impacts from land use activities in the Watershed.

- To increase awareness of over use and appropriate use of fertilizer and pesticides.

ACTIVITIES:

Invite corporations (golf courses, nurseries, etc.) to develop demonstration sites using BMPs, giving recognition, and using the demonstration sites for onsite homeowner education.

- American Electric Power (AEP) donated funding for the drain markers placed by Three Oaks Elementary School students.

- AEP also awarded a grant to the Galien River Conservation District to develop a "Forest Features Program" presented to local schools.

5.8A EVALUATION

The community outreach during the Galien River Transition/Implementation Grant has done an effective job of reaching the community leaders about the importance of the Galien River's water quality through public meetings, news articles, civic group presentations, printed public service ads, watershed tours, a Watershed Short Course, meetings with decision makers, and sessions with townships on zoning options. These efforts have raised awareness with decision makers, however, community outreach to increase the understanding of the general public has not been effective.

In the Galien River Watershed Management Plan many strategies are outlined for increasing the public understanding but there is no evaluation of which tools are the most effective. As community outreach funding is limited, the understanding of which community outreach tools will be the most effect in reaching the general public is necessary. Michigan State University Extension has developed a tool called the "Social Profile", which determines the most effective message and method of delivery. The Social Profile will be used to determine the communities' understanding of water quality issues now and then seven years later to measure the progress in increasing the public's understanding. The first Social Profile information will be used to develop a community outreach plan. The community outreach plan will have yearly goals to increase the communities' understanding of watershed threats over the next seven years. Community volunteer days, distribution of door hangers, watershed signage, newspaper articles, programs for schools, and public service ads on television will likely be critical parts of the community outreach plan strategy. At the end of the seven years, another Social Profile of the Watershed will be conducted to measure the success of the community marketing plan and set the stage of continually raising community awareness. The details of the social profile are included in Tables 4.9A and 6.3A.

There is a need to hold a number of courses for landowners including turf management and native landscaping to highlight the importance of landowner management activities in riparian corridors and increasing the amount of native plants.

CHAPTER 6 - EVALUATION METHODS

Addendum Summary - To meet the EPA required nine elements, substantial documentation of evaluation methods must be incorporated into the plan to assess the effectiveness of the activities and determine if progress is being made toward meeting the goals in the WMP. Section 6.2A describes the evaluation criteria and monitoring components available for use. Measurable goals and milestones are explained in Table 6.3A.

6.2A IMPLEMENTATION PROJECT EVALUATION CRITERIA

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 Galien River Watershed (Watershed) in response to problems defined in the planning process. A well planned evaluation process measures the effectiveness of the Watershed plan 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 Michigan Department of Environmental Quality (MDEQ) and/or the Michigan Department of Natural Resources.

The Galien River Watershed Steering Committee (Steering Committee), as part of the Chikaming Open Lands Implementation Grant, is responsible for tracking the progress of pollution prevention efforts, as well as revising and updating the Galien River Watershed Management Plan (WMP). A review of the implementation process, effectiveness of pollution prevention activities, and tracking of these activities has been discussed in quarterly Steering Committee meetings. These meetings assisted in the WMP update and evaluation process, allowing for any necessary midstream corrections to be made. The Steering Committee expected input into the evaluation process from local counties, municipalities, and organizations within the Watershed.

An evaluation of the implementation of the WMP will provide the Steering Committee an opportunity to assess the effectiveness of the activities that have been implemented to achieve the goals set forth in the WMP. This chapter will describe the set of criteria, based on the milestones developed, that will be used to determine if the pollutant reductions are being achieved over time and if substantial progress is being made toward attaining water quality standards.

Criteria will also be established to determine whether the WMP needs to be revised if the pollution reductions are not being achieved or progress is not being made toward attaining water quality standards. The WMP would need to be revised if the milestones are not being met or the goals seem unattainable, even with efficient implementation of the Best Management Practices (BMPs). Monitoring components are also described to evaluate the effectiveness of the implementation efforts over time, based on the criteria. The evaluation process is outlined in Table 6.3A. The process is organized by matching a monitoring component to each BMP recommended in the WMP, and then describing the criteria and milestones for measuring progress towards meeting the goals and objectives.

The Sediment and Nutrient Subcommittee discussed evaluation methods and developed milestones to determine whether the BMPs are being implemented and if the progress in meeting the goals is moving in the right direction. The parties responsible for working with the Steering Committee in evaluating the achievement of the milestones are also included in Table 6.3A. The task of measuring progress is a necessary component of creating a dynamic and effective WMP for the Watershed.

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 the success of the project, what improvements are necessary to the project, and which BMPs need 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.

SUMMARY OF MONITORING COMPONENTS

Many parameters are currently being measured in the Watershed. Some are conducted at a local level, while others are administered at county and state levels. The establishment of targets, against which observed measurements are compared, is essential for the monitoring components to be successful in determining whether progress toward meeting the goals is being made. For some of the monitoring components, a firm target was set, such as “Increase the number of failed septic systems reported by 5% every 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 Steering Committee can use to gauge the implementation efforts. The monitoring components recommended for this Watershed in Table 6.3A are summarized below.

MICHIGAN DEPARTMENT OF AGRICULTURE (MDA) CONSERVATION DISTRICT REVIEW

The MDA is responsible for overseeing the operations of the conservation districts around the state. Yearly reviews of the districts are conducted to determine if activities, programs, and funding sources that the districts use are effective to carry out their missions.

USDA - NATURAL RESOURCES CONSERVATION SERVICE (NRCS) YEARLY STATUS REVIEWS

The NRCS District Office is required to report annually on the agricultural practices installed in the county under all Farm Bill Programs. Tracking the practices and the resource concerns which they address will assess water quality impacts from agricultural operations.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY (MDEQ) BIOLOGICAL AND MACROINVERTEBRATE MONITORING GLEAS PROCEDURE NO. 51

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. Establishing this protocol in the Watershed would enable the assessment of the improvement of the fish and macroinvertebrate communities.

MDEQ TOTAL MAXIMUM DAILY LOAD (TMDL) MONITORING

The MDEQ had established a TMDL for Deer Creek and Galien River for *E. coli*. A loading allocation has been determined for the nonpoint source discharges in the Watershed. Reductions in inputs of *E. coli* to the Watershed can be determined through monitoring exceedances of those loads and the number of violations occurring. Once all known sources have been eliminated, ability to meet water quality standards will be the basis for considering whether the TMDLs need to be revised.

BERRIEN COUNTY HEALTH DEPARTMENT (BCHD)

The BCHD conducts surface water monitoring programs to protect public health. Testing is for standard water quality parameters, in both wet and dry weather, including phosphorus and bacteria. The BCHD has taken grab samples in New Buffalo and has offered to work with volunteers to take more samples and see if the Great Lakes Laboratory would analyze the samples to collect statistically significant samples at these areas. The BCHD continues to sample the New Troy area in collaboration with the MDEQ.

BERRIEN COUNTY DRAIN COMMISSIONER (BCDC)

The BCDC regularly conducts physical inventories and inspections of the county drains, investigating problems associated with soil erosion and sedimentation, high flows, habitat degradation, and agricultural practices impairing water quality.

BERRIEN COUNTY PARKS AND RECREATION DEPARTMENT ANNUAL REPORTS

The department's activities and land acquisitions are tracked in their annual reports and can be used to monitor those activities in the Watershed.

WASTEWATER TREATMENT PLANT AND INDUSTRIAL COMPLIANCE TESTING

Wastewater and industrial discharges are regulated under permits issued by the MDEQ. These permittees are generally in compliance with discharge permits. The number of treated domestic wastewater discharges to the Watershed could increase as more development occurs outside established sewer service areas. A review of the reports submitted to the MDEQ and a listing of violations per year will assist in monitoring improvements in the Watershed.

MDEQ STREAM CROSSING SURVEYS

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 is photo-documented with a digital picture 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, in-stream cover, stream corridor, and potential pollutant sources. MDEQ conducts these surveys on a 5-year cycle for each watershed.

EMBEDDEDNESS STUDIES

The MDEQ had proposed many methods to assess the amount of sedimentation in a stream and a method for documenting changes in that amount of sediment. An embeddedness study measures the extent to which a brick or other object is covered by sediment 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 embeddedness study will be done yearly.

POLLUTANT REDUCTION CALCULATIONS

The MDEQ provides instruction to calculate and document pollutant reduction from treatments to sources of sediment and nutrient pollutants using BMPs. The methods have standardized the progress reporting to systematically represent water quality impacts and statewide achievements. As BMPs are installed, pollutant reductions can be calculated to estimate the amount of pollutants prevented from entering the stream and compare the cost of BMPs to the amount of pollutants reduced.

REVIEW OF COMMUNITY MASTER PLANS AND ORDINANCES

The township and community ordinances in the Watershed were developed in the 1970s and have since become outdated for rapid modern development patterns. To help direct new development, communities have recently begun to develop master plans. New Buffalo City, Oronoko, Weesaw, Chikaming, Three Oaks, and Buchanan Townships have developed master plans that provide a vision or goal of what they would like their communities to look like in the future. Weesaw Township's Master Plan has not been approved, though it has been completed for two years. Three Oaks Township is currently revising their master plan. The master plans have included provisions for the protection of water resources and open space; however, the ordinances in these communities do not always support the goals of the master plan. A follow-up of the progress in updating the master plans and ordinances is recommended.

HYDROLOGIC AND HYDRAULIC ANALYSIS

In 2002, a model was developed by Fishbeck, Thompson, Carr & Huber, Inc., to assess the hydrologic conditions in the Watershed and to determine peak flows. This model could be run again in five years to illustrate if the practices and management strategies adopted in the Watershed have reduced peak flows and address the high-flow issues associated with water quality impairments. Protection of existing flows in stable reaches could be measured indirectly by continued stability of those stable reaches. In unstable reaches, improvement in flows can be evaluated indirectly by measuring reduction in bank erosion or by land use changes known to reduce peak flows and runoff volumes (e.g., restoration of wetlands, reduction of imperviousness, reconnection of floodplain).

SURVEY OF PARKS AND RECREATIONAL AREAS

Parks report on their management of pet waste and wildlife populations and surveys could be conducted to measure the effectiveness of the management practices. Duck feeding regulations could be established for the Village of New Buffalo, since BCHD sampling indicated duck feeding areas as problem areas.

VOLUNTEER WATER QUALITY MONITORING FOR SURFACTANTS

Testing for surfactants should be considered to improve the conclusions drawn from any monitoring to identify bacteria sources in the Watershed. The detergent ingredient is often analyzed by illicit connection programs. Presumably, it would be present in water contaminated by septic systems to which washing machines, dishwashers, and other appliances are connected, but absent from water contaminated by illegal discharges from boats, or by wildlife, and/or cattle. Surfactants can be measured with field test kits.

The following 'decision tree' for interpreting data collected was suggested by Mr. Joe Rathbun, MDEQ:

- Bacteria hit during wet weather (WW) but not dry weather (DW) = runoff from animal waste, not septic systems or boats.
- Bacteria hit AND surfactant hit during DW = septic systems, but not boats (presumably) or animals.
- Bacteria hit BUT NO surfactant hit during DW = boats, but not septic systems or animals.

This assumes that bacteria inputs from animal wastes are largely a WW phenomenon; land runoff containing bacteria from cows, geese, and gulls is a much bigger source than these animals doing their business directly into the water during DW. Some evidence suggests this might not be 100% true. A study from New Zealand demonstrated that cows are 50 times more likely to excrete directly into a stream as they wade across than on the adjacent riparian lands (New Zealand National Institute of Water and Atmospheric Research, 2002). For this WMP, however, WW runoff is assumed to be a bigger problem than DW direct inputs.

Illegal discharges from boats are a difficult input to measure. These discharges could happen in DW or WW, and might even have surfactants in them if the boat used water for washing dishes or frequent hand washing.

MEASURABLE GOALS, CRITERIA, AND MILESTONES

An evaluation of the implementation of the WMP will provide the Steering Committee an opportunity to assess the effectiveness of the activities that have been implemented to achieve the goals set forth in the WMP. This chapter expands on the previous evaluation methods to describe the set of criteria, based on the milestones developed, that will be used to determine if the pollutant reductions are being achieved over time and if substantial progress is being made toward attaining water quality standards.

Criteria was established to determine whether the WMP needs to be revised if the pollution reductions are not being achieved or progress is not being made toward meeting designated uses. The WMP would need to be revised if the milestones are not being met or the BMPs being implemented are not adequately meeting the defined goal. If additional watershed concerns are discovered, the milestones, actions, and commitments would also need to be updated. The evaluation process is outlined in Table 6.3A. The process is organized by matching a monitoring component to each BMP recommended and then describing the criteria and milestones for measuring progress toward meeting the goals and objectives. The Steering Committee developed 2- and 7-year milestones to determine whether the BMPs are being implemented, and if the progress in meeting the goals is moving in the right direction.

The parties responsible for working with the Steering Committee in evaluating the achievement of the milestones are also included in Table 6.3A. The task of measuring progress is a necessary component of creating a dynamic and effective management plan.

The evaluation methods presented in this chapter will assist the Steering 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.

Table 6.3A - Evaluation Components

BMPs	Monitoring Components	Units of Measurement	Criteria	2-Year Milestone (2007)	7-Year Milestone (2012)	Evaluation Schedule	Responsible Parties
Trash and Debris - Recommendations of Obstruction Flowchart	**BCDC -** Drain Commissioner's office inspections **GRCD -** River Cleanup reports	Frequency of petitions to clean drains Amount of trash and debris collected or reported	Decrease in amount of trash and debris in waterways	Development of inspection schedule Partnership agreement with group to conduct river cleanups Cleanups or drain maintenance of 8 sites	90% of drains inspected to establish baseline River cleanup scheduled for every year Cleanups or drain maintenance on 57% of total sites (33 of 58)	Inspect yearly Semi-yearly reports	Drain Commissioner's Office, Conservation District
Streambank Erosion - Spillways, riprap toe or slope protection, seeding, soil bioengineering regrading bank	**BCDC -** Drain Commissioner's office inspections **GRCD -** Erosion pin study	Number and location of streambank repairs and improvements Results of erosion pin study	Decrease amount of streambank erosion	Complete one stabilization project	Install streambank erosion techniques to 60% of those identified (6 of 10)	Inspect yearly	Drain Commissioner's Office, Conservation District

Table 6.3A - Evaluation Components

BMPs	Monitoring Components	Units of Measurement	Criteria	2-Year Milestone (2007)	7-Year Milestone (2012)	Evaluation Schedule	Responsible Parties
Rill and Gully Erosion - Berm and tube with filter strip, filter strip, bioengineering	**NRCS -** USDA yearly status reviews **GRCD -** embeddedness study	Number and location of WASCOBs, stream buffers, and filter strips installed	Increased participation in Farm Bill programs Reduced embeddedness	Identify farmland in need of WASCOBs, stream buffers, and filter strips Complete practices at 1 site	Install WASCOBs, stream buffers, and filter strips on 50% of sites (6 of 12)	Yearly	NRCS, Conservation Districts
Road/Stream Crossings - Bioengineering, riprap, soil erosion and sedimentation control, pulling back banks, removing sediment, riprap culverts, riprap outlet protection, remove logs, replace culvert, clean out culvert	**BCRC -** Road Commission yearly reports	Number of stream crossings improved	High priority stream crossings improved Reduced embeddedness	Identification of all priority projects Completion of 8 projects	Complete all high priority sites	Crossings inspected after completed and then inspected yearly	Berrien County Road Commission
Tile Outlets - Outlet stabilization, filter strips, check inlet	**NRCS** - USDA yearly status reviews **GRCD -** embeddedness study	Number and location of tile outlet stabilization and filter strips installed	Increased participation in Farm Bill programs Reduced embeddedness	Identify farmland in need of tile outlet stabilization and filter strips Stabilize 3 sites	Install tile outlet stabilization and filter strips on 66% of total sites (10 of 15)	Sites inspected after completed and then inspected yearly	NRCS, Conservation Districts

Table 6.3A - Evaluation Components

BMPs	Monitoring Components	Units of Measurement	Criteria	2-Year Milestone (2007)	7-Year Milestone (2012)	Evaluation Schedule	Responsible Parties
MSUE Turf Management and landscaping with native plants education courses	**Education Committee -** Riparian landowner educational activities	2 courses	Decrease the damage done by lawns next to river and increase the homes using native landscaping	Hold 1st course	Hold 2nd course	Evaluation at end of courses	Fernwood Nature Center
Establish and sustain the financial and institutional capacity of Galien River Conservation District to assume responsibility for coordinating the implementation of the Galien River WMP to act as the primary advocacy group, information clearing house, grant writing, and implementation of farm and volunteer focused projects	**Michigan Department of Agriculture (MDA)** - Conservation District Review	Catalog of funding sources, record amount and source of funds received for implementation and operation	Increased ability to gain funding and implement critical Galien River farmer and volunteer programs	Receive Volunteer Stream Cleanup and Buffer Grants	Develop sustainable financial arrangements for performance of the routine office operations (e.g. staff, workshops), grant writing ability, and funding to implement projects outlined in Galien River WMP Addendum	Yearly	MDA, GRCD

Table 6.3A - Evaluation Components

BMPs	Monitoring Components	Units of Measurement	Criteria	2-Year Milestone (2007)	7-Year Milestone (2012)	Evaluation Schedule	Responsible Parties
Provide riparian landowners with information regarding shoreline protection and restoration (non-agricultural owners)	**NRCS and MSU -** Tracking of buffers installed through USDA yearly status reviews and MSU reports	Number and acreage of buffers	Increase riparian buffer along the Galien River	Prioritized list of riparian owners, one workshop, 5 acres of buffers installed	5 workshops and door to door distribution of information to every priority owner, total of 25 acres of buffers installed	Yearly	Conservation District and garden clubs, MSU Extension
Develop a volunteer water quality monitoring program	**GRCD -** Annual report	Number of volunteers trained per year, number of equipment kits provided to volunteers, recorded collected data	Increase database on river quality and community understanding of needs	1 volunteer workshop, train 20 volunteers, monitoring equipment kits, on-line database	Part-time staff hired to conduct training sessions, 100 volunteers trained	Yearly	Conservation District
Educate local planning officials about water quality, smart growth, and protection of natural resources through coordinated planning, zoning, and ordinances	**SWMC -** Review of township and county plans	Number of ordinances passed and enforced, number of attendees at each training session, evaluation form of training sessions	Protection of the Galien River through ordinances passed by increasing knowledge of township and county government officials	County passing a point-of-sale septic system ordinance, 4 of the 6 townships passing farmland protection ordinances to allow landowners to apply for farmland protection programs	All townships with farmland preservation ordinances, all townships with shoreline zoning ordinances	End of 7-year evaluation of township ordinances	Southwest Michigan Commission, townships and county planning commissions, and boards

Table 6.3A - Evaluation Components

BMPs	Monitoring Components	Units of Measurement	Criteria	2-Year Milestone (2007)	7-Year Milestone (2012)	Evaluation Schedule	Responsible Parties
Increase public understanding about basic water quality issues, including the economic benefits of natural systems and open space	**GRCD -** Results of community profile survey	Number of landowners increasing their understanding of the Watershed and water quality	Complete social profile, analyze data, and develop a community marketing plan	Complete "before" social profile, develop community marketing plan and be ready to launch marketing plan	Complete "after" social profile to determine success of marketing plan	Social profile to be completed once every 7 years along with a revision to community outreach plan	Chikaming Open Lands, Galien River Conservation District, The Conservation Fund
			Maintain watershed boundary signs	Replace watershed signs as needed	All signs still visible and in good condition	Yearly	Berrien County Road Commission
			From community marketing plan, develop door hangers on important watershed topics	Develop and distribute door hangers to 10% of the watershed community	Develop and distribute door hangers to all watershed community residents	Yearly	Galien River Conservation District
Increase community understanding of flood control, groundwater filtration, recreation, higher property values and tourism linked to increased water quality	**GRCD -** Results of community profile survey	Number of landowners increasing their understanding of the Watershed and water quality	From community marketing plan, determine newspaper articles that are most effective and place articles regularly to build public understanding	Increase space in newspapers by 10% per year	At the end of 7 years increase articles about watershed 70%	Yearly tracking of newspaper and a social profile study once every 7 years to determine best focus of press materials	Chikaming Open Lands, Galien River Conservation District, The Conservation Fund

Table 6.3A - Evaluation Components

BMPs	Monitoring Components	Units of Measurement	Criteria	2-Year Milestone (2007)	7-Year Milestone (2012)	Evaluation Schedule	Responsible Parties
			Based on the community marketing plan, place public service ads on television and cable	3 public service ads per year on 2 television and 1 cable station	5 public service ads per year on 2 television and 1 cable station	Yearly	Galien River Conservation District
Engaging school children in the watershed, educating them and the community	**GRCD** - Annual report	Number of classrooms completing projects	Increase the number of school children engaged in the Watershed	3 sessions with all 4th or 5th graders in Three Oaks, Chikaming, Galien and New Buffalo Schools	3 more sessions with all 4th, 5th, and 1 high school grade at all schools in Watershed	Yearly	Galien River Conservation District
Develop manure management plans and comprehensive nutrient management plans (CNMPs) (part of GAAMPs)	**NRCS** - USDA yearly status reviews	Number and location of agricultural BMPs installed	Increased participation in Farm Bill programs	Identify agricultural operations in need of manure management plans and CNMPs	Develop manure management plans and CNMPs needed	Yearly	USDA Natural Resources Conservation Service (NRCS), Conservation Districts
Promote no-till and conservation tillage farming practices	**NRCS** - USDA yearly tillage surveys **GRCD** - Embeddedness study	Acreage and location of fields using no till	Increased acreage of no till or conservation tillage Reduced embeddedness	Identify cropland that could use no till practices, increase of 5% per year	Continued use of no till practices on identified critical areas, increase of 35% (increase from 7,071 acres to 9,946 acres)	Yearly	NRCS, Conservation Districts

Table 6.3A - Evaluation Components

BMPs	Monitoring Components	Units of Measurement	Criteria	2-Year Milestone (2007)	7-Year Milestone (2012)	Evaluation Schedule	Responsible Parties
	NRCS - USDA yearly status reviews	Acres cover crops plants	Increase in acres of cover crops	Identify farmland needing cover crops	Increased enrollment in Continuous cover crops	Yearly	NRCS, Conservation Districts
Increase amount of agricultural practices in watershed improving water quality	**NRCS** - USDA yearly status reviews	Acres under nutrient management plans	Increase number of nutrient management systems	500 acres	Total of 1,750 acres	Yearly	Conservation District and NRCS
		Number of waste storage systems	Increase number of waste storage systems	1 system identified and designed	Total of 2 systems completed	Yearly	Conservation District and NRCS
		Number of sites using composting practices	Increase number of waste treatment compositing	1 site using composting practices	Total of 3 sites using composting practices	Yearly	Conservation District and NRCS
		Number of Comprehensive Nutrient Management Plans (CNMPs)	Increase waste utilization	1 CNMP completed	Total of 3 CNMPs completed	Yearly	Conservation District and NRCS
		Acres using mulch tillage practices	Increase amount of mulch tillage	5% increase in acres per year (from 2,700 acres)	35% increase in acres (from 2,700 acres)	Yearly	Conservation District and NRCS

Table 6.3A - Evaluation Components

BMPs	Monitoring Components	Units of Measurement	Criteria	2-Year Milestone (2007)	7-Year Milestone (2012)	Evaluation Schedule	Responsible Parties
Build on previous exercise of developing a Green Infrastructure to develop a plan for all the watersheds in Berrien County	**Berrien County Parks Department** - Berrien County Parks Annual Report	Completed and implemented plan	Increased protection of critical habitats, 100-year flood plains, groundwater recharge areas, headwaters, parks, prime and agricultural land, natural areas, and open space	Organize committee to undertake plan and evaluate previous effort	Complete plan and begin implementation of land and easement acquisition	Yearly	Berrien County Parks Southwest Michigan Land Conservancy
Livestock exclusion fencing	**NRCS** - USDA yearly status reviews	Number of exclusions	Exclude all livestock from river and tributaries	Maintain existing fencing on livestock exclusions and fence any new livestock crossings	Maintenance of existing livestock exclusion fencing and fence every new livestock crossing	Yearly	NRCS
Wetland Reserve Program for wetland restoration	**NRCS** - USDA yearly status reviews	Areas of prior converted land restored to wetlands and number of Wetland Reserve Easements	Increased participation, and increase number of wetland restorations in flood prone areas	Identify 1 area	Install 3 areas or 100 acres total	Yearly	NRCS, Conservation Districts, MDEQ Wetlands Working Group

Table 6.3A - Evaluation Components

BMPs	Monitoring Components	Units of Measurement	Criteria	2-Year Milestone (2007)	7-Year Milestone (2012)	Evaluation Schedule	Responsible Parties
Installation of municipal sanitary sewer system in New Troy	**MDEQ** - Administrative Consent Order (ACO) documentation	2.63 miles of system installed and connection to 136 homes	136 homes with septic systems connected to new system	Prioritize and contact homes for sanitary sewer systems	Install sanitary sewer systems in prioritized areas, or complete municipal sanitary sewer systems totaling 1.5 miles and 136 users hooked up	Schedule coordinated with ACO	New Troy
	Volunteer Monitoring Program, GRCD, MDEQ and BCHD - Water quality monitoring results for *E. coli* in TMDL areas of Weesaw Township and Deer Creek	Bacteria counts per 100 ml	Reduction of *E. coli* levels	Sources of contamination found, funding for volunteer monitoring program	Meet *E. coli* water quality standards for total body contact recreation (130 count/100 ml) in critical water bodies in the Watershed, volunteering monitoring program in place	End of scheduled date for TMDL implementation, yearly volunteer monitoring program	MDEQ, BCHD, GRCD
Berrien County enforcement of Time-of-Sale septic system inspection and maintenance	**BCHD** - Annual Report, **Phase II Communities** - Annual Reports IDEP implementation	Number of failing septic systems reported and permits for new construction	Elimination or control of septic system failures	Correction or replacement of 50% of number of failed septic systems reported	Correction or replacement of 90% of total number of failed septic systems reported	Yearly	BCHD

Table 6.3A - Evaluation Components

BMPs	Monitoring Components	Units of Measurement	Criteria	2-Year Milestone (2007)	7-Year Milestone (2012)	Evaluation Schedule	Responsible Parties
Increase non-agricultural riparian landowner knowledge and implementation of watershed friendly practices	**MDA** - Annual report	Number of landowners buffering the river	Eliminate mowing along river bank and develop wooded buffer strips along the River	Hold 2 workshops	Hold total of 3 workshops and have 30 landowners stop mowing and plant a wooded buffer strip	Yearly	Galien River Conservation District
Complete purchase of development rights (PDR) easements on prime agricultural land	**Berrien County** Annual reports	Number of farms selling development rights	Complete purchase of development right easements on farmland to encourage other producers to sign up	2 PDR easements on agricultural land	Total of 7 PDR easements on agricultural land	Yearly	Berrien County Planning
Complete conservation easements on priority water quality areas	**Chikaming Open Land** - MDEQ grant quarterly reports	Number of easements	Complete purchase of easements	2 conservation easements on priority areas	Total of 17 conservation easements on priority areas	Yearly	Chikaming Open Lands
Eliminate New Buffalo beach closings due to *E. coli*	**BCHD** - MDEQ website for reporting closings	Number of beach closings	Eliminate beach closings	Reduction in number of beach closings	Elimination of beach closings	Yearly	Berrien County Health Department
Complete fish survey of Galien River and develop plan to improve fisheries resources linked to water quality	**MDNR** - yearly report	Information on fish species distribution, population abundance, and current fish communities	Provide baseline data for fisheries management	Begin fish survey	Complete fish survey and implement plan	Yearly	MDNR

Table 6.3A - Evaluation Components

BMPs	Monitoring Components	Units of Measurement	Criteria	2-Year Milestone (2007)	7-Year Milestone (2012)	Evaluation Schedule	Responsible Parties
Increase the use of the revised Galien River Watershed Management Plan	**MDEQ** - grant application tracking statistics **SWMC -** website tracking	Proportion of grant applications receiving funding Number of hits on website	Increase use of WMP by the public and officials	Place updated plan on Southwestern Michigan Commission website and in libraries	Integrate plan goals into agencies mentioned in plan	Yearly	Southwest Michigan Commission, townships and county planning commissions and boards
Improve Soil Erosion and Sedimentation Control (SESC) programs through training	**BCDC** - SESC records	Number of employees successfully completing training	Reduction of erosion and sedimentation from construction sites	Develop field employee training program for SESC	Train 6 of 12 of field employees trained for SESC in 6 townships and county	Yearly	County Enforcing Agent (Drain Commissioner's office), Municipal Enforcing Agents
Improve SESC programs through ordinances	**BCDC** - SESC records	Number and status of violations and the number of project shutdowns	Reduction of erosion and sedimentation from construction sites	Implement a county SESC ordinance and identify projects with SESC violations	Decrease in number of resolved and unresolved SESC violations, decrease the percentage of project shutdowns	Yearly	Berrien County
Manage pet waste and wildlife populations in watershed and duck feeding regulations for the Village of New Buffalo	**Berrien County Parks Department** - Survey of parks and recreational areas	Number of pet waste information stations	Requests for more pet waste information stations	Identify popular riparian areas for dog walkers and concentrations of wildlife	Install pet waste stations and implement wildlife population controls	Yearly	County and community parks and recreation departments

Table 6.3A - Evaluation Components

BMPs	Monitoring Components	Units of Measurement	Criteria	2-Year Milestone (2007)	7-Year Milestone (2012)	Evaluation Schedule	Responsible Parties
Overall goal and objectives	**BCHD** - County Beach Monitoring Program	Beach closings	Decrease in number of beach closings or number of sampling events over the water quality standards	Sources of contamination found	Meet *E. coli* water quality standards for total body contact recreation (130 count/100 ml) in critical water bodies in the watershed	Yearly	BCHD
Overall goal and objectives	**GRCD** - Cost/benefit comparisons of costs of installed BMPs for each site to amount of pollutants reduced	Results of comparisons	Increased pollutant removal per dollars spent for BMPs	Establish pollutants reduced and costs for systems of BMPs	Create spreadsheets comparing costs and benefits of BMPs	After installation of system of BMPs	Local municipalities and counties
Overall goal and objectives	**MSUE** - Community Profile Surveys	Results of survey	Increase in awareness of watershed issues	Establish baseline measurement of awareness of watershed issues	Conduct follow-up survey and compare results	Every 5 years	Local municipalities and counties

CHAPTER 7 - SUSTAINABILITY

Addendum Summary - This Chapter presents an update of implementation efforts that have begun to improve water quality in the Watershed. Section 7.1A includes activities conducted that were listed as long-term planning efforts and Section 7.3A includes additional information on existing programs and opportunities that will sustain watershed management.

7.1A LONG-TERM PLANNING EFFORTS

Many partners stepped forward in 2003 at the end of the planning phase and agreed to implement portions of the Galien River Watershed Management Plan (WMP). The Galien River Watershed Steering Committee (Steering Committee) supported these efforts through the end of the project, at which time, The Conservation Fund (TCF) assumed responsibility for monitoring the progress and assisting with finding funding opportunities. The activities have been implemented to date as follows:

Recommendation in WMP: TCF will coordinate the overall effort to implement the recommendations in the WMP.

- TCF assisted Chikaming Open Lands in developing the grant application for the Galien River Watershed Implementation Grant. The grant was awarded to Chikaming Open Lands and TCF will be coordinating the following implementation efforts:
    - Acquiring 17 water quality and open space easements
        - The NRCS could rank a drain easement with a proposed new system to determine if it is a priority for a conservation easement. A determination would be made whether that easement would qualify for the buffer strip program proposed under this grant. The Galien River Conservation District could meet with the landowner to discuss the easement.
        - Chikaming Open Lands is contacting 200 landowners over the next three years to acquire conservation easements on key tracts from willing sellers. Maps were created to highlight priority areas for conservation easements for water quality benefits, including TMDL areas, riparian areas, highly erodible soils, high quality areas, lower quality areas, and other areas, as shown in Appendix 3.
    - Continuing the educational program about the project

- Facilitating and increasing officials' knowledge
    - The Southwestern Michigan Commission (SWMC) will produce a planning commission newsletter as part of the Galien River Implementation Grant.
- Conducting road/stream crossing non-routine maintenance
- Completing streambank erosion stabilization on key sites
- Developing an evaluation process
- Continuing the educational program for agricultural landowners

- The SWMC was contracted to work with Weesaw, Three Oaks, and Chikaming Townships to develop master plans and ordinances to support those master plans. A priority issue is the development of a septic system ordinance to prohibit illicit connections and authorize enforcement actions to correct the problems.

- The League of Women Voters hosted a Galien River Watershed Forum with TCF and the Berrien County Health Department to discuss problems related to pollutions and partial degradation of the Watershed. Thirty people attended the Forum and issues brought up at that meeting were considered in this revised WMP.

- The SWMC facilitated the Berrien County Watershed Short Course to educate residents and local officials about watershed issues in Berrien County.

- The BCRC is repairing an erosion site in Chikaming Township at Indian Trail and Algonquin. A ravine was formed where three drains converge and severe erosion has occurred at the site.

Recommendation in WMP: TCF will write and submit a grant to install buffer strips.

- The Galien River Conservation District will be leading the efforts to install buffer strips, as part of the Galien River Implementation Grant.

Recommendation in WMP: The Galien River Conservation District will reprint the Watershed newsletters in the Conservation District newsletter to generate more interest.

- The Galien River Conservation District has been printing four newsletters per year and has had articles in each newsletter about the Watershed Project. The District will continue to promote the project through the implementation phase.

- The SWMC posted the WMP and PowerPoint presentations on their website:

  http://www.swmicomm.org/SWMC/GALIEN_River_Watershed_DraftPlan.pdf

Recommendation in WMP: Weesaw Township will continue to look for funding to improve the sewer infrastructure.

- Weesaw Township has applied for a 40-year grant and loan, from the USDA rural development program, to build the sewer infrastructure by 2009.

Recommendation in WMP: The Tri-State Watershed project will serve as an umbrella under which other watershed grants will function.

- The Tri-State Watershed project continues to pursue funding and form partnerships.

Recommendation in WMP: The National Fish and Wildlife Foundation (NFW) is developing a proposal that will be reviewed by the Berrien County Board and TCF.

- No progress has been reported on this activity.

Recommendation in WMP: The PALS/Kellogg Foundation is offering grants that The Conservation Fund will apply for and will match NFW funding.

- TCF applied for a grant but was not awarded the funds. This source of funding will be reconsidered during the next round of requests for proposals.

Recommendation in WMP: The League of Women Voters and Chikaming Township will sponsor a land-use planning workshop with funding through the Coastal Zone Management Program.

- The SWMC has been working with Chikaming, Three Oaks, and Weesaw Townships on ordinances individually, rather than in a group setting in a workshop. This approach was found to be much more effective in educating the planning boards and getting changes to happen.

Recommendation in WMP: Chikaming Township will submit a grant proposal to the Michigan Trust Fund to restore native vegetation on 256 acres of newly acquired parkland.

- Chikaming Open Lands was awarded the grant from the Michigan Trust Fund to restore native vegetation.

- Chikaming Open Lands is working to acquire 31.5 acres of wetlands bordering the Galien River on the southern edge of Sturgeon Beach. Funding is being pursued from the Michigan Natural Resources Trust Fund.

- Chikaming Open Lands has acquired a 10-acre conservation easement donation on old-growth beech-maple forest along a tributary of the Galien River and buffering Warren Woods.

7.3A ONGOING PROGRAMS AND OPPORTUNITIES

The watershed-based NPDES Phase II Storm Water requires urbanized areas to develop a WMP and a Storm Water Pollution Prevention Initiative. The Phase II Communities in Berrien and Cass Counties are in the process of developing the Lower St. Joseph/Galien River WMP to be submitted to the MDEQ by December 1, 2005. Although no urbanized areas are within the Watershed, the Berrien County Administration, Drain Commissioner, Road Commission, and portions of the Phase II Communities of Lake, Buchanan, Bertrand, and New Buffalo Townships are within the Watershed. These entities have been participating in the development of the WMP to ensure that urban BMPs and educational efforts to reduce storm water pollution are included in the plan.

The Conservation Reserve Program (CRP) was created in 1985 as part of the Food Security Act. A farmer may enter into a long-term contract to set aside land and establish a permanent cover. In return, the farmer receives an annual per-acre rent and up to half the cost of establishing cover on land that has recently been farmed and is highly erodible or environmentally sensitive. In the first five years of the program, 33.9 million acres were enrolled in the CRP. Additional Acts in 1990 and 1996 have allowed continued enrollment and expanded the scope from reducing soil erosion to include habitat conservation. A continuous CRP will be used to fund vegetative work on buffers where conservation easements purchased under the implementation grant are currently being administered by Chikaming Open Lands.

Participants may sign up at any time to perform the following practices on their land:

- Filter strips
- Riparian buffers
- Shelterbelts, field windbreaks, and living snow fences
- Grass waterways
- Shallow water areas for wildlife
- Salt-tolerant vegetation
- Certain approved public wellhead protection areas

Today, the Environmental Benefits Index is used to prioritize land offered for enrollment. Scores are based on a cost factor, plus six environmental factors, as follows:

- Wildlife
- Water quality
- Erosion
- Enduring benefits
- Air quality benefits from reduced wind erosion
- State or National Conservation Priority Areas (CPAs). The Great Lakes, along with Long Island Sound, the Chesapeake Bay, the Longleaf Pine region, and the Prairie Pothole region comprise the national CPAs.

As part of the **Farmland Protection Program**, applications for the Berrien County Purchase of Development Rights Program were available for owners of farmland in Bainbridge and Sodus Townships in fall 2005. The purpose of this program is to apply for state funding to purchase the development rights on farm property from property owners. Twelve townships in the county have passed farmland protection ordinances with a Purchase of Development Rights resolution.

In September 1999, the MDEQ entered a consent agreement with **Forest Lawn Landfill, Inc.** (FLL) to resolve violations of the Solid Waste Management Act. The order requires FLL to maintain the existing groundwater remediation system and to prevent further leachate and contaminated runoff from entering the Galien River. In addition to the above requirements, FLL is required to undertake a Supplemental Environmental Project that provides 85 acres of riparian habitat near the landfill site on the banks of the Galien River (MDEQ Waste Management Division). This stretch of river could be used as a public park to permanently protect riparian habitat from development pressures.

Project Title: Galien River Watershed Management Plan
Job Number: G01338
Engineer: DF2
Date: 12/15/2003

Template Title: Galien River Watershed - Input Data for Estimate of Sediment Loading due to Agricultural Fields (RUSLE)

Sub-District	Route Number	Total Area (Acres)	Farm Area (Acres)	Slope Length (ft)	Soil Type	% of Soil	Slope (%)	Soil Loss	Soil Type	% of Soil	Slope (%)	Soil Loss
East Galien River	EGR 1	18823	11038	600	16B	35%	2%	11602	37	24%	0.5%	1033
Galien River A	GRA 1	16139	11219	600	16B	52%	2%	17363	64A	18%	2%	3192
Galien River B	GRB 1	14185	7176	600	34B	53%	2%	15210	28B	27%	2%	3064
Galien River C	No agricultural areas											
South Galien River	SGR 1	12793	4758	600	34B	69%	2%	13095	28B	20%	2%	1505
Spring Creek	SC 1	15311	5525	600	16B	49%	2%	8028	34B	26%	2%	5802
Dowling Creek	DC 1	13658	9192	600	16B	64%	2%	17375	14C	17%	0.5%	1102

Note - Highlighted Soil Types have Erosion Rates above the Tolerable Soil Loss.

Project Title: Galier
Job Number: G013
Engineer: DF2
Date: 12/15

Template Title: Galier

Sub-District	Soil Type	% of Soil	Slope (%)	Soil Loss	Soil Type	% of Soil	Slope (%)	Soil Loss	Soil Type	% of Soil	Slope (%)	Soil Loss	Soil Type	% of Soil	Slope (%)	Soil Loss
East Galien River	14C	20%	10%	54715	78C	12%	10%	25223	34B	9%	2%	3922				
Galien River A	17	14%	0.5%	998	14C	12%	8%	24129	13C	2%	10%	2667	15C	2%	10%	7646
Galien River B	16B	10%	2%	2134	57A	10%	1%	525								
Galien River C																
South Galien River	36	8%	0.5%	236	15C	3%	10%	5154	10D	0.1%	12%	145				
Spring Creek	20	13%	0.5%	337	78C	8%	10%	8554	13C	3%	10%	2203				
Dowling Creek	61A	10%	1%	1443	15C	7%	2%	2735	63C	3%	2%	387				
																Total

Note - Highlighted Soil Ty

Project Title: Galier
Job Number: G013
Engineer: DF2
Date: 12/15

Template Title: Galier

Sub-District	Weighted Soil Loss (tons/yr)
East Galien River	18631
Galien River A	12845
Galien River B	9154
Galien River C	0
South Galien River	9510
Spring Creek	6236
Dowling Creek	11655
	68032

Note - Highlighted Soil Ty

Project Title: Galien River Watershed Management Plan
Job Number: G03594
Engineer: DF2 EWO
Date: 38378.00 Revised 11-08-2005

FISHBECK, THOMPSON,
CARR & HUBER, INC.
1515 Arboretum Drive, SE
Grand Rapids, MI 49546
616-575-3824

Template Title: Galien River Watershed - Agricultural Soils - Dowling Creek

MUSYM	K-FACTOR	AREA3_SF	AREA3_AC	AREA3_PERC	HIGH_EROD	% LARGE AREA	% HIGH EROD
10D	0.15	80105.8600	1.8390	0.0200	Y		0.0200
63C	0.17	2617951.2900	60.0999	0.6538	Y		0.6538
13C	0.17	2523104.1700	57.9225	0.6301	Y		0.6301
13D	0.17	1510896.8600	34.6854	0.3773	Y		0.3773
20	0.20	17589567.0600	403.8009	4.3929	N	4.3929	
11C	0.24	944629.4700	21.6857	0.2359	Y		0.2359
11D	0.24	624863.8800	14.3449	0.1561	Y		0.1561
32	0.28	33697068.7500	773.5783	8.4157	N	8.4157	
62	0.28	16979634.6300	389.7988	4.2406	N	4.2406	
25	0.28	16353866.2500	375.4331	4.0843	N	4.0843	
17	0.28	13583995.0700	311.8456	3.3925	N	3.3925	
16B	0.32	99264844.8200	2278.8073	24.7909	N	24.7909	
14C	0.32	29257396.3000	671.6574	7.3069	Y		7.3069
14B	0.32	12671914.5200	290.9071	3.1647	N	3.1647	
14D	0.32	10495380.8300	240.9408	2.6212	Y		2.6212
78C	0.32	6876492.4800	157.8625	1.7174	Y		1.7174
14E	0.32	3785810.3600	86.9102	0.9455	Y		0.9455
78D	0.32	945299.6400	21.7011	0.2361	Y		0.2361
61A	0.37	17940742.6000	411.8628	4.4806	N	4.4806	
12C	0.37	963696.0100	22.1234	0.2407	Y		0.2407
12D	0.37	326886.5800	7.5043	0.0816	Y		0.0816
15C	0.43	19693376.0400	452.0977	4.9183	Y		4.9183
33D	0.43	31857.9300	0.7314	0.0080	Y		0.0080
TOTAL			**9192.1126**			**68.4351**	**23.8174**

MUSYM	ACT. ACRES	SOIL NAME	K-FACTOR	% OF ACRES	SLOPE	TOTAL ACRES
63C	2.1	METEA	0.17	3%	2.0%	245
16B	49.3	CROSIER	0.32	64%	12.0%	5839
14C	12.8	RIDDLES	0.32	17%	0.5%	1519
61A	7.6	WHITAKER	0.37	10%	10.0%	905
15C	5.8	GLYNWOOD	0.43	7%	2.0%	684
TOTAL	**77.6**			**100%**		**9192**

Project Title: Galien River Watershed Management Plan
Job Number: G03594
Engineer: DF2 EWO
Date: 1/26/2005 Revised 11-08-2005

FISHBECK, THOMPSON,
CARR & HUBER, INC.
1515 Arboretum Drive, SE
Grand Rapids, MI 49546
616-575-3824

Template Title: Galien River Watershed - Agricultural Soils - East Galien River

MUSYM	K-FACTOR	AREA3_SF	AREA3_ACRE	AREA3_PERC	HIGH_EROD	% LARGE AREA	% HIGH EROD
57A	0.15	18497919.8800	424.6538	3.7108	N	3.7108	
64A	0.15	15512556.4500	356.1193	3.1119	N	3.1119	
13C	0.15	5260222.6600	120.7581	1.0552	Y		1.0552
10D	0.15	1335217.0100	30.6524	0.2679	Y		0.2679
37	0.17	31867162.2800	731.5694	6.3928	N	6.3928	
42A	0.17	15305739.7600	351.3714	3.0705	N	3.0705	
63C	0.17	2286156.9400	52.4829	0.4586	Y		0.4586
13D	0.17	607255.0700	13.9407	0.1218	Y		0.1218
78C	0.24	22995944.8200	527.9143	4.6132	Y		4.6132
11C	0.24	6348734.6500	145.7469	1.2736	Y		1.2736
11D	0.24	1067911.0100	24.5159	0.2142	Y		0.2142
11E	0.24	163776.9800	3.7598	0.0329	Y		0.0329
56C	0.24	47607.7700	1.0929	0.0096	Y		0.0096
32	0.28	26512107.5300	608.6342	5.3185	N	5.3185	
16B	0.32	50364606.8600	1156.2123	10.1035	N	10.1035	
14C	0.32	42164863.9000	967.9721	8.4586	Y		8.4586
14B	0.32	41245050.9300	946.8561	8.2741	N	8.2741	
14D	0.32	11676732.4400	268.0609	2.3424	Y		2.3424
78D	0.32	8116437.6700	186.3278	1.6282	Y		1.6282
14E	0.32	2256539.4300	51.8030	0.4527	Y		0.4527
12C	0.37	772508.9400	17.7344	0.1550	Y		0.1550
12D	0.37	276927.6900	6.3574	0.0556	Y		0.0556
34B	0.43	27942994.5000	641.4829	5.6056	N	5.6056	
15C	0.43	1774869.5100	40.7454	0.3561	Y		0.3561
TOTAL			**11038.8786**			**45.5877**	**21.4956**

MUSYM	SUM %	SOIL NAME	K-FACTOR	% OF ACRES	SLOPE	TOTAL ACRES
37	16.3	GRANBY	0.17	24%	0.5%	2680
78C	8.0	OSHTEMO	0.24	12%	10.0%	1324
16B	23.7	CROSIER	0.32	35%	2.0%	3899
14C	13.1	RIDDLES	0.32	20%	10.0%	2154
34B	6.0	BLOUNT	0.43	9%	2.0%	981
TOTAL	**67.1**			**100%**		**11039**

Project Title: Galien River Watershed Management Plan
Job Number: G03594
Engineer: DF2
Date: 1/26/2005

FISHBECK, THOMPSON,
CARR & HUBER, INC.
1515 Arboretum Drive, SE
Grand Rapids, MI 49546
616-575-3824

Template Title: Galien River Watershed - Agricultural Soils - Galien River A

MUSYM	K-FACTOR	AREA3_SF	AREA3_ACRE	AREA3_PERC	HIGH_EROD	% LARGE AREA	% HIGH EROD
10D	0.15	149389.2100	3.4295	0.0305	Y		0.0305
13C	0.15	6217922.8000	142.7439	1.2696	Y		1.2696
13D	0.15	1320731.9100	30.3198	0.2697	Y		0.2697
57A	0.15	15777987.5500	362.2128	3.2216	N	3.2216	
65F	0.15	26005.5900	0.5970	0.0053	Y		0.0053
63C	0.17	2197574.2600	50.4494	0.4487	Y		0.4487
64A	0.17	40026430.3100	918.8804	8.1726	N	8.1726	
19A	0.20	18116683.9300	415.9018	3.6991	N	3.6991	
11C	0.24	1454738.7500	33.3962	0.2970	Y		0.2970
11E	0.24	94549.1500	2.1705	0.0193	Y		0.0193
29	0.24	16355067.7000	375.4607	3.3394	N	3.3394	
56C	0.24	74042.0500	1.6998	0.0151	Y		0.0151
78C	0.24	3178767.2100	72.9745	0.6490	Y		0.6490
78D	0.24	2252234.3800	51.7042	0.4599	Y		0.4599
17	0.28	23948841.3000	549.7897	4.8899	N	4.8899	
32	0.28	15713965.0100	360.7430	3.2085	N	3.2085	
14B	0.32	18162552.4500	416.9548	3.7084	N	3.7084	
14C	0.32	34982268.8800	803.0824	7.1427	Y		7.1427
14D	0.32	9896686.0400	227.1966	2.0207	Y		2.0207
14E	0.32	1507408.1700	34.6053	0.3078	Y		0.3078
16B	0.32	165830057.8100	3806.9343	33.8593	N	33.8593	
12C	0.37	1808566.3100	41.5190	0.3693	Y		0.3693
12D	0.37	653463.7800	15.0015	0.1334	Y		0.1334
61A	0.37	22069672.8300	506.6500	4.5062	N	4.5062	
15C	0.43	5142520.0100	118.0560	1.0500	Y		1.0500
TOTAL			**11219.4405**			**68.6050**	**14.4880**

MUSYM	ACT. ACRES	K-FACTOR	% OF ACRES	SLOPE	TOTAL ACRES
13C	2.0	0.15	2%	10.0%	278
64A	15.1	0.17	18%	2.0%	2074
17	11.4	0.28	14%	0.5%	1572
16B	42.1	0.32	52%	2.0%	5781
14C	9.5	0.32	12%	8.0%	1301
15C	1.6	0.43	2%	10.0%	213
TOTAL	**81.7**		**100%**		**11219**

Project Title: Galien River Watershed Management Plan
Job Number: G03594
Engineer: DF2 EWO
Date: 1/26/2005 Revised 11-08-2005

FISHBECK, THOMPSON,
CARR & HUBER, INC.
1515 Arboretum Drive, SE
Grand Rapids, MI 49546
616-575-3824

Template Title: Galien River Watershed - Agricultural Soils - Galien River B

MUSYM	K-FACTOR	AREA3_SF	AREA3_AC	AREA3_PERC	HIGH_EROD	% LARGE AREA	% HIGH EROD
10B	0.15	12181437.7200	279.6473	3.7906	N	3.7906	
10D	0.15	1519760.3800	34.8889	0.4729	Y		0.4729
10F	0.15	2916.5600	0.0670	0.0009	Y		0.0009
57A	0.15	14052731.8700	322.6063	4.3729	N	4.3729	
28B	0.17	37701097.6300	865.4981	11.7318	N	11.7318	
37	0.17	10574689.4400	242.7615	3.2906	N	3.2906	
42A	0.17	11594233.7900	266.1670	3.6079	N	3.6079	
64A	0.17	14539329.4000	333.7771	4.5243	N	4.5243	
31A	0.28	12600183.0000	289.2604	3.9209	N	3.9209	
14C	0.32	36667.8400	0.8418	0.0114	Y		0.0114
16B	0.32	14264182.5300	327.4606	4.4387	N	4.4387	
33D	0.37	31103.7500	0.7140	0.0097	Y		0.0097
15C	0.43	2393624.7000	54.9501	0.7448	Y		0.7448
34B	0.43	150552917.2300	3456.2194	46.8490	N	46.849	
TOTAL			**7176.2720**			**86.5267**	**1.2397**

MUSYM	ACT ACRES	SOIL NAME	K-FACTOR	% OF ACRES	SLOPE	TOTAL ACRES
57A	8.6	Thelford loamy sand	0.15	10%	1.0%	706
28B	23.2	Rimer	0.17	26%	2.0%	1893
16B	8.4	Crosier silt loam	0.32	10%	2.0%	684
34B	47.6	Blount	0.43	54%	2.0%	3892
TOTAL	**87.8**			**100%**		**7176**

Project Title: Galien River Watershed Management Plan
Job Number: G03594
Engineer: DF2 EWO
Date: 1/26/2005 Revised 11-08-2005

FISHBECK, THOMPSON,
CARR & HUBER, INC.
1515 Arboretum Drive, SE
Grand Rapids, MI 49546
616-575-3824

Template Title: Galien River Watershed - Agricultural Soils - South Galien River

MUSYM	K-FACTOR	AREA3_SF	AREA3_ACRE	AREA3_PERC	HIGH_EROD	% LARGE AREA	% HIGH EROD
10D	0.15	299437.5300	6.8741	0.1348	Y		0.1348
10F	0.15	33003.9500	0.7577	0.0149	Y		0.0149
28B	0.17	23891276.6700	548.4682	10.7573	N	10.7573	
42A	0.17	11813353.3500	271.1973	5.3191	N	5.3191	
13C	0.17	6161.5300	0.1414	0.0028	Y		0.0028
36	0.24	13907596.1300	319.2745	6.2620	N	6.2620	
14D	0.32	490399.2500	11.2580	0.2208	Y		0.2208
34B	0.43	122838291.2600	2819.9791	55.3091	N	55.3091	
15C	0.43	3988736.8500	91.5688	1.7960	Y		1.7960
33D	0.43	1108206.2100	25.4409	0.4990	Y		0.4990
33E	0.43	93519.5700	2.1469	0.0421	Y		0.0421
TOTAL			**4758.0148**			**77.6475**	**2.8725**

MUSYM	ACT. ACRES	SOIL NAME	K-FACTOR	% OF ACRES	SLOPE	TOTAL ACRES
10D	0.2	OAKVILLE FINE SAND	0.15	0%	12.0%	9
28B	16.1	RIMER	0.17	20%	2.0%	954
36	6.3	PEWAMO SILT LOAM	0.24	8%	0.5%	371
15C	2.6	GLYNWOOD LOAM	0.43	3%	10.0%	152
34B	55.3	BLOUNT	0.43	69%	2.0%	3281
TOTAL	**80.2**			**100%**		**4758**

Project Title: Galien River Watershed Management Plan
Job Number: G03594
Engineer: DF2 EWO
Date: 1/26/2005 Revised 11-08-2005

FISHBECK, THOMPSON,
CARR & HUBER, INC.
1515 Arboretum Drive, SE
Grand Rapids, MI 49546
616-575-3824

Template Title: Galien River Watershed - Agricultural Soils - Spring Creek

MUSYM	K-FACTOR	AREA3_SF	AREA3_AC	AREA3_PERC	HIGH_EROD	% LARGE AREA	% HIGH EROD
10D	0.15	26807.8100	0.6154	0.0111	Y		0.0111
57A	0.17	8592134.5100	197.2483	3.5649	N	3.5649	
13C	0.17	3205978.7700	73.5991	1.3302	Y		1.3302
13D	0.17	2132648.1200	48.9589	0.8848	Y		0.8848
63C	0.17	36497.2600	0.8379	0.0151	Y		0.0151
20	0.20	11898714.9300	273.1569	4.9368	N	4.9368	
19A	0.20	10273245.9400	235.8413	4.2624	N	4.2624	
11C	0.24	1724978.4600	39.6001	0.7157	Y		0.7157
11D	0.24	364069.5800	8.3579	0.1511	Y		0.1511
11E	0.24	194108.0400	4.4561	0.0805	Y		0.0805
32	0.28	23807009.1100	546.5337	9.8776	N	9.8776	
25	0.28	14242509.2000	326.9630	5.9093	N	5.9093	
17	0.28	9015672.3800	206.9714	3.7406	N	3.7406	
31A	0.28	8562732.2900	196.5733	3.5527	N	3.5527	
16B	0.32	27056196.3700	621.1248	11.2257	N	11.2257	
78C	0.32	7409944.1000	170.1089	3.0744	Y		3.0744
14C	0.32	3919373.1900	89.9764	1.6262	Y		1.6262
78D	0.32	2665499.6000	61.1915	1.1059	Y		1.1059
14E	0.32	619802.8400	14.2287	0.2572	Y		0.2572
14D	0.32	344049.0600	7.8983	0.1427	Y		0.1427
61A	0.37	10319242.4200	236.8972	4.2815	N	4.2815	
34B	0.43	49778359.5000	1142.7539	20.6533	N	20.6533	
15C	0.43	2927752.8200	67.2120	1.2147	Y		1.2147
33E	0.43	354905.7400	8.1475	0.1473	Y		0.1473
33D	0.43	343902.9800	7.8949	0.1427	Y		0.1427
TOTAL			**5525.2337**			**84.0726**	**13.8152**

MUSYM	ACT. ACRES	SOIL NAME	K-FACTOR	% OF ACRES	SLOPE	TOTAL ACRES
13C	3.2	SPINKS	0.15	3%	10.0%	185
20	12.8	GILFORD	0.20	13%	0.5%	743
16B	46.4	CROSIER	0.32	49%	2.0%	2698
78C	7.7	OSHTEMO	0.32	8%	10.0%	449
34B	24.9	BLOUNT	0.43	26%	2.0%	1451
TOTAL	**95.0**			**100%**		**5525**

BERRIEN COUNTY
PURCHASE OF DEVELOPMENT RIGHTS PROGRAM

PROPERTY OWNER APPLICATION FORM

Instructions

Read Step 1 – Eligibility, to determine whether your farm is eligible. If the farm is eligible, then complete the remainder of the application. Read and sign the back of the application form and return by mail to your locally participating unit of government (Bainbridge or Sodus Townships only).

Step 1 – Eligibility

All applications must meet these minimum requirements in order to apply.

- The parcel(s) are located within a locally participating unit of government (Bainbridge and Sodus Townships)
- At least 51% of the land in the nominated parcel must be devoted to an agricultural use as defined in Part 362 of NREPA. Woodlots do not count towards the land area.
- The owner of record must sign the application.
- Mineral rights must be either owned by the landowner or must be subordinated when the development rights are acquired.
- The nominated parcel must be at least 20 acres in size, unless the parcel is located adjacent to preserved land or is a viable agricultural entity. If the parcel is less than 20 acres in size, the landowner must provide written documentation that the land is in active agriculture. The LPB will review requests for consideration of parcels less than 20 acres in size on a case-by-case basis to determine if the development rights should be considered for purchase based on proximity to other preserved lands or the viability of the parcel for agricultural use.

Step 2 – Contact Information

Land owner: Evening Phone:

Address: Daytime Phone:

City & Zip: Email:

Step 3 – Property Location Information

Property address (if different from above):

Parcel ID Number(s):

Township:
Number of acres: Acres nominated: Acres in Ag production:

Step 4 – Matching Funds

Emphasis will be placed on parcels that have matching funds. Matching funds may be money contributed by public, private or non-profit sources or can be via an offer of the landowner to accept less than the appraised purchase value of the development rights and donates the remaining portion of their development rights value. A letter of commitment regarding matching funds must accompany the application.

Step 5 – Property Ownership Information

I own the nominated property by ☐ Deed ☐ Land Contract

If a land contract, the seller's signature is required in the certification section.

Are you aware of the existence of any environmental contaminants or concerns with the property? ☐ Yes ☐ No

If so, please describe:

Check one of the following:

☐ I own all mineral rights

☐ I own some mineral rights

☐ I do not own any mineral rights

Step 6 – Economic Impact

Mark all of the following that applies:

☐ Does the parcel(s) contain an "on farm" winery or directly contributed to and is owned by the owner of an "on farm" winery where at least 51% of the product used to manufacture the wine is grown on the same farm

☐ Does the parcel(s) on contract with a winery

☐ Does the parcel(s) significantly contribute to the support of a farm market (qualifying farm markets/roadside stands are those with "off road" parking for consumers)

Fill in the following:

Acres containing specialty crops processed in Berrien County (defined as a vegetable, greenhouse and/or nursery, tree fruit, grapes, or blueberries):

Acres containing specialty crops processed in adjacent county:

Acres containing commodity crops processed in Berrien County (defined as corn, soybeans, wheat, barley, oats, etc.) or hay crops (defined as alfalfa, timothy, grass, etc.):

Step 7 – Conservation Values/Practices

Is there a USDA/NRCS approved conservation plan on file for nominated parcel(s)?

☐ Yes ☐ No

Are there significant natural resource features including natural water bodies and water courses, sand dunes, wildlife habitat (as defined by participating in the federal WHIP program), wetlands and other open space?

☐ Yes ☐ No

If yes, please give a description and the number of acres:

Mark any of the following that applies (if unknown, leave this section blank):

- ☐ The parcel(s) fronts on a major stream that drains more than 640 acres
- ☐ The parcel(s) fronts on a minor stream that drains between 100 and 640 acres
- ☐ The parcel(s) fronts) on a stream that drains less than 100 acres or has a year round spring, pond, or lake of 3 acres or more

Step 8 – Creation of Blocks of Preserved Land

Mark the following that applies:

- ☐ Land is directly adjacent to preserved land with at least 500 feet of shared boundary
- ☐ Land is directly adjacent to preserved land with less than 500 feet of shared boundary
- ☐ Land is not adjacent but within ½ mile of preserved land
- ☐ Land is not adjacent but between ½ to 2 miles of preserved land

Is the majority of the land within ½ mile of a parcel enrolled in the Farmland and Open Space Preservation Act (PA 116)? ☐ Yes ☐ No

Step 9 – Discretionary

Are there other unique historical, geological, architectural or any other significant features on the property?

☐ Yes ☐ No

If yes, please describe:

Step 10 – Type of Agricultural Production

Please fill in the following:

Acres of land devoted to growing specialty crops:

Acres of land devoted to growing commodity crops:

Acres of land devoted to pasture:

Acres of land accessible to irrigation:

Is the land adjacent to a livestock production operation? ☐ Yes ☐ No

Is the land within ½ mile of a livestock production operation? ☐ Yes ☐ No

Step 11 – Agreement

Submission of this application to the locally participating unit of government and to the Berrien County Farmland Preservation Board (LFPB) indicates an applicant's interest in participating in the Berrien County Purchase of Development Rights Program. Neither the applicant, the County, nor the Preservation Board is bound in any way by this expression of interest. The applicant agrees to allow a Preservation Board representative to visit the nominated property at a time convenient to the applicant in order to collect and verify information necessary to evaluate the application. The Preservation Board representative will not visit the property without permission of the applicant.

I _____ (name of applicant) am interested in applying to the Berrien County Purchase of Development Rights Program and do agree to the terms outlined above.

_____ _____

Signature Date

Application Checklist

To submit this application:

- Make sure the farm(s) meet the eligibility criteria described in Step 1
- Complete the information requested in Steps 2 through 11
- Read, sign, and date the Agreement above
- Mail completed application to the Clerk of your locally participating unit of government by **Monday, August 29, 2005**

Bainbridge Township:
7315 Territorial Road
Watervliet, MI 49098

Sodus Township:
Sodus Township Hall
Sodus, MI 49126

If you have any questions about the application, contact John Burt, Berrien County Planning Director at 983-7111 extension 8274.

What the townships need to know to access farmland and open space preservation funds.

Rescheduled to March 28, 2005*

Garber Auditorium – Chan Shun Hall
Andrews University – Berrien Springs, MI
Registration at 6:30 p.m. • Meeting at 7 p.m.

In cooperation with Michigan Farmland and Community Alliance Mr. Charles R. Eckenstahler will be the presenter for the evening.

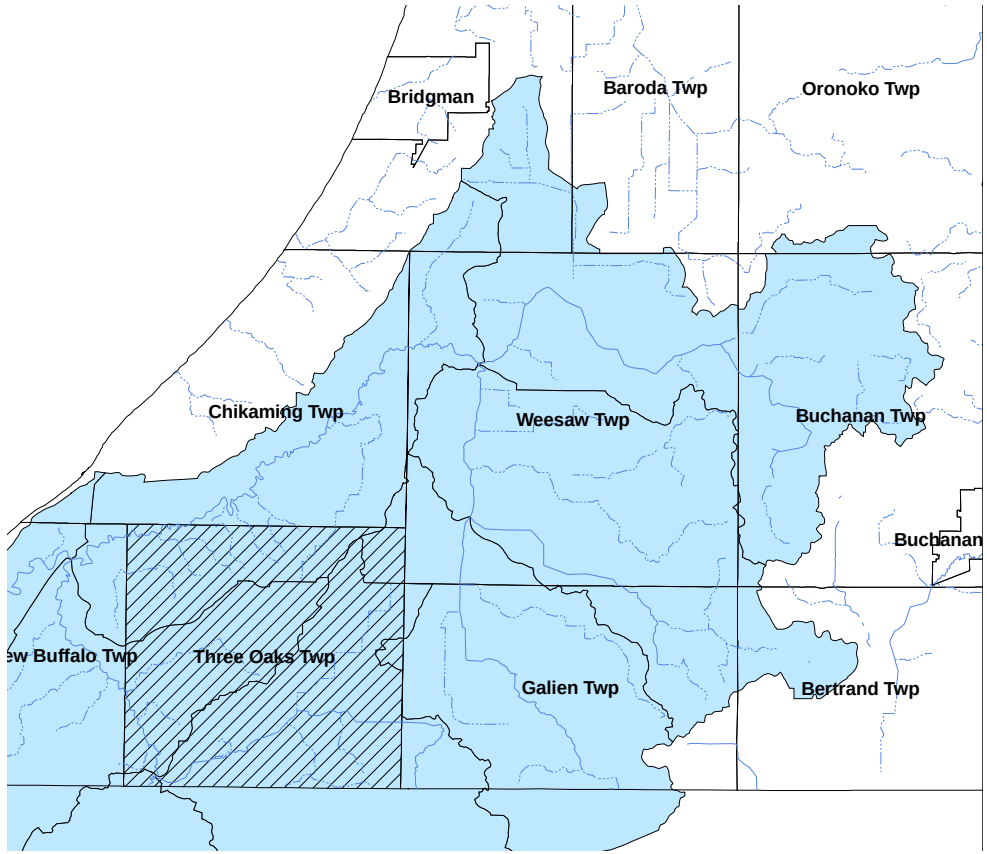
RSVP to Berrien County Farm Bureau before March 24 by calling (269) 473-4791 between 8:30 a.m. and 4:30 p.m.

Meeting sponsors: Berrien County Planning Department; Berrien County Farm Bureau; Galien River Soil Conservation District; St. Joseph River Soil Conservation District; Michigan State University Extension; The Conservation Fund; GreenStone Farm Credit Services – Berrien Springs

* Due to snow day.

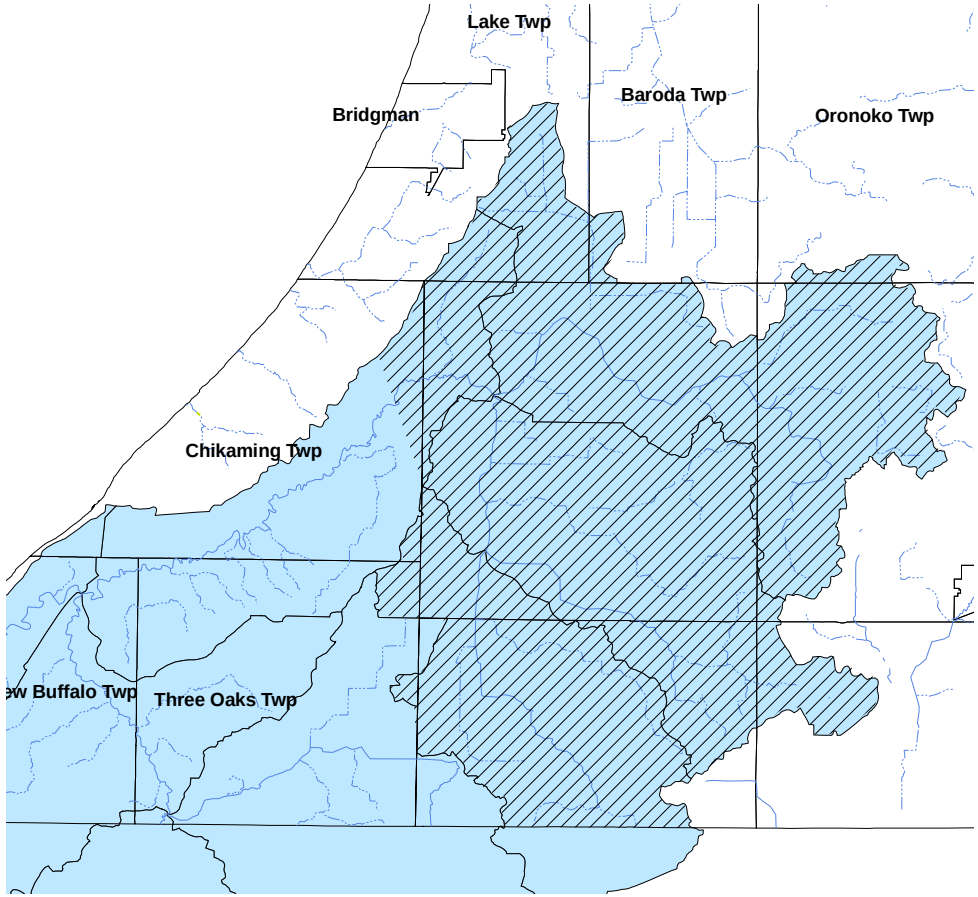
BERRIEN COUNTY FARM BUREAU

Priority Areas/Water Quality Benefits



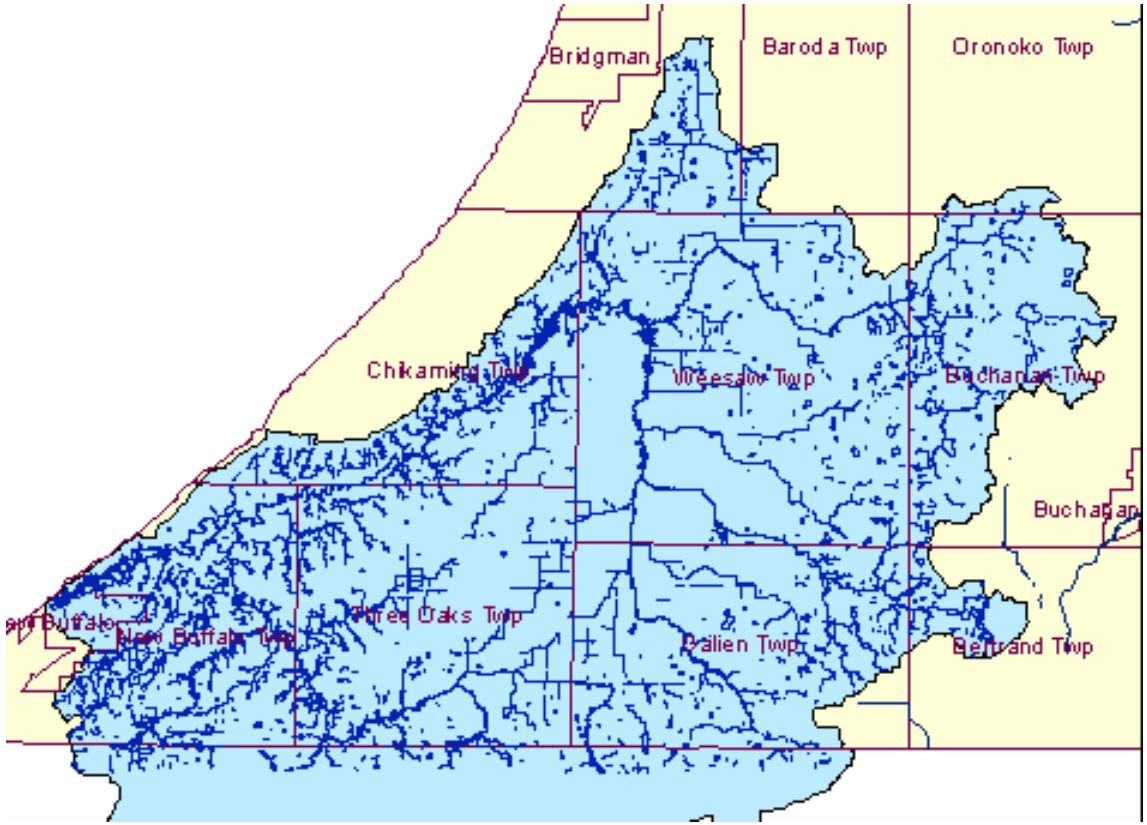
TMDL Area - Priority area related to Deer Creek TMDL

Priority Areas/Water Quality Benefits



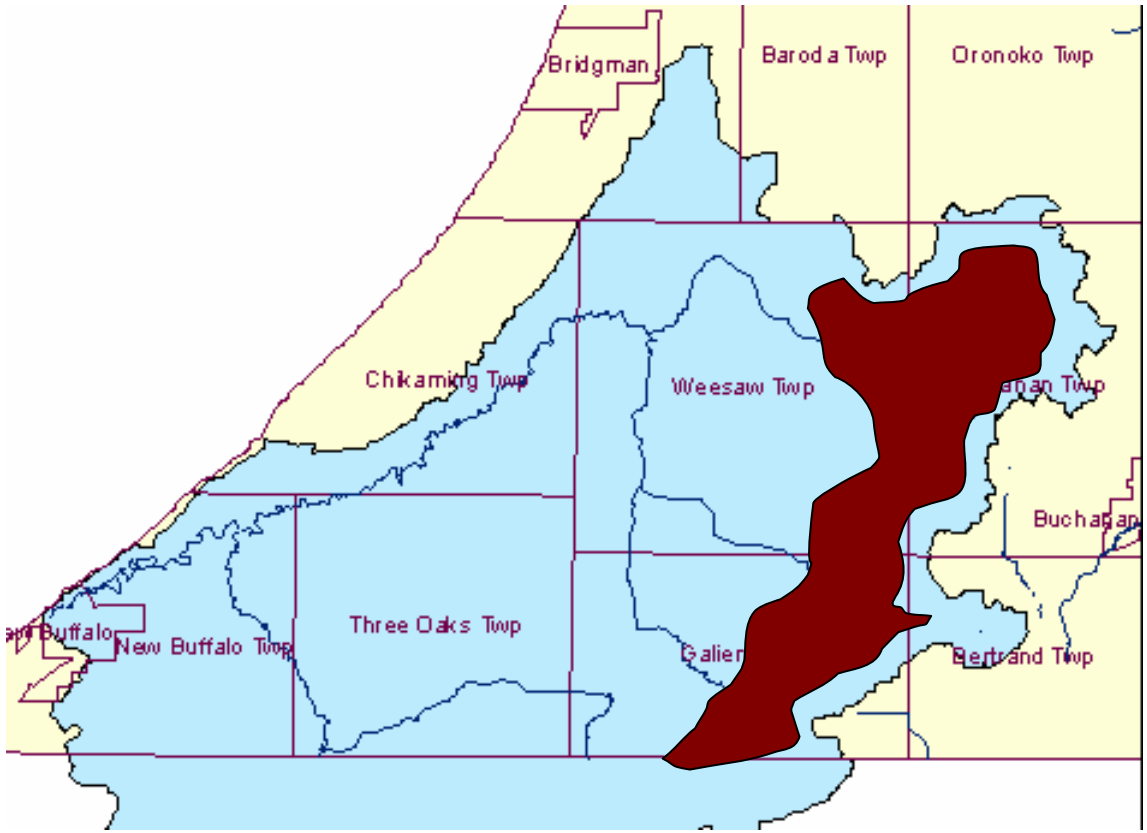
TMDL Area - Priority area related to Galien River TMDL

Priority Areas/Water Quality Benefits



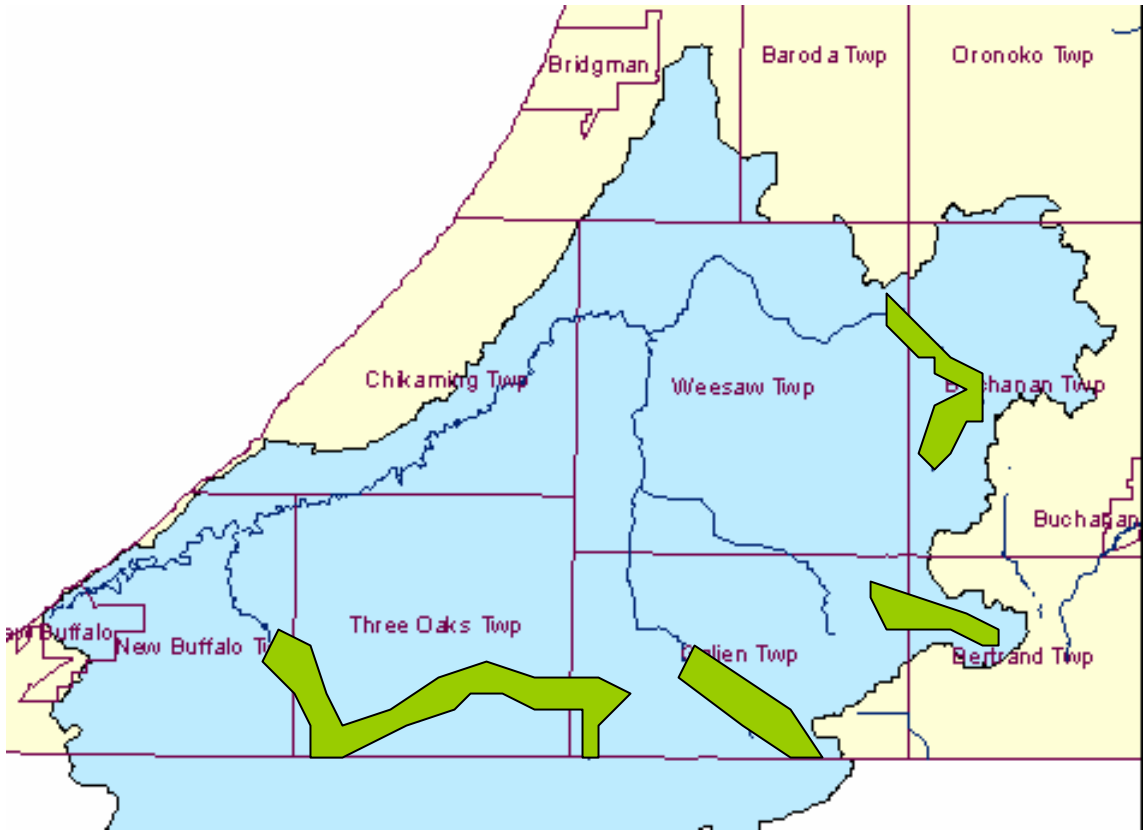
Riparian Areas - land bordering the rivers, streams, and drainage ditches

Priority Areas/Water Quality Benefits



Highly Erodible Soils

Priority Areas/Water Quality Benefits

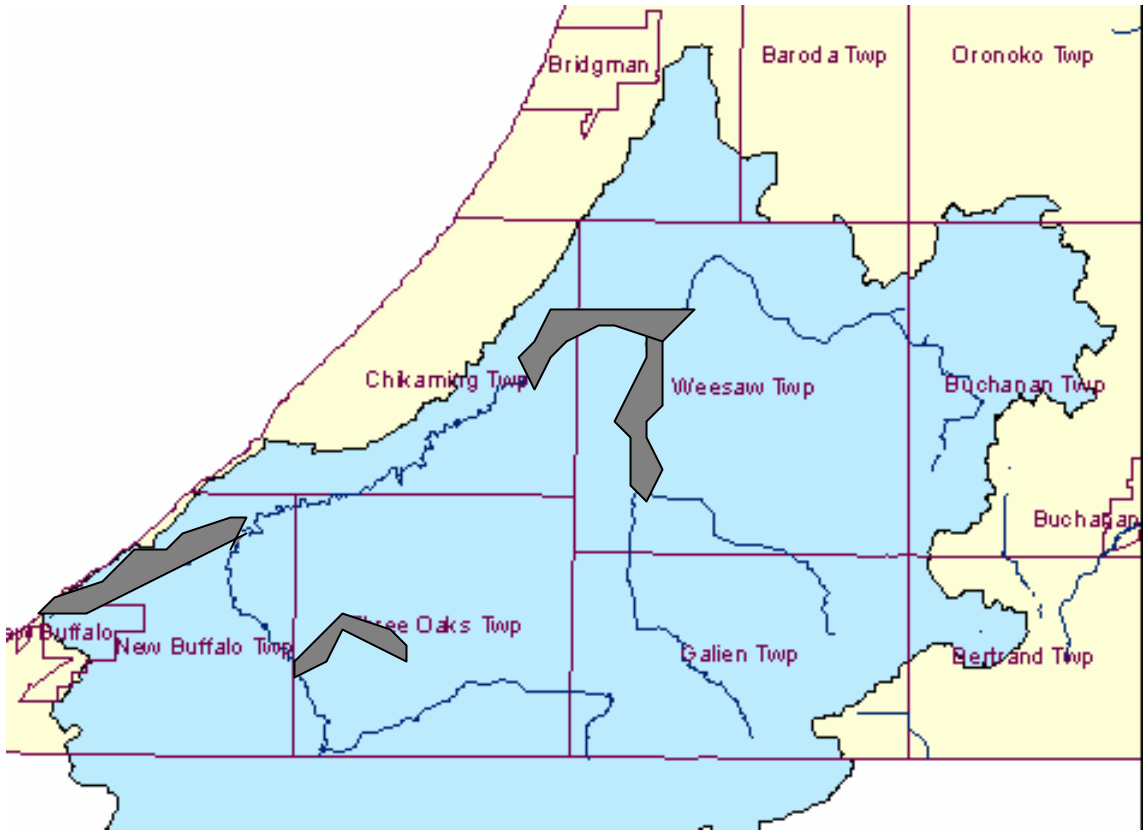


High Quality Areas:

Spring Creek
South Branch
Headwaters of Dowling Creek

East Branch Headwaters
Dayton Lake Area

Priority Areas/Water Quality Benefits

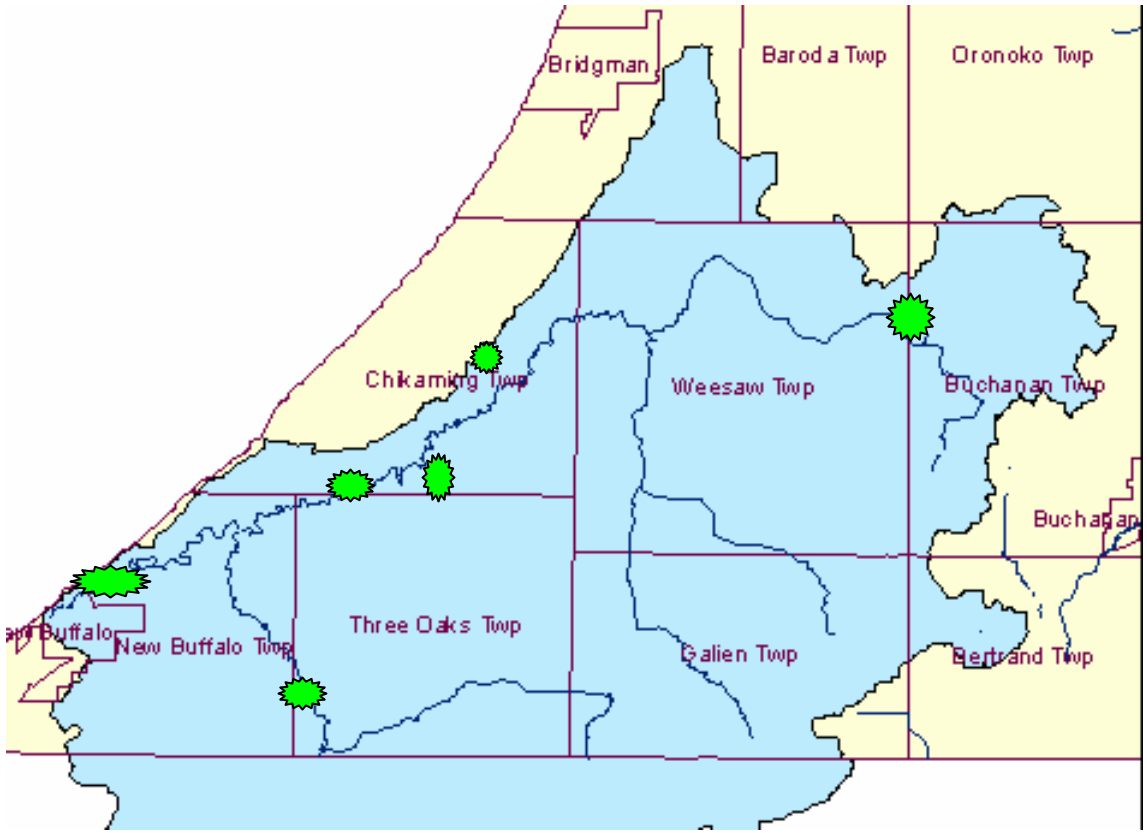


Lower Quality Areas:

<u>Development/*E. coli*:</u>
New Buffalo Area

<u>TMDLS:</u>
Dowling Creek after Blue Jay Drain
Main Branch near New Troy
Deer Creek

Priority Areas/Other



<u>Proximity to other protected areas:</u>

Warren Woods State Park
Marsh in New Buffalo
DNR or township properties