

BACTERIA REDUCTION IMPLEMENTATION PLAN FOR THE MIDDLE HURON RIVER WATERSHED

October 2011 — September 2016

For the purpose of achieving the Total Maximum Daily Load (TMDL) and removing the bacteria impairment of the Huron River downstream of Argo Pond to Geddes Pond

Developed by and for the Middle Huron Partners and Stormwater Advisory Group (SAG).

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- C: Limno-Tech, Inc. 2000. Supporting Document for the Geddes Pond/ Huron River *E. coli* TMDL.
- D. Michigan Department of Environmental Quality (DEQ). 2001. Monitoring data for the Geddes Pond/Huron River *E. coli* TMDL.
- E: Earth Tech. 2002. *E. coli* and weather data for all monitoring sites in the Geddes Pond/Huron River *E. coli* TMDL area.
- F: City of Ann Arbor, 2002. Precipitation data and *E. coli* data for Geddes Pond/ Huron River *E. coli* TMDL area.
- G. Biological Consulting Services of North Florida, Inc. September 2002. Ribotyping analysis of *E. coli* samples.

H. Goose Control Best Management Practices.

I. Matrix of Current *E. coli* Reduction Efforts in the Watershed.

Not referenced in the plan document but utilized in the plan development:

J. City of Ann Arbor Water Treatment Plant. 2002. Water quality monitoring data of Barton Pond.

K. Standard methods for *E. coli* sampling, as promulgated by the EPA, may be seen at <http://www.epa.gov/nerlcwww/>.

L: Earth Tech. 2002. Summary of *E. coli* monitoring data for Geddes Pond: daily and monthly geometric mean.



Gallup Park attracts large numbers of waterfowl that may contribute to the problem of excessive *E. coli* levels in Geddes Pond and the Huron River.

Introduction

The following plan is an updated version of the Implementation Plan that was developed and approved by the Michigan Department of Environmental Quality in 2003. Numerous sections have received minor updates to reflect current status. A few sections have received major updates due to new information or new programs.

Problem Definition

Geddes Pond, located on the Huron River in Washtenaw County, Michigan, is listed as an impaired waterbody on Michigan's Section 303(d) list (Impaired Waterbodies List) due to impairment of recreational uses by the presence of elevated levels of pathogens. The listed segment addresses approximately five miles of the Huron River located in the Ann Arbor area, from Geddes Dam at Dixboro Road upstream to Argo Dam (see the map in Appendix A). This segment is also the receiving water for Allens Creek (a tributary that was enclosed in the 1920s) Traver Creek, Millers Creek, Malletts Creek, and Swift Run Creek. Water sampling in this area has shown that Michigan Water Quality Standards (WQS) for *Escherichia coli* (*E. coli*) are not consistently being met in this waterbody or its tributaries.

According to the Washtenaw County Environmental Health Department, a permanent sign is posted at the perimeter of Geddes Pond instructing people to stay out of the water after rain events due to potentially dangerous pathogen levels. As general policy, the Department advises citizens to stay out of all surface waters for 48 hours after a major rain event to allow pathogen levels to decrease.

A two-mile segment of Allens Creek is listed as an impaired waterbody on the Section 303(d) list due to impairment of recreational uses by the presence of elevated *E. coli* pathogens, and was scheduled for TMDL creation in 2004. Rather than embark on a separate TMDL process for this segment, the Allens Creek listing is being addressed through the Geddes Pond/Huron River *E. coli* TMDL. The Huron River Watershed Council water quality monitoring program added a long-term sampling site on this segment.

The Nature of Escherichia coli¹

Bacteria are among the simplest, smallest, and most abundant organisms on earth. Bacteria are "procaryotic" organisms—a term which indicates a cellular structure lacking an organized nucleus and nuclear membrane. Instead of containing genetic information stored on several chromosomes, bacteria contain a single strand of DNA. These organisms reproduce by binary fission, which occurs when a single cell divides to form two new cells called daughter cells. Each daughter cell contains an exact copy of the genetic information contained in the parent cell. The process continues with each daughter cell giving rise to a generation of two new cells. The generation time is the time required for a given population to double in size. This time can be as short as 20 minutes for some bacteria species (e.g., *Escherichia coli*).

¹ Text adapted from MDEQ, Surface Water Quality, NPDES Permits website. February 2003.

While the vast majority of bacteria are not harmful, certain types of bacteria cause disease in humans and animals. Examples of waterborne diseases caused by bacteria are: cholera, dysentery, shigellosis and typhoid fever. During the London cholera epidemics of 1853-1854, Dr. John Snow observed that nearly everyone who became ill obtained their drinking water from a specific well into which a cesspool was leaking. Those who became ill either drank water from the well or came into contact with fecally contaminated material while tending those already sick. Concerns about bacterial contamination of surface waters led to the development of analytical methods to measure the presence of waterborne bacteria. Since 1880, coliform bacteria have been used to assess the quality of water and the likelihood of pathogens being present. Although several of the coliform bacteria are not usually pathogenic themselves, they serve as an indicator of potential bacterial pathogen contamination. It is generally much simpler, quicker, and safer to analyze for these organisms than for the individual pathogens that may be present. Fecal coliforms are the coliform bacteria that originate specifically from the intestinal tract of warm-blooded animals (e.g., humans, beavers, raccoons, etc.). They are cultured in a special growth medium and incubated at 44.5° C.

The first U.S. standards for drinking water, established by the Public Health Service in 1914, were based on coliform evaluations. It was reasoned that the greatest source of human pathogens in water was from human waste. Each day, the average human excretes billions of coliform bacteria. These bacteria are present whether people are ill or healthy. Monitoring for coliform bacteria was designed to prevent outbreaks of enteric diseases, rather than to detect the presence of specific pathogens. Today, coliform bacteria concentrations are determined using methods specified by the Environmental Protection Agency (EPA) and *Standard Methods for the Examination of Water and Wastewater* (AWWA, APHA, and WEF, 20th ed., 1998).

Sources of Bacteria²

Human sources of bacteria can enter water via either point or nonpoint sources of contamination. Point sources are those that are readily identifiable and typically discharge water through a system of pipes. Communities with sewer systems may not have enough capacity to treat the extremely large volume of water sometimes experienced after heavy rainfalls. At such times, treatment facilities may need to bypass some of the wastewater. During bypass or other overflow events, bacteria-laden water is discharged directly into the surface water as either sanitary sewer overflow (SSO) or as combined sewer overflow (CSO). Power outages and flooding can also contribute to the discharge of untreated wastewater.

Illicit connections to storm sewers are a source of bacteria in surface waters, even during dry periods. A connection to a storm sewer is "illicit" when the wastewater requires treatment prior to discharge and should be routed to the sanitary sewer. Only storm water and certain permitted discharges (e.g. clear, non-contact cooling water) should be discharged to a storm sewer.

Nonpoint sources are those that originate over a more widespread area and can be more difficult to trace back to a definite starting point. Failed on-site wastewater disposal systems (septic systems) in residential or rural areas can contribute large numbers of coliforms and other bacteria to surface water and groundwater.

² Text adapted from MDEQ, Surface Water Quality, NPDES Permits website. February 2003

Animal sources of bacteria are often from nonpoint sources of contamination. Concentrated animal feeding operations, however, may become point source dischargers. Agricultural sources of bacteria include livestock excrement from barnyards, pastures, rangelands, feedlots, and uncontrolled manure storage areas. Land application of manure and sewage sludge can also result in water contamination, which is why states require permits, waste utilization plans, or other forms of regulatory compliance.

Storm water runoff from residential, rural, and urban areas can transport waste material from domestic pets and wildlife into surface waters. Landscaping practices may create ideal habitat for geese and other migratory waterfowl, concentrating populations during the nesting season or creating year-round flocks, and creating hazardous quantities of fecal litter, leaving *E. coli* and other disease-causing organisms ready to be washed into ponds and waterways.

Bacteria from both human and animal sources can cause disease in humans. Bacteria-laden water can either leach into groundwater and seep, via subsurface flow, into surface waters or rise to the surface and be transported by overland flow. Bacteria in overland flow can be transported freely or within organic particles. Overland flow is the most direct route for bacteria transport to surface waters. Underground transport is less direct, because the movement of water and bacteria is impeded by soil porosity and permeability constraints.

TMDL Mandate and Applicable Regulations

Section 303(d) of the Federal Clean Water Act and the United States Environmental Protection Agency's (U.S. EPA) Water Quality Planning and Management Regulations (40 CFR Part 130) require states to develop Total Maximum Daily Loads (TMDLs) for waterbodies that are not meeting Water Quality Standards (WQS). The impaired designated use for Geddes Pond/Huron River at this location is total body contact recreation. Rule 100 of the Michigan WQS requires that this waterbody be protected for total body contact recreation from May 1 to October 31. The target levels for this designated use are the ambient *E. coli* standards established in Rule 62 of the WQS as follows:

R 323.1062 Microorganisms

Rule 62. (1) All waters of the state protected for total body contact recreation shall not contain more than 130 *Escherichia coli* (*E. coli*) per 100 milliliters, as a 30-day geometric mean. Compliance shall be based on the geometric mean of all individual samples taken during 5 or more sampling events representatively spread over a 30-day period. Each sampling event shall consist of 3 or more samples taken at representative locations within a defined sampling area. At no time shall waters of the state protected for total body contact recreation contain more than a maximum of 300 *E. coli* per 100 milliliters. Compliance shall be based on the geometric mean of 3 or more samples taken during the same sampling event at representative locations within a defined sampling area.

The Michigan Department of Environmental Quality (DEQ) finalized the Geddes Pond/Huron River *E. coli* TMDL in August, 2001 (Appendix B). The TMDL was developed based in part on a support document written by Limno-Tech, Inc. (Appendix C). The support document contains

background information about the listed waterbody, known water quality data, and source assessment. The TMDL was approved by the U. S. EPA on September 17, 2001. The MDEQ recommends that the targets of the TMDL be achieved within 10 years of the approval date, or August 2011.

All surface tributaries (not enclosed) are required to comply with the WQS of 130 *E. coli* per 100 ml as a 30-day geometric mean. This requirement applies to Traver Creek, Millers Creek, Malletts Creek, and Swift Run Creek. Because enclosed tributaries are not considered waters of the state, the daily maximum WQS of 300 *E. coli* per 100 ml will apply as a monthly average to Allens Creek and the direct drainage area (i.e. storm sewers which discharge directly to the Huron River). By maintaining the concentration of 300 *E. coli* per 100 ml in the enclosed tributaries, any area of WQS exceedance in the Huron River will be minimized. If the pathogen inputs can be controlled so that surface tributaries meet a 30-day geometric mean of 130 *E. coli* per 100 ml, the enclosed tributaries meet a monthly average of 300 *E. coli* per 100 ml and background levels do not significantly increase, then total body contact recreation in this reach of the Huron River will be protected.

Sampling Effort and Data Summary

The Huron River (Geddes Pond) was placed on the Section 303(d) list in August, 2001, due to impairment of recreational uses by the presence of elevated levels of pathogens. Historical exceedances of state standards and high bacteria counts were common in the 1970s, 1980s, and 1990s, although improvements have been made since the peaks of the 1980s. The Huron River Pollution Abatement program of the late 1980s and early 1990s identified numerous sources of pathogens in the TMDL area and pursued their elimination. A compilation of this historical data is contained in Appendix C (Limno-Tech, Inc., 2000). These data indicate that Lower Geddes Pond has consistently exhibited the highest bacteria concentrations among all Huron River reaches in the Ann Arbor area. Geddes Pond is also the receiving water for three direct tributaries (Millers Creek, Malletts Creek and Swift Run Creek), plus Traver Creek and Allens Creek that enter upstream of Island Park. Historic data indicate that each of these tributaries exceed the WQS for pathogens as well. Background (upstream) levels of *E. coli* in Barton Pond were determined to be 10 *E. coli* per 100 ml. Additional sampling conducted in 2001 by the DEQ corresponds with the findings of the historical data and indicates that the listed reach and its tributaries continue to exceed the WQS for *E. coli*. These sampling results are included in Appendix D.

In 2002, sampling efforts were focused on source identification. With the input of stakeholders, appropriate sampling locations were selected throughout each tributary and sampled on a rotating basis from May to October, 2002. In addition, routine monitoring was conducted at the mouth of each tributary and on Geddes Pond. These sampling results are included in Appendix D. The Huron River Watershed Council (HRWC) established long-term monitoring sites on these tributaries and at the Allens Creek outfall in 2003 and began monitoring for *E. coli* in 2006 through present day. Sampling results from this effort are included in Appendix F.

The results of the 2002 data indicate that Geddes Pond exceeded the 30-day geometric mean (130 *E. coli* per 100 ml) for full body activities during the second half of July, and all of August. There was an additional single sampling event that exceeded the full body activity daily maximum standard (300 *E. coli* per 100 ml) in September. Each tributary sampled had elevated *E. coli*, and seemed to be influenced by wet weather events. Data collected by the HRWC over the past five years shows that the seasonal average *E. coli* concentration for each tributary still exceeds the 30-day standard of 130 *E. coli* per 100 ml, despite surrounding area municipal strategies to mitigate this situation. These data are shown in Figure 1. Although these seasonal averages are high, there were several individual sampling results at each site with *E. coli* concentrations that were below single event and 30-day standards. These lower results mostly occurred in May 2009. (see Appendix F).

Attempts were also made to identify the sources of *E. coli* to determine if the source was human, non-human, or a combination thereof. Initially, one DNA sampling event was conducted in August 2002, with results being inconclusive. In 2005, the Washtenaw Drain Commissioner's office (now known as the Washtenaw County Water Resources Commissioner) conducted a study with the Ann Arbor municipal storm sewer system to identify species-specific sources of *E. coli*, applying library-based genotypic bacteria source tracking (BST) (see Appendix G). Storm sewers on Buckingham Rd and Sheridan Rd, the subjects of the study, are integral to the Malletts Creek IDEP program, and were found to have no illicit sewer connections during an IDEP investigation conducted in 2003. However, *E. coli* sampling results indicated that high concentrations of the bacteria were still present in the storm sewers, even in dry weather conditions (see Figure 2). BST analysis of samples collected in spring and fall of 2005 indicated that pets (primarily cats) and raccoons were the primary sources of *E. coli* in the storm sewers at both sites. Human sources were also identified in a couple of the samples.

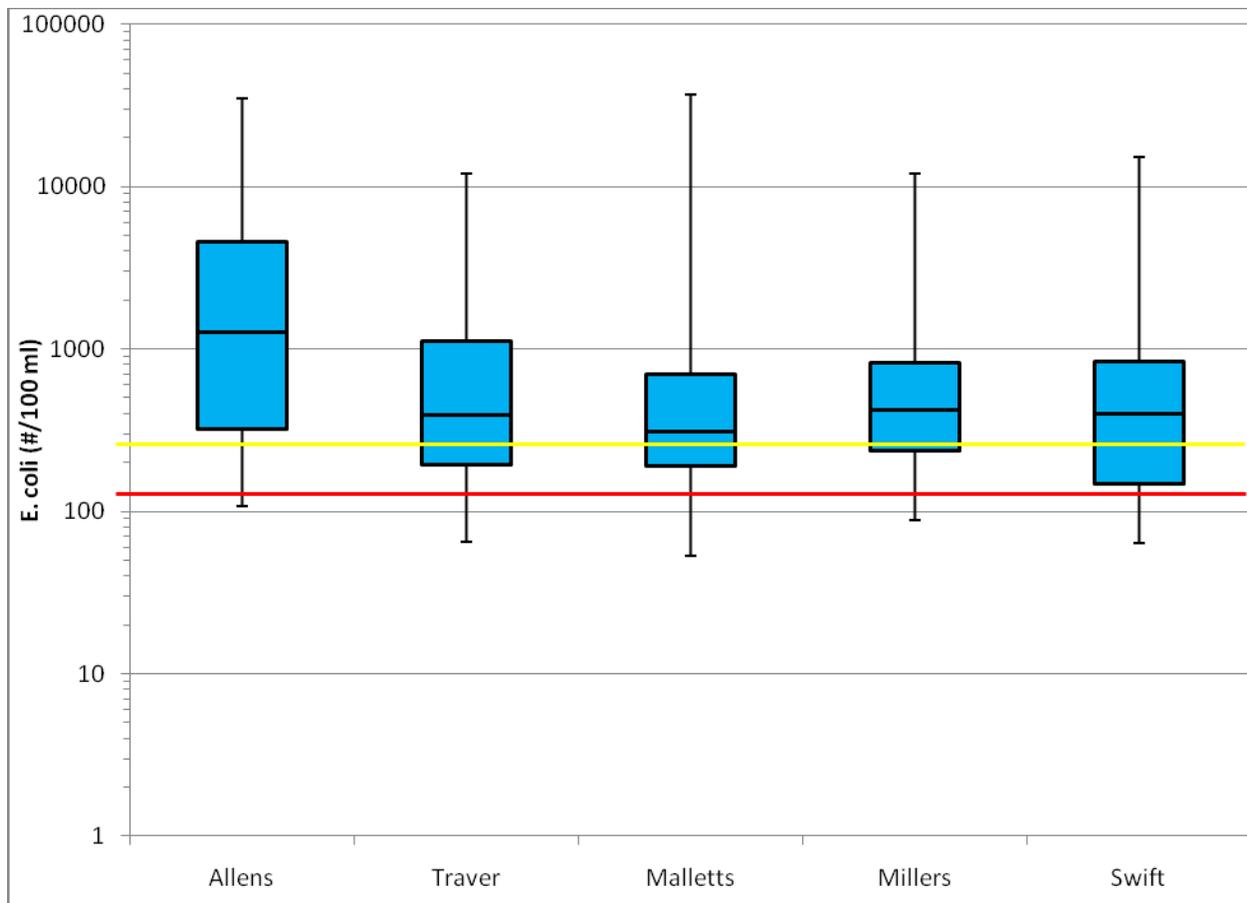


Figure 1. Range of *E. coli* sample results from monitoring 2006-10 at 5 tributaries to the TMDL section of the Huron River. Boxes represent 25-75% quartile data range, with the center bar representing the median. Whiskers represent minimum to maximum sample results. Lines indicate the full-body contact standard.

Sources of the Problem and Stakeholders Involved

For this waterbody, the primary loading of pathogens enters the Huron River directly through the tributaries and storm sewers within the listed reach. Given the low level of *E. coli* in the Huron River upstream of the listed reach, the guiding water quality management principle used to develop the TMDL was that compliance with the numeric pathogen target in the Huron River depended on pathogen control in the tributaries and storm sewers.

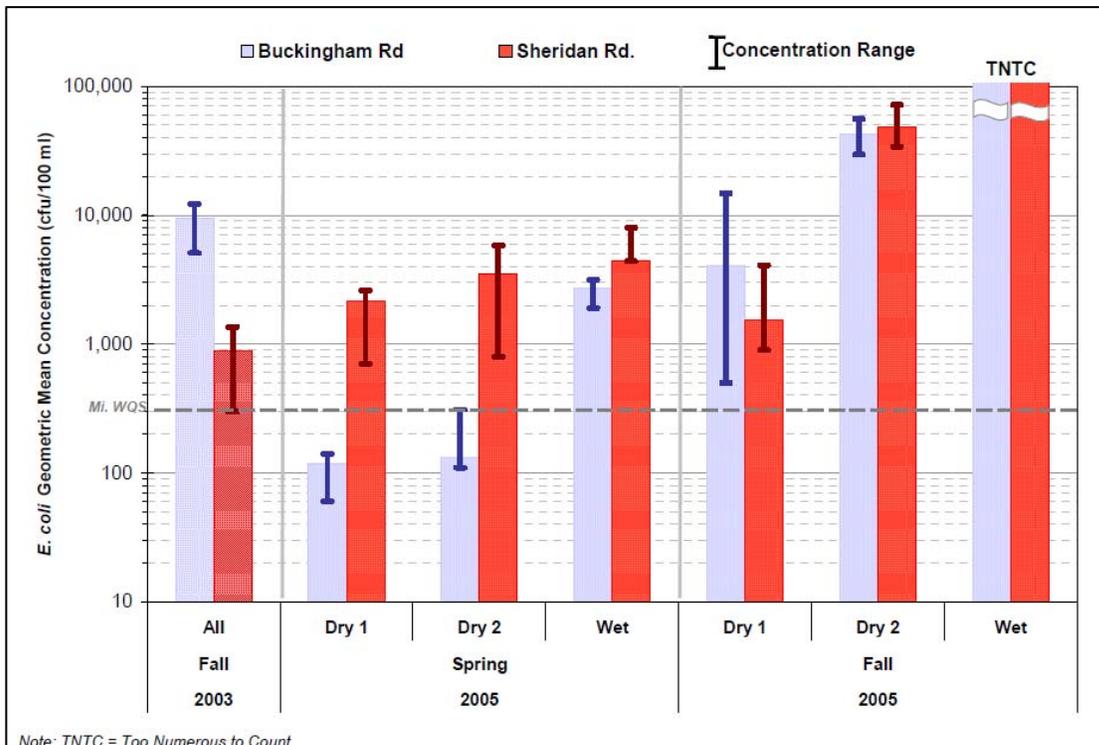


Figure 2. Quantitative *E. coli* Concentrations Measured at the Storm Sewer Sampling Locations.

Potential pathogen sources for this waterbody include sources typically associated with urban and suburban runoff because the immediate watershed is primarily composed of these land types. Source evaluation indicates that bacteria loads from much of Ann Arbor enter Geddes Pond/Huron River via the storm water system. Bacteria loads are also delivered to Geddes Pond/Huron River by tributaries that drain a large portion of the Ann Arbor area. Other pathogen sources for Geddes Pond/Huron River likely include upstream inputs, pet and wildlife feces, and a small number of malfunctioning on-site wastewater treatment systems (septic systems). Agricultural land uses located in the upstream reaches of the Traver Creek watershed make livestock and horse feces other potential sources. Illicit sewer connections which may have contributed to bacterial loads earlier in the decade have been identified and eliminated.

Governmental units in the Geddes Pond/Huron River watershed include the City of Ann Arbor, the University of Michigan (U-M), Ann Arbor Charter Township, Northfield Township, Pittsfield Charter Township, Lodi Township, Scio Township, Ypsilanti Charter Township, and Superior Charter Township. In addition, the Washtenaw Water Resources Commissioner has jurisdiction over those tributaries (or portions thereof) designated as county drains, and the Washtenaw County Road Commission has jurisdiction over drains in the county road right-of-ways. Of these, the following participate in the Middle Huron Stormwater Advisory Group (SAG) which meets to discuss continued planning and implementation of projects to address impairments of the middle Huron River watershed:

- City of Ann Arbor
- Pittsfield Charter Township
- Ypsilanti Charter Township

- Washtenaw County Water Resources Commissioner
- Washtenaw County Road Commission.

These agencies also take part in the Middle Huron Partnership, which was developed as a voluntary partnership to address excessive phosphorus in Ford and Belleville Lakes. That group also meets with the SAG to discuss and implement projects to address other impairments, including bacteria. Additional members of the Partnership include:

- University of Michigan
- Ann Arbor Charter Township
- Scio Township
- Superior Charter Township

Table 1 shows the distribution of land in each subwatershed in the listed reach by government entity. The stakeholders made the conscious decision to gain active involvement from the entities with more significant landownership in the TMDL area. This decision reflects the group's understanding that stakeholders with jurisdiction over minute portions of the TMDL area have little motivation to be engaged extensively in the planning process. However, all stakeholders have equal opportunity to comment on drafts of the implementation plan.



The Huron River at Gallup Park provides recreation for young and old alike.

Table 1. Distribution of land for each subwatershed in the listed reach of the Huron River.

	Subwatershed Area (sq. mi)	Percentage of Land Area in Subwatershed	Percentage of Immediate Watershed
Allens Creek			
City of Ann Arbor	4.0	90	
University of Michigan	0.43	10	
Total area	4.43	100	13
<hr/>			
Traver Creek			
City of Ann Arbor	3.3	45	
University of Michigan	0.072	1	
Ann Arbor Township	3.8	52	
Northfield Township	0.17	2	
Total area	7.342	100	22
<hr/>			
Millers Creek			
City of Ann Arbor	2.4	67	
University of Michigan	1.2	33	
Ann Arbor Township	0.0028	0.0007	
Total area	3.6028	100	11
<hr/>			
Malletts Creek			
City of Ann Arbor	7.6	68	
University of Michigan	0.42	3.7	
Pittsfield Township	2.5	23	
Ann Arbor Township	0.017	0.2	
Lodi Township	0.43	3.8	
Scio Township	0.1403	1.3	
Total area	11.1073	100	32
<hr/>			
Swift Run			
City of Ann Arbor	1.9	35	
Pittsfield Township	2.7	50	
Ann Arbor Township	0.69	13	
Superior Township	0.09	1.6	
Ypsilanti Township	0.021	0.4	
Total area	5.401	100	16
<hr/>			
Direct Drainage			
City of Ann Arbor	1.8	82	
University of Michigan	0.39	18	
Total area	2.19	100	6
<hr/>			
TOTAL	34.0731		100

Specific Goals and Objectives

The goal of the Geddes Pond/Huron River *E. coli* TMDL is to achieve the WQS of 130 *E. coli* per 100 ml as a 30-day geometric mean in Geddes Pond and its tributaries from Geddes Dam at Dixboro Road upstream to Argo Dam, except in Allens Creek where the goal is to achieve 300 *E. coli* per 100 ml as a 30-day geometric mean (see Appendix B). Data show that urban storm water runoff, with a significant bacterial component attributed to wildlife and pet sources, is the dominant source of *E. coli* in this area. Implementation activities to meet the TMDL require measures to reduce *E. coli* sources and loads.

Measures to reduce *E. coli* will include activities that, to a large extent, are already required of the National Pollutant Discharge Elimination System (NPDES) municipal storm water permittees within the watershed under Phase I and Phase II of the municipal storm water permitting program. Currently, the City of Ann Arbor, U-M and the Michigan Department of Transportation hold NPDES Phase I municipal storm water permits. In 2003, Ann Arbor Charter Township, Pittsfield Charter Township, Lodi Township, Scio Township, Ypsilanti Charter Township, and Superior Charter Township were required to obtain NPDES Phase II permits. Lodi and Scio Townships eventually had their permits removed.

Both Phase I and Phase II municipal storm water permits provide mechanisms for controlling bacterial loads to Geddes Pond and its tributaries and a structure for source characterization efforts. Storm water permits require that a plan for effective elimination of illicit discharges and prohibition of illicit discharges be developed, that all catch basins be mapped and regularly cleaned, that effective storm water management in areas of redevelopment and new development occur, and that a public education program regarding storm water management and impacts of storm water pollution be implemented.



Pickerel weed and lily pads bloom in the shallow reaches of Geddes Pond.

Current and New Programs for *E. coli* Reduction in the Watershed

The stakeholders in this TMDL are familiar with watershed-based cooperation, having partnered on point source and non-point source phosphorus reductions with the goal of meeting a nutrient TMDL for Ford and Belleville lakes. The Middle Huron River Watershed Initiative, the partnership working to meet the nutrient TMDL, has pursued pollutant reductions for over 15 years. Most of the stakeholders in the *E. coli* TMDL were signatories on two consecutive five-year agreements to voluntarily reduce phosphorus contributions to the middle Huron River. In the interim, the signatories revised these agreements to reflect current conditions within the watershed and renewed support to continue pollution reduction efforts. A third agreement to update activities and establish new commitments to continue the pollution reduction efforts in this watershed is currently under development.

Through the coordinated efforts of all stakeholders, coupled with the implementation of municipal storm water permit requirements and the current and ongoing efforts of the Middle Huron River Watershed Initiative, pathogen inputs to the tributaries and storm sewers can be reasonably controlled, with the possible exception of inputs from wildlife and feral domesticated animals. However, based on the results of the pathogen source tracking study conducted for the Water Resources Commission, it is unlikely that urban runoff will meet the TMDL load allocation even if the TMDL plan is fully implemented. A literature review conducted by HRWC found few references to successful projects or programs to eliminate or control these types of generalized urban sources. This presents a true challenge to the watershed, the partners within, and the Michigan DEQ.

Programs currently in effect in the watershed, or planned for the near future, include continued efforts to reduce illicit discharges, reduce domestic animal and wildlife sources, remove *E. coli* by treatment, and prevent or minimize pollution through land use planning, regulations and protection. A summary list of priority projects for the next 5 years is included in Table 2. A complete matrix of past, current, and future *E. coli* reduction efforts in the watershed is provided in Appendix I. Many of the past programs, initiated when the original TMDL Implementation Plan was developed, are still on-going and relevant today as viable opportunities to help achieve the objectives and requirements of the TMDL.

Table 2. Summary of the 5-Year E. coli Reduction Strategy, 2012-16

Activity	E. coli Source Reduced	Implementation Timeframe	Cost Estimate 2012-2016	Lead Agency
Septic Inspection	Human	Ongoing	\$92,000	Washtenaw County
Illicit discharge elimination program	Human	5 years	\$800,000	SAG Members*, U of M
Storm Water Drain Marking Project	Stormwater	ongoing	\$100,000	SAG Members, U of M
RV Waste Disposal Education	Human	ongoing	\$2,000	U of M, City of Ann Arbor, HRWC
Public Education Program (PEP)	Multiple	ongoing	\$335,000	SAG Members, U of M
Pump Station Contingency Plan	Human	ongoing	\$32,000	Ann Arbor Township
Phase II Public Education and Public Involvement: Agriculture/Farmland Education	Agricultural	2013-14	\$4,000-\$6,000	SAG Members, Ann Arbor Twp.
Education on Pet Waste	Pet waste	Ongoing	Part of PEP	SAG Members, U of M
Doggie Bags in Parks	Pet waste	ongoing	\$3,000	City of Ann Arbor
Pooper Scooper Ordinance	Pet waste	Ongoing	Not tracked	SAG Members
Operation Goose Down	Wildlife	ongoing	Unknown	Pittsfield Township
Community Partners for Clean Streams	Multiple	ongoing	\$800,000	WCWRC
Native Landscaping Ordinance Development	Wildlife, stormwater	Ongoing	\$5,000	City of Ann Arbor, Ann Arbor Township, Pittsfield Township
Update Storm Water Management Standards (Pond Landscaping Section)	Wildlife	ongoing	\$5,000	SAG Members
Gallup Park and Mary Beth Doyle Park Goose Control	Wildlife	Ongoing	\$100,000	City of Ann Arbor
Farmland Protection Program	Stormwater	ongoing	Unknown	City of Ann Arbor, Pittsfield Township, Ann Arbor Township
Wetlands Protection Program	Stormwater	ongoing	\$3,000	City of Ann Arbor, Ann Arbor Twp, Pittsfield Twp, Scio Twp
Rules and Ordinances for Storm Water Management	Stormwater	Update in 2012	Not tracked	WCWRC
Illegal Dumping and Pollution Incidence Response Enhanced Program	Human	Ongoing	Not tracked	WCWRC
State Revolving Fund Load Projects	Stormwater	2012-2015	\$8,500,000	WCWRC, City of Ann Arbor, Pittsfield Twp

Ann Arbor Capital Improvement Plan projects	Stormwater		\$7,000,000	City of Ann Arbor
Totals		2012-16	\$17,783,000	

* SAG Members include all entities with stormwater permits who are participating in the Middle Huron Stormwater Advisory Group, as listed in the stakeholder section on page 12.

Efforts to Reduce Illicit Discharges

Septic System Inspection Programs

Septic System Inspection Programs are meant to identify and correct failing septic systems that discharge human waste into groundwater or on the surface, and directly or indirectly into surface water. These programs help identify illicit connections and prevent or eliminate illicit discharge.

Washtenaw County's "Time of Sale" Ordinance requires that prior to any residential property transfer: 1) the septic system must be inspected by certified inspectors, 2) a report must be submitted to the Environmental Health Regulation Department and 3) the seller must receive an authorization letter from the Department. Over 4,300 systems have been evaluated annually, countywide, with over 540 septic system corrections documented to date. Most of the municipalities in Washtenaw County are now participating in this program.

Illicit Discharge Elimination Program (IDEP)

The purpose of the IDEP is to remove non-storm discharges to storm sewers to improve water quality. This program locates and eliminates any illicit connections in sanitary and storm pipes, thus preventing untreated sewage flow to the Huron River. The program is also meant to help meet the Geddes TMDL, and fulfill storm water permit obligations.

Project data include sampling records, video and a dye-test database. The following entities are involved in the IDEP: Washtenaw County, the City of Ann Arbor, Michigan Department of Environmental Quality (MDEQ), and the University of Michigan (U-M). Future areas of investigation, pending funding, are Allens, Swift Run, Traver and Millers Creeks.

The City of Ann Arbor inspects the storm sewer annually by closed circuit T.V., inspecting about 35,000 linear feet and removing debris from about 125,000 linear feet of line. The City sub-contracts to Washtenaw County, approximately four days per month, to do illicit connection screening within Malletts Creek. This program was in effect until December 2003. The estimated cost of the program is \$225,000 per year for the City of Ann Arbor and Washtenaw County combined. The HRWC provided information and education (tip cards) on illicit discharges for the City in FY 2003-2004.

The University of Michigan conducts dry weather screening by checking manholes for flow during dry weather. If flow is observed, a sample is collected to determine chemical parameters of the water, including *E. coli* content. This process is meant to track down cross-connections between sanitary and storm sewer lines, and eliminate them. Campus is typically screened in sections, so that the entire campus is covered in five years. Data are then compiled into dry weather screening reports. The annual cost of screening is approximately \$30,000. Illicit connection correction costs range from \$1,000 to \$500,000 depending on site specifics.

Recreational Vehicle (RV) Waste Disposal Education

The University of Michigan Health System and Occupational Safety and Environmental Health (OSEH) implemented this program to prevent the illicit discharge of black water from RVs, after a small number of RV illicit discharges were reported. The plan educates RV owners about proper waste disposal to prevent illicit discharges through signs and fliers. The plan also prohibits RVs from parking overnight in U-M lots, except in U-M hospital lots posted for RV parking. There have been no RV illicit discharges reported since the program began. The estimated cost of the program is \$2,000, and it is ongoing with no end date.

The HRWC also provides RV waste disposal education, under contract for the City of Ann Arbor. The Council conducted a survey of RV owners gathered in the Pioneer High School parking lot for a football game, and distributed educational fliers.

Storm Drain/Catch Basin Marking

The purpose of storm water drain marking is to eliminate waste entering the Huron River through storm drains, by means of creating public awareness of the danger of dumping into these drains. Storm drains are marked with a warning stating that any waste entering the drain goes straight to the Huron River. Along with the marking, the project places educational fliers on the doors of residences in the vicinity of newly marked drains.

Markers are continuously placed on drains and replaced every few years, when old markers begin to fade or fall off. New storm drains have a warning engraved or cast into the iron frame stating "Dump No Waste - Drains to Waterways." This program began early in the last decade, with approximately 6,500 drain markers having been placed in the City of Ann Arbor, on the U-M campus, and in the City of Ypsilanti and Ypsilanti Township area. This is an ongoing project with no end date. Through the Water Resources Commission CPCS program, the WRC has given out 2500 markers in the last year alone.

Participants in drain marking activities include the Huron River Watershed Council, City of Ann Arbor, Ypsilanti Charter Township, Pittsfield Charter Township, Washtenaw County, Water Resources Commission, and University of Michigan facilities and student groups—EnAct, North Campus Service Day, and Residential Student Housing. Pittsfield Township spent \$1,500 for label production and Washtenaw County spends approximately \$5,000 per year for their markers. The University of Michigan has spent a total of \$8,000 for markers. Additionally, the City of Ann Arbor spends approximately \$1.50 for each new lexan marker, while \$3.05 is spent on each "crystal" coated marker. Volunteers provide the labor to apply markers and hang educational fliers on doors.

Information and Education Mass Media Campaign/Public Education Program (PEP)

The purpose of this program is to provide awareness and education about septic system maintenance and its effect on water quality. Information is distributed through "Keep your septic system safe" tip cards, "Smart Home Maintenance" flyers, articles in the HRWC newsletter, public service announcements on the radio, and calendars.

The program raises awareness of septic system maintenance requirements and storm drain pollution prevention, which should reduce *E. coli* entering the Huron River through illicit discharges. However, the impact is difficult to measure beyond the number of homeowners who have received the materials throughout the watershed, including Ypsilanti Township, the City of Ann Arbor, Van Buren Township, YCUA service area, Sumpter Township, Village of Milford, customers of Edward Surovell Realtors, and HRWC members.

Those involved are: HRWC, local governments, businesses, local media, homeowner's associations, school districts, the USDA Home*A*Syst staff, and three watershed organizations. HRWC will continue to run its program to meet the obligations of the City of Ann Arbor's Phase I permit. Limited quantities of the materials are available upon request, with mass reprints produced when several communities join in placing an order from HRWC.

Information and Public Education Through the Internet

The purpose of this program is to provide awareness and education about local water quality issues. Information is available at the web pages of local units of government, including Pittsfield Charter Township at <http://pittsfieldtwp.org>, the City of Ann Arbor at <http://www.a2gov.org>, Washtenaw County at <http://www.ewashtenaw.org>, the Huron River Watershed Council at <http://www.hrwc.org>, and U-M Occupational Safety and Environmental Health Department at <http://www.oseh.umich.edu/environment/storm.shtml>. The University of Michigan receives feedback from visitors to its Storm Water Education page. Information and public education through the internet is an ongoing program with minimal cost.

Pump Station Overflow Plan

This plan is meant to reduce pump station flooding, which can cause illicit discharge to enter the Huron River past Geddes dam. The plan was implemented by Ann Arbor Charter Township. Estimated costs are unknown.

Efforts to Reduce Animal Sources – Domestic

Farmer Education

This program is meant to educate farmers on the potential impacts of current livestock management practices on surface water quality. Providing awareness and technical information to farmers, using various educational materials, should reduce the amount of *E. coli* in surface water from animal waste. Those involved are: Ann Arbor Charter Township, HRWC, the Natural Resources Conservation Service (NRCS), the Washtenaw Water Resources Commission, and the USDA Farm*A*Syst staff. The time frame for the plan is 2013-14. Estimated costs are \$4,000 - \$6,000 for Ann Arbor Township.

Education about Pet Waste

This program provides awareness and education to the public concerning the impact of pet waste on surface water quality. The purpose of this education is to decrease the amount of *E. coli* entering the Huron River due to pet waste. HRWC coordinates the production, printing, and distribution of educational flyers regarding the impact of pet waste on water quality. They also distribute storm water calendars that include this information. Pet waste education information is also located on the U-M OSEH website. The impact of the plan will be measured by surveying the population after one year to see if recommendations are being followed. Those involved include HRWC, U-M, the City of Ann Arbor and Ypsilanti Charter Township. The program runs from Spring 2003 forward. The cost of the fliers is \$0.03 per piece, while the cost of the calendars is about \$0.80 each.

Doggie Bags in Parks

This program provides bags for pet waste clean up. This should reduce pet waste in parks, subsequently reducing the amount of *E. coli* entering the Huron River from pet waste. This project is ongoing in the City of Ann Arbor. Estimated costs are unknown.

Pooper Scooper Ordinance

The purpose of this program is to educate the general public on the impact of pet waste on surface water quality, and to reduce pet waste entering the storm sewer. The plan should decrease illicit discharge into the Huron River by controlling a source of pollution. Local units of government, including Washtenaw County and the City of Ann Arbor, are involved with this project. The City of Ann Arbor has enacted such an ordinance and efforts are made to publicize it through their website.

Efforts to Reduce Animal Sources – Wildlife

Operation Goose Down

This program is meant to decrease *Giant Canada* goose populations, eliminate year-round goose habitation, and in turn, reduce the amount of goose droppings containing *E. coli* that have potential to contaminate waterways. Ongoing application of best management practices such as pond buffer plantings, replacing turf with shrubs and trees, and interfering with feeding and nesting will potentially reduce areas of contamination. See Appendix H for more details regarding the BMPs. The program is being developed in Pittsfield Charter Township, with homeowners and institutional partners invited to become involved. The timeline for this project is 2003 and forward. Costs are site specific, but research on goose control BMPs shows availability of numerous successful and cost-effective methods. It should be noted that DNR wildlife specialists report that there are no data showing harm to human health from the type of *E. coli* present in goose waste.

Community Partners for Clean Streams

This program provides education through public and private partnership, promoting the protection of watersheds and waterways through presentations, print material, and signed

agreements to use BMPs and abide by good housekeeping measures. The intent is to address water fowl habitat and discourage geese through landscaping, storm water pond maintenance, and riparian elements. Those involved include Washtenaw County, businesses, institutions, and multi-family residences, totaling 120 partners. This project is ongoing with no end date. Estimated costs are \$160,000 per year.

Native Landscaping Ordinance Development

This program diminishes green grass cover, on which geese enjoy foraging with an unobstructed view, and encourages the growth of tall prairie species. The purpose of this plan is to displace foraging geese by creating an environment unfavorable to geese, subsequently reducing the *E. coli* count in the Huron River from goose droppings. This program, involving Ann Arbor Charter Township, the City of Ann Arbor and Pittsfield Charter Township, is ongoing. Estimated Costs are \$5,000.

Update Storm Water Management Standards (Pond Landscaping Section)

This plan is meant to reduce nuisance geese habitat at storm water ponds by the installation of shoreline buffer planting or other means. The plan is utilized each time the storm water system is reviewed or equivalent, with no end date. Those involved include local units of government and U-M. In the future, parks departments may become involved to employ the same strategy near public water features. Estimated costs are unknown.

Gallup Park Goose Control

The City of Ann Arbor initiated an effort to control the local goose population in and around Geddes Pond. They have contracted with Goose Works, who collects eggs from nests on the islands in the Pond, and traps geese when they are molting and moves them to more appropriate locations in the wild. Goose Works also brings in dogs on occasion to disturb the geese, making them less likely to nest or forage around Gallop Pond. The program is ongoing and considered very successful in reducing the goose population in Gallop Park and on the pond islands, though no population numbers are available. This is an activity requiring a permit from MDNR. Estimated yearly costs are unknown.

Efforts to Reduce *E. coli* by Land Use Planning & Protection

Farmland Protection Program

This program prevents surface and storm water pollution through permanently retaining large areas of permeable ground and the natural areas associated with farmland, such as windrows, swales, meadows, small wetlands, and woodlots. Preservation of farmland helps protect the headwaters of Geddes Pond tributaries. Implementation of this plan is expected to eliminate future illicit discharges by precluding further urbanization and by promoting BMPs among farmers raising crops and animals. Under Purchase of Development Rights (PDR) programs, landowner applications are awarded points competitively, based on such factors as a history of good conservation and storm water management practices.

This program will be carried out by Ann Arbor City and Pittsfield and Ann Arbor Charter Townships through ongoing implementation of PDR Ordinances, the Ann Arbor Parks Department Green Belt Program, with funding of PDR through local tax millage, the USDA 2002 Farm Bill, the Michigan Farmland Preservation Board, and land conservancies. Others involved are: the Washtenaw Farmland Conservation Group, Washtenaw County, Farm Bureau, farmers, farmland owners, the USDA Natural Resources Conservation Service, and the Ecology Center. This project began in 1998 with the passage of the County's PDR Ordinance. Pittsfield enacted a local PDR Ordinance in 2002, and Ann Arbor Township in 2003. Since then, Scio and Webster Townships have also adopted PDR ordinances. Estimated costs are unknown.

The Comprehensive Plan

This tool can help to preserve open land and protect the tributary watersheds, by discouraging residential development outside of sewer, water, and road infrastructure, preventing sprawl development. Through new agricultural preservation zoning, open space in planned unit developments, and recreation-conservation zoning, future illicit discharges can be decreased. The project is ongoing, running from August 2002 forward. Several townships have developed or updated comprehensive master plans to address development issues. The cost to update the plan for Pittsfield Charter Township was \$100,000 and over 200 hours of work invested by staff. The cost of maintaining the update is estimated at \$5,000 per year.

Wetlands Protection Program

This program, consisting of local regulations and incentives, is meant to protect wetlands on one-fifth of an acre or larger, since damaged and destroyed small wetlands cannot provide the services of filtering and cleaning pollutants in storm water. The program will protect numerous wetlands in the Malletts and Swift Run sub-watersheds, thus helping to buffer the Huron River. A model local wetland ordinance is available from HRWC; the Michigan Coastal Zone Management Program requested the ordinance's development.

Those involved are: Pittsfield Charter Township (with specific involvement by ordinance enforcement officers, Pittsfield Natural Resources Commission, property owners who register for stewardship benefits, and volunteer stewards) the City of Ann Arbor, Scio Township and Ann Arbor Charter Township. Under the Pittsfield program, stewardship incentives will be announced on an annual basis, with the eventual goal of enrolling all wetlands owners and restoring and improving the health of township wetlands. This program began in the spring of 2003 and continues. Cost of ordinance development was approximately \$15,000 in staff and legal time. Pittsfield Township budgeted \$1,200 for program start up.

Other Ordinance Development

Ann Arbor Charter Township addressed wetlands protection along with open space, reducing parking and road requirements, and natural features buffer areas. Implementing the recommendations of the 1999 Washtenaw County Drain Commissioner Study was estimated to cost \$5,000.

Pittsfield Charter Township developed a Natural Features Ordinance to protect trees, native landscapes, and significant wildlife habitat, and a Storm Water Management/Surface Water Quality Ordinance to prevent nonpoint sources of pollution and reduce impervious surface.

Efforts to Reduce *E. coli* by Treatment

Site Design for Malletts Creek Regional Detention – Completed

This program will redesign the flood control structure to improve water quality treatment at Malletts Creek and to improve habitat. The new design is expected to significantly reduce bacteria (see http://pub.epa.gov/npdes/stormwater/menuofbmps/post_27.cfm for more information). The construction will take place between 2006 and 2007, based on available funds. Those involved are: Washtenaw County, the City of Ann Arbor, Pittsfield Charter Township, Huron River Watershed Council, and MDEQ. This activity is a one-time occurrence. Pre and post construction water quality sampling will occur. Estimated cost of design is \$250,000 and the estimated cost of construction is \$3.4 million.

Rules and Ordinances for Storm Water Management

This program helps reduce the *E. coli* count of surface water by preventing flooding, controlling flow, treating storm water, and discouraging geese by using native landscape buffers near waterways and ponds. Additionally, this program is meant to revise existing storm water management ordinances to meet required design standards of the Washtenaw County Drain Commissioner. This program was implemented by detaining the first flush for a 24-hour period, thus reducing bacteria count. Revised rules are currently in final draft form and will require infiltration of first flush. The Rules of the Water Resources Commissioner are revised roughly every 2 years. The next revision of the Rules will be completed by 2012. All Phase II permitted entities have adopted stormwater ordinances which refer to the Water Resources Commission stormwater standards.

Overcoming Barriers and Closing Gaps

As framed by the terms of the TMDL, the ultimate measure of implementation success will be documented changes in water quality, showing improvement over time. However, potential barriers to this accomplishment exist and must be considered in implementation planning.

Positive feedback from even the most diligent efforts may be several years in the future due to the lead time needed to implement best management practices throughout the watershed. Participants must set realistic expectations about the amount of time needed to continue identified programs while awaiting positive results. Otherwise, impatience, discouragement, or competition for limited local funding could lead to discontinuation of effective programs. Prompt communication of small successes through news releases, web sites, and community newsletters will be important to encourage the continued efforts of TMDL partner communities.

The tracking of quantitative results over time carries a set of technical and logistical challenges. Variation in weather patterns over the years of a study adds to the complexity of trend analysis of the data. Collecting correctly timed wet weather samples is particularly daunting, as personnel may not be available during a particular major summer storm occurring outside of business hours. Over the past 3 years, the HRWC has begun wet weather/storm event sampling, deploying autosamplers programmed to take water samples tailored to the predicted length of the storm event. Capturing storm events is often challenging, however the HRWC has had considerable success in collecting this data to gain a better understanding of the impact of stormwater runoff on pollutant concentrations in the tributaries contributing to the stretch of the Huron River where the TMDL is designated.

Over the past several years, there have been significant advances in source identification for *E. coli* pollution via DNA testing. The ‘bacteria source tracking’ (BST) methods have been successfully used in Michigan and other states to identify species-specific sources of bacteria, such as human, dog, cat, Canada goose and raccoon that contribute to elevated concentration of *E. coli* observed in streams and rivers. With this diagnostic capability we will be able to better direct our efforts to reduce the specific sources of *E. coli* contamination in the contributing waters of the Huron River.

There are also gaps in our knowledge of bacterial survival and reproduction under conditions found in yards, parks, ditches, and ponds. For example, requiring a certain number of hours of onsite retention for storm water runoff is thought to guarantee that live *E. coli* bacteria will not escape and reproduce elsewhere. This has been established elsewhere. A systematic study of real world conditions to detail the effectiveness of retention, infiltration, and other strategies for control of bacteria, would further our confidence in, and understanding of, these control measures. Our knowledge gap has begun to close with a recent laboratory study conducted simulating urban stormwater runoff conveyed through conventional bioretention media to investigate the bacteria removal efficiency of this media. It was concluded that bacterial removal could be effective and sustainable, and that indigenous protozoa can facilitate this process. Exploring opportunities with the scientific community, such as this, may prove to be beneficial in finding a workable solution to *E. coli* contamination where the urban sources of the bacteria are difficult to control.

The next few years will provide a challenge to demonstrate that reductions in *E. coli* pollution of the Huron River can be achieved given the difficulty to control general urban sources as demonstrated previously and in other parts of the country. With the current economic downturn restricting government and institutional resources, another challenge will be to identify the most cost-effective measures and to continue funding them. Managers and programs will both need to become adaptive, while continuing to appeal to the public's expectation that the waters of our state will attain the standards set forth by Congress through the passage of the Clean Water Act in 1972.



Submergent and emergent aquatic vegetation, including invasive purple loosestrife, proliferates by mid-summer in Geddes Pond, limiting the usability of the waters.

Accountability Structure for Implementation: Participants, Reporting, Timeline, Monitoring, Contingency Plans

The stakeholders for this implementation plan are committed to continued water quality improvement in the Geddes Pond watershed. Those who have taken on this responsibility are:

- Ann Arbor Charter Township
- City of Ann Arbor
- Huron River Watershed Council
- Michigan Department of Environmental Quality
- Pittsfield Charter Township
- University of Michigan, Ann Arbor Campus
- Washtenaw County Water Resources Commission Office
- Washtenaw County Board of Commissioners and Environmental Health Department
- Washtenaw County Environmental Health Department
- Washtenaw County Road Commission

The following units of government will also be subject to the TMDL:

- Michigan Department of Transportation

Lodi, Northfield, Scio, Superior and Ypsilanti townships have negligible land within the contributing basin and are not expected to be involved in plan implementation unless new information indicates potential sources within these areas.

The eight stakeholders listed above are committed to continued water quality improvement in the Geddes Pond contributing area. Toward this end, local governments, the Huron River Watershed Council and the University of Michigan have been conducting a variety of actions, prior to TMDL development, to improve water quality and promote stewardship. Pre-TMDL activities included bio-monitoring, habitat assessment, septic inspection at time of sale, illicit discharge elimination, mass media educational campaigns, development standards, water resources protection ordinances, wetlands protection and wetlands restoration. As demonstrated, many other activities have been established after the original Implementation plan was developed. Many of these actions have involved stakeholder collaboration; others are unique to individual stakeholders and their constituencies. The variety and number of these programs can be seen in detail in Appendix I.

Although a great many ongoing actions to restore water quality and habitat in Geddes Pond are voluntary, each stakeholder has assumed responsibility to continue their efforts, as resources allow and needs dictate. Through initiating and continuing these voluntary actions, each stakeholder has assumed responsibility for a share of water quality restoration in the Huron River Basin. These discretionary programs are dependent on funding, perceived needs, sound and reliable technical assistance, clear regulatory authority, constituent support, and demonstrated effectiveness. Some actions have been required under the permit regulations of the Clean Water Act.

Phase I communities have been under permit since December, 1995. Their permits specify best management practices to achieve water quality improvement, including *E. coli* reduction. Permit renewal applications will continue to include provisions consistent with the Geddes Pond TMDL, such as illicit discharge elimination, and public information and education.

Phase II communities and entities must submit detailed compliance language that must also include provisions consistent with the Geddes Pond *E. coli* TMDL. Phase II communities with Certificates of Coverage are required to submit an approvable plan to comply with all six minimum measures, including provisions consistent with any TMDL affecting the jurisdiction or watershed. The Michigan Department of Transportation, the Washtenaw County Water Resources Commissioner's Office, and public school systems received separate Certificates of Coverage and must meet the same requirements as local governments.

Taken together, these stakeholders have primary land use authority over 97% of the contributing area for the *E. coli* TMDL. Under their storm water permits, these communities and organizations are obligated to develop, implement, and enforce a storm water management program designed to reduce the discharge of pollutants from the drainage system to the "maximum extent practicable," to protect the designated uses of the waters of the state, to protect water quality, and to satisfy the appropriate water quality requirements of state and federal law. Storm water controls designed to attain the goals of the TMDL must be incorporated into the storm water management plan, and each permittee must implement appropriate best management practices to comply with the TMDL implementation plan. Both separately and jointly, through a coordinated public education and involvement strategy, stakeholders will also engage in communication with the public that addresses *E. coli* TMDL problems, solutions, and successes.

Additionally, the permittees are required to submit annual progress reports to the Michigan DEQ which shall contain the following: a description of the status of compliance with general permit conditions, an updated assessment of the water quality conditions within their jurisdiction, a description of identified water quality stresses, and a summary of all information collected and analyzed—including monitoring data. The report must include a summary of upcoming storm water activities and a description of planned changes in BMPs or measurement of goals. The City of Ann Arbor and the University of Michigan must also provide an assessment of the pollution reduction and probable receiving water quality effects associated with the program's implementation.

Since each storm water permit requires annual reporting, and TMDL goals and activities must be incorporated into the measures prescribed by the permit, separate TMDL reporting is unnecessary. In 2007, and at subsequent five-year intervals, the MDEQ is scheduled to complete basin-wide monitoring of the Huron River watershed. Future projects under this implementation plan may incorporate additional monitoring if resources allow. Stakeholders' storm water permit reporting will include an updated assessment of the water quality conditions within their jurisdiction in either narrative or numeric form. The purpose of this update is to show any obvious changes in *E. coli* levels since the previous progress report. Change may be demonstrated by use of data collected by other sources or a group monitoring program.

The partners to this process continue to meet 3-4 times per year as part of a stakeholder group to evaluate progress. This updated plan represents their effort to adapt the original plan to current conditions and knowledge. TMDL stakeholders will review the status of TMDL implementation every five years for continuous improvement opportunities.

Through adaptive management—a process that assesses conditions and trends throughout plan implementation, and provides feedback to stakeholders so that adjustments can be made—this implementation plan is intended to ultimately achieve TMDL compliance. Through the annual meetings of the County Intergovernmental Phase II Coordination Committee, the TMDL Implementation Plan working group will meet to review Phase II compliance plans. The MDEQ will track permit compliance through storm water permit oversight, including monitoring activities that address the TMDL implementation goals. Unless the EPA determines that it is necessary to separate TMDL enforcement from the storm water permit process, enforcement authority will reside in the MDEQ's authority under the provisions of the storm water rules.



Evocative of Monet's painting of Giverny in Normandy, this scene of the Huron River and Geddes Pond illustrates how the river's water quality is a key aesthetic asset for the greater Ann Arbor community.