8. Implementation Roadmap

Introduction

This chapter of the Watershed Management Plan (WMP) details the steps to achieve the goals and objectives for the subwatershed (see Chapter 6). Simply, it is a roadmap to guide implementation of these steps or actions. To facilitate their presentation, the actions have been grouped into the categories used in Chapter 7 (except that 'Stormwater Best Management Practices' has been broken down into two categories – see 5 and 6 below; and 'Monitoring' is discussed in Chapter 9):

1. **Watershed Planning, Institutionalization, and Implementation;**
2. **Public Education and Participation;**
3. **Ordinances, Zoning, and Development Standards;**
4. **Good Housekeeping and Pollution Prevention;**
5. **Stormwater Best Management Practices: Non-Construction Related Soil Erosion and Sediment Control;**
6. **Stormwater Best Management Practices: Other Pollutant Load Reducing Controls;**
7. **Natural Features and Resources Management; and**
8. **Recreation Promotion and Enhancement.**

In order to meet the goals and objectives of the plan, the Subwatershed Advisory Group (SWAG) developed a reasonable schedule that is based on numerous factors including: water quality improvement potential, cost, and projected implementation time. This general schedule is presented in Figure 8-1 on an 'action category' basis. The markers in the timeline (◆) denote implementation milestones (note that not all actions have milestones associated with them).. These milestones are introduced in Figure 8-2. Details for each milestone are discussed further in Chapter 9.

Quotable Quotation

"Anything else you're interested in is not going to happen if you can't breathe the air and drink the water.

Don't sit this one out.

Do something.

You are … alive at an absolutely critical moment in the history of our planet."

- Carl Sagan

Figure 8-1. General schedule.

Short Term	Long Term				
2010	2015	2020	2025	2030	2035
1. Watershed Planning, Institutionalization, and Implementation ◆ ◆ ◆ ◆		◆			
2. Public Education and Participation		◆	◆	◆	
3. Ordinances, Zoning, and Development Standards		◆			
4. Good Housekeeping and Pollution Prevention		◆	◆	◆	
5. Stormwater Best Management Practices: Non-Construction Related Soil Erosion and Sediment Control		◆			
	6. Stormwater Best Management Practices: Other Pollutant Load Reducing Controls		◆		
7. Natural Features and Resources Management		◆		◆	
		8. Recreation Promotion and Enhancement		◆	

Figure 8-2. Implementation milestones.

Action Category	2010	2015	2020	2025
1. Watershed Planning, Institutionalization, and Implementation	2007: Evaluation and Revision Procedure 2007: Update SWPPI 2008: Update WMP 2009: Update SWPPI Reconvene SWAG Implementation Clearinghouse Pollutant Source Identification	Total Maximum Daily Loads		
2. Public Education and Participation	Signage Public Involvement Public Meetings Municipal Officials Education	Municipal Employee Training *(2013)* Demonstration Projects		
3. Ordinances, Zoning, and Development Standards *(all milestones = 2013)*		Stormwater Management Stds. Development Management Preserve Natural Features Pollution Prevention		
4. Good Housekeeping and Pollution Prevention	Sources of Sediment Contaminants Actions to Remediate Contaminated Sediments Trash/Debris Reduction Spill Prevention / Notification / Response	Storm Sewer Maintenance and Operations *(2013)* Pollution from Roads / Lots *(2013)* Pollution from Municipal Facilities *(2013)* Turf Management Practices *(2013)* Waste Management Animal Waste Control Sanitary / Combined Sewer Planning and Maintentance Flood Control Projects Septic System Practices Groundwater		
5. Stormwater Best Management Practices: Non-Construction Related Soil Erosion and Sediment Control		Bare Soil Repair Streambank Stabilization Eroding Road Stabilization Streambank Use Exclusion Sensitive Site Control Structural Controls		
6. Stormwater Best Management Practices: Other			Mitigate Existing Impervious Surfaces Infiltration Techniques Filtration Techniques Vegetative Buffers and Natural Conveyance Retention and Detention	
7. Natural Features and Resources Management	Identify Natural Features		Natural Land Reserves Natural Feature Protection Natural Feature Restoration	
8. Recreation Promotion and Enhancement				Recreation Program Riparian Parks Access Sites Fishing Opportunities Trails / Decks

Appropriateness of Actions

The implementation measures presented in this plan are in accordance with the Water Quality Management Plan (WQMP) for Southeast Michigan which stipulates that actions should at least address:

- constructing pollution and flood control equipment and structures;
- identifying municipal and private sector BMPs;
- identifying project administration and funding; and
- promoting education programs.

Source: SEMCOG, 1999.

Terminology

'Permittees' or **'Phase II Permittees'** are those entities which are covered by a COC under permit MIG619000 and include any nested jurisdictions with a cooperative agreement with a permittee.

'Subwatershed Advisory Group (SWAG) members' are those entities represented and participating in the SWAG and are eligible for grants to implement the appropriate action (a case-by-case basis).

'Other entities' are those present in the subwatershed or with a vested interest in the subwatershed that have not participated as a 'SWAG member' and are eligible for grants to implement the appropriate action (a case-by-case-basis; international organizations are possible examples).

Actions to Achieve Goals and Objectives

This section discusses the individual actions that will be taken to meet the goals and objectives of this plan. As discussed in Chapter 1, this plan was developed to meet the requirements of the National Pollutant Discharge Elimination System (NPDES) Phase II program and General Permit No. MIG619000 (or 'Watershed-based Permit') but also to meet the requirements of a number of funding programs (see Chapter 1). As such, not all of the actions detailed in this chapter are required actions.

Requirements of the Phase II program derive mainly from the 'Watershed-based Permit' language and include actions related to a Public Education Plan (PEP), an Illicit Discharge Elimination Plan (IDEP), development of a WMP containing actions (with permittee commitments) needed to achieve the goals and objectives and evaluation methods, and submittal of Storm Water Pollution Prevention Initiatives (SWPPIs) that contain other specific actions.

Additionally, the Michigan Department of Environmental Quality (MDEQ) has issued Certificates of Coverage (COCs) that indicate dates by which PEPs, IDEPs, WMPs and updates, SWPPIs and updates, and Annual Reports must be submitted.

In order to provide the most robust plan possible, this WMP contains references to most of the aforementioned elements. To distinguish which actions are required and commitable actions of this WMP, consider that:

1) The PEPs and IDEPs have been submitted and are being implemented as of submittal of this WMP. As such, the communities neither modify their existing plans nor commit to additional actions through this WMP, but simply include these as actions in the plan for reference and potential funding above and beyond the existing actions being taken in compliance with the PEPs and IDEPs. Some communities may choose to include PEP and IDEP actions in their SWPPIs;
2) The 'other specific actions' to be included in the SWPPI have been defined as actions in the plan to reduce confusion; and
3) Submittal of the WMP-updates, SWPPIs and updates, and Annual Reports are not SWPPI reportable commitments.

To further clarify the issue, the text in the following sub-sections which gives the details of each action, is abutted by an outlined box that defines which actions are Phase II requirements with supporting discussion.

The bracketed text following each item indicates its short name used in some tables in the plan.

The permittees feel that some elements of even the Phase II required actions may be fundable through various grant programs. For example, the permittees feel that the development of products or programs which are utilized by non-permittee Subwatershed Advisory Group (SWAG) members represented by the WMP, or other non-permittees outside of the subwatershed, can be grant funded, but it is the application of the products or implementation of the program that is the Phase II component.

1 Watershed Planning, Institutionalization, and Implementation

These actions consist of those that are meant to foster the cooperative watershed planning and decision-making approach in both the short and long term between all levels of government and local stakeholders. *The benefit of these actions is the funding, implementation, and long-term institutionalization of the WMP.*

When feasible and appropriate the Subwatershed Advisory Group (SWAG) will attempt to coordinate planning efforts with the groups representing the other subwatersheds in the Clinton River Watershed, and other watershed groups (and their respective subwatershed groups) that the communities of the SWAG are involved with. The focus of coordinating planning efforts can be to consolidate goals and objectives and coordinate actions being taken such that implementation and achievement is streamlined, especially for SWAG members represented by multiple WMPs (e.g. Clinton Township, which is in the R2W, Clinton River East, and North Branch subwatersheds of the Clinton River Watershed, in addition to the Lake St. Clair Direct Drainage and Anchor Bay subwatersheds of the Lake Drainage Watershed).

When feasible and appropriate, the SWAG and its members will utilize planning tools such as Geographic Information Systems (GIS), the Integrated Coastal Management (ICM) tool, the Potential Conservation Area Analysis (GLC, 2004), and those developed through the Clinton River Watershed Initiative (CRWI) – including a hydrological model of the watershed – to guide action implementation and other management decisions with the most up-to-date information and analytical processes.

Planning Levels

Watershed planning occurs on many levels. This is one of many subwatershed plans being prepared throughout the watershed, region, and state. Planning for the entire watershed is occurring through the Remedial Action Plan (RAP) process and cooperation with the Clinton River Watershed Council. Some planning has also occurred for the entire Lake St. Clair Sub-basin.

Benefits of the Actions

The benefits of the actions are given on a category basis. The introductory text for each subsection discussing an action category has italicized text that highlights the benefits of that group of actions.

1-1 Promote and Reconvene Subwatershed Advisory Group [SWAG]

Voluntary Action – dependent on funding

During the four years following submittal of this plan, the SWAG will document the progress of implementing the WMP under the current voluntary and informal organizational structure (see Chapter 9) and will take actions to promote visibility of and encourage increased participation in the SWAG.

Encouraging visibility and increasing participation may include regular e-mail communication with the member entities about the mission and purpose of the SWAG, current news, status of activities, a schedule for upcoming activities, and benefits of membership and may include communication with other interested entities (including business and citizen groups), formal means of communication such as a newsletter, and attendance at relevant meetings

Also during this time, the SWAG will research alternative methods for long-term WMP implementation (as presented in Chapter 10). At the end of this four year period, the SWAG will reconvene for long-term WMP implementation (which may simply be continuing with the current organizational structure), continuing its visibility and participation activities.

Phase II Requirement

The evaluation mechanisms defined in Chapter 9 (that will be included in the ERG) meet the 'Watershed-based Permit' requirement for the WMP to contain *methods for evaluation of progress.*

1-2 Evaluation and Revision Procedure [ERG]

In the year following submittal of the WMP (and its subsequent updates), the SWAG will develop 'Evaluation and Revision Guidance' (ERG) to guide future updates to this WMP (see Action 1-6). The ERG will provide the context for measuring action completion, product and facility usage, and behavioral and pollution-level changes associated with WMP implementation. The ERG will define:

- Monitoring protocols (locations, data, parameters, etc) based on information presented in the WMP;
- Achievement levels to help gauge success;
- Data reporting/submittal requirements, both audience (international, national, state, regional, and local governments, and the public) as well as mechanism (web site, etc);
- Triggers to initiate the evaluation and revision procedure (including the WMP update schedule); and
- Steps to take to complete the evaluation and revision procedure.

The ERG will be based largely on the information presented in Chapter 9, but will be developed in consideration of any conditions that have changed since the plan was submitted.

Voluntary Action – dependent on funding

Importance of the Funding Program

The Funding Program (Action 1-3) is a vastly important mechanism for defining how the WMP-participants will implement the actions defined in this plan. Although not specifically mentioned in the narrative on these pages, referencing the Funding Program to identify potential funding sources is a task that will be required to successfully implement most of the actions in the WMP.

1-3 Develop Funding Program [Funding]

The SWAG will develop a 'Funding Program' that identifies anticipated budget needs and funding sources to help implement the WMP. The Funding Program will define:

- Funding sources for all actions in the plan (including contaminated sediment remediation – which is not technically addressed in the plan, but will benefit the SWAG);
- Funding sources at all appropriate levels (international, federal, state, regional, local, private sector, etc.);
- Program dates, eligibility requirements, and funding levels;
- Advantages and disadvantages of the funding sources,
- Steps to take to procure identified funding; and
- Actions to take with respect to establishing a stormwater utility (e.g. supporting legislation),

The Funding Program will be based largely on Table 8-2, which identifies estimated costs and hours associated with each action, and Tables 8-4 and 8-5, which expand on Table 8-2 to identify potential sources of financial and technical assistance. Chapter 7 may also help identify some valuable resources for action implementation.

The Funding Program should be updated annually such that up-to-date information on grant availability and funding levels is readily available to SWAG members.

1-4 Develop Grant Proposals [Grants]

Grant proposals will be developed and submitted as available and as determined by the SWAG members, utilizing the Funding Program to save time and effort. When feasible, SWAG members will work together to share funding on an action-by-action basis.

Voluntary Action – dependent on funding

1-5 Update SWPPI [Update SWPPI]

Following the submittal of this WMP in 2006, the SWAG will coordinate the revision of the Phase II Permittees' Storm Water Pollution Prevention Initiatives (SWPPIs) or Abbreviated SWPPIs which were submitted on or before November 1, 2005. This coordination may be, in part, in the form of guidance or a template which is developed based on the contents of this plan. The end result of this action will be for every Phase II Permittee to have developed a revised or first full SWPPI (no longer 'Abbreviated'), based in part on information provided to them by the SWAG, and submit it to the MDEQ by May 1, 2007.

Following the submittal of the updated WMP in 2008, the SWAG will assist with the revision of the Phase II Permittees' SWPPIs which were submitted on or before May 1, 2007. This assistance may be, in part, in the form of guidance or a template which is developed based on the contents of the updated plan. The end result of this action will be for every Phase II Permittee to have developed a revised SWPPI, based in part on information provided to them by the SWAG, and submit it to the MDEQ by May 1, 2009.

Phase II Requirement

A SWPPI update based on this WMP is listed in the COC for each permittee.

This action does not have to be addressed in the SWPPI, however.

1-6 Update WMP [Update WMP]

During the second year following submittal of this plan, the SWAG will update this plan in accordance with the ERG (Action 1-2) or prepare a written determination not to update the plan and submit it to MDEQ on or before November 1, 2008.

The plan updates will then continue based on the schedule spelled out by the MDEQ in the reissued Certificates of Coverage under the Watershed-based Permit, expected to be every two to five years.

Phase II Requirement

A WMP update or determination not to update the plan is listed in the COC for each permittee.

This action does not have to be addressed in the SWPPI, however.

1-7 Annual Reports [Annual Reports]

Annually, each Phase II Permittee is required to submit an 'Annual Report' by the date specified in their respective Certificate of Coverage. The report should document all of the decisions, actions, and results performed as part of the Phase II program during the previous year, including: IDEP, PEP, New Point Source Discharges of Stormwater, SWPPI, Other Actions, Nested Drainage System Agreements, and Special Reporting Requirements. Specifics for each category can be found in the Watershed-based Permit text.

The SWAG will coordinate the Annual Reports by providing guidance or a template to each Phase II Permittee and providing necessary information related to actions that have been implemented (see Action 1-2 – the ERP).

Phase II Requirement

Annual Reports are listed in the COC for each permittee.

This action does not have to be addressed in the SWPPI, however.

Phase II Requirement

The 'Watershed-based Permit' language requires listing TMDL *concerns*, *problems*, or *opportunities* and *some actions specific to storm water controls* in the WMP.

The language also requires *that long-term goals … shall include attaining compliance with any TMDL*.

This action ensures that TMDLs are incorporated into the WMP and as such does not have to be addressed in the SWPPI.

However, Phase II actions added to the WMP under this action will likely be included in future SWPPIs.

1-8 Total Maximum Daily Loads [TMDLs]

When a lake or stream does not meet Water Quality Standards (WQS), a study is led by the MDEQ to determine the amount of a pollutant that can be put in a waterbody from point sources and nonpoint sources and still meet WQS. The result of this study is termed a 'Total Maximum Daily Load' (TMDL) and describes how much of a pollutant a lake or stream can assimilate. The SWAG will support the implementation of TMDLs affecting the subwatershed through modifications to the WMP.

The list of scheduled TMDLs for the subwatershed includes:

- 2006 – Red Run Drain and Bear Creek for pathogens (CSOs); and
- 2010 – Clinton River Watershed for PCB WQS exceedances.

The purpose of this action is to ensure that future TMDLs are incorporated to the plan by updating the contents including problems and concerns, goal language, opportunities, and actions.

Voluntary Action – dependent on funding

1-9 Implementation Clearinghouse [Clearinghouse]

In order to efficiently track the implementation of the WMP, to support its evaluation and revision (Action 1-2), and to coordinate the reporting of the Phase II Permittees (Actions 1-5, 1-7, and 1-8), the SWAG will track all programs and activities related to implementation of the WMP.

All SWAG members implementing WMP actions will be responsible for reporting their activities to the SWAG on a quarterly basis, including survey results. The SWAG will log the reported information in accordance with the ERP (Action 1-2). The SWAG may also check with non-SWAG entities to document if any related actions have been implemented.

The SWAG will explore the possibility of using an interactive website where this information can be submitted/ retrieved.

Voluntary Action – dependent on funding

1-10 Identify Sources of Pollutants [Sources]

An integral part of watershed management planning is documenting pollutant sources. This information will form the basis for the implementation of most of the actions of this WMP.

The SWAG will base the identification primarily on the contents of this WMP. The pollutant source identification should also consider studies conducted after this plan is submitted and additional focused work including stakeholder surveys, additional field assessments, and reports from field crews (for which reporting protocols may be developed and adopted). Focus should also be placed on distinguishing wet weather and dry weather sources and their relative contributions.

Pollutant Sources

Consideration should be given to researching new generation pesticides, pharmaceuticals, endocrine disrupters, and other chemicals. Their potential for affecting the subwatershed should be considered.

2 Public Education and Participation

As alluded to in the beginning of this section, public education is a Phase II requirement (based on language of the Watershed-based Permit) and is addressed through each permittee's PEP. Each PEP lays out the approach for informing the public about their role in protecting water quality and preventing stormwater pollution. These PEPs were created with the input of resident, stakeholders, and professionals in the environmental education field, were submitted on May 1, 2004, and are currently being implemented.

However, in seeking to broaden public education activities, include public participation concerns, and leverage potential funding opportunities, the SWAG has included additional actions in this WMP. Again, as the beginning of this section explained, the permittees do not intend these actions to modify their existing PEPs nor commit them to additional actions (under the Phase II program).

In general, the SWAG will rely on the materials and messages of existing educational programs, such as the Clinton River Watershed Council (CRWC), the Southeast Michigan Council of Governments (SEMCOG) or the state, to educate and engage the public.

The text in the following subsections describes actions to be taken in the public education and participation realm. *The benefit of these actions is the increase in public and municipal staff knowledge and awareness to facilitate the paradigm shift needed to change adverse behavior affecting the watershed.*

2-1 Public Education Plan Implementation [PEP]

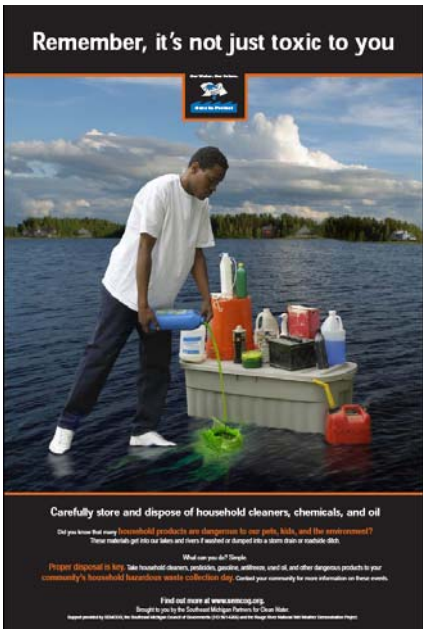
The PEPs contain numerous actions that are currently being implemented by SWAG entities. Most of this implementation is contracted with the CRWC or provided by SEMCOG (in support of its member communities), but some entities are engaged in their own or additional implementation. Many of these actions support the goals and objectives of this WMP and, as such, this action is included for reference.

The general components of the PEPs are listed in Chapter 4. A brief summary of these components includes:

- Community Education – consisting of watershed stewardship, stormwater system knowledge, illicit discharge program, personal actions impacting water quality, waste management / dumping, and riparian land management; and
- Youth Education – consisting of the community education components repackaged for students, other programs, experiments and activities, and lesson plans / info for teachers.

The limited summary given above is not comprehensive. Some of the permittees may include components of the following actions in their PEP.

Example of Public Education Materials



Courtesy of SEMCOG.

Phase II Requirement

The PEPs are currently being implemented outside of this WMP.

Reporting is currently done in the Annual Reports for each permittee.

Inclusion in the SWPPI is an option and is not required.

Voluntary Action – dependent on funding – unless included in PEP

Potential Targets for Business Education

Potential targets for business education include, but are not limited to:

- Marine-related businesses;
- Automotive maintenance centers;
- Restaurants;
- Junk yards;
- Golf courses; and
- Lawn care providers.

Phase II Requirement

The 'Watershed-based Permit' language requires that the SWPPI include *a training and inspection program for staff and contractors*.

2-2 Additional Public Education [Public Ed.]

Additional activities and messages not included in an individual PEP may be considered for implementation by the SWAG or its constituent members. Where not part of an implementing entity's PEP, these actions may be eligible for grant funding:

- Additional Community Education – such as habitat conservation and restoration, native and invasive wildlife management, dissemination of planning and water quality information, registered watercraft owner information, recreation education, and a rain garden awareness program; and
- Business Education – including how facilities and operations affect stormwater, pollution prevention activities to minimize this potential, environmentally-friendly construction, new ordinance details, and environmental audit assistance.

2-3 Municipal Employee Training [Municipal Train.]

Municipal employee training refers to keeping staff, both in-house and contracted, aware of how their actions affect stormwater. While many different departments affect stormwater in some way, a key department is the maintenance department. Maintenance staff maintain fleet vehicles, store chemicals, sweep streets, clean catch basins, conduct lawn care, maintain dumpsters, dispose of solid waste, and de-ice the roads. If not done correctly or regularly, these activities can have an adverse affect on stormwater.

Each permittee will ensure the appropriate amount of training is attained by each staff member with the potential to directly impact stormwater runoff. Mainly, this training will be provided by SWAG entities other than the individual communities, such as SEMCOG or county-level governments.

2-4 Demonstration Projects [Demos]

Voluntary Action – dependent on funding

Supporting demonstration projects for stormwater management at new developments or redevelopments will help the community, including municipal officials, developers, planners, residents, and businesses, understand how stormwater management techniques can be incorporated into the community. Developers may be more open to non-traditional techniques if they see that the techniques are successful or other incentives are provided. Demonstration projects will be chosen based on their minimization of impact to the environment, visibility, innovation, coordination with developer, and cost. Examples of demonstration projects include green roofs, pervious pavement parking lots, zero discharge development, residential rain gardens, and cluster development. Developers should be approached early in the project planning phase to incorporate low impact design techniques.

2-5 Signage [Signage]

Voluntary Action – dependent on funding – unless included in PEP

Educational signage refers to educating the public about specific issues through the use of signs placed strategically throughout the subwatershed. Examples of possible sign uses include:

- to mark watershed boundaries;
- to mark wellhead protection boundaries;
- to point out tips and directives at recreation areas such as "No Dumping" or "Don't Feed the Geese";
- to indicate times, at beaches, when it may not be safe to participate in water-based activities due to the presence of pathogens may reduce the risk of sickness; and
- to provide water quality, vegetation, and wildlife protection tips at boat launches.

Watershed Sign

Courtesy of SEMCOG

2-6 Public Involvement [Involvement]

Voluntary Action – dependent on funding – unless included in PEP

WMP-participant support of volunteer-based watershed programs helps increase the public's involvement and subsequent awareness of watershed issues. Examples of public involvement programs that the SWAG may initiate or leverage to foster watershed stewardship and disseminate public education materials include adopt-a-road, adopt-a-river, children's water festival, water reuse rally, community focus/planning groups, storm drain marking/door hanger programs, clean-up days, and data collection (water quality, frog and toads, benthic macroinvertebrates).

Voluntary Action – dependent on funding – unless included in PEP

2-7 Community Forums and Stakeholder Workshops [Meetings]

Community forums and stakeholder workshops provide a means to mold the ever-evolving WMP. It is critical to have community input in order for the watershed to work together as a whole toward the common goal of protecting and restoring the watershed. Public forums and stakeholder workshops were held to develop this WMP and may continue to be held periodically to keep the public informed and involved. Forums and workshops may include a report on progress made towards achieving the goals and objectives of the plan.

Voluntary Action – dependent on funding – unless included in PEP

2-8 Municipal Officials' Involvement and Education [Officials]

Involving and educating municipal officials (mayors, city/village councils, township trustees, department heads, zoning boards, planning commissions, etc.) on the existence, reason for, and contents of the WMP is essential to successful implementation of many of the actions.

Municipal officials may become involved by participating in workshops, demonstration projects, and public speaking engagements on community stormwater issues. Information can also be passed on to officials through letters, informational packets, and meetings. Educational topics may include:

- best management practices and standards that can be used to promote sustainability in the community and reduce point and nonpoint source pollution;
- model ordinances and information on existing programs that provide technical and cost-share assistance;
- techniques for reviewing each development project for water quality impacts and a fair mechanism for rejecting those that would adversely affect water quality (e.g. violate water quality standards); and
- stormwater-related and other curricula to get feedback on adopting a standard curriculum into the school districts.

3 Ordinances, Zoning, and Development Standards

These actions consist of those that require administrative measures by the implementing agency and potentially a program supporting implementation. *The benefit of these actions is an improvement in surface water and groundwater quality through the prevention or minimization of the effects of urbanization or other pollutant sources.*

The Phase II Permittees are required to implement some combination of elements because the Watershed-based Permit requires:

> "The development, implementation, and enforcement of a comprehensive stormwater management program for post-construction controls for areas of new development and significant redevelopment. The goal is to protect the designated uses in the receiving water from the effects commonly associated with urbanization.
>
> The permittee shall evaluate and implement site appropriate, cost-effective structural and nonstructural BMPs that prevent or minimize the impacts on water quality. Common controls for urbanization include: policies and ordinances to direct growth to identified areas, to limit the rate and volume of stormwater discharged to pre-development hydrologic levels, to protect sensitive areas such as wetlands and riparian areas, and to maintain or increase open spaces; encouraging infill development in higher density urban areas and areas with existing infrastructure; establishing in-stream maximum flow targets designed to minimize streambank erosion and maintain healthy aquatic populations; and coordinating release volumes and rates from detention basins to achieve in-stream maximum flow targets."

The implementation of these actions, including development of ordinances, zoning changes, and development standards, will be coordinated with appropriate stakeholders, such as the Michigan Townships Association (MTA), planners, developers and homebuilders, and realtors to find incentives for developers to implement non-traditional stormwater management techniques. This coordination may be in the form of a roundtable discussion.

Implementing the following actions may include the development of design manuals containing:

- standards;
- inspection requirements;
- maintenance requirements;
- pollutant removal efficiencies for the different practices that developers can consider for to meet stormwater standards;
- site layout requirements; and
- natural features protection.

Recommended Implementation Approach

MDEQ personnel have indicated that they would like to see the appropriate entities in the subwatershed begin implementation of the actions in this category by conducting an internal review of programs and ordinances within two years of submitting this plan. The focus of the review should be to determine which ordinances support the actions in this category and what new ordinances or changes to existing ordinances are necessary to successfully implement these actions.

Phase II Requirement

The 'Watershed-based Permit' requires a comprehensive stormwater management program … for areas of new development and significant redevelopment.

This action will be tailored, as appropriate, for permittees in all settings, both urban and suburban.

This action is also desirable for implementation in rural (non-permittee) areas to minimize mitigation efforts in the future.

3-1 Stormwater Management Standards [Standards]

Because of the varying characteristics of the permittees in the subwatershed, they require a wide range of options to meet this Phase II requirement. Options that may be considered include:

- Discharge Limitations:
  - Of pollutant levels in runoff water (i.e. suspended solids, phosphorus, pathogens); and
  - Of peak flow rates and total runoff volume (i.e. limiting to pre-development levels);
- Infiltration Requirements:
  - Of total volume or percentage of site;
- Impervious Surface Limitations:
  - Of overall site imperviousness (i.e. road widths, cul-de-sacs, parking lots); and
  - Of directly connected impervious areas; and
- Natural Drainage Patterns:
  - Through minimization of site disturbance to retain natural topography;
  - Through restricting slopes to encourage sheet flow; &
  - Through preserving or reintroducing open channel conveyance with natural channel shapes and meanders.

This action is meant to allow both prescriptive and non-prescriptive approaches in combination. For example, some situations may require certain BMPs while others may require any combination of BMPs to achieve certain targets or limitations.

Phase II Requirement

The 'Watershed-based Permit' requires a comprehensive stormwater management program … for areas of new development and significant redevelopment.

This tailor-able action is most appropriate for permittees in settings that have developable land, but is available as an option to all permittees to control redevelopment.

This action is also desirable for implementation in rural (non-permittee) areas to minimize mitigation efforts in the future.

3-2 Managing Development Patterns [Development]

Because of the varying characteristics of the permittees in the subwatershed, they require a wide range of options to meet this Phase II requirement. Options that may be considered include:

- encouraging infill and redevelopment (i.e. relaxing frontage and setback requirements);
- encouraging open space in development and redevelopment projects;
- implementing a site plan and review process;
- restricting the construction of private roads;
- restricting development in the 100-year floodplain;
- setting large minimum lot sizes for development;
- requiring cluster development;
- incorporating above and other measures into existing land use / master plans and zoning; and
- developing these if they don't currently exist.

3-3 Preserve Natural Areas / Features [Natural Features]

Because of the varying features of the permittees in the subwatershed, this action, or components thereof, may not be applicable. However, there are a wide range of features to protect and many considerations to make for their protection.

Features to be protected may include: wetlands, waterbodies, riparian areas, headwater areas, groundwater recharge areas, forested areas, and habitat areas.

Measures for their protection may include:

- no net loss policies;
- restricting alteration of these areas (e.g. limiting road crossings);
- restricting disruptive or soil disturbing uses in or near protected areas;
- encouraging their connection to adjacent natural and undeveloped areas; and
- setback ordinances restricting development and significant maintenance from occurring within a specified buffer zone,

Stronger measures will specifically reference those known existing areas and features in need of protection and identify opportunities for including features in large-scale green infrastructure systems. Consideration should be given for the use of some of these areas as passive parks to increase support for action.

Phase II Requirement

The 'Watershed-based Permit' requires a comprehensive stormwater management program … for areas of new development and significant redevelopment.

This tailor-able action is most appropriate for permittees in suburban settings that have natural features, but is available as an option to all permittees.

This action is also desirable for implementation in rural (non-permittee) areas to minimize mitigation efforts in the future.

Other types of legal-based mechanisms the SWAG may be pursuing are those to prevent pollution from activities as opposed to land types.

3-4 Pollution Prevention Ordinances / Programs [Prevention]

Generally, these are not Phase II requirements. However, permittees may opt to use this action to support Phase II actions listed under Action Category 4 'Good Housekeeping and Pollution Prevention'. As such, some permittees may construe implementation of mechanisms under this action as components of, or in lieu of, some Action Category 4 Phase II requirements.

Voluntary Action – dependent on funding – unless indicated as a component of, or in lieu of, a Phase II requirement in Action Category 4

Ordinances or programs that may be considered include:

- Requirements for the maintenance and disposal of wastes from private stormwater infrastructure;
- Requirements for private pavement (e.g. roads, lots) cleaning methods, cleaning schedules, and the disposal of wastes;
- Requirements for the restriction of phosphorus in fertilizers and the proper use of pesticides, herbicides, and fertilizers, including proper disposal of excess product;
- Requirements for waste management at vehicle service stations;
- Requirements for materials storage, spill prevention, and cleanup;
- Requirements for the use and maintenance of dumpsters;
- Requirements for proper solid waste management, including prohibitions against illegal dumping;
- Requirements for proper yard waste disposal; and
- Requirements for septic systems, including: site standards (e.g. exclusion areas, lot size requirements, setbacks), performance standards, point-of-sale inspections, and annual licensing based on proof of inspection.

Strong ordinances and programs will also address enforcement of the requirements.

4 Good Housekeeping and Pollution Prevention[1]

These actions consist of those that the SWAG members may take with respect to their facilities and encourage with respect to their employees, citizens, and other stakeholders. The purpose of good housekeeping and pollution prevention is to reduce the generation of pollutants and prevent those that have been generated from reaching environmentally sensitive areas, including waterbodies. *The benefit of good housekeeping and pollution prevention is the improvement of surface water and groundwater quality by minimizing the impacts of pollution generating activities.*

Some of these actions are Phase II requirements as the Watershed-based Permit requires:

> "The submission of the SWPPI (Stormwater Pollution Prevention Initiative) shall, at a minimum, include…the evaluation and implementation of pollution prevention and good housekeeping activities, as appropriate. This item shall include a training and inspection program for staff and contractors employed by the permittee in activities that may affect stormwater runoff. The permittee shall include the following activities for inclusion in the SWPPI, or explain why the activities do not apply: maintenance activities, maintenance schedules, and inspection procedures for stormwater structural controls to reduce pollutants (including floatables) in discharges from the permittee's separate stormwater drainage system; controls for reducing or eliminating the discharges of pollutants from streets, roads, highways, parking lots, and maintenance garages; procedures for the proper disposal of operation and maintenance waste from the separate stormwater drainage system (dredge spoil, accumulated sediments, floatables, and other debris); ways to ensure that flood management projects assess the impacts on the water quality of the receiving waters and, whenever possible, examine water quantity structures for incorporation of additional water quality protection devices or practices; and implementation of controls to reduce the discharge of pollutants related to application of pesticides, herbicides, and fertilizers applied in the permittee's regulated area."

[1] The definition of pollution prevention used in this plan is that which is used in the Watershed-based Permit language. Other programs utilize different definitions and this is important to consider, especially when applying for pollution prevention grants.

4-1 Identify Sources of Sediment Contaminants [Sed. Sources]

Voluntary Action – dependent on funding

An objective of this WMP is to select and implement pollution prevention activities for current and future sources of sediment contamination. This action embodies the first step in that process: identifying the sources. To accomplish this, the SWAG may take the following steps:

- Reference the WMP and additional sources to identify all sediment contaminants present in the subwatershed;
- Review the WMP, scientific literature, a survey of stakeholders, and visual assessments to generate a list of sources and their respective locations, including Part 201 sites and 'Superfund' sites; and
- Generate a document, and/or database, that summarize this information. These may feed into the decision-making process for implementing the remaining pollution prevention and good housekeeping actions (4-2 through 4-15) such that the current and future sources of sediment contamination are considered.

4-2 Identify Actions to Remediate Contaminated Sediments [Remediation]

Voluntary Action – dependent on funding

Where sediment contamination exists, it is desired to identify clean-up opportunities that are cost effective and non-threatening to the environment (in terms of contaminant re-suspension). Building on the identification of sediment contaminants performed in Action 4-1, research may be conducted to identify existing and emerging technologies to remediate the sediment. This information will be provided to SWAG members, along with identified funding opportunities (see the Funding Program – Action 1-3), for them to explore the possibility of implementing remediation activities and obtaining funding for such (as the actual implementation of such activities is outside of the scope of this plan).

4-3 Storm Sewer System Maintenance and Operations [Storm Sewer]

Phase II Requirement

The 'Watershed-based Permit' language requires that the SWPPI include *maintenance activities, maintenance schedules, and inspection procedures for stormwater structural controls* and *procedures for the proper disposal of operation and maintenance waste from the separate stormwater drainage system.*

Committing permittees will define procedures to ensure that inspection, maintenance, and cleaning of the storm sewer system are done in such a manner that pollutant discharges from the system are minimized. Additionally, the procedures will include provisions for the proper disposal of wastes generated from these activities.

The procedures may include:

- implementation of an optimized catch basin and BMP cleaning schedule;
- a program that disconnects any downspouts which are directly connected to the storm sewer system and reroutes them to discharge onto pervious or vegetated areas;
- an asset inventory to ensure that all infrastructure is accounted for and documented; and
- a labeling program for the storm sewer infrastructure to ensure accurate field work and cross-referencing with an asset management database.

Phase II Requirement

The 'Watershed-based Permit' language requires that the SWPPI include *controls for reducing or eliminating the discharges of pollutants from streets, roads, highways, parking lots….*

4-4 Minimizing Pollution from Roads and Lots [Roads / Lots]

Committing permittees will define procedures to ensure that the discharges of pollutants from streets, roads, highways, and parking lots are minimized.

The procedures may include:

- proper design, construction, maintenance, and reconstruction of roads, utilities, and their waterbody crossings (including proper materials handling/disposal);
- an optimized street and parking lot sweeping schedule;
- an optimized street and parking lot sweeping protocol (e.g. wet instead of dry to minimize wind transport);
- an optimized pavement de-icing protocol;
- an optimized fire hydrant flushing protocol; and
- consideration of structural BMPs, as necessary.

Phase II Requirement

The 'Watershed-based Permit' language requires that the SWPPI include *controls for reducing or eliminating the discharges of pollutants from … maintenance garages.*

4-5 Minimizing Pollution from Municipal Facilities [Garages]

Committing permittees will define procedures to ensure that the discharge of pollutants from maintenance garages is minimized.

The procedures may include:

- vehicle fleet management requirements (e.g. purchasing requirements, non-polluting service areas, washing vehicles in proper locations);
- materials storage and spill prevention requirements; and
- consideration of structural BMPs, as necessary.

Phase II Requirement

The 'Watershed-based Permit' language requires that the SWPPI include *controls to reduce the discharge of pollutants related to application of pesticides, herbicides, and fertilizers…*

4-6 Turf Management Practices [Turf Practices]

Committing permittees will define procedures to ensure that the discharge of pollutants such as pesticides, herbicides, and fertilizers from turf areas is minimized.

The procedures may include:

- restrictions on the types and amount of fertilizers, pesticides, and herbicides that can be used;
- proper training and certification for pesticide applicators;
- optimum watering protocols;
- optimum mowing protocols; and
- standards and incentives to accelerate the planting of trees on both public and private lands.

Voluntary Action – dependent on funding

4-7 Waste Management [Waste]

One component of waste management is managing solid waste. SWAG members may choose to implement new or augment existing programs, including:

- A recycling program (e.g. curb-side collection & drop-off);
- A hazardous waste management program (e.g. household hazardous waste collection, electronics drop-off, oil and grease collection, mercury thermometer exchange;
- A dumpster management program that ensures that all trash is inside the dumpster, it is covered, and that it is not discharging contaminated stormwater;
- A yard waste collection/management program (e.g. curb-side collection & drop-off; composting and reuse/selling);
- Support of legislative efforts to reduce pollutant discharges, especially those of concern in the subwatershed, from all sources including air emissions; &
- Regular evaluation of MDEQ data related to point sources.

Solid Waste Management Plans

When implementing this action, entities will have to follow the rules defined by any Solid Waste Management Plan that may apply.

4-8 Animal Waste Control [Animal Waste]

Voluntary Action – dependent on funding

Animal waste has the potential to contribute to pathogen and nutrient contamination of waterbodies. In order to minimize this potential, the SWAG members may choose to implement new or augment existing programs, including:

- Evaluating the impacts of animals (wild and pet) on *E. coli* levels in waterbodies and developing/participating in a regional bacterial source tracking system;
- Requiring the collection and proper disposal of pet wastes;
- Identifying areas where wild animal populations (e.g. geese) contribute to waterbody contamination and prescribing the appropriate measures to deter animals from congregating; and
- Defining and promoting pet run areas away from waterbodies where feasible.

4-9 Sanitary and Combined Sewer System Planning and Maintenance [San. Sewer]

Voluntary Action – dependent on funding

Planning and maintenance of sanitary and combined sewers is critical in preventing the occurrence of sanitary sewer overflows (SSOs) and combined sewer overflows (CSOs). There are a number of considerations to make in this realm, including:

- Giving high priority to connecting areas of septic service, particularly those areas causing documented problems;
- Ensuring proper plant capacities and interceptor capacities;
- Replacing failing system components;
- Constructing facilities or implementing programs to prevent the occurrence of CSOs, SSOs, and basement backups (e.g. infiltration and inflow programs including downspout disconnection);
- Improving municipal and industrial pretreatment programs (e.g. reduced pollutant concentrations, reduced flows – provides offset capacity for service expansion);
- Defining of future service areas or to guide development and preserve natural areas; and
- Employing operating and maintenance procedures that minimize the generation and discharge of pollutants.

SWAG members may choose to directly address some of these considerations. However, in many cases, the SWAG members may have little direct influence on the decision-making process and must rely on expressing these concerns as recommendations to the appropriate entities.

Phase II Requirement

The 'Watershed-based Permit' language requires that the SWPPI includes *ways to ensure that flood management projects assess the impacts on the water quality of the receiving waters and, whenever possible, examine water quantity structures for incorporation of additional water quality protection devices or practices.*

4-10 Flood Control Projects [Flood]

Committing permittees will define mechanisms for assessing the impacts of flood management projects on water quality and examining water quantity structures for incorporation of additional water quality protection devices or practices.

The mechanisms may include:

- Making recommendations to other entities engaging in flood control management to report the impacts on water quality; and
- Instituting a program to examine water quantity structures under the permittee's jurisdiction, developing a prioritized program to retrofit these structures, and implementing the prioritized program.

Phase II Requirement

The IDEPs are currently being implemented outside of this WMP.

Reporting is currently done in the Annual Reports for each permittee.

Inclusion in the SWPPI is an option and is not required.

IDEP Hotline Numbers

Macomb County 877 679 4337

Oakland County 248 858 0931

4-11 Illicit Discharge Elimination Plan Implementation [IDEP]

The IDEPs contain numerous activities for identifying and correcting illicit connections that are currently being implemented by SWAG entities. This action supports the goals and objectives of this WMP and, as such, this action is included for reference.

The IDEPs contain at least some of the following characteristics:

- dry weather screening of outfalls into waters of the state;
- dye testing municipal facilities, including swimming pools;
- provisions for determining the source and responsibility of the discharge, and ownership and maintenance of the sewer system and drains;
- an integration of outfall inspections and reporting during routine field operations;
- a 24-hour hotline that provides the public an immediate mechanism to report any water quality issues; and
- updates to outfall location maps, when appropriate.

Permittees may wish to implement additional related activities that are not included as part of their IDEP. Non-permittee SWAG members may also wish to implement some of these listed, or unlisted, activities. Where not part of an implementing entity's IDEP, or in the case of non-permittees, these activities may be eligible for grant funding.

An additional consideration for funding is expanding the scope of the hotlines to be used for: 1) documenting violations of natural features protection (i.e. dumping, tree removal); 2) reporting recreational hazards such as log jams; and 3) providing information for those residents wishing to become more involved or participate in pollution prevention and conservation activities.

4-12 Septic System Practices [Septic]

Voluntary Action – dependent on funding

The SWAG and/or its members may develop a program to minimize pollutant discharges from:

- single and two family residential septic systems;
- commercial and small community septic systems discharging up to 10,000 gallons per day; and
- other On-site Sewage Disposal Systems (OSDS), as appropriate.

In Michigan, the local health departments, with autonomous sanitary codes, are the primary regulators for single and two family residential septic systems. Commercial and small community septic systems discharging up to 10,000 gallons per day fall under the "Michigan Criteria for Subsurface Sewage Disposal". This statewide document is carried out by the local health departments under certification by the MDEQ.

Septic system practices to be implemented may include:

- Technical assistance (clustering systems, maintenance education, maintenance districts, leaching chambers, siting, etc.);
- Inspections (point-of-sale, annual licensing, performance level, identification of failing systems, etc.);
- Enforcement (correction of problems, maintenance checks, etc.);
- Recommendations for alternative technologies in areas where septic systems and sewers are not highly feasible sewage disposal methods; and
- Incentives for septage transfer stations and convenient disposal facilities.

The proper implementation of this action may require revisions to the local health or sanitary code in addition to other legal-based mechanisms.

4-13 Trash/Debris Reduction [Trash]

Voluntary Action – dependent on funding

The SWAG and/or its members may develop a program to identify sites that have excessive trash and debris and to prioritize these sites.

This program may include procedures for removing the trash and debris and will be coordinated with volunteer activities conducted under Action 2-6 (e.g, Adopt-A-Road, Adopt-A-River).

Additionally, measures may be instituted to ensure that all events which result in excessive trash, such as festivals and street fairs, are coordinated with the appropriate O&M Departments.

4-14 Spill Prevention / Notification / Response [Spills]

Voluntary Action – dependent on funding

The SWAG and/or its members may develop a spill prevention, notification, and response program which may include assistance with investigation of major spills to waterways, fish kills and other emergency water quality issues.

Voluntary Action – dependent on funding

Abandoned Well Issues

It has been recommended that entities wishing to locate and close abandoned wells should involve the county health department. In many cases, it is their responsibility to ensure that abandoned wells are sealed.

Municipal authorities can encourage formal abandonment by requiring cross-connection installation and testing for wells that may remain active after buildings are connected to municipal water supplies.

Source: Mair, 2006.

4-15 Groundwater [Groundwater]

The SWAG and/or its members may develop a program to prevent the pollution of groundwater and ensure that levels are maintained by ensuring proper recharge and restricting overuse. Components of such a program may include:

- A groundwater inventory to identify areas of groundwater recharge and vulnerable areas, as well as their proximity to potentially polluting activities or land uses. This assessment may consider the needs of future developing areas;
- Wellhead protection areas may be delineated based on the results of the inventory and signage erected to identify the areas. The development of wellhead protection plans may be considered, and if pursued, may be coordinated with the MDEQ's Water Wellhead Protection Program; and
- An abandoned well locating, inspection, and closure program may be implemented. This may include supporting legislation to increase regulatory control at the state and local level thus making the process more cost-effective.

5 Stormwater Management Best Management Practices: Non-Construction-Related Soil Erosion and Sediment Control

These actions are generally those that can be implemented to begin the process of achieving pollutant loading reductions in the short term, extending into the long term. These actions consist of those specifically targeted to prevent soil erosion, control sediment from non-point sources or potential point sources, and correct known soil erosion problems. Early implementation of these actions should focus on public lands, with long-term implementation including private lands if necessary. *These actions benefit surface water quality by identifying areas of significant soil erosion and utilizing controls to prevent or minimize sediment discharge to waterbodies.*

Specific sources to identify include:

- Bare soil areas;
- Streambank erosion areas;
- Road erosion areas;
- Problematic uses within the riparian corridor;
- Specific sites potentially generating considerable amounts of pollution (i.e., landscape supply companies, landfills, quarries, concrete suppliers, etc.);
- Wind erosion areas;
- Other areas requiring structural controls; and
- Agricultural areas generating pollution.

It is noted that construction-related soil erosion and sediment control is a recognized potential source of sediment; however this source is addressed through other permit programs and is not a component of this plan. SWAG members wishing to address this source should explore becoming involved in the authorizing and enforcing hierarchy regulated by the MDEQ (refer to Chapter 7 for additional discussion on this topic).

5-1 Bare Soil Repair [Bare Soil]

Voluntary Action – dependent on funding

Areas of bare soil have the potential to erode and load sediment into waterbodies. The most problematic bare soil areas are those near waterbodies or those near impervious surfaces. The SWAG and/or its members may take the following steps to repair bare soil areas:

- Utilizing the pollutant source identification (Action 1-10), repair soil problem areas on public land and contact private landowners to encourage repair;
- Researching the possibility for instituting corrective action on private lands through various enforcement mechanisms; and
- Implementing enforcement mechanism if possible, and correct bare soil problems on private lands.

Efforts to repair bare soil include grass or native vegetation planting and sod placement or the use of containing structures, retaining walls, or terracing. Steep slopes which contribute to the problem may be mitigated with stabilization structures, including vegetation, and grade breaks.

Voluntary Action – dependent on funding

5-2 Streambank / Shoreline Stabilization [Stabilization]

Streambank and outfall erosion are of critical concern because the eroded soil directly enters a waterbody. The SWAG and/or its members may take the following steps to stabilize streambanks:

- If seeking funding for streambank stabilization, obtain documentation that stream hydraulics will not cause the problem to re-emerge (an MDEQ requirement);
- Utilizing the pollutant source identification (Action 1-10), repair eroding streambanks in accessible locations; and
- Seek access to problematic locations through interactions with appropriate stakeholders and repair streambanks when access issues are resolved.

Voluntary Action – dependent on funding

5-3 Road and Ditch Stabilization [Roads]

Road and ditch erosion is of critical concern because the eroded soil may directly enter the storm sewer system or a nearby waterbody (through runoff or by wind action) and may also cause a public safety concern. The SWAG and/or its members may take the following steps to stabilize roads and ditches:

- Utilizing the pollutant source identification (Action 1-10), repair failing paved roads, pave or stabilize dirt roads, and stabilize ditches and embankments on public land and contact private landowners to encourage repair;
- Researching the possibility for instituting corrective action on private lands through various enforcement mechanisms; and
- Implementing enforcement mechanism if possible, and correct eroding roads and ditches on private lands.

Voluntary Action – dependent on funding

5-4 Streambank Use Exclusion [Use Exclusion]

Certain activities in the riparian corridor may exacerbate soil erosion problems. These may include ad hoc walking trails too near a waterbody (as opposed to planned and properly constructed trails). The SWAG and/or its members may consider the following to exclude problematic uses from streambank access:

- Utilizing the pollutant source identification (Action 1-10) to identify problematic uses;
- Installing physical barriers to restrict access where appropriate and feasible;
- Installing educational / informational signage; and
- Engaging in cooperative efforts with riparian landowners to restrict harmful uses.

5-5 Specific Site Control [Specific Sites]

Voluntary Action – dependent on funding

Certain sites in the subwatershed, such as (e.g. landscaping supply companies), have the potential to generate large amounts of sediment that may unintentionally enter the stormwater drainage system either on-site or by being transported off-site and deposited on impervious surfaces. The SWAG and/or its members may consider the following to minimize pollution from sensitive sites:

- Utilizing the pollutant source identification (Action 1-10) to identify specific sites;
- Developing appropriate procedures or structural modifications to implement at these sites and working with the sites to realize the improvements (i.e. on-site vehicle washing for vehicles dealing with sediment generating substances); and
- Installing appropriate structures in the public right-of-way (i.e. rock entrances designed to dislodge sediment from vehicle tires).

5-6 Structural Controls [Structural]

Voluntary Action – dependent on funding

Where point sources cannot be controlled with sensitive site actions (see 5-5) or non-point sources are a problem, structural controls may be added that intercept sediment either before it enters or before it is discharged from the storm sewer system. The SWAG and/or its members may consider referencing the pollutant source identification (Action 1-10) and constructing appropriate structures (e.g. catch basin inserts, grit chambers) where appropriate to achieve pollutant load reductions.

The implementation of structural controls should be coordinated with road or utility work to reduce installation costs.

6 Stormwater Management Best Management Practices: Other Pollutant Load Reducing Controls

These actions are those that are expected to be implemented in the long-term to achieve the majority of pollutant loading reductions in accordance with targeted levels (see Chapter 5). These actions can be implemented on public lands but are more geared towards private land implementation. Many of these actions can be implemented during new development and significant redevelopment (see '3 Ordinances, Zoning, and Development Standards'), although retrofit implementation (the type required to quantify pollutant loading reductions) is likely to require a significant funding source, due to the intensive nature of many of these actions. Implementation of the following actions should rely on the pollutant source identification (Action 1-10). These actions are applicable to the major stressors that impact the subwatershed: sediment, phosphorus, and pathogens, and flow. *Similar to Category 5, Category 6 actions benefit surface water quality through the implementation of controls to prevent or minimize pollutant discharge to waterbodies.* For implementation of these activities, coordination with developers and government officials should be sought to gain support for these type of projects (see Actions 3-1, 3-2, and 3-3).

Refer to Chapter 7 for additional information concerning the following actions.

Voluntary Action – dependent on funding

6-1 Mitigate Existing Impervious Surfaces [Imperviousness]

By managing runoff from impervious surfaces before it enters the storm sewer system or nearby waterbody, peak flow rates, total volume runoff, and pollutant concentrations can be reduced.

The SWAG and/or its members may consider the following to mitigate existing impervious surfaces:

- Vegetated parking lot islands;
- Vegetated road medians;
- Green roofs;
- Pervious pavement / pavers;
- Rain barrels and cisterns (only with timely usage or interim draining protocols being followed); and
- Managing flow from bridge scupper drains.

Voluntary Action – dependent on funding

6-2 Infiltration Techniques [Infiltration]

Using infiltration techniques to manage runoff reduces peak flow rates, total volume runoff, and pollutant concentrations that would otherwise enter the storm sewer system and impact a nearby waterbody. Infiltration techniques refer to practices which promote groundwater recharge and where the soils are conducive for infiltration.

The SWAG and/or its members may consider the following to reduce stormwater impacts through infiltration:

- Rain gardens / tree boxes / bioretention;
- Infiltration basins;
- Infiltration trenches;
- Porous pipe and underground infiltration systems; and
- Water spreading.

6-3 Filtration Techniques [Filtration]

Voluntary Action – dependent on funding

Filtration techniques are similar to infiltration techniques in that they reduce peak flow rates, total volume runoff (if bio-filtration is used), and pollutant concentrations. They differ in that filtration is usually used in areas where the soils are not appropriate for infiltration. Subsequently, filtration techniques bring in an alternative filtering media, such as sand, and use an underdrain to direct the treated water to a storm sewer system or waterbody.

The SWAG and/or its members may consider the following to reduce stormwater impacts through filtration:

- Sand/ organic / media filters (surface and underground);
- Pocket filters;
- Intermittent filters;
- Recirculating filters;
- Filter strips; and
- Perimeter sand filters.

6-4 Vegetative Buffers & Natural Conveyance [Natural Buffers]

Voluntary Action – dependent on funding

Using vegetative conveyance to manage runoff reduces peak flow rates, pollutant concentrations, and in some cases total volume runoff that would otherwise enter the storm sewer system or nearby waterbody.

The SWAG and/or its members may consider the following to reduce stormwater impacts through vegetative buffers and natural conveyance:

- Herbaceous and forested riparian buffers;
- Wet and dry swales; and
- Vegetated channels.

6-5 Retention and Detention [Re-/Detention]

Voluntary Action – dependent on funding

Using retention and detention to manage runoff reduces peak flow rates, pollutant concentrations, and total volume runoff that would otherwise enter the storm sewer system or nearby waterbody.

The SWAG and/or its members may consider the following to reduce stormwater impacts through vegetative buffers and natural conveyance:

- Detention / retention ponds;
- Pond/wetland systems;
- Extended detention wetlands;
- Shallow wetlands; and
- Submerged gravel wetlands.

7 Natural Features and Resources Management

These actions target the identification, protection, and restoration of natural features within the subwatershed. Natural features include animal habitat, land preserves, water resources, geology, and wildlife. *The benefit of these actions is to our natural resources that provide economic and social benefits as well as vital habitat for wildlife and aquatic animals.*

Voluntary Action – dependent on funding

7-1 Identify Natural Features [ID Natural Features]

Identifying natural features in the subwatershed is integral to implementing other protection and restoration actions. The natural features identification will be prepared by the SWAG and will rely heavily on the contents of this WMP and should utilize any information generated or updated since this WMP was submitted, input from other state, regional, and local resources, and field verifications. The identification should prioritize locations that should be targeted for protection and restoration (along with noted deficiencies), and also:

- which features are unprotected and which are in imminent danger, including: shoreline areas; amphibians, reptiles, and mussels; endangered/threatened species; and sources of woody debris;
- the most effective method for protecting specific features;
- the cost associated with the protection method;
- any limits to preservation and/or restoration (incompatible adjacent land uses and site contamination);
- any factors reinforcing candidacy for preservation and/or restoration, including:
  - proximity to other protected areas or waterbodies;
  - inclusion in existing green infrastructure such as trails or natural corridors;
  - connecting a variety of natural community types;
  - seeking to increase contiguous natural area; and
  - increasing the acreage of underrepresented communities;
- the current ownership status;
- the lead organization for implementing the protection measure, including the ultimate owner of the land and/or development rights; and
- maps of appropriate detail.

Natural Features Information in the WMP

As a basis for the natural features identification, the WMP has summarized information in the Michigan Natural Features Inventory, Macomb County Natural Features Inventory, Lake St. Clair Environmental Characterization / Coastal Habitat Restoration and Conservation Plan, 'Explore Our Natural World: A Biodiversity Atlas of the Lake Huron to Lake Erie Corridor', and numerous other documents.

Voluntary Action – dependent on funding

7-2 Natural Land Reserves [Land Reserves]

This action deals with the preservation of land as natural area and to add to the green infrastructure. Action 3-3 embodies the passive method of preserving natural areas: passing ordinances and zoning. This action is comprised of active preservation methods, including: purchasing land, purchasing/transferring development rights, conservation easements, land trusts, leases, deed restrictions, and covenants. This action should be implemented mainly through the SWAG members coordinating with and supporting the work of conservancy groups and government agencies, but may be implemented by the SWAG members themselves if appropriate situations arise. Incentives such as tax credits may also be developed for allowing natural features to be restored through such actions as conservation easements or long-term leases.

7-3 Natural Feature Protection [NF Protection]

Voluntary Action – dependent on funding

The SWAG and/or its members may consider protecting natural features in the public domain as well as encouraging and helping facilitate protection on private lands. Some directives upon which to implement actions for natural feature protection may include:

- Ensuring appropriate boundaries around natural areas and waterbodies are established to exclude incompatible land uses and other problem activities (except designated access spots);
- Ensuring wetlands and floodplains are hydraulically available to be used for water retention purposes;
- Ending the practice of straightening and enclosing drains;
- Changing existing dam operations such that minimum flow requirements are established and met and dams are operated as fixed crest structures (not as opened / closed gates);
- Restrict the construction of new dams, in-line detention basins, and lake-level regulators to protect natural water cycles, protect wetlands, and ensure adequate stream flow;
- Remove dams that are no longer used for their original purpose, are a safety hazard, or have failed;
- Managing shoreline erosion by utilizing alternatives to traditional shoreline hardening;
- Restricting new, or focusing mitigation on existing, impervious areas near waterbodies and wetlands;
- Engaging in fisheries and aquatic habitat management activities with sport fishing and conservation groups
- Engaging in terrestrial habitat management;
- Engaging in threatened and endangered species management;
- Supporting implementation of Michigan's Aquatic Nuisance Species State Management Plan Update, noting that the U.S. Coast Guard has primary control over ballast water discharges (which introduce most nuisance species); and
- Developing a comprehensive aquatic wildlife program.

7-4 Natural Feature Restoration [NF Restoration]

Voluntary Action – dependent on funding

The SWAG and/or its members may consider restoring natural features in the public domain as well as encouraging and helping facilitate restoration measures on private lands. Example activities to restore natural features include:

- Daylighting streams;
- Utilizing/encouraging native plantings & management techniques;
- Engaging in or encouraging reforestation and the planting of trees;
- Protecting endangered and threatened species;
- Eradicating invasive and exotic species;
- Advocating the use of backyard conservation programs by private citizens to add valuable habitat in developed areas,
- Supporting the stocking of native fish in streams;
- Managing areas to provide habitat and act as corridors between natural areas (such as utility corridors and roads);
- Incentives for private landowners to allow the reestablishment of vegetated buffers around already impacted waterbodies;
- A wetland mitigation/expansion program.

Recreation Consideration

To ensure funding is available to assist in the implementation of these actions, each entity should ensure that desired actions (and associated activities) are documented in a Recreation Master Plan.

8 Recreation Promotion and Enhancement

These actions relate to increasing recreational opportunities in the watershed and providing education within the recreation areas related to habitat, natural features, and the watershed. *These actions benefit the public by connecting them to their water resources and fostering a stewardship ethic.*

Voluntary Action – dependent on funding

8-1 Recreation Program [Recreation Program]

To enhance and create recreation areas in the subwatershed, the SWAG and its members may coordinate with existing recreation programs to:

- target locations to provide public education;
- minimize the impacts that problematic activities have on water resources; and
- identify locations to provide recreation activities and facilities.

Voluntary Action – dependent on funding

8-2 Riparian Land Conservation for Parks [Riparian Parks]

For the SWAG and/or its members, incorporating riparian land into parks is a way to conserve this area and let the community enjoy the resource. When using sensitive riparian land for new parks, consideration should be given to leaving vegetated buffers along the water's edge and keeping parking lots away from the water. Existing riparian parks with modified riparian corridors may consider: utilizing stormwater management techniques, reducing grass mowing and fertilizing, and addressing any other maintenance issues that may affect the waterbody.

Voluntary Action – dependent on funding

8-3 Canoe / Boat Landings / Access Sites [Access]

The SWAG and/or its members may consider adding or enhancing existing access sites to help promote recreation. Access sites provide a stabilized area to access the water, thus protecting other locations. They also provide an opportunity to educate the public about the watershed and how their actions can affect water quality and recreational opportunities.

The SWAG may also support legislation to add a recreational component to the definition of navigability. This may help define a public right on streams, especially smaller ones, to use the waterbody for recreational activities.

Voluntary Action – dependent on funding

8-4 Restore Fishing Opportunities [Fishing]

The SWAG and/or its members may consider restoring natural fisheries that may currently be compromised. While large-scale wildlife management is the function of the Michigan Department of Natural Resources, certain local activities can provide benefits in terms of habitat restoration, migration assistance/blockage removal, and public access that will increase recreational fishing opportunities.

Voluntary Action – dependent on funding

8-5 Trails / Observation Decks [Trails / Decks]

Similar to Action 8-3, the SWAG and/or its members may consider adding or enhancing trails and observation decks to help promote recreation. These facilities provide access to natural areas while controlling and minimizing disturbances. They also provide an opportunity to educate the public about natural features and impacts to them. It may be necessary to increase the public right-of-way if seeking to add trails in certain areas.

Relationship to Goals and Objectives

The actions discussed in this section have been selected to make progress towards achieving the goals and objectives. The relationship of the actions to the goals / objectives (and other requirements) is presented in Table 8-1.

The actions are indexed to the goals / objectives as either 'primary' or 'secondary'. Primary actions for a goal / objective are those in which the goal language explicitly or implicitly addresses specific wording of the goal / objective or is likely to provide quantifiable load reductions for pollutants related to the goal / objective. Secondary actions may address specifics of a goal / objective but require implementation information that has not been generated at the plan level or may provide load reductions for pollutants related to the goal / objective but the load reductions are non-quantifiable.

Also in the table, the actions denoted as Phase II requirements are marked with an asterisk. In this plan, all of the goals / objectives have at least one action supporting them in the primary / secondary category. However, because the Phase II program does not deal with funding or recreation, there are no Phase II actions supporting goal / objective III.A.i, III.A.ii, VI.A.i, VI.A.ii, and VI.A.iii.

Additional Actions

An additional set of actions designed to provide an evaluation and revision mechanism for this WMP is defined in Chapter 9.

Sources of the Actions

The actions laid out in this WMP have been generated through consideration of numerous sources, including:

- Watershed-based Permit Requirements;
- The SEMCOG Water Quality Management Plan;
- The Clinton River Assessment (Francis, 2005);
- Clinton River Watershed Remedial and Preventative Action Plan, 1998;
- The St. Clair River and Lake St. Clair Comprehensive Management Plan, June 2004;
- Storm Water Pollution Prevention Initiatives of various permittees; and
- Other Watershed Management Plans representing various permittees.

Action Details

This section presents the details of the actions. Table 8-2 lists the actions and includes the following columns:

- Number (**No.**) – lists the action category and action number;
- **Action** – gives the action title;
- **Lead** – indicates the lead agency in charge of the action (only reflects who will coordinate/initiate an activity and does not imply complete responsibility) and includes: 'SWAG' and 'Permittees';
- **Schedule** – gives the **begin and end** schedule for an action (short term = prior to 2010; long term = after 2010), milestone year, the cycle for the action, and an indication of whether or not the action has been started or is complete;
- **Cost Estimate** - indicates material costs and labor hour estimates, and the details, primary cost bearer, and cost cycle to implement an action;
- **Assistance Needed** - indicates financial and technical assistance needed to implement an action;
- **Authority** – lists the federal, state or local legislation, or other mechanism, which allows, prohibits, or requires an action;
- **Comments** – lists any additional detail about the action;
- **Include in SWPPI** - indicates whether or not the action (or a portion thereof) is to be included in the SWPPI or is optional (Y, N, O); and

History of Actions Taken

Various entities in the Clinton River Watershed and surrounding areas have implemented watershed protection actions in the past. The 1988 MDNR RAP identifies some of these, including:

- Implementation of drain commissioner requirements for stormwater detention;
- Adoption of sewer service areas map;
- Establishment of Areawide Water Quality Board;
- Designated Management Agency agreements;
- Educational materials;
- Technical assistance projects;
- The CRWC strategy for stormwater management in urbanizing watersheds (assessment report, technical assistance directory, guide for stormwater management, master stormwater policy plans, etc.);
- Consideration of water quality and habitat conditions in flood control planning studies and projects by the USACE;
- Dredging of the Clinton River mouth segment and consideration of ideas to improve the conditions of this segment;
- Stricter enforcement of NPDES permit compliance;
- Proactive environmental policies implemented by private entities;
- Habitat improvements; and
- River cleanups.

Source: MDNR, 1988.

Many of these actions have continued to the present day, and many other actions not listed here have been implemented in the intervening time.

- SWPPI Commitment Level – indicates whether or not, and to what level, each permittee is committing to the Phase II actions; the commitment levels are as follows:

  - - - = no commitment by the Phase II Permittee as the action is not applicable;
  - N = no commitment by the Phase II Permittee as the action is not able to be implemented;
  - W = no commitment by the Phase II Permittee, but would like to consider implementing the action if funding is acquired;
  - Y = Phase II Permittee commits to the action;
  - E = Phase II Permittee commits to the action and is already doing it in some capacity; and
  - D = Phase II Permittee commits to the action and has already completed it.

Any disagreements that a SWAG member or Permittee may have with the actions of the plan, or any other part, are detailed in Appendix F.

Financial and Technical Assistance

To assist the SWAG and its members in implementing the actions of the plan, sources of financial and technical assistance have been identified. In Table 8-3 potential grant programs and technical resources are identified for each action. Table 8-4 cross-references the funding programs with the numerical references assigned in Table 8-4.

Table 8-1. Relationship of actions to goals and objectives.

Goal / Objective	No.	Action Number	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	1	2	3	4
		Action Category	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3
	Action	Short Title	SWAG	ERG*	Funding	Grants	Update SWPPI*	Update WMP*	Annual Reports*	TMDLs*	Clearinghouse	Sources	PEP*	Public Ed.	Municipal Train.*	Demos	Signage	Involvement	Meetings	Officials	Standards*	Development*	Natural Features*	Prevention
VII.C.i - Green Infrastructure																				●	●	●		
VII.B.ii - NF Restoration Plan										○			○											
VII.B.i - Identify NF Restoration													○											
VII.A.ii - NF Protection													○								○	○	●	○
VII.A.i - Natural Features Inventory																						○		
VI.B.ii - Implementation Mechanism	●	●	●		●	●	●		●															
VI.B.i - Institutionalize Plan	●					●																		
VI.A.iii - Create New Funding			●																					
VI.A.ii - Grant Proposals				●																				
VI.A.i - Funding Opportunities			●																					
V.B.i - Reduce CSO / SSO										●											●	○	○	
V.A.i - Manage Storm Water																					●	○	○	
IV.A.ii - Habitat Restoration																							○	
IV.A.i - Habitat Identification																							○	
III.A.iii - Increase Opportunities																								
III.A.ii - Recreational Education														●										
III.A.i - Health Risk Education														●										
II.C.ii - Outreach Evaluation		●									●													
II.C.i - Social Marketing													●	●	●		●			●				
II.B.ii - Behavior Modification													○	○		●			●					
II.B.i - Action Understanding													●	●	●		●			●				
II.A.ii - Interactive Learning													○	○		●		●	●					
II.A.i - Targeted Outreach													●	●	●		●			●				
I.D.iii - Pathogen Reduction										●		●									○	○	○	○
I.D.ii - Illicit Connections										○														
I.D.i - Septic Systems										○														
I.C.ii - Sediment Management																					○	○	○	○
I.C.i - Sediment Sources												●												
I.B.ii - Nutrient Control																					○	○	○	○
I.B.i - Nutrient Sources												●												
I.A.ii - Prevent Contamination										○														
I.A.i - Sediment Remediation										○														

LEGEND
● = Primary
○ = Secondary

* denotes Phase II required action.

Table 8-1. Relationship of actions to goals and objectives. (continued)

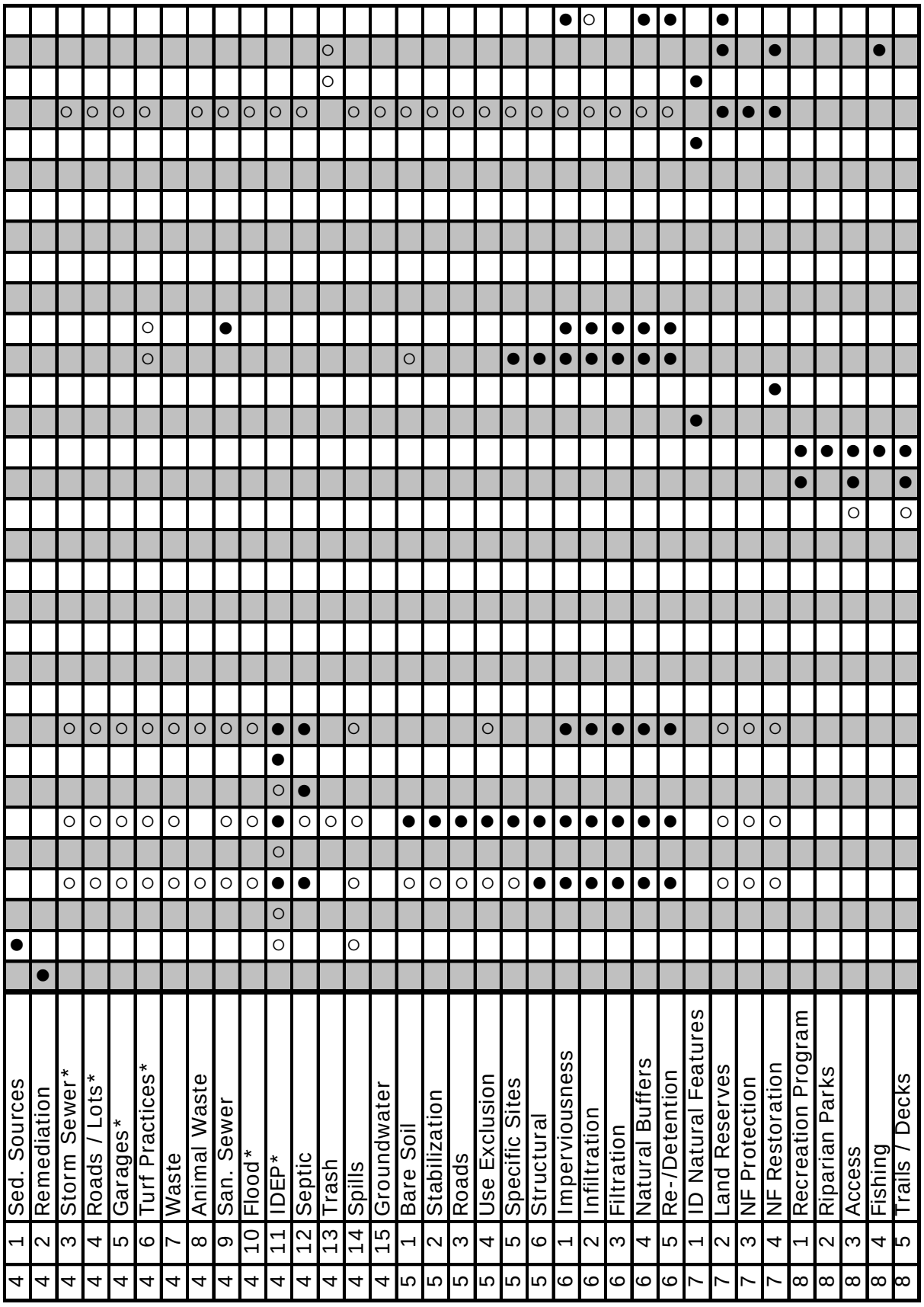


Table 8-2. Action details.

Action			Lead	Authority	Schedule					
Category	Number	Long Title	Lead Agency * - does not exclude other SWAG members from doing	Federal, state or local legislation, or other mechanism, which allows, prohibits, or requires an activity	Started (Y/N)	Begin Short Term is before 2010; Long Term is after	Milestone	End Short Term is before 2010; Long Term is after	Cycle * - or permit schedule	Complete (Y/N); n/a for ongoing
1	1	Promote and Reconvene Subwatershed Advisory Group	SWAG	Various state laws	N	Short Term	2010	n/a	Ongoing	n/a
1	2	Evaluation and Revision Guidance	SWAG	Phase II Permit	N	Short Term	2007	n/a	5-year*	n/a
1	3	Develop Funding Program	SWAG	n/a	N	Short Term	n/a	n/a	Annual	n/a
1	4	Develop Grant Proposals	SWAG	Various federal / state laws	N	Short Term	n/a	n/a	As needed	n/a
1	5	Update SWPPI	Permittees	Phase II Permit - COC	N	2007	2007/9	n/a	5-year*	n/a
1	6	Update WMP	SWAG	Phase II Permit - COC	N	2008	2008	n/a	5-year*	n/a
1	7	Annual Reports	Permittees	Phase II Permit - COC	Y	n/a	n/a	n/a	Annual-Oct	n/a
1	8	Total Maximum Daily Loads	SWAG	Phase II Permit	N	Short Term	2015	n/a	n/a	n/a
1	9	Implementation Clearinghouse	SWAG	n/a	N	Short Term	2010	n/a	Ongoing	n/a
1	10	Identify Sources of Pollutants	SWAG	n/a	N	Short Term	2010	Long Term	n/a	N
2	1	Public Education Plan Implementation	Permittees	Phase II Permit - PEP	Y	n/a	n/a	n/a	Ongoing	n/a
2	2	Additional Public Education	SWAG	n;/a	N	Short Term	n/a	n/a	Ongoing	n/a
2	3	Municipal Employee Training	Permittees*	Phase II Permit	Y	n/a	2013	n/a	Ongoing	n/a
2	4	Demonstration Projects	SWAG	n/a	N	Long Term	2015	n/a	Ongoing	n/a
2	5	Signage	SWAG	n/a	Y	n/a	2010	n/a	Ongoing	n/a
2	6	Public Involvement	SWAG	n/a	Y	n/a	2010	n/a	Ongoing	n/a
2	7	Community Forums and Stakeholder Workshops	SWAG	n/a	Y	n/a	2010	n/a	Ongoing	n/a
2	8	Municipal Officials Involvement and Education	SWAG	n/a	Y	n/a	2010	n/a	Ongoing	n/a
3	1	Stormwater Management Standards	Permittees*	Phase II Permit / Home Rule	N	Short Term	2013	Long Term	n/a	N
3	2	Managing Development Patterns	Permittees*	Phase II Permit / Home Rule	N	Short Term	2013	Long Term	n/a	N
3	3	Preserve Natural Areas/Features	Permittees*	Phase II Permit / Home Rule	N	Short Term	2013	Long Term	n/a	N
3	4	Pollution Prevention	Permittees*	Home Rule	N	Short Term	2013	Long Term	n/a	N
4	1	Identify Sources of Sediment Contaminants	SWAG	n/a	N	Short Term	2010	Long Term	n/a	N
4	2	Identify Actions to Remediate Contaminated Sediments	SWAG	n/a	N	Short Term	2010	Long Term	n/a	N
4	3	Storm Sewer System Maintenance and Operations	Permittees*	Phase II Permit	N	Short Term	2013	Long Term	n/a	N
4	4	Minimizing Pollution from Roads and Lots	Permittees*	Phase II Permit	N	Short Term	2013	Long Term	n/a	N
4	5	Minimizing Pollution from Municipal Facilities	Permittees*	Phase II Permit	N	Short Term	2013	Long Term	n/a	N
4	6	Turf Management Practices	Permittees*	Phase II Permit	N	Short Term	2013	Long Term	n/a	N
4	7	Waste Management	SWAG	n/a	N	Long Term	2015	Long Term	n/a	N
4	8	Animal Waste Control	SWAG	n/a	N	Short Term	2015	Long Term	n/a	N
4	9	San. / Combined Sewer System Planning and Maintenance	SWAG	n/a	N	Long Term	2015	n/a	Ongoing	n/a
4	10	Flood Control Projects	SWAG	Phase II Permit	N	Short Term	2015	Long Term	n/a	N
4	11	Illicit Discharge Elimination Program (IDEP)	Permittees*	Phase II Permit - IDEP	Y	n/a	n/a	n/a	Ongoing	n/a
4	12	Septic System Practices	SWAG	n/a	N	Long Term	2015	n/a	Ongoing	n/a
4	13	Trash/Debris Reduction	SWAG	n/a	Y	Short Term	2010	n/a	Ongoing	n/a
4	14	Spill Prevention / Notification / Response	SWAG	n/a	N	Short Term	2010	Long Term	n/a	N
4	15	Groundwater	SWAG	n/a	N	Long Term	2015	Long Term	n/a	N
5	1	Bare Soil Repair	SWAG	n/a	N	Short Term	2015	n/a	Ongoing	n/a
5	2	Streambank Stabilization	SWAG	n/a	N	Short Term	2015	n/a	Ongoing	n/a
5	3	Eroding Road Stabilization	SWAG	n/a	N	Short Term	2015	n/a	Ongoing	n/a
5	4	Streambank Use Exclusion	SWAG	Home Rule	N	Long Term	2015	Long Term	n/a	N
5	5	Specific Site Control	SWAG	n/a	N	Long Term	2015	Long Term	n/a	N
5	6	Structural Controls	SWAG	n/a	N	Long Term	2015	Long Term	n/a	N
6	1	Mitigate Existing Impervious Surfaces	SWAG	n/a	N	Long Term	2020	n/a	Ongoing	n/a
6	2	Infiltration Techniques	SWAG	n/a	N	Long Term	2020	n/a	Ongoing	n/a
6	3	Filtration Techniques	SWAG	n/a	N	Long Term	2020	n/a	Ongoing	n/a
6	4	Vegetative Buffers and Natural Conveyance	SWAG	n/a	N	Long Term	2020	n/a	Ongoing	n/a
6	5	Retention and Detention	SWAG	n/a	N	Long Term	2020	n/a	Ongoing	n/a
7	1	Identify Natural Features	SWAG	n/a	N	Short Term	2010	Long Term	n/a	N
7	2	Natural Land Reserves	SWAG	n/a	N	Long Term	2020	n/a	Ongoing	n/a
7	3	Natural Feature Protection	SWAG	n/a	N	Long Term	2020	n/a	Ongoing	n/a
7	4	Natural Feature Restoration	SWAG	n/a	N	Long Term	2020	n/a	Ongoing	n/a
8	1	Recreation Program	SWAG	n/a	N	Long Term	2025	Long Term	n/a	N
8	2	Riparian Land Conservation for Parks	SWAG	n/a	N	Long Term	2025	n/a	Ongoing	n/a
8	3	Canoe / Boat Landings / Access Sites	SWAG	n/a	N	Long Term	2025	n/a	Ongoing	n/a
8	4	Restore Fishing Opportunities	SWAG	n/a	N	Long Term	2025	n/a	Ongoing	n/a
8	5	Trails / Observation Decks	SWAG	n/a	N	Long Term	2025	n/a	Ongoing	n/a

Table 8-2. Action details. (rows continue across from previous page)

Cost / Labor Estimate					Assistance Req.		Comments	SWPPI Commit. Level										
Material Costs ($) ** - does not include long term costs associated with changes*	Labor Hours ** - does not include long term labor associated with changes*	Cost Details	Cost / Labor Bearer ** - or other entity if implementing*	Cost / Labor Cycle	Financial ($) *see Table 8-4 for potential grant progs.*	Technical *see Table 8-4 for potential sources*	**COMMITMENT LEGEND** --=not applicable N=no commitment W=no commitment, wish list item E=commitment, already doing Y=commitment D=commitment, completed	Include in SWPPI (Yes/No/Option)	Center Line, City of	Clinton Township	Hazel Park, City of (+nested	Lamphere Public Schools	Madison Heights, City of	Rochester Hills, City of	Shelby Township	Troy, City of	Macomb County (+nested jurisd.)	Oakland County (+ nested jurisd.)
$15,000	150-300	Promo. Materials	Entire SWAG	annual	$0	$0		N										
None	100-200		Entire SWAG	each cycle	$0	$0		N										
$5,000	100-200	Legal Fees	Entire SWAG	annual	$0	$0		N										
$500	40-80	Proposal Copies	Entity Seeking Grant	each proposal	$0	$0		N										
$500	100-250	SWPPI Copies	Each Permittee	each update	Chapter 4	Chapter 4		N										
$5,000	500-1000	Plan Copies	Entire SWAG	each update	$0	$0		N										
$1,500	100-250	Report Copies	Each Permittee	annual	Chapter 4	Chapter 4		N										
None	200-400		Entire SWAG	each TMDL	$0	$0		N										
None	150-300		Entire SWAG	annual	$0	$0		N										
None	200-400		Entire SWAG	once	$0	$0		N										
$10,000	250-500	Materials / Dist.	Each Permittee	annual	Chapter 4	Chapter 4	REFER TO PEP	O										
$10,000	250-500	Materials / Dist.	Implementing Entity	annual	$0	$0		N										
$5,000	250-500	Handouts	Each Permittee	annual	Chapter 4	Chapter 4		Y	Y	E	N	Y	Y	E	Y	E	Y	E
$30,000+	500-1000	Materials/Adverts	Implementing Entity	each project	$0	$0		N										
$2,500	100-250	Signs	Implementing Entity	per 10 signs	$0	$0		N										
$5,000	150-300	Materials	Implementing Entity	per activity	$0	$0		N										
$5,000	150-300	Materials	Implementing Entity	per meeting	$0	$0		N										
$5,000	200-400	Materials	Implementing Entity	annually	$0	$0		N										
$30,000	1000-2000	Legal Fees, Docs.	Each Permittee*	once	Chapter 4	Chapter 4		Y	Y	Y	N	--	N	E	W	W	Y	D
$30,000	1000-2000	Legal Fees, Docs.	Each Permittee*	once	Chapter 4	Chapter 4		Y	E	Y	N	--	N	W	W	W	--	--
$30,000	1000-2000	Legal Fees, Docs.	Each Permittee*	once	Chapter 4	Chapter 4		Y	--	E	N	--	N	W	W	W	E	E
$30,000	1000-2000	Legal Fees, Docs.	Each Permittee*	once	$0	$0		O	E	Y	N	Y	E	Y	W	W	E	Y
None	500-750		Entire SWAG	once	$0	$0		N										
$10,000	400-800	Documents	Entire SWAG	once	$0	$0		N										
None*	400-800*		Each Permittee*	once	Chapter 4	Chapter 4		Y	E	E	Y	Y	E	E	Y	E	Y	E
None*	400-800*		Each Permittee*	once	Chapter 4	Chapter 4		Y	Y	Y	Y	Y	N	E	W	W	Y	E
None*	400-800*		Each Permittee*	once	Chapter 4	Chapter 4		Y	E	E	Y	Y	E	E	Y	E	Y	E
None*	400-800*		Each Permittee*	once	Chapter 4	Chapter 4		Y	Y	E	Y	Y	N	W	W	E	Y	E
$5,000*	600-1200*	Legal Fees	Implementing Entity	once	$0	$0		N										
$5,000*	600-1200*	Legal Fees	Implementing Entity	once	$0	$0		N										
$1,000	200-400	Documents	Implementing Entity	annual	$0	$0		N										
None*	400-800*		Each Permittee*	once	Chapter 4	Chapter 4		Y	--	Y	N	--	--	W	W	E	--	E
$2,000	150-300	Documents	Each Permittee	ann./100 outfall	Chapter 4	Chapter 4	REFER TO IDEP	O										
None	2000-4000		Implementing Entity	annual	$0	$0		N										
$1,000	100-200	Materials	Implementing Entity	per event	$0	$0		N										
None*	200-400*		Implementing Entity	once	$0	$0		N										
$50,000*	1000-2000	Materials	Implementing Entity	total	$0	$0		N										
$5,000	200-400	Materials	Implementing Entity	each location	$0	$0		N										
$10,000	300-600	Materials	Implementing Entity	each location	$0	$0		N										
$10,000+	250-500	Materials	Implementing Entity	each location	$0	$0		N										
$10,000	250-500	Signs, Fencing	Implementing Entity	each location	$0	$0		N										
$10,000	250-500	Structures	Implementing Entity	each location	$0	$0		N										
$15,000	250-500	Structures	Implementing Entity	each location	$0	$0		N										
$25,000+	400-800	Materials	Implementing Entity	each project	$0	$0		N										
$25,000+	400-800	Materials	Implementing Entity	each project	$0	$0		N										
$25,000+	400-800	Materials	Implementing Entity	each project	$0	$0		N										
$25,000+	400-800	Materials	Implementing Entity	each project	$0	$0		N										
$25,000+	400-800	Materials	Implementing Entity	each project	$0	$0		N										
$1,500	250-500	Documents	Entire SWAG	once	$0	$0		N										
$100,000+	500-1000	Land, Legal Fees	Land Purch. Entity	each location	$0	$0		N										
$10,000+	300-600	Various	Implementing Entity	each project	$0	$0		N										
$10,000+	300-600	Various	Implementing Entity	each project	$0	$0		N										
$1,500	250-500	Documents	Entire SWAG	once	$0	$0		N										
$100,000+	500-1000	Land, Legal Fees	Land Purch. Entity	each acquisition	$0	$0		N										
$25,000+	400-800	Materials	Implementing Entity	each facility	$0	$0		N										
$15,000+	500-1000	Materials	Implementing Entity	each location	$0	$0		N										
$25,000+	400-800	Materials	Implementing Entity	each facility	$0	$0		N										

Table 8-3. Potential funding/technical assistance.

Actions			Financial Assistance Programs			
Category	Number	Action Title	USDA NRCS	USFWS USGS NPS	USEPA	GLC
1	1	Promote and Reconvene Subwatershed Advisory Group	4, 6	7	3, 6, 7, 8, 9, 11, 13, 22, 23, 28	
1	2	Evaluation and Revision Guidance	2, 4, 6		3, 6, 7, 8, 9, 13, 18, 22, 23, 25, 26	
1	3	Develop Funding Program	2, 4, 6		3, 6,7, 8, 9, 13, 18, 22, 23, 25, 26, 35	
1	4	Develop Grant Proposals	2, 4, 6		3, 6, 7, 8, 9, 13, 18, 22, 23, 25, 26, 35	
1	5	Update SWPPI	6		3, 6, 7, 8, 11, 13, 23, 26	
1	6	Update WMP	2, 4, 6		3, 6, 7, 8, 9, 13, 18, 22, 23, 25, 26	
1	7	Annual Reports	2, 4, 6		3, 6, 7, 8, 9, 13, 18, 22, 23, 25, 26	
1	8	Total Maximum Daily Loads	4, 6		3, 6, 7, 8, 11, 13, 23	
1	9	Implementation Clearinghouse	2, 6		3, 6, 7, 8, 13, 23, 26	
1	10	Identify Sources of Pollutants	2	6, 7	1, 3, 4, 6, 7, 8, 9, 13, 17, 18, 19, 22, 23, 25, 26, 30, 31, 32, 39, 41	
2	1	Public Education Plan Implementation	1, 2, 3, 4, 8, 11, 12	1, 2, 3, 4, 5, 9, 10, 11,	3, 6, 9, 11, 13, 21, 23, 25, 26, 40	
2	2	Additional Public Education	2		3, 6, 7, 9, 11, 13, 23, 25, 26, 40	
2	3	Municipal Employee Training	2		3, 6, 9, 11, 13, 23, 25, 26, 40	
2	4	Demonstration Projects	2, 9	6, 12	1, 3, 4, 6, 7, 9, 11, 13, 18, 19, 25, 37, 38, 40, 42, 43	
2	5	Signage	2		3, 6, 7, 9, 11, 13, 23, 25, 26, 40	
2	6	Public Involvement	2		3, 6, 7, 9, 11, 13, 23, 25, 26, 38, 40, 43	
2	7	Community Forums and Stakeholder Workshops	2		3, 6, 7, 9, 11, 13, 23, 25, 26, 38, 40, 43	
2	8	Municipal Officials Involvement and Education	2		3, 6, 9, 11, 13, 23, 25, 26, 40	
3	1	Stormwater Management Standards	2	2,3	2, 3, 9, 10, 11, 13, 26	
3	2	Managing Development Patterns	1, 2, 3, 4, 6, 7	12	2, 3, 7, 9, 13, 23, 26	
3	3	Preserve Natural Areas/Features	1, 2, 3, 8	12	2, 3, 9, 13, 23	
3	4	Pollution Prevention	2		2, 3, 9, 13, 23, 26, 30, 31, 32	
4	1	Identify Sources of Sediment Contaminants	2, 4, 9	6, 7	1, 3, 4, 6, 7, 8, 9, 13, 17, 18, 19, 22, 23, 25, 26, 27, 39, 41	
4	2	Identify Actions to Remediate Contaminated Sediments	2, 4, 9	6, 7	1, 3, 4, 6, 7, 8, 9, 13, 17, 18, 19, 22, 23, 25, 26, 27, 39, 41	
4	3	Storm Sewer System Maintenance and Operations	13, 14, 16		11, 23, 24	
4	4	Minimizing Pollution from Roads and Lots	2		3, 7, 9, 13, 23, 26, 30, 31, 32, 39, 41	
4	5	Minimizing Pollution from Municipal Facilities	2		3, 7, 9, 13, 23, 26, 30, 31, 32, 39, 41	
4	6	Turf Management Practices	4		7, 9, 13	
4	7	Waste Management	2, 13, 14, 15, 16		3, 7, 8, 9, 13, 22, 23, 26, 30, 31, 32, 33, 34, 41	
4	8	Animal Waste Control	2		3, 6, 7, 9, 11, 13, 23, 25, 26, 39, 41	
4	9	San. / Combined Sewer System Planning and Maintenance	13, 14, 16		11, 23, 24, 29, 36	
4	10	Flood Control Projects	4, 17	4	9	
4	11	Illicit Discharge Elimination Program (IDEP)	2		3, 6, 7, 9, 11, 13, 23, 24, 25, 26, 39, 41	
4	12	Septic System Practices	13, 14, 16	7	3, 6, 7, 11, 13, 23, 24, 26, 39, 41	
4	13	Trash/Debris Reduction	13, 14, 15, 16	7	3, 6, 13, 23, 26, 33, 34, 39, 41	
4	14	Spill Prevention / Notification / Response	2		3, 7, 9, 13, 23, 26, 30, 31, 32, 39, 41	
4	15	Groundwater	3	7	3, 4, 5, 12, 15, 16, 22, 41, 44	
5	1	Bare Soil Repair	3, 4		9	1
5	2	Streambank Stabilization	3, 4	1, 4, 5	9	1
5	3	Eroding Road Stabilization	4		9	1
5	4	Streambank Use Exclusion	4	1, 4, 5	9	1
5	5	Specific Site Control	3, 4		9	1
5	6	Structural Controls	3, 4		9	
6	1	Mitigate Existing Impervious Surfaces			3, 13, 39	
6	2	Infiltration Techniques	2, 3, 4, 9		3, 9, 11, 13, 24, 39	
6	3	Filtration Techniques	2, 3, 4, 9		3, 9, 11, 13, 24, 39	
6	4	Vegetative Buffers and Natural Conveyance	2, 3, 4, 5, 8, 9	2, 3	2, 3, 9, 10, 11, 13, 24, 39	
6	5	Retention and Detention	2, 3, 4		3, 9, 11, 13, 24, 39	
7	1	Identify Natural Features	1, 2, 3, 5, 6, 8, 10, 11, 12	2, 3, 7, 9, 11, 12	10, 20	
7	2	Natural Land Reserves	1, 2, 3, 5, 6, 8, 10, 11, 12	2, 3, 9, 10, 11, 12	10	
7	3	Natural Feature Protection	1, 2, 3, 5, 6, 8, 10, 11, 12	2, 3, 9, 10, 11, 12	10	
7	4	Natural Feature Restoration	1, 2, 3, 4, 5, 6, 8, 10, 11,	2, 3, 9, 10, 11, 12	9, 10	
8	1	Recreation Program	1	8, 11		
8	2	Riparian Land Conservation for Parks	1, 4, 8, 10, 12	1, 4, 5, 8, 9, 10, 11, 12		
8	3	Canoe / Boat Landings / Access Sites	1, 3	1, 4, 5, 8	13	
8	4	Restore Fishing Opportunities	1, 3, 4, 8	1, 4, 5, 11	13	
8	5	Trails / Observation Decks	1	8, 12		

Table 8-3. Potential funding/technical assistance. (rows continue across from previous page)

Fin. Asst. Progs. (cont'd)				Technical Assistance Programs and Resources
NOAA EDA USDOC	USACE	FHA USDOT	MDEQ MDNR MDCH	
				SEMCOG, NRCS & USDA (6), CWP, legal
3, 5	2		2, 3	MDEQ , EPA, CWP, SEMCOG, NRCS & USDA (6), USACE (2)
3, 5	2		2, 3	SEMCOG, NRCS & USDA (6), USACE (2), legal
3, 5	2		2, 3	SEMCOG , NRCS & USDA (6), USACE (2), legal
2				MDEQ, SEMCOG, local entities, CRWC
3, 5	2		2, 3	CRWC , SEMCOG, NRCS & USDA (6), USACE (2)
3	2		2, 3	MDEQ, SEMCOG, CRWC, NRCS & USDA (6), USACE (2), local entities
				MDEQ , USEPA, USGS, MSU IWR
	2			CRWC , SEMCOG, MDEQ, SN
3, 4				MDEQ , MDNR, CWP, USEPA, local entities
1, 2, 4, 5, 6	1		1	CRWC, SEMCOG, NRCS & USDA (3), MDNR, MDEQ, MSUE, AAW, MAS, TNC, TPL, MNA, WHIP, MDA, (ALSO 2-2)
4				CDs, USFWS, NAWMP, PF, DU, MLC, USACE (1), MLC, GRP, LAP, School Districts, CGEE, USEPA, GREEN, (ALSO 2-1)
4				SEMCOG , MDEQ
4				Local Entities , CRWC, SEMCOG, MDEQ, MDNR
4				CRWC , MDEQ, MDNR, local entities
4				CRWC , SEMCOG, MEC, MLC, SN, MSUE, AAW
4				CRWC , SEMCOG, AAW
4				SEMCOG, CRWC, local government
				Local Entities, MDEQ, Legal , SEMCOG, MDOT
				Local Entities, MDEQ, Legal, SEMCOG, LID Center, NRCS & USDA (3), MDA, MDNR, MEC, CRP, CDs
5				Local Entities, MDEQ, Legal, SEMCOG, SMLC, TNC, TPL, MNA, MLC, NRCS & USDA (3), CDs, MDNR
				Local Entities, MDEQ, Legal , SEMCOG, MDNR
2, 3, 4, 6	3			MDEQ, GLC, USEPA GLNPO, USFWS, USGS, NOAA
2, 3, 4, 6	3			MDEQ, GLC, USEPA GLNPO, USFWS, USGS, NOAA
				Local Entities, MDEQ, Legal , CWP
				MDEQ, Legal, local entities, MDOT, CWP, FHA, FTA
				Local Entities, MDEQ, Legal , MDOT, CWP
				Local Entities, MDEQ, Legal, MDNR, MTESP, GRP
2, 3				MDEQ, Legal, local entities, WHMD, MRC
4				Local Entities, MDNR, USFWS
				MDEQ, Local Entities, SEMCOG
6	4, 5			Local Entities, MDEQ, FEMA-NFIP, USACE (4)
4				MDEQ, Legal, local entities, CRWC, SEMCOG, CWP, SWC
				MDEQ, local entities, legal
				Local Entities, CRWC , MDEQ
				MDEQ, Legal, local entities, CWP
				MDEQ, Legal , MGSP, GF, USEPA, NRCS & USDA (3), local entities
				Local Entities, MDEQ , CWP, EPA, SWC, MDNR
1, 2, 6				Local Entities, MDEQ , CWP, EPA, SWC, MDNR, NRCS & USDA (3)
				Local Entities, MDEQ , CWP, EPA, SWC, MDNR, MDOT
1, 2, 6				Local Entities, MDEQ , CWP, EPA, SWC, MDNR, NRCS & USDA (3), legal
	6			Local Entities, MDEQ , CWP, EPA, SWC, MDNR, NRCS & USDA (3), MDA, legal
				Local Entities, MDEQ , manufacturers, EPA, MDOT
2				MDEQ, LID Center, EPA, CWP, SWC, MDOT, local entities
2, 4				MDEQ, LID Center, EPA, CWP, SWC, local entities
2, 4				MDEQ, LID Center, EPA, CWP, SWC, local entities
2, 4, 5				MDEQ, LID Center, EPA, CWP, SWC, local entities
2, 4				MDEQ, LID Center, EPA, CWP, SWC, local entities
5				MDNR, MNFI, MCNFI, CDs, MLC, MNA, SMLC, TNC, TPL, NRCS & USDA (5, 6, 10)
5				SMLC, MLC, MNA, TNC, TPL, CDs, MDNR, GRP, NRCS & USDA (5, 6, 10)
5				MDNR , MNA, TNC, CRP, NRCS & USDA (5, 6, 10), CDs, MDA , SN
5	1			MDNR , MNA, TNC, CRP, NRCS & USDA (5, 6, 10), CDs, MDA , SN, USACE (1), MDA, GLC, MIPC, MANSC, GLPANS, GLAGAP
				Local Entities, CRWC, MDNR, SEMCOG
1, 2, 5, 6				SMLC , MLC, TPL, local entities, NRCS & USDA (10), CDs, MDEQ, MDNR,
1, 2, 6				CRWC, MDNR, local entities
1, 2, 5, 6, 7				CRWC, TU, USFWS, MDNR, CRCRP, GLC, CDs, local entities
		1		CRWC , HCMA, local entities, MDNR

Table 8-4. Numerical cross-reference for previous table.

Organization	Program #	Program	Federal Catalog #	Financial Assistance	Technical Assistance
USDA	1	Conservation Reserve Program	10.069	X	
USDA	2	Cooperative Extension Service	10.500	X	
NRCS, USDA	3	Soil and Water Conservation	10.902		X
NRCS, USDA	4	Watershed Protection and Flood Prevention	10.904	X	X
NRCS, USDA	5	Plant Materials Conservation	10.905		X
NRCS, USDA	6	Watershed Surveys and Planning	10.906		X
NRCS, USDA	7	Farmland Protection Program	10.913	X	
NRCS, USDA	8	Wildlife Habitat Incentive Program	10.914	X	
USDA	9	Scientific Cooperation and Research	10.961	X	
NRCS, USDA	10	Resource Conservation and Development	10.901		X
NRCS, USDA	11	Water Bank Program	10.062	X	
NRCS, USDA	12	Wetlands Reserve Program	10.072	X	
USDA	13	Water and Waste Disposal Systems for Rural Communities	10.760	X	
USDA	14	Technical Assistance and Training Grants	10.761	X	
USDA	15	Solid Waste Management Grants	10.762	X	
USDA	16	Water and Waste Disposal Loans	10.770	X	
NRCS, USDA	17	Watershed Rehabilitation Program	10.916	X	X
NRCS, USDA	18	Agricultural Management Assistance	10.917	X	
NOAA	1	Interjurisdictional Fisheries Act of 1986	11.407	X	
NOAA	2	Coastal Zone Management Administration Awards	11.419	X	
NOAA	3	Unallied Management Projects	11.454	X	
NOAA	4	Cooperative Science and Education Program	11.455	X	
NOAA	5	Habitat Conservation	11.463	X	
NOAA	6	Coastal Services Center	11.473	X	
NOAA	7	Anadromous Fish Conservation Act	11.405	X	
NOAA	8	Unallied Science Program*	11.472	X	
NOAA	9	Hydrologic Research*	11.462	X	
NOAA	10	Environmental Sciences, Applications, Data, and Education*	11.440	X	
NOAA	11	Marine Sanctuary Program*	11.429	X	
NOAA	12	Office of Oceanic and Atmospheric Research (OAR) Joint and Cooperative Institutes*	11.432	X	
USACE	1	Aquatic Plant Control	12.100		X
USACE	2	Planning Assistance to States	12.110		X
USACE	3	Remedial Action Plan Program		X	
USACE	4	Emergency Rehabilitation of Flood Control Works or Federally Authorized Coastal Protection Works	12.102		X
USACE	5	Emergency Operations Flood Response and Post Flood Response	12.103	X	X
USACE	6	Beach Erosion Control Projects	12.101	X	X
USFWS	1	Sport Fish Restoration	15.605	X	
USFWS	2	Coastal Wetlands Planning, Protection and Restoration Act	15.614	X	
USFWS	3	North American Wetlands Conservation Fund	15.623	X	
USFWS	4	Coastal Program	15.630	X	
USFWS	5	Partners for Fish and Wildlife	15.631	X	
USGS	6	Assistance to State Water Resources Research Institutes	15.805	X	
USGS	7	U.S. Geological Survey Research and Data Acquisition	15.808	X	
USGS	8	Outdoor Recreation Acquisition, Development Planning	15.916	X	
USFWS	9	Conservation Grants Private Stewardship for Imperiled Species	15.632	X	
USFWS	10	Landowner Incentive	15.633	X	
USFWS	11	Challenge Cost Share	15.642	X	
USGS	12	Rivers, Trails and Conservation Assistance	15.921	X	X
USFWS	13	Wildlife Restoration	15.611	X	
NPS	14	Historic Preservation Fund Grants-In-Aid*	15.904	X	
NPS	15	National Natural Landmarks Program*	15.910		X
NPS	16	National Historic Landmark*	15.912		X
FHA, USDOT	1	Recreational Trails Program	20.219	X	
USEPA	1	Surveys, Studies, Investigations, Demonstrations and Special Purpose Activities Relating to the Clean Air Act	66.034	X	
USEPA	2	Compliance Assistance Support Services to the Regulated Community and Other Assistance	66.305	X	
USEPA	3	Water Pollution Control State and Interstate Program	66.419	X	
USEPA	4	Surveys, Studies, Demonstrations, and Special Purpose Section 1442 of the Safe Drinking Water Act	66.424	X	
USEPA	5	State Public Water System Supervision	66.432	X	
USEPA	6	Surveys, Studies, Investigations, Demonstrations and Training Grants and Cooperative	66.436	X	
USEPA	7	Targeted Watershed Initiative	66.439	X	
USEPA	8	Water Quality Management Planning	66.454	X	
USEPA	9	Nonpoint Source Implementation Grants	66.460	X	
USEPA	10	Wetland Program Development Grant	66.461	X	

Table 8-4. Numerical cross-reference for previous table. (continued)

Organization	Program #	Program	Federal Catalog #	Financial Assistance	Technical Assistance
USEPA	11	Water Quality Cooperative Agreements	66.463	X	
USEPA	12	Capitalization Grants for Drinking Water State Revolving Funds	66.468	X	
USEPA	13	Great Lakes Program	66.469	X	X
USEPA	14	Pesticide Environmental Stewardship Regional Grants	66.714	X	
USEPA	15	Water Protection Grants to the States	66.474	X	
USEPA	16	Water Security Training and Technical Assistance Grant Program	66.478	X	
USEPA	17	Science to Achieve Results (STAR) Program	66.509	X	
USEPA	18	Surveys, Studies, Investigations and Special Purpose Grants Within the Office of Research and Development	66.510	X	
USEPA	19	Office of Research and Development Consolidated Research	66.511	X	
USEPA	20	State Information Grants	66.608	X	
USEPA	21	Protection of Children and the Aging as a Fundamental Goal of Public Health and Environmental	66.609	X	
USEPA	22	Surveys, Studies, Investigations and Special Purpose Grants Within the Office of the Administrator	66.610	X	
USEPA	23	Pollution Prevention Grants Program	66.708	X	
USEPA	24	Capacity Building Grants and Cooperative Agreements for States and Tribes	66.709	X	
USEPA	25	Surveys, Studies, Investigations, Training Demonstrations and Educational Outreach	66.716	X	
USEPA	26	Source Reduction Assistance	66.717	X	
USEPA	27	Toxic Substances Compliance Monitoring Cooperative Agreements	66.701	X	
USEPA	28	International Financial Assistance Projects Sponsored by the Office of International Affairs	66.931	X	
USEPA	29	State Revolving Fund		X	
USEPA	30	The Pollution Prevention Information Network Competition (Pollution Prevention Resource Exchange)		X	
USEPA	31	The Source Reduction Grant Program Competition		X	
USEPA	32	The Pollution Prevention Grant Program		X	
USEPA	33	Solid Waste Management Assistance	66.808	X	
USEPA	34	Hazardous Waste Management State Program Support	66.801	X	
USEAP	35	Capitalization Grants for State Revolving Funds	66.458	X	
USEAP	36	Wastewater Operator Training Grant Program (Technical Assistance)	66.467	X	
USEPA	37	Environmental Protection Consolidated Research	66.500	X	
USEPA	38	Senior Environmental Employment Program	66.508	X	
USEPA	39	Environmental Protection Consolidated Grants Program Support	66.600	X	
USEPA	40	Environmental Justice Grants to Small Community Groups	66.604	X	
USEPA	41	Performance Partnership Grants	66.605	X	
USEPA	42	Surveys, Studies, Investigations and Special Purpose Grants	66.606	X	
USEPA	43	Environmental Policy and Innovation Grants	66.611	X	
USEPA	44	State Underground Water Source Protection	66.433	X	
USEPA	45	Environmental Education Grants*	66.951	X	
USEPA	46	Environmental Education and Training Program*	66.950	X	
USEPA	47	Construction Grants for Wastewater Treatment Works*	66.418	X	
USEPA	48	Beach Monitoring and Notification Program Implementation Grants*	66.472	X	
USEPA	49	Chemical Emergency Preparedness and Prevention (CEPP) Technical Assistance Grants*	66.810	X	
NIH, HSS	1	Biological Response to Environmental Health Hazards*	93.113	X	
ATSDR, HSS	2	Great Lakes Human Health Effects Research*	93.208	X	
MDEQ	1	Beach Act Funds		X	
MDEQ	2	Clean Water Act Section 319 Grant Program		X	
MDEQ	3	Clean Michigan Initiative Environmental Bond		X	
GLC	1	The Great Lakes Basin Program for Soil Erosion and Sediment Control Grant Program		X	

Pollutant Load Reductions

In addition to meeting Phase II permit requirements, and addressing the goals and objectives of the WMP, the actions presented in this chapter are designed to address the significant stressors presented in Chapter 5. These stressors include: sediment, phosphorus, pathogens, and hydrologic flow. Addressing sediment, phosphorus, and pathogens involves achieving a reduction in loading of these pollutants. Addressing hydrologic flow involves mitigating impervious surfaces such that the flashiness of target waterbodies does not increase.

The following sub-sections discuss the actions to be taken to address each stressor.

Sediment

Based on the analysis in Chapter 5, the following load reductions are required for the various catchments in the subwatershed:

- Big Beaver Creek 496 tons/year
- Plum Brook - East 209 tons/year
- Plum Brook - West 153 tons/year
- Red Run - East 557 tons/year
- Red Run - South 608 tons/year
- George W. Kuhn[2] 44 tons/year

This equals a total of 2,067 tons/year that will be prevented from loading into the waterbodies of the subwatershed.

The loading reductions will come from the implementation of many actions over many years, including some from sources that have yet to be specifically identified.

Activities to Address Known Sources

Based on data previously collected and other data collected specifically in support of this plan, a list of specific activities to reduce pollutant loads has been identified.

Bare Soil Repair (Action 5-1)

The 'Pervious Area Assessment' of the 'Unified Subwatershed and Site Reconnaissance' protocol documented 2 locations of bare soil erosion within the subwatershed. This is assumed to be 1% of the total in the subwatershed, giving a total of 200 locations. These locations are assumed to be distributed between the catchments on an area-weighted basis, yielding:

- Big Beaver Creek:46 locations
- Plum Brook – East: 24 locations
- Plum Brook – West: 32 locations
- Red Run – East: 42 locations
- Red Run – South:56 locations

Each location is estimated to be 500 square feet and have a loading rate of 2.5 lbs/sf/yr (0.00125 tons/sf/yr). The annual sediment load in each catchment that may be removed by repairing bare soil areas can be calculated as:

Future Loadings

Changing conditions in the subwatershed, such as land use conversion, may result in higher pollutant loadings than those calculated in Chapter 5. However, it is assumed these increases will be offset by planning actions (see Action Category 3) that are designed to minimize the impacts of development.

[2] The George W. Kuhn catchment is comprised of combined sewers and only discharges sediment during combined sewer overflow (CSO) events. A specific action may be implemented to address CSOs, but this catchment is omitted from the technical discussion because the other actions will have little impact on sediment in the CSO area.

Bare Soil Repair Load Reduction (tons/yr) =

locations X 500 sf per location X 0.00125 tons/sf/yr

Applying this equation for each catchment yields the following estimated load reductions:

- Big Beaver Creek:29 tons/yr
- Plum Brook – East: 15 tons/yr
- Plum Brook – West: 20 tons/yr
- Red Run – East: 26 tons/yr
- Red Run – South:35 tons/yr

Streambank Stabilization (Action 5-2): Utilizing Road-Stream Crossing Data

The 'Road-Stream Crossing Survey' involved surveying 36 sites in the subwatershed out of 95 total (38%). The number of sites surveyed in each catchment and the extrapolated total are given as follows:

- Big Beaver Creek: 11 surveyed of 29 total
- Plum Brook – East: 8 surveyed of 21 total
- Plum Brook – West: 10 surveyed of 26 total
- Red Run – East: 3 surveyed of 8 total
- Red Run – South:4 surveyed of 11 total

The number of poor and fair streambank conditions documented is given as follows:

- Big Beaver Creek: 1 poor and 0 fair sites
- Plum Brook – East: 2 poor and 0 fair sites
- Plum Brook – West: 2 poor and 0 fair sites
- Red Run – East: 0 poor sites and 3 fair sites
- Red Run – South:0 poor sites and 0 fair sites

If these documented conditions are extrapolated to the non-surveyed locations, the total number of expected poor and fair streambank conditions in each catchment is:

- Big Beaver Creek: 3 poor and 0 fair sites
- Plum Brook – East: 6 poor and 0 fair sites
- Plum Brook – West: 6 poor and 0 fair sites
- Red Run – East: 0 poor sites and 8 fair sites
- Red Run – South:0 poor sites and 0 fair sites

Each site is assumed to be 500 sf, the erosion rate for poor sites is 10 lbs/sf/yr (0.005 tons/sf/yr), and the erosion rate for fair sites is 5 lbs/sf/yr (0.0025 tons/sf/yr). The annual sediment load in each catchment that can be removed by repairing streambanks at road/stream crossings can be calculated as:

Road-Stream Crossing Stabilization Load Reduction (tons/yr) =

(# poor sites X 500 sf X 0.005 tons/sf/yr) +

(# fair sites X 500 sf X 0.0025 tons/sf/yr)

Applying this equation for each catchment yields the following estimated load reductions:

- Big Beaver Creek: 8 tons/yr
- Plum Brook – East: 15 tons/yr
- Plum Brook – West: 15 tons/yr
- Red Run – East: 10 tons/yr
- Red Run – South:0 tons/yr

Streambank Stabilization (Action 5-2): Utilizing Unified Stream Assessment Data

The 'Unified Stream Assessment' surveyed eight 0.5 mile stretches on three streams in the subwatershed and five others in three other

subwatersheds (Clinton River East, North Branch, and Lake St. Clair Direct Drainage). Based on this data, the eroding area per stream mile averaged 300 feet long by 10 feet high (3,000 sf/mile). However, this data was applicable to 3rd order streams only and it is necessary to estimate eroding area characteristics for 1st, 2nd, and 4th order streams. These characteristics include:

- 1st order streams: 50 feet long by 1 foot high (50 sf/mile)
- 2nd order streams: 100 feet long by 3 feet high (150 sf/mile)
- 4th order streams: 400 feet long by 12 feet high (4,800 sf/mile)

Based on photographic evidence, it was noted that many of the eroded areas did not appear to be active. As such, it was assumed that the eroding area square footage per mile should be reduced by approximately 66%, such that:

- 1st order streams: 20 sf/mile
- 2nd order streams: 100 sf/mile
- 3rd order streams: 1,000 sf/mile
- 4th order streams: 1,600 sf/mile

The total stream miles in each catchment were obtained from GIS and are given as:

- Big Beaver Creek: 29 miles
- Plum Brook – East: 20 miles
- Plum Brook – West: 35 miles
- Red Run – East: 13 miles
- Red Run – South:5 miles

The total stream miles in each catchment were broken down into stream orders based upon ratios presented in 'Fluvial Processes in Geomorphology' (Leopold, 1964). These are presented as follows (where indicated, the numbers have been adjusted to account for unique catchment configurations – e.g. the catchment having reduced 1st and 2nd order streams due to the presence of storm sewers)::

- Big Beaver Creek
  - 1st Order: 17 miles
  - 2nd Order: 8 miles
  - 3rd Order: 4 miles
- Plum Brook - East
  - 1st Order: 11 miles
  - 2nd Order: 6 miles
  - 3rd Order: 3 miles
- Plum Brook - West
  - 1st Order: 23 miles
  - 2nd Order: 12 miles
- Red Run - East
  - 1st Order: 4 miles (adjusted)
  - 2nd Order: 4 miles (adjusted)
  - 3rd Order: 3 miles (adjusted)
  - 4th Order: 2 miles (adjusted)
- Red Run - South
  - 1st Order: 1 (adjusted)
  - 2nd Order: 2 miles (adjusted)
  - 3rd Order: 2 miles (adjusted)

Stream Order

Stream order is a measure of the position of a stream in the hierarchy of tributaries.

- 1st order streams are those which have no tributaries; the average length is 1 mile with an average 1 square mile drainage area
- 2nd order streams are those which have only 1st order streams as tributaries; the average length is 2.3 miles with an average 4.7 square mile drainage area
- 3rd order streams have only 1st and 2nd order streams as tributaries; the average length is 5.3 miles with an average 23 square mile drainage area
- 4th order streams have only 1st, 2nd, and 3rd order streams as tributaries; the average length is 12 miles with an average drainage area of 109 square miles

The loading rate is assumed to be 5 lbs/sf/yr (0.0025 tons/sf/yr). The annual sediment load in each catchment that can be removed by stabilizing streambanks (not at road-stream crossings) can be calculated as

Unified Stream Assessment Stabilization Load Reduction (tons/yr) =
((# 1st order stream miles X 20 sf/mile actively eroding) +
(# 2nd order stream miles X 100 sf/mile actively eroding) +
(# 3rd order stream miles X 1,000 sf/mile actively eroding) +
(# 4th order stream miles X 1,600 sf/mile actively eroding))
X 0.0025 tons/sf/yr

Applying the equation for each catchment yields the following load reductions:

- Big Beaver Creek: 56 tons/yr
- Plum Brook – East: 42 tons/yr
- Plum Brook – West: 24 tons/yr
- Red Run – East: 67 tons/yr
- Red Run – South:23 tons/yr

Summary

The following table summarizes the load reductions that are estimated to be achieved if the known sources are addressed.

Table 8-5. Loading reductions that result from addressing known sources.

Catchment	Bare Soil (tons/yr)	Road-Stream Crossing (tons/yr)	Unified Stream Assessment (tons/yr)	Total (tons/yr)
Big Beaver Creek	29	8	56	**93**
Plum Brook - East	15	15	42	**72**
Plum Brook – West	20	15	24	**59**
Red Run - East	26	10	67	**103**
Red Run - South	35	0	23	**58**
TOTAL	**125**	**48**	**212**	**383**

Addressing these known problems will account for 18% of the target sediment load reduction in the subwatershed.

Activities to Address Other Sources

To meet the target load reductions (either in concert with or in lieu of addressing the issues discussed in the previous topic) additional actions will have to be implemented. A detailed removal plan has not been developed because different municipalities may choose to use different techniques based on preferred practices, available resources, physical site constraints, and funding. Some of the actions that may be implemented and for which a reduction in sediment load may be calculated include, with select examples (additional details can be found in Chapters 7 and 8):

4-3 Storm Sewer System Maintenance and Operations
4-4 Minimizing Pollution from Roads and Lots
4-5 Minimizing Pollution from Municipal Facilities
4-11 IDEP
Example: Once the current IDEP cycle is completed, each community may take its measured data and the number of problems that were corrected to calculate a reduction in sediment loading.
4-12 Septic System Practices
5-1 Bare Soil Repair
5-2 Streambank / Shoreline Stabilization
5-3 Road and Ditch Stabilization
5-4 Streambank Use Exclusion
Example: Where unauthorized access to a waterbody has resulted in erosion problems, exclusion measures may be erected and the reduction in sediment loading calculated.
5-5 Sensitive Site Control
Example: A site, such as a landscaping supply company, which is determined to discharge 50 t/yr of sediment, may have controls installed to reduce this discharge.
5-6 Structural Controls
Example: Swirl separators or sediment traps may be installed in municipal catch basins to achieve a reduction in sediment loading that can be calculated once the devices have been put into service.
6-1 Mitigate Existing Impervious Surfaces
Example: 1,000 acres of urban land (with a loading rate of 300 lbs/ac/yr) may be outfitted with parking lot islands and side drainage ditches (with a 60% removal efficiency) that result in a 90 t/yr reduction in sediment load.
6-2 Infiltration Techniques
6-3 Filtration Techniques
6-4 Vegetative Buffers and Natural Conveyance
6-5 Retention and Detention
7-4 Natural Feature Restoration

Summary

This subsection of the plan does describe in some detail how sediment loading reductions can be achieved, but does not prescribe in detail how this implementation has to occur. This is to provide the greatest flexibility for the entities implementing this plan to select actions that are appropriate based on cost, funding opportunities, and other factors such as updated data and load analyses.

The ultimate goal of the actions presented in this subsection is to collectively achieve the desired sediment loading reduction in each catchment of the subwatershed.

Phosphorus

Based on the analysis in Chapter 5, the following load reductions are required for the various catchments in the subwatershed:

- Big Beaver Creek 4 tons/year
- Plum Brook - East 2 tons/year
- Plum Brook - West 2 tons/year
- Red Run - East 6 tons/year
- Red Run - South 20 tons/year
- George W. Kuhn[3] 1 tons/year

This equals a total of 35 tons/year that will be prevented from loading into the waterbodies of the subwatershed.

The loading reductions will come from the implementation of many actions over many years, including some from sources that have yet to be specifically identified.

Activities to Address Known Sources

First, given an assumed concentration of phosphorus in soil of 0.0005 lb/lb, the actions presented in Table 8-5 provide phosphorus reductions as presented in Table 8-6.

Table 8-6. Phosphorus load reductions associated with the addressing of known sediment problems.

Catchment	Bare Soil (tons/yr)	Road-Stream Crossing (tons/yr)	Unified Stream Assessment (tons/yr)	Total (tons/yr)
Big Beaver Creek	0.01	< 0.01	0.03	**0.04**
Plum Brook - East	0.01	0.01	0.02	**0.04**
Plum Brook – West	0.01	0.01	0.01	**0.03**
Red Run - East	0.01	0.01	0.03	**0.05**
Red Run - South	0.02	0.00	0.01	**0.03**
TOTAL	**0.06**	**0.03**	**0.10**	**0.19**

When feasible, these load reductions should be corrected with sampled phosphorus/soil ratios. As currently calculated, these reductions account for only around 0.5% of the total needed for the subwatershed.

Activities to Address Other Sources

To meet the target load reductions (either in concert with or in lieu of the reductions obtained through addressing sediment issues) additional actions will have to be implemented. A detailed removal plan has not been developed because different municipalities may choose to use different

[3] The George W. Kuhn catchment is comprised of combined sewers and only discharges sediment during combined sewer overflow (CSO) events. A specific action may be implemented to address CSOs, but this catchment is omitted from the technical discussion because the other actions will have little impact on sediment in the CSO area.

techniques based on preferred practices, available resources, physical site constraints, and funding. Some of the actions that may be implemented and for which a reduction in phosphorus load may be calculated include, with select examples (additional details can be found in Chapters 7 and 8):

- 4-3 Storm Sewer System Maintenance and Operations
- 4-4 Minimizing Pollution from Roads and Lots
- 4-5 Minimizing Pollution from Municipal Facilities
- 4-8 Animal Waste Control
- 4-9 Sanitary and Combined Sewer System Planning and Maintenance
  Example: Implementing advanced treatment technologies at the Warren Waste Water Treatment Plant to reduce the amount of phosphorus that is discharged.
- 4-11 IDEP
  Example: Once the current IDEP cycle is completed, each community may take its measured data and the number of problems that were corrected to calculate a reduction in phosphorus loading.
- 4-12 Septic System Practices
- 5-1 Bare Soil Repair
- 5-2 Streambank / Shoreline Stabilization
- 5-3 Road and Ditch Stabilization
- 5-4 Streambank Use Exclusion
- 5-5 Sensitive Site Control
  Example: A site, such as a nursery or greenhouse which is determined to discharge 1 t/yr of phosphorus may have controls installed such that its discharge is reduced to 0.1 t/yr.
- 5-6 Structural Controls
  Example: Swirl separators or pollutant traps may be installed in municipal catch basins to achieve a reduction in loading that can be calculated once the devices have been put into service.
- 6-1 Mitigate Existing Impervious Surfaces
  Example: 1,000 acres of urban land (with a loading rate of 1.0 lbs/ac/yr) may be outfitted with parking lot islands and side drainage ditches (with a 60% removal efficiency) that result in a 0.3 t/yr reduction in sediment load.
- 6-2 Infiltration Techniques
- 6-3 Filtration Techniques
- 6-4 Vegetative Buffers and Natural Conveyance
- 6-5 Retention and Detention
- 7-4 Natural Feature Restoration

Summary

This subsection of the plan does describe in some detail how phosphorus loading reductions can be achieved, but does not prescribe in detail how this implementation has to occur. This is to provide the greatest flexibility for the entities implementing this plan to select actions that are appropriate based on cost, funding opportunities, and other factors such as updated data and load analyses.

The ultimate goal of the actions presented in this subsection is to collectively achieve the desired phosphorus loading reduction in each catchment of the subwatershed.

Pathogens

The complex nature of pathogens requires an analysis that does not rely on achieving quantified load reductions, but instead eventually achieving compliance with concentration-based water quality standards. This is in accordance with the MDEQ developed approach in the pathogen TMDL for the Red Run Drain and Bear Creek.

This approach involves implementing pathogen reducing actions to address all sources (especially those present in the Middle Branch catchments, the Central Main Branch catchment, and the West Main Branch catchment) and continuously monitoring to determine if progress is being made.

Achieving the water quality standard will be the result of many actions over many years, including some that address sources that have yet to be specifically identified. Some of the actions that may be implemented to reduce pathogen discharges include, with select examples:

- 4-8 Animal Waste Control
  Example: Providing pet waste disposal opportunities near waterbodies where pet runs are available will prevent pathogens from this waste from entering waterbodies through stormwater runoff.
- 4-9 Sanitary and Combined Sewer System Planning and Maintenance
  Example: Improvements to sanitary and combined sewer systems, especially where known SSOs and CSOs occur, will reduce pathogen discharges to waterbodies.
- 4-11 IDEP
  Example: The main emphasis of the IDEP programs is to find and correct illicit discharges to waterbodies, especially those of the type where raw sanitary sewage is discharging from the storm sewers. This action will reduce pathogen discharges to waterbodies.
- 4-12 Septic System Practices
- 5-4 Streambank Use Exclusion
- 5-5 Sensitive Site Control
  Example: A site which is known to discharge high levels of pathogens can be fitted with controls to reduce or eliminate this discharge.
- 5-6 Structural Controls
- 6-1 Mitigate Existing Impervious Surfaces
- 6-2 Infiltration Techniques
- 6-3 Filtration Techniques
- 6-4 Vegetative Buffers and Natural Conveyance
- 6-5 Retention and Detention
- 7-4 Natural Feature Restoration

The ultimate goal of the actions presented in this subsection is to collectively achieve the pathogen water quality standard at all sampled locations throughout the subwatershed.

Hydrologic Flow

The complex nature of hydrologic flow requires an analysis that does not rely on achieving quantified load reductions, but instead addressing impervious surfaces such that the flashiness of the flow in waterbodies does not increase.

This approach involves implementing imperviousness mitigating actions especially on directly connected impervious areas (based on the prioritized critical area catchments defined in Chapter 5: Gloede Drain, Central Main Branch, and East Main Branch) and regularly monitoring to determine if progress is being made.

Ensuring that flashiness does not increase, or actually decreases, will be the result of many actions over many years. Some of the actions that may be implemented to mitigate impervious surfaces include, with select examples:

- 6-1 Mitigate Existing Impervious Surfaces
  Example: 1,000 acres of urban land may be outfitted with parking lot islands and side drainage ditches that reduce peak discharge rates to nearby waterbodies which reduces their peak flow rates.
- 6-2 Infiltration Techniques
  Example: A 500 acre residential neighborhood may be outfitted with infiltration devices that reduce discharge volume to nearby waterbodies which reduces their total discharge.
- 6-4 Vegetative Buffers and Natural Conveyance
- 6-5 Retention and Detention
- 7-4 Natural Feature Restoration

The ultimate goal of the actions presented in this subsection is to collectively mitigate impervious surfaces such that waterbodies in the subwatershed experience no increase in their flashiness indices.

Adaptive Management

The actions and the associated details presented in this chapter were selected in an adaptive management setting that considered the current conditions of the subwatershed. As the planning process moves forward, and new information becomes available, the actions and details will change as appropriate in future versions of the plan.

Decision-making Principles and Prioritization Process

While there were numerous factors in play when determining the actions to include in the WMP, a few of the important principles include:

- Addressing permit requirements;
- Addressing other funding requirements;
- Addressing the goals and objectives of the plan;
- Addressing known water quality issues;
- Addressing the desires of the public;
- Addressing public concerns;
- Cost considerations;
- Maintenance considerations;
- Appropriateness of action;
- Likelihood of success (i.e., achieving pollutant reduction or successfully addressing an objective);
- Relevant social and scientific research;
- Previous experience with the actions; and
- Potential for public acceptance.

The actions have been prioritized in that a timeline has been assigned to guide their implementation. The timeline was assigned based on:

- prescribed dates for submittals;
- feedback from the SWAG members as to when the actions needed to and realistically could be implemented (with a consideration for leveraging those actions which are already occurring)
- addressing the most pressing water quality problems as soon as possible;
- implementing the most cost-effective measures in the short-term (to make the best use of scarce funds); and
- relegating actions requiring outside funds to the long-term portions of the schedule (to provide ample time to procure necessary funding).

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