Developing a Watershed Management Plan for Water Quality:

An Introductory Guide

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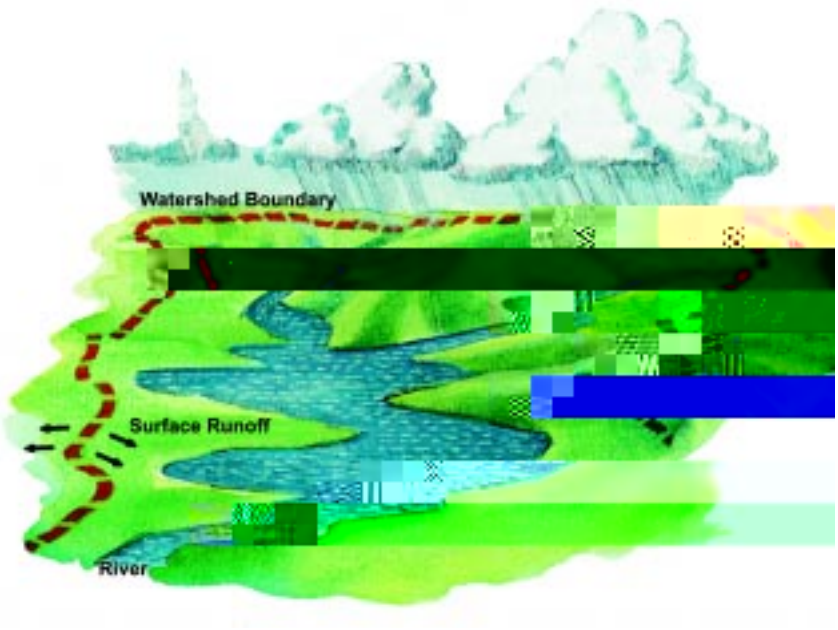
Introduction

This guide was written to help local units of government, nonprofit organizations, and citizens develop watershed management plans. It outlines a process for gathering people, information, and resources together to protect and improve Michigan's water resources.

A **watershed** is an area of land that drains to a common point. On a very broad scale, imagine a mountain, and think of the highest ridges on the mountain as the boundaries of



Does a watershed management plan address just surface waters?

Because **surface waters**—including rivers, streams, lakes, ponds, and **wetlands**—drain to and are recharged by groundwater, watershed plans sometimes include groundwater protection activities. This is particularly common in areas with predominantly sandy soils, since pollutants on the land can readily infiltrate the groundwater.

In addition to addressing water quality, this planning process can also be used for other resource issues, such as a community's desire to protect critical habitat for an endangered species. Often such "desired uses" help build community support for the water quality efforts in a watershed.

How long does it take to develop a watershed management plan focusing on water quality?

Based on DEQ Nonpoint Source Program experience, most watershed management plans take 12–24 months to develop, with 15–18 months being the average time frame.

Who can help?

As you develop your watershed management plan, you are encouraged to contact DEQ Nonpoint Source Program staff for assistance. They can provide:

- Water quality information available from the DEQ
- Suggestions on who to contact for additional water quality data
- Information about other watershed manage-

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Chapter 1: Identifying and Networking with Local Agencies and Citizens

Chapter Objectives

- Identify water quality concerns
- Identify other groups or individuals with similar concerns
- Form a steering committee
- Identify a lead organization
- Discuss all existing and perceived concerns
- Define the geographic scope of the watershed based on the concerns
- Modify committee membership based on the geographic scope of the watershed
- Begin to develop a resource library

Chapter Products

- ❑ A watershed steering committee, lead organization, and technical committee
- ❑ A description of the watershed and a map with the watershed boundaries
- ❑ A resource library

How do you begin a watershed project?

If you are interested in starting a watershed management project to protect water quality, your first step is to identify your water quality concerns and find individuals or organizations who have similar concerns. Begin by contacting the people and organizations that you know. If they have an interest in water quality, they may be potential partners who can assist you with the watershed planning process.

Once you have contacted the people you know, consider other groups who may be interested in addressing water quality. Anyone who may have a stake in the watershed plan should be encouraged to share their concerns and offer suggestions for possible solutions. By involving **stakeholders** in the initial stages of project development, you will be helping to ensure long-term success. Consider contacting the potential stakeholders listed in the box at right, to determine if they have water quality concerns. They may also be aware of other individuals who might be interested in helping with the project.

the steering committee members those who can make decisions and influence change? If not, contact the missing stakeholders and invite them to participate. Keep in mind that as concerns are identified and the plan is developed, the membership of the committee may change.

A steering committee provides overall direction for a watershed project. Members include decision makers, people with authority to make change, and people affected by the change.

Who should lead the steering committee?

Once the steering committee is in place, the next step is to identify a lead organization. This may be your organization or agency or another organization represented on the committee. The leader's role is to ensure that the watershed planning and implementation process continues to move forward. The most appropriate organization to lead the effort is the one that can represent the entire project area, and has the staff and resources necessary to carry out the plan.

The most appropriate lead organization also depends on the priority concerns within the watershed. For example, if the land use in the project area is predominantly agricultural, it may be appropriate for the local conservation district to provide leadership. If the primary concern is urban **storm water**, a drain commissioner's or township office might be an appropriate lead organization.

How should the steering committee operate?

To ensure that meetings run smoothly, it is important to identify some basic roles and responsibilities for the steering committee. For example, someone should serve as secretary to document the important decisions made at the meetings and distribute them to

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Depending on your situation, the techni-

Chapter 2: Getting to Know Your Watershed

Chapter Objectives

- Identify designated and desired uses for your watershed
- Identify pollutants in your watershed
- Identify sources of pollutants in your watershed
- Identify causes of pollutants
- Develop goals based on designated and
- Develop an initial water quality summary

Chapter Product

❑ A water quality summary of designated and desired uses, known and suspected pollutants, sources and causes, and overall goals

Introduction

Once your steering and technical committees have been organized, the next step is to work from the list of water quality concerns and learn about your watershed. This chapter will help you understand the current condition of water quality in your watershed and help you determine goals for your watershed that focus on water quality. You will also develop a water quality summary that will serve as the foundation of your watershed management plan.

What are designated uses and how will they help you identify water quality concerns?

The primary criterion for water quality is whether the waterbody meets designated uses. **Designated uses** are recognized uses of water established by state and federal water quality programs (see box at right for a list of designated uses). In Michigan, the goal is to have all waters of the state meet all designated uses.

Designated Uses*

All surface waters of the state of Michigan are designated for and shall be protected for all of the following uses:

1. Agriculture
2. Industrial water supply
3. Public water supply at the point of intake
4. Navigation
5. Warmwater fishery
6. Other indigenous aquatic life and wildlife
7. Partial body contact recreation
8. Total body contact recreation between May 1 and October 31

**Certain waterbodies are also protected as a coldwater fishery*
Citation: R323.1100 of Part 4, Part 31 of PA 451, 1994, revised 4/2/99

Identifying the designated uses that are not being met and those uses that are threatened by activities on the land is a critical part of all watershed management plans.

Is your waterbody meeting designated uses?

Each of the water quality concerns that your steering committee listed for your watershed will correspond with one or more designated uses. In the "Example Watershed" introduced in Chapter 1, algal blooms are occurring. According to newspaper reports, these blooms are interfering with wading and fishing, which is associated with the designated use of *partial body contact recreation*. You can therefore say that the *partial body contact recreation* designated use is impaired in the Example Watershed.

Example Watershed Concerns	*Example Watershed Impaired Designated Uses*
Algal blooms	Partial body contact recreation, warmwater fishery
Eroding road-stream crossings and river flooding	Aquatic life/wildlife
Livestock in streams and poor fishing	Warmwater fishery

To evaluate all designated uses, your steering and technical committees should gather as much information as they can about the watershed. For example, if a Department of Natural Resources Fisheries Division survey reports that sediment from stream bank erosion is filling in spawning areas and decreasing fish productivity, then the *warmwater fishery* designated use may be impaired. For all water quality concerns in your watershed—including both verified and perceived concerns—the steering and/or technical committee should identify the designated uses that are impaired.

Who can help you determine if the waterbody is meeting its designated uses?

The DEQ Surface Water Quality Division Nonpoint Source Program staff can provide water quality data about various watersheds. The assistance they provide can be supplemented with other contacts in the community based on the pollutants you identify. For example, if the newspaper has reported "elevated ***E. coli*** levels," you might contact your local health department to verify that those levels exceeded water quality standards (i.e., to verify that the designated use, *total and/or partial body contact recreation*, is impaired). Other resource contacts in Appendix A may be able to provide information about your watershed.

You can also refer to the *Water Quality and Pollution Control in Michigan* report (available from DEQ), which provides an assessment of the designated uses of Michigan's lakes, streams, and rivers.

Will your water meet designated uses in the future?

In some cases, activities and resulting pollutants in the watershed may prove to be a threat to water quality. Threatened waterbodies are defined as those that currently meet water quality standards but may not in

Suggestions for identifying desired uses include:

- Seeking stakeholder/steering committee input
- Contacting local newspapers or searching the Internet to inquire about previously published local interest stories on water quality, wildlife, or recreation in the watershed
- Talking to local park and recreation officials to determine if recreational plans have been developed for the watershed
- Checking with local recreation groups such as canoe livery operators and fishing clubs

At this point, you should have a list of the designated uses that are not being met and the designated uses that are threatened. You should also have a list of desired uses for your watershed.

How do you identify known or suspected pollutants?

The next step in developing your watershed plan is to identify the pollutants that are threatening or impairing the designated uses. A designated use is threatened or impaired because of the presence of one or more pollutants in the water. For example, if the designated use *warmwater fishery* is threatened due to urbanization, then one pollutant of concern may be sediment, since development activities may increase erosion and sediment **runoff**. The table top right provides a list of pollutants that are typically associated with each designated use. A more detailed description of typical pollutants is provided in Appendix B.

The list of pollutants that you develop at this stage is an initial "best guess" based on your familiarity with the watershed and available information. You will verify the presence of the pollutants later. To develop the initial list of pollutants, the steering or technical committee might contact organizations, universities, or local health departments that are likely to have monitoring reports and research studies.

Designated Use	*Typical Pollutants Affecting the Designated Use*
Agriculture	Hydrology (i.e., too little water to irrigate)
	Nutrients
Public water supply	Nutrients (nitrates)
	Pesticides
Navigation	Sediment
Warmwater fishery	Sediment
	Hydrology (i.e., "flashy" streams)
Other indigenous aquatic life and wildlife	Sediment
	Pesticides
	Temperature
Partial body contact recreation	*E. coli* bacteria
	Nutrients
Industrial water supply	Suspended solids

Example Watershed Causes for Each Source	
Sources*	***Causes***
Livestock in stream (k)	Unrestricted access (k)
Failing septic systems (s)	Improperly designed and maintained septic systems (s)
Residential fertilizer use (s)	Improper application (s)
Road-stream crossings (k)	Undersized culverts due to increased hydrologic flow (k)

What is in a water quality summary?

Your watershed plan should also include a water quality summary. The water quality summary is a short and clearly written synopsis of water quality in the watershed. It includes the designated and desired uses addressed in the plan, the known and suspected pollutants, known and suspected sources of the pollutants, their known and suspected causes, and the goals for the watershed. Such a summary can be used to educate citizens, stakeholders, and local officials. An example initial water quality summary is given on the right.

At this point you should develop your initial water quality summary. After you have completed your inventory and analyzed the data in the upcoming chapters, you will modify and finalize the water quality summary (Chapter 11). The final summary will provide an accurate picture of your watershed and a clear link between the goals and conditions in the watershed.

Example Water Quality Summary (Initial)

The Example Watershed waterbody has three designated uses that are impaired: (1) partial body contact recreation, (2) aquatic life/wildlife, and (3) warmwater fishery. The designated use public water supply is threatened.

Project Goals

The first project goal is to restore partial body contact recreation use by reducing *E. coli* bacteria and nutrient loadings. The second goal is to…

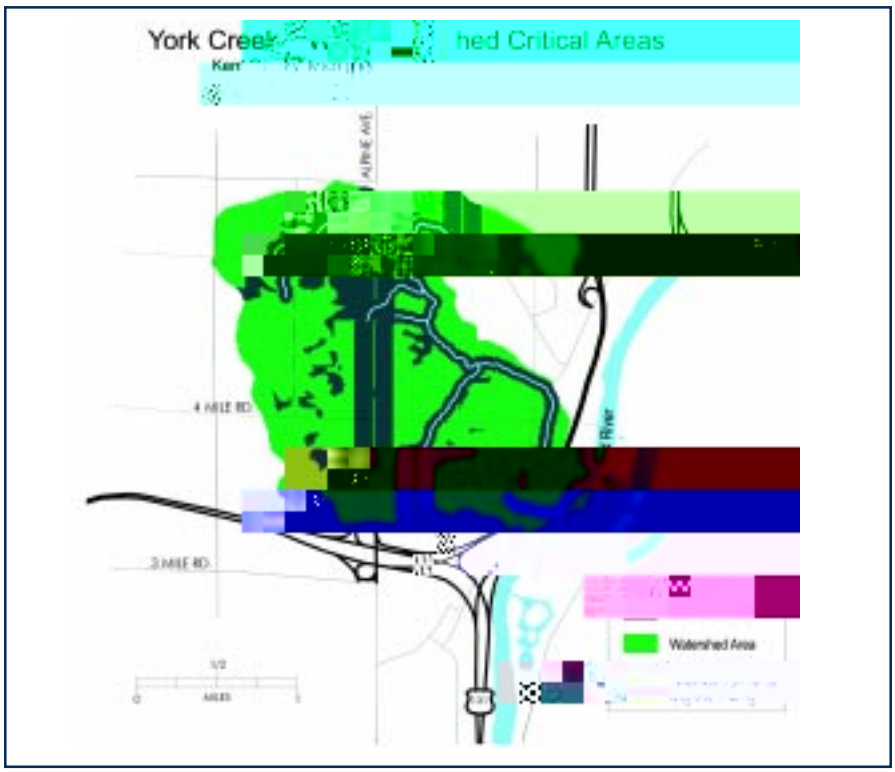
Other goals based on the remaining impaired or threatened designated uses should also be stated.

Recreation

The designated use of partial body contact recreation is impaired due to undesirable algal blooms and *E. coli* levels. The only known source of these pollutants is livestock in the stream. Suspected sources include failing septic systems and the misapplication and/or over-application of fertilizer in residential areas.

Uncontrolled livestock access to streams results in *E. coli* and nutrient deposition directly into the water. When septic systems do not properly treat waste, nitrates can be transported from the septic field area to the waterbody, where they contribusrojered or 1h2lhe rab-0.m the se(n*-0.5os)]TJissolvi

In the York Creek watershed, planners identified eroding stream banks as a source of pollutants. They initially identified the critical area as simply the corridor along the stream. Other known pollutants included increased hydrologic flows due to development and increased storm water runoff. Because development was primarily occurring along a particular street, York Creek's critical area was expanded to include that street. In addition, the York Creek watershed is hilly, and the planners identified several areas with highly erodible soils, which they added to the critical area. York Creek's critical area, then, was a blend of a stream corridor, a development corridor, and patches of erodible land outside the corridors.



A critical area might also consist of one or more subwatersheds. Water quality data may show that within the watershed, only one or two upstream areas contribute the vast majority of pollutants to the waterbody.

In the Lake Macatawa watershed in Ottawa and Allegan Counties, planners divided the watershed into multiple subwatersheds. They then created maps combining the subwatersheds based on three land use categories. This method allowed experts in each of the identified land uses to conduct an inventory of the subwatersheds. After the inventories were conducted, the planners were able to implement different strategies for each land use.

Chapter 4: Surveying the Watershed to Inventory Your Critical Area

Chapter Objectives

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In the Example Watershed, through the inventory and phone calls to local experts, the committee verified all "known" pollutants, sources, and causes. During the inventory, a sheen of oil was observed below a storm drain; therefore, oils and grease were moved from the suspected to the known pollutant list. Storm drains (which empty into the river) also became known sources of oils and grease. When a light rain storm resulted in flooding, planners contacted the U.S. Geological Survey for hydrology data. With this information, urban storm water was added as a known source of increased hydrologic flow, and poor storm water management practices were determined to be the cause. In addition, residential fertilizer use was added as a known source of nutrients because of the number of vivid green manicured lawns ending at the water's edge.

While many pollutants and sources became known in the Example Watershed, some pollutants, sources, and causes could not be confirmed as "knowns." No water quality data confirmed that pesticides were creating a water quality problem and no one observed heavy use of pesticides on agricultural lands or residential gardens. Thus, pesticides and their possible

Chapter 5: Prioritizing Pollutants, Sources and Causes

Chapter Objectives

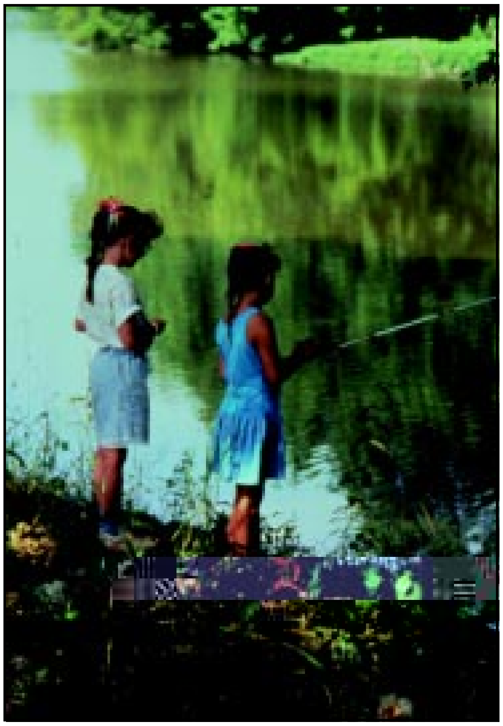
- Prioritize pollutants for your watershed based on the designated uses
- Prioritize sources and causes of the pollutants

Chapter Product

❑ A prioritized list of pollutants, sources, and causes for your watershed

Introduction

Based on your inventory of the critical area, you should have a thorough understanding of the pollutants, sources, and their causes. The next step is to prioritize them to help you decide which should be addressed first in your watershed management plan. By prioritizing, you may be able to achieve the greatest pollutant reduction while treating the fewest sources, leading to the greatest water



Example Watershed Prioritization Process for Sources and Causes of Sediment			
Sources	**Priority Ranking**	**Causes**	**Priority Ranking**
Eroding road-stream crossings	1	Undersized culverts (increased hydrologic flow)	1
Stream bank erosion	2	Flow fluctuation (poor storm water management practices) Human access	1 2
Livestock in stream	3	Unlimited access	1

This table is not complete. You should prioritize for all sources and causes.

Criteria commonly used by watershed projects for ranking sources include the frequency of occurrence, the degree to which the source degra[illegible] the water, and an analysis o[illegible] [illegible] costs for addre[illegible]

After [illegible]izing pollutant sources, the next ste[illegible] to review the causes of the sources. [illegible]t may not be necessary to prioritize all of the causes, since some will logically need to be addressed before other causes or other sources. For example, if flow fluctuations are causing stream bank erosion, you will want to address the flow problem before you begin stabilizing eroding stream banks. The Example Watershed's prioritized causes are listed above right.

Chapter 6: Determining Objectives for Your Watershed Goals

Chapter Objective

- Develop objectives for each of your watershed goals

Chapter Product

❑ A table showing objectives for each of your watershed goals

Introduction

Having completed the steps in Chapters 1 through 5 of the watershed planning process, you should have the necessary information to determine detailed objectives and tasks to meet your watershed goals. At this point, you should have goals for your watershed and understand:

- The physical characteristics of your watershed
- The pollutants that are impairing and threatening designated uses
- The sources and causes of pollutants
- The desired uses of your watershed

In addition, your pollutants, sources, and causes should be prioritized. In this chapter you will determine objectives for each of your goals.

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Chapter 7: Identifying Systems of Best Management Practices Needed

Chapter Objectives

- Identify the Best Management Practices (BMPs) for each source or cause of pollution in your watershed
- Combine BMPs into systems

Chapter Product

❑ A table showing the systems of BMPs needed for each source or cause of pollution, and estimated costs

Introduction

At this point, you have a list of objectives for achieving each of your watershed goals. This chapter will help you identify the Best Management Practices needed to address the priority sources and causes of pollutants in your critical area.

What is a Best Management Practice (BMP)?

A Best Management Practice is a land management practice that a landowner implements to control sources or causes of pollution. There are three types of BMPs that treat, prevent, or reduce water pollution.

- Structural BMPs: "brick and mortar" practices that require construction activities

For each source in your watershed, you should develop a table of sources, information resources, and the name of the systems of BMPs most appropriate for the source.

In the Example Watershed, flow fluctuations were identified as a cause of erosion and flooding. Because erosion and flooding are problems throughout the watershed, the technical committee recommended that a hydrologic analysis be conducted to identify the degree to which flow needs to be controlled, and how future and existing flow could be controlled. The technical committee used a hydrologic analysis to identify where watershed-wide BMPs could be installed, including storm water basins, buffer strips, and infiltration practices. They with s5 basi teced,7(7Tm3Elized outletElimr 0ons 3nd fm0 0 11537 3nd flo)10(1(72(evi ilized oute-te 7ized oulv)teria such 02

Source	*BMP Manual*	*Potential System of BMPs*
Road-stream crossings	Guidebook of BMPs for Michigan Watersheds	Watercourse crossings BMP, Detention basin BMP
Stream banks	Guidebook of BMPs for Michigan Watersheds	Stream bank stabilization BMP
Urban storm water	Guidebook of BMPs for Michigan Watersheds; Stormwater Management Guidebook	Dependent upon hydrologic analysis
Storm drains	Stormwater Management Guidebook; I/E	Dependent upon hydrologic analysis
Impervious surfaces	Guidebook of BMPs for Michigan Watersheds	Dependent upon hydrologic analysis
Livestock in stream	Michigan Ag BMP Manual	Resource Management System -2 pasture management
Failing septic systems	I/E	—
Residential fertilizer use	I/E	—

culverts. By determining the causes at each source in your critical area, and the package of BMPs typically needed, you will be able to obtain better cost estimates for your BMPs.

In the Example Watershed, the technical committee created a table of objectives by source (see Chapter 6), causes for that source, the typical system of BMPs needed based on the appropriate BMP manual, the number of similar sites, and an estimate of cost per site. You should develop a similar table for your critical area and include systems of BMPs for all of your sources.

Objective by Source	*Causes*	*Typical System of BMPs*	*Number of Similar Sites*	*Estimated Cost/Site*
Reduce sediment at eroding road-stream crossings	Eroding road-stream crossing needing culvert replacement	Replace culvert with single-span bridge or new culvert, reshape and vegetate side slopes, install water turnouts with stabilized outlets, rock at abutment. Some paving of approaches; some detention or infiltration for treatment of runoff.	10	$50,000
Reduce sediment at eroding road-stream crossings	Eroding road-stream crossing needing culvert extensions	Culvert extensions, reshape and vegetate side slopes. Some water turnouts and stabilized outlets.	10	$23,000

Note that the example is not complete. Your table should include the objective by source, causes, systems of BMPs, number of sites, and cost estimates for all sources.

Criteria for selecting site-specific BMPs include:

- The BMPs must meet the goals or criteria of the watershed plan
- Effectiveness or appropriateness of the BMPs based on what the BMPs do and the site-specific characteristics
- Implementation costs
- Expected life of each practice
- Management costs
- Acceptability of the practices to the landowner and community
- Maintenance requirements

Before BMPs are implemented, the factors above are considered for a site, and the BMPs are grouped into a site plan. A site plan shows the location and type of BMPs to be installed, elevation and grades, and design specifications. A site plan is usually designed by an engineer or a landscape architect. Site plans must be developed for all projects submitted for CMI Nonpoint Source funding, many projects submitted for federal nonpoint source funds, and many projects submitted for CMI Clean Water Fund funding. All BMPs need to meet the standards and specifications explained in the BMP guidance manuals previously described. For more information on site plans, contact the DEQ Nonpoint Source Unit for a copy of *BMPs, Site Plans and Engineering Review.*

Au Sable River Project

In the Au Sable River Watershed project, the primary focus was on stabilizing eroding stream banks to protect the world-class trout fishery. The watershed planner developed site plans and presented them to the steering committee for approval. The steering committee consisted of key users of the river—canoe livery owners, anglers, and owners of Au Sable river boats. Each site plan had to meet the needs of all the key users. In one case, a site plan for a boat launch with rock at the river's edge was unacceptable to owners of the Au Sable river boats, so the plan was changed, and cedar logs were installed instead. Small changes in the site plan led to acceptance of the plan by the key users of the river. This process was time-consuming, but every site stabilization project on the Au Sable River was completed with the interest and support of its users.

Chapter 8: Identifying and Analyzing Projects, Programs, and Ordinances

Chapter Objectives

- Identify the local programs, projects, and ordinances that currently impact water quality
- Evaluate them to see if they are consistent with the goals of your watershed plan
- Identify opportunities to coordinate with or improve upon existing programs

Chapter Product

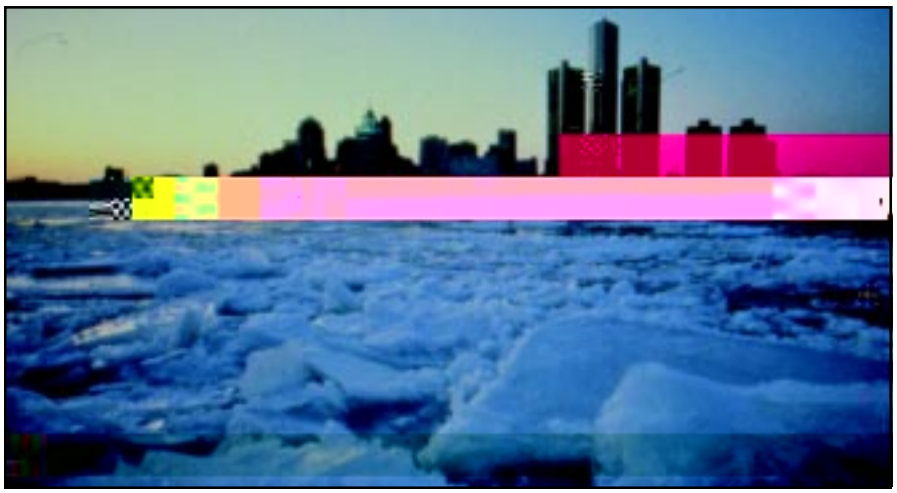
❑ A summary of existing local projects, programs, and ordinances, and any modifications needed to meet the watershed goals

Introduction

In this chapter, you will assess the local programs that impact water quality within your watershed. The goal is to build upon and coordinate with existing projects and programs. You will also assess whether local ordinances are adequately protecting water quality.

Where do you begin?

With input from your steering committee and the work that has been completed in the previous chapters, you are probably familiar with many of the projects, programs, and ordinances that address water quality in your watershed. For example, you might know that an annual stream cleanup is held along a stretch of the river, or that a storm water ordinance exists in the township that encompasses your critical area. Now, you will obtain more specific information about these projects, programs, and ordinances.



If you are not aware of the water quality projects, programs, and ordinances in your watershed, begin by asking members of your steering and technical committees for their input. In addition, review the archives of your local newspaper to help you identify federal, state, and local water-related initiatives within the watershed. Gather written information about them, and speak with the individuals who represent those programs.

You should begin with the projects, programs or ordinances with which you are familiar. Ask yourself the following questions:

- How does the project or program relate to the goals of the watershed project?
- Is the project, program, or ordinance effectively protecting water quality? If not, how can it be improved?
- What partnerships exist and how well are they working?
- Do opportunities exist for launching new activities in cooperation with an existing project, program, or ordinance?

Note how the agencies and organizations in the watershed operate, as well as their legal and jurisdictional authority. For example, you may need to ask the local road commission staff about their maintenance schedule and how they set priorities for upcoming work. Begin by summarizing the roles and limitations of each of your stakeholder groups. For example, you may need to research the authority and limitations of the drain commissioner or planning board. This step is important because you do not want to make a recommendation in your watershed management plan that no one has the authority to carry out.

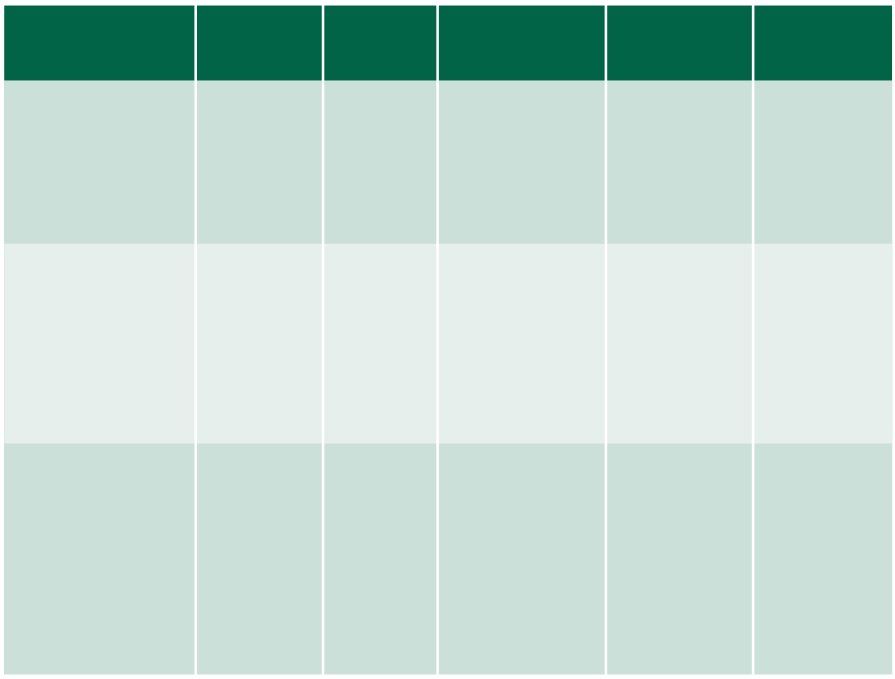
You should also familiarize yourself with any land use ordinances or restrictions within the watershed, such as wetland or storm water ordinances, setback requirements for new development projects, or any other ordinances that relate to water quality or land use. This can be a very time-consuming task. However, since land use controls are a critical component of watershed management plans, this is an important step in the process.

In the Example Watershed, the technical committee reviewed the sources and causes of the pollutants within the critical area, and listed the ongoing projects, programs, and ordinances that address those pollutants. Beginning with their priority pollutant—sediment—and their number one source—road-stream crossings—they listed their observations from the watershed inventory:

- Some culverts are too short and need to be extended
- Some culverts are too small (i.e., the water is backing up) and need to be replaced
- Some structural BMPs installed in the past are not being maintained

To address these problems, the committee realized that they needed more information about the design criteria used by the road commission, as well as procedures that are in place within that office.

To address another of the priority sources, urban storm water, the committee needed to know about any storm water ordinances within the county, township, or municipality, and what they entailed. When they reviewed their



Example Watershed Goal: Protect Warmwater Fishery

Objective	Tasks	Responsible Organization	Milestones	Timeline	Estimated Costs
Reduce sediment from eroding road-stream crossings	Work with Merediment				

Chapter 9: Informing and Involving the Public

Chapter Objectives

- Identify target audiences
- Develop messages for the target audiences
- Select delivery mechanisms for disseminating the messages
- Use this information to develop an information/education strategy for your watershed

Chapter Product

❑ An information and education strategy for your watershed that involves the public and stakeholders

What is an information/education strategy and how will it help?

An information/education (I/E) strategy is a tool used to inform the public and motivate them to take action. It is a coordinated strategy tailored to the specific water quality concerns and people within your watershed.

An I/E strategy is needed because the majority of behavioral changes that will be needed to address the sources and causes of pollution in the watershed will be voluntary, rather than be required by law. And, before individuals will consider changing their behavior, they need to understand the watershed concerns and how their individual activities can play a role in protecting the quality of their water. A well designed and implemented I/E strategy will improve public participation in your watershed project, because it will provide information to the individuals who are most likely to have an impact on water quality and motivate them to make necessary changes.

How do you begin to develop an I/E strategy?

Your steering committee should begin by reviewing the goals and tasks developed in Chapters 6 through 8, as well as the list of pollutants, sources, and causes in the critical area that were prioritized in Chapter 5.

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How do you deliver the message to the target audience?

Choose your delivery mechanisms for each target audience based on how each group typically accesses information, and who or what they consider to be reliable sources of information. Delivery mechanisms include:

- One-on-one contacts
- Presentations to targeted groups
- Press releases and news articles in local papers
- Public service announcements or programs on local cable channel
- Watershed project newsletter
- Watershed project web site with links to related sites
- Watershed tours
- Watershed signs
- Inserts in agency newsletters
- Workshops targeted to specific audiences
- Special events and activities such as water festivals, stream clean-ups, or storm drain stenciling
- Presentations at regularly scheduled meetings of townships, planning commissions, associations, or other groups

The Example Watershed steering committee included a column in the table on page 34 showing delivery mechanisms.

Many watershed projects have found that one-on-one contact is a very effective method of delivering messages. Working with a respected member of the target audience to share the information is also useful. For example, an agricultural producer who has successfully incorporated changes might share his or her experiences with other producers in the watershed.

In addition to the above examples, steering committee members can share information with individuals from their respective organizations or agencies. If other groups are interested in reaching similar audiences, you should explore opportunities to combine your efforts. Remember that continual education and repetition are key to raising awareness and changing behavior.

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Chapter 11: Assembling Your Watershed Plan

Chapter Objectives

- Add any missing tasks
- Refine the water quality summary
- Assemble the watershed plan

Chapter Product

❑ The watershed management plan document, including the final water quality summary

Introduction

In this chapter you will complete your plan by integrating the chapter products developed throughout the planning process and adding a few more tasks. You will also finalize your water quality summary.

What information is needed to complete your watershed management plan?

By this point you should have a table of tasks, responsible parties, milestones, timeline, and estimated costs for all objectives for all of your goals. You may want to combine your tables from Chapters 7–10 into one table.

To complete your table add the following, as appropriate for your watershed:

- Tasks for verifying any remaining suspected pollutants, sources, and causes (see Chapter 4)
- Tasks for achieving desired use goals
- Tasks related to project coordination and administration

At this point you should add tasks needed to institutionalize watershed protection

What is included in the final water quality summary?

Using the information gathered in the previous chapters, you should modify

Assembling the Plan

In addition to the products that have been developed throughout the previous chapters, a watershed management plan should present a complete picture of the watershed. As you assemble your plan, keep in mind that a person with limited knowledge of the watershed should be able to read the plan and understand the needs and proposed solutions for effectively managing and restoring all designated uses in the watershed.

The ultimate outcome of your plan is an action-oriented approach for addressing water quality in the watershed. Use your plan to seek funding sources for implementation. Remember that your plan is not static and may change as implementation proceeds. Work with your steering committee to review the watershed management plan periodically to ensure that tasks are being implemented and that the plan is updated.

Example Water Quality Summary (Final)

The Example Watershed waterbody has three designated uses that are impaired: (1) partial body contact recreation, (2) aquatic life/wildlife, and (3) warmwater fishery. The designated use public water supply is threatened.

Project Goals

Appendix A: Resources

State Agencies	*Contact Information / Websites*	*Information and Assistance*
DEQ Surface Water Quality Division	Phone: 517/373-1949 www.deq.state.mi.us/swq/ Nonpoint Source Pollution Program Unit 517/373-2867 www.deq.state.mi.us/swq/nps/ npshome.htm Michigan Watershed Homepage www.deq.state.mi.us/swq/watershd /index.html NPDES Permits Unit 517/373-8088 I/E Coordinator 517/241-7733	Designated uses, nonpoint source pollution, Best Management Practices, CWA 305B Report, CWA 303D report, monitoring data, water quality standards and assessments, NPDES discharge **permits**, storm water management, investigation of complaints, and response to accidental releases.
DEQ Land and Water Management Division	Phone: 517/373-1170 www.deq.state.mi.us/lwm/ Hydrologic Studies Unit 517/373-1170 Inland Lakes Management 517/373-8000 Wetlands Unit 517/373-8000 Soil Erosion Unit 517/335-3178 Coastal Programs 517/373-1950	Hydrology studies, lake management and monitoring, wetlands, cooperative lake monitoring program, coastal zone program
DEQ Drinking Water & Radiological Protection Division	Phone: 517/335-9218 www.deq.state.mi.us/dwr/	Public water supply systems, local health department directory, non-community water supply systems, Wellhead Protection Program information
DEQ Waste Management Division	Phone: 517/373-2730 www.deq.state.mi.us/wmd	Regulation of large and small quantity generators of hazardous waste, facilities discharging to groundwater, waste landfills and facilities
DEQ Geological Survey Division	Phone: 517/334-6907 www.deq.state.mi.us/gsd/	Topographic and geologic maps
DEQ Environmental Assistance Division Assistance Center	Phone: 800/662-9278 www.deq.state.mi.us/ead/	Pollution prevention, regulations, permit information, Community Right to Know
DEQ Environmental Response Division	Phone: 517/373-9837 www.deq.state.mi.us/erd/	Environmental clean up programs
DNR Land and Mineral Services Division	Phone: 517/241-2438 www.dnr.state.mi.us/RED/default.htm	Resource Mapping and Aerial Photography (RMAP)—GIS data and aerial photography information
DNR Wildlife Division	Phone: 517/373-1263 www.dnr.state.mi.us/Wildlife/default.htm	Endangere055pecies, Michigan public lands maps, private lands program

DNR Fisheries Division Phone: 517/373-1280

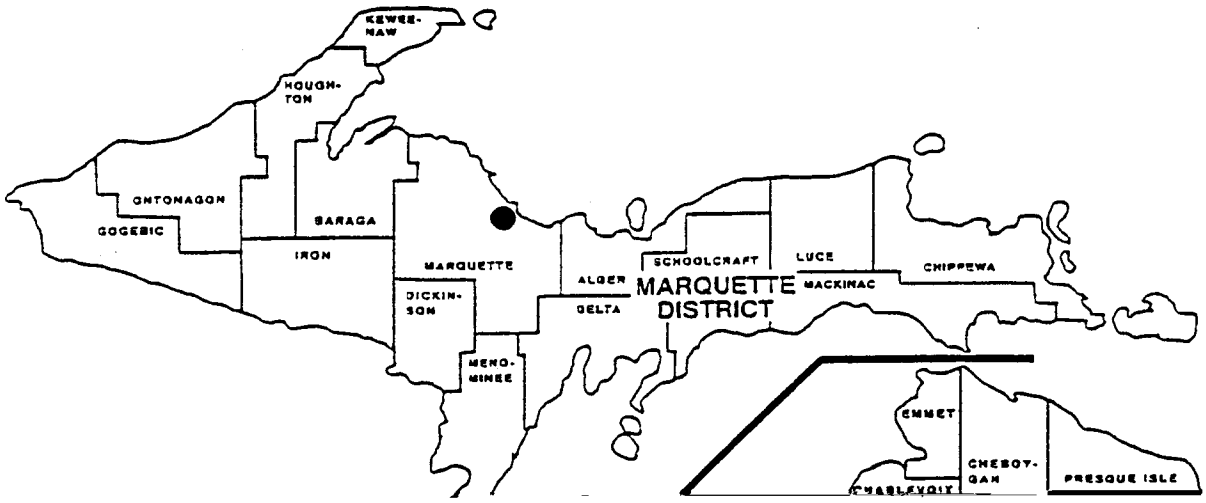
US eDe(c)(2d Wildlife Service)-8327(Endanger)11(ed.fws.go)22(v/statl-r3.html)]TJ 0 -1 0 TD001 Tw[(USR)55(egion 3 Office)]TJ 8 0 10 362279 2

Universities	*Contact Information / Websites*

DEQ Watershed Project	*Nonpoint Source Grantee*	*Phone*
Brooks Creek (Newaygo County)	Newago County Conservation District	231/924-7131
Burt Lake (Cheboygan County)	Northeast Michigan Council of Governments	517/732-3551
Carlson Creek (Luce County)	Luce-West Mackinaw Soil Conservation District	906/341-5304
Carp River (Mackinac County)	Chippewa Soil Conservation District	906/632-7051
Cass River Watershed Livestock Exclusion (Sanilac County)	Sanilac Conservation District	810/648-2116
Chippewa River, North Branch (Isabella County)	Isabella Soil Conservation	517/772-9152
Chocolay River (Marquette County)	Marquette County Conservation District	906/226-9460
Christiana Creek (Cass County)	Cass County Soil Conservation District	616/445-8643
City of Grand Blanc Groundwater Planning Project (Genesee County)	City of Grand Blanc	810/694-1118
Clam River (Wexford County)	Wexford Soil and Water Conservation District	231/775-7681
Crockery Creek (Ottawa and Muskegon Counties)	Muskegon County Soil and Water Conservation District	231/924-7131
Davis Creek (Kalamazoo County)	Kalamazoo Conservation District and River Partners Program of the Forum of Kalamazoo County	616/327-1258 616/337-7002
Doe/Furlong Creek (Mackinac County)	Luce-West Mackinaw Soil Conservation District	906/341-8215
Donnell Lake -SCD (Cass County)	Cass County Soil and Water Conservation District	616/445-8643
Donnell Lake -MSU (Cass County)	Michigan State University Institute of Water Research	517/355-3742
Dowagiac River (Cass and Van Buren Counties)	Cass County Soil and Water Conservation District	616/445-8643
Dowagiac (MEANDRS) (Cass and Van Buren Counties)	Cass County Soil & Water Conservation District	616/685-0017
Duff Creek (Sanilac County)	Sanilac County Soil Conservation District	810/648-2116
Elk River (Antrim County)	Antrim Soil Conservation District	231/533-8709
Elk River Chain of Lakes (Antrim County)	Conservation Resource Alliance	231/946-6817
Farm Assessment System (Statewide)	Michigan State University Extension	517/355-2308
Fish Creek (Montcalm County)	Montcalm Soil and Water Conservation District	517/831-4606
Ford Lake (Washtenaw County)	Washtenaw County Environmental Health	734/971-4542

Mitchell Creek (Grand Traverse County)	Grand Traverse County Drain Commissioner	231/922-4728

DEQ Watershed Project	*Nonpoint Source Grantee*	*Phone*
Rogue River (Kent, Ottawa, Newaygo, Muskegon and Montcalm Counties)	Grand Valley Metro Council	616/895-3749
Rouge River (Wayne County)	Wayne County	313/224-3620
Sanilac County Abandoned Wells (Sanilac County)	Sanilac Soil and Water Conservation District	810/648-2116
Sauk-Coldwater Rivers (Branch County)	Branch Soil Conservation District	517/278-2725
Scales Creek (Houghton County)	Houghton-Keweenaw Soil Conservation District	906/482-0360
South Branch of the Big Salt River (Isabella County)	Isabella Soil Conservation District,	517/772-9152
South Branch of the River Raisin (Lenawee County)	Lenawee Soil Conservation District	517/263-7400
South Lake Leelanau (Leelanau County)	Conservation Resource Alliance	231/946-6817
Stewardship in Huron River (Washtenaw County)	Huron River Watershed Council	734/769-5123
Stony Creek (Clinton County)	Clinton Conservation District	517/224-4318
Sycamore Creek (Ingham County)	Ingham County Health Department	517/887-4300
Timber Box Culvert (Grand Traverse County)	Conservation Resource Alliance	231/946-6817
Tobacco River (Gladwin and Clare Counties)	Gladwin Soil and Water Conservation District	517/426-9621
Tollgate Drain Sand Peat Filter (Ingham County)	Ingham County Drain Commissioner,	517/676-8395
Total Nutrient Management (Huron County)	Michigan State University Extension	517/269-9949
Whetstone Brook (Marquette County)	Marquette Soil and Water Conservation District	906/226-9460
Willow Creek (Ingham County)	Ingham County Drain Commissioner	517/676-8395
York Creek (Kent County)	Alpine Township	616/784-1262



For as[redacted] watershed management plans, contact the local DEQ Surface Water Quality Division, Nonpoint Source Program staff in the district office nearest you, or contact the Nonpoint Source Unit staff in Lansing at 517/373-2867.

Cadill[redacted]
231/775-3960

Grand R[redacted]
616/356-0500

Jackson District Office
517/780-7690

Marquette District Office
906/228-6561

Plainwell D[redacted]
616/692-2120

Saginaw Bay District Office
517/686-8025 Ext. 8264 or 8261

Shiawassee District Office

Nonpoint source pollutants are any of the substances listed below that can degrade the water quality by impairing the designated use(s) of the water.

Animal manure—Manure is a source of nutrients, salts, and organic matter that can degrade water quality.

Depressed dissolved oxygen—When the oxygen dissolved in water and readily available to aquatic organisms (mg/l) is below optimal levels.

Hydrologic flow fluctuation—When the natural hydrology of the watershed changes due to increases in storm water runoff.

Metals—Toxic substances, such as mercury and lead, that come from urban runoff or atmospheric deposition.

Nitrogen—An element that at certain levels can cause excessive algae and aquatic weed growth.

Organic matter—Residue from plant or animal origin (including leaves and grass clippings). In excessive amounts organic matter can lower dissolved oxygen levels.

Pathogens—Human disease causing bacteria or viruses.

Pesticides—Chemical substances used to kill pests such as weeds, insects, algae, rodents, and other undesirable agents.

Petroleum and petroleum by-products (oil and grease)—Urban pollutants that are transported by rainfall from roads, parking lots, and improper storm drains.

Salts—Chemical compounds from winter road deicing, septic systems, and water softener outwash.

Sediment—Soil that is transported by air and water and deposited on the stream bottom.