HOME*A*SYST
Home Assessment System

This assessment examines the special role that shoreline residents have in preventing contamination of their lake or stream. Use this publication as a supplement to the Home*A*Syst book (WQ-51).

This supplement has three sections:

1. **Managing Household Wastewater**
   *(Home*A*Syst Chapter 11)*
2. **Caring for the Lawn and Garden**
   *(Home*A*Syst Chapter 9)*
3. **Managing Stormwater Around Your Home**
   *(Home*A*Syst Chapter 7)*

WQ-52
Revised
August 2008

Michigan Groundwater Stewardship Program

MICHIGAN STATE UNIVERSITY EXTENSION

Managing Shoreline Property to Protect Water Quality

A **watershed** is an area of land that drains to a common body of water. Your actions and your neighbors' actions affect water quality within this area. What happens on your property can affect the entire watershed. **Stormwater** is water from rain or melting snow that does not soak into the ground. It flows across rooftops and parking lots, down ditches and slopes, and even across gardens and lawns. Along the way, it may pick up litter and transport a number of pollutants (see box at right). Stormwater eventually flows to storm drains and storm sewers and drains untreated into the nearby waterways.

Possible shoreline pollutants

- **Fertilizers**
- **Stormwater runoff**
- **Yard waste (lawn clippings, leaves, branches, weeds)**
- **Soil from shoreline erosion**
- **Ash from campfires and burned yard waste**
- **Animal waste from pets and wildlife such as waterfowl**
- **Pesticides**
- **Oil and gas from boats and other motorized watercraft**
- **Septic system discharge**
- **Salt**

As a **riparian** — someone living on property adjacent to or near a body of water such as a lake, pond, river, stream or marsh — you have a vested interest in preventing pollutants from entering the water. Many activities on or around your property can affect water quality, so you have the ability to significantly improve what happens along your shore. This supplement lists some special water quality concerns for shoreline residents and actions you can take to avoid contaminating surface water and groundwater.

Why are shoreline areas vulnerable to pollution?

Activities on shoreline property are more likely to pollute water than activities in areas away from the water. Because homes are often closer together and native plants and wetlands have been replaced with lawns, beaches and seawalls, pollutants coming from sensitive shoreline areas have less chance of being filtered before reaching the water.

There are several symptoms of lower water quality:

- Increased weed and algal growth due to excess nutrients. Phosphorus is the nutrient of greatest concern. Even small amounts of phosphorus, in most cases, can cause excessive plant and algae growth.

*The Home*A*Syst Assessment Guide (Extension Bulletin WQ-51) is available from County MSUE Extension offices.*

- Cloudy water due to sediment (soil) and algae.
- Poor fishing and increased numbers of stunted fish.
- Evidence of coliform bacteria in the lake (indicates the presence of human or animal waste).

Three chapters in the Home*A*Syst book warrant special attention by shoreline residents: "Managing Household Wastewater" (Chapter 11), "Caring for Your Lawn and Garden" (Chapter 9) and "Managing Stormwater Around Your Home" (Chapter 7). Complete the Home*A*Syst risk assessment, then consult this supplement for more information on these topics.

Part 1: Household Wastewater Management in Shoreline Areas *(supplement to Home*A*Syst Chapter 11)*

If you live on shoreline property, maintaining your septic system requires more care than maintaining a similar system located in other places. Soil type and nearness to both groundwater and surface water increase the chance that your system will allow harmful pollutants to get into the water.

Loam and clay-type soils have a greater long-term ability to hold nutrients and prevent them from moving through the soil than do sandy soils. Although clay soils adsorb nutrients more readily, septic systems in clay soils are more likely to clog and fail, causing nutrients and contaminants to bubble to the surface, eventually running off to the shore. On the other hand, very sandy soil may allow nutrients to move down quickly to groundwater. Thus, both very sandy and very heavy (clay) soils create high risk of water contamination from septic system waste.

After leaving the septic system and encountering soil saturated with water, nutrients or biological contaminants can move significant distances — in some instances, as much as several hundred feet or more. In soil not saturated with water, biological contaminants (bacteria and viruses) are usually rendered inactive within a few feet of the drainfield. On the other hand, some nutrients — nitrate, for example — can travel much greater distances, depending on the type of soil, the amount and concentration of waste, and the age of the system.

Because septic systems on shoreline property are often close to the water and located in areas sometimes saturated during high water periods, they are very likely to leak wastes into lakes and streams. Shoreline erosion can also shorten the distance between the septic system and the shoreline, increasing the likelihood that liquid waste may move into surface water. This pollution can happen even though your system appears to be working well and complies with local health department codes.

For more information on on-site wastewater management, contact your local health department, MSU Extension office or a septic system contractor.

What to do

Pay special attention to the recommendations in the household wastewater chapter of Home*A*Syst (WQ-51). Those actions are especially important in shoreline areas.

In addition, consider the following recommendations:

- **Have your septic tank pumped by a licensed pumper on a regular basis**. The tank should be pumped about every three to five years. **Table 1** can help you estimate how often your septic tank should be pumped. By design, holding tanks must be pumped because they have no outlet. They may need to be pumped as often as every month or every week depending on the amount of wastewater generated and the tank capacity.
- **If you convert or expand your home, improve the septic system at the same time**. One of the biggest risks from septic systems occurs when seasonal homes are converted to year-round use or are expanded. Frequently, these improvements are made without updating and expanding the existing septic system. The increased load on the septic system may cause contaminants to enter your lake or stream. Remember, contamination can occur even though the septic system appears to be working fine.
- **Plant a vegetative buffer strip of deep-rooted plants between the drainfield and the shoreline**. These buffers can absorb some of the nutrients before they reach water. See the next section, "Yard and Garden Care", for more details on how to establish a buffer.
- **If you are building a new home, construct the septic system as far away from the shoreline as possible**. This distance should be even greater than health department codes require. This can be a minimum of 50 to 100 feet depending on the local or state health department code that has jurisdiction over the property. For example, in the case of a platted subdivision, the state guideline requires a minimum distance of 100 feet between the septic system and the shoreline. These regulations are designed primarily to protect human health rather than prevent other effects, such as excessive weed growth. Putting the septic system on the side of the house will help reduce the amount of runoff to the lake or stream. Also, design the system to meet your present and future needs.
- **Hook up to a community sewage system or alternative disposal method, if available**. For some lakes, these systems offer cost-effective, long-term solutions to water quality problems caused by septic systems. The use of these systems is restricted by local health department codes and requires design and construction by experienced engineers and contractors. To find out more about community sewage system options for your area such as a multiple-home "cluster" septic system, contact your local health department or township board. If your system has to be on the lake or stream side of the house, the health department may permit a mound system. This increases the distance between the drainfield pipes and the water table. Before selecting an alternative system, be sure that it will yield the desired results. Many factors may contribute to excessive weed growth, so it is possible in some situations that wastes from septic systems may have a relatively minor impact on lake or river quality.

Table 1. Years between pumpings.

Find your tank size (in gallons) along the left side of the table. Go across the row to the column for the number of people in your home. Where the row and column intersect, you'll find the estimated years between pumpings. Example: if you have two people in your household and a 1,000-gallon tank, with average use and no garbage disposal, you would need to pump the tank approximately every 5.5 years.

Estimated Number of Years Between Septic Tank Pumpings						
	Number of people in your household					
Tank size (gallons)	1	2	3	4	5	6
500	5.5	2.5	1.5	1	.5	.5
1000	12	5.5	3.5	2.5	2	1.5
1500	18.5	9	5.5	4	3	2.5
2000	25	12	8	5.5	4.5	3.5

✔ Assessment 1 – Reducing Risks from Shoreline Septic Systems

	1. Low risk/ recommended	2. Medium risk/ potential hazard	3. High risk/ unsafe situation	Your risk
Distance of drainfield to groundwater	Water table always more than 4 feet below drainfield.	Water table sometimes less than 4 feet below drainfield.	Water table often very close to or above the drainfield.	
Distance to shoreline	Septic system located 100 feet or more from shore.	Septic system located between 100 and 30 feet from shore.	Septic system located less than 30 feet from shore.	
Soil type	Loam or sandy loam soil.	Loamy sand soils.	Sand or clay soils.	
Septic tank pumping and inspection (includes holding tanks)	Septic tank pumped and visually inspected on a regular basis — every 3 to 5 years (or as needed) — and holding tanks pumped as needed.	Septic tank pumped but not regularly. Holding tank occasionally overflows or leaks between pumpings.	Septic tank not pumped. Holding tank regularly overflows or leaks between pumpings.	
Home conversion or expansion (bedrooms or baths added)	If home has been converted from seasonal to year-round use or expanded, septic system upgraded.	If home has been converted to year-round use or expanded, septic system maintained or monitored more often.	Home converted from seasonal to year-round use or expanded without any changes to septic system.	

Part 2: Yard and Garden Care *(supplement to Home*A*Syst Chapter 9)*

Proper landscape care is especially important in lakeshore and streambank areas. The shoreline zone is the last defense against pollutants coming off the land, and how you design and maintain this area can determine whether significant impacts to the water will occur. On the positive side, creative landscaping in shoreline areas can greatly enhance the beauty and enjoyment of your lake or stream while improving water quality and enhancing wildlife habitat (Figure 1).

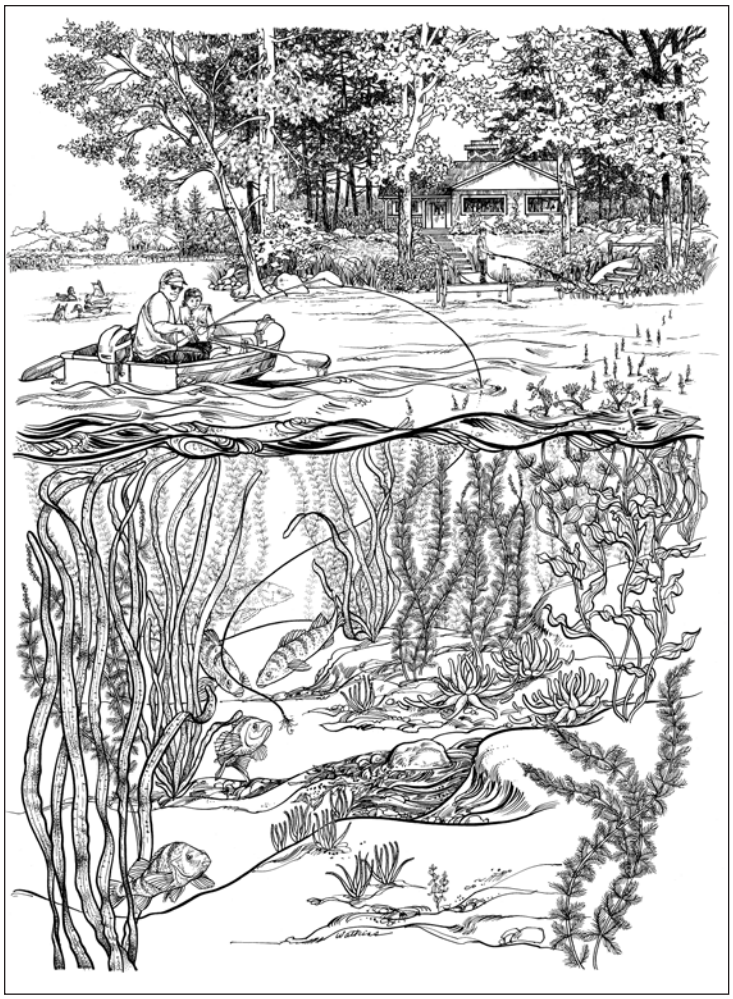

Figure 1. Beneficial landscaping helps improve habitat for a variety of aquatic organisms and protect water quality.

Of special focus is the 30-foot-wide **vegetative buffer strip or zone** adjacent to the shoreline. The roots in this vegetated buffer zone not only serve to stabilize the soil to help prevent erosion but also filter pollutants and sediments from runoff before it enters waterways, thereby protecting water quality. Buffer strips should not be fertilized.

The goals of improved shoreline landscape management are to:

- Use landscape plants that minimize the need for fertilizer and chemical pest control.
- Reduce use of fertilizers and pesticides near the shore.
- Reestablish a buffer of plants near the shore.
- Reduce landscape maintenance practices that allow soil and pollutants to wash into the water.

Landscape design

Before Michigan inland lakes and streams became popular locations to build homes, they were surrounded by native plants, trees and shrubs that acted as filters and held the soil in place, effectively limiting the amount of nutrients entering the water. This native vegetation also provided important habitat for wildlife. The plants not only grew along the shore but also extended out into the water. During building development, these natural barriers were often removed and replaced with lawns or other vegetation. As a result, waves and currents were more likely to damage the shoreline, requiring residents to seek less successful methods of protecting the shoreline such as seawalls. Building roads and other impervious surfaces increased surface runoff.

One important goal of shoreline management is to reestablish the shoreline vegetation. Ideally, this buffer strip should be 30 feet wide or greater and made up of low-maintenance (preferably native) grasses, wildflowers, perennials, shrubs and trees with additional aquatic plants extending out into the water. Low-growing species should extend into and be closest to the water. Trees and larger plants should be farther from the shore. The deep root systems of the native grasses, wildflowers and shrubs will protect the shoreline from erosion, minimizing the need for hard armoring with rock riprap or seawalls. The perfect buffer strip is wide, continuous and dense. However, most shoreline residents prefer something less dense that still allows easy shoreline access and views of the water. This modified design will still provide an effective buffer (Figs. 2 and 3). Even a 10-foot-wide strip of unmowed grass along the shoreline will slow polluted runoff. Over time, seeds in the soil will germinate, and native plants will begin to reappear.

Michigan's growing conditions are extremely variable. For specific landscape species recommendations for your area, contact your local county MSU Extension office or conservation district.

Seawalls constructed of wood, metal or concrete are common methods of stabilizing shorelines. The disadvantages of these structures are that they are a hindrance to wildlife species and reptiles that use the shoreline area for feeding and shelter, detract from the beauty of the shore, and sometimes increase wave and ice damage on adjacent properties. Moreover, they may or may not effectively protect the shoreline area from erosion and ice damage.

In some situations however, seawalls are the best alternative for shoreline protection. For example, a seawall may be the best option in the case of a narrow lakefront property with seawalls on each side that divert wave energy from both directions into the middle property. Note that other variables contribute to this situation, including lake level management, wave energy, ice push, soil structure and existing vegetation. Often, though, other methods may provide better protection and improve the shoreline environment. One alternative is to reestablish the natural slopes leading to the shore and into the lake, then stabilize the area with a vegetative buffer strip. On more difficult sites, it may be possible to partially reestablish the original slope, then add rock riprap to stabilize the area. It may be desirable to consult an engineering company specializing in shoreline protection or your local conservation district.

A permit may be required for earth changes within 500 feet of a lake or stream. Visit **www.deq.state.mi.us/sesca** for a list of soil erosion permitting agencies throughout Michigan.

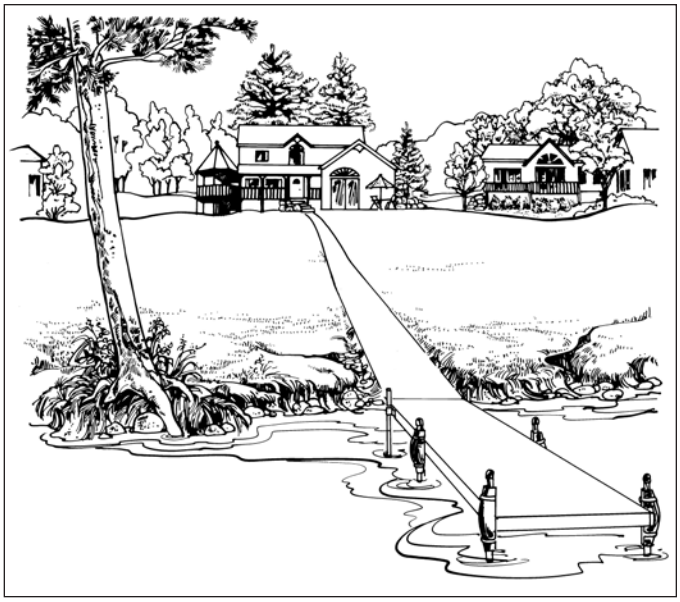

Figure 2. Waterfront property before beneficial landscaping.

Figure 3. Waterfront property after beneficial landscaping.

Landscape maintenance

A key goal of lakeside landscape management is minimizing nutrients and chemicals entering the water. As with septic systems, the major nutrient of concern is phosphorus because it is often the limiting nutrient in lakes and accelerates algal growth in our waterways. It is contained in commercial fertilizer, compost and animal manure. To minimize the impact of nutrients and chemicals:

- **Get your soil tested**. Before buying fertilizer, get your soil tested to determine what nutrients your lawn or garden needs, if any. Contact your local MSU Extension office for more information on year-round soil testing.

- **Use fertilizers that contain low or no phosphorus, slow-release nitrogen and no pesticides.** The numbers on a fertilizer bag show the percentage of each nutrient (nitrogen, phosphate, potash) in the formulation. To be sure that a fertilizer contains low or no phosphorus, look at the middle number, which (Figure 4) shows the percent of phosphate by weight in the bag (e.g., 26-0-3). Because of the increased concern about the effect of phosphorus on water quality, zero-phosphorus fertilizers are more widely available from many fertilizer retailers. When asked, many commercial lawn care companies will apply no-phosphorus fertilizer for their shoreline customers.

  Organic-based fertilizers or those containing slow-release nitrogen are those listed as water-insoluble nitrogen (WIN). They will release nitrogen slowly, feeding the lawn over time. Nutrients are not released faster than the lawn can take them up. Applying the same amount of nitrogen in a form that's rapidly available poses a potential runoff threat to a nearby lake or stream.

  Finally, look for products that are free of pesticides. If a weed problem develops, try hand digging weeds or spot treating affected areas instead of applying pesticides to your entire lawn or garden, especially if only a small portion of the area requires treatment.

Figure 4. No-phosphorus lawn fertilizer suitable for application near lakes and streams.

- **Be careful when selecting and applying fertilizer.** Select the type of fertilizer suitable for the plants to be fertilized. Do not use a garden fertilizer for a lawn area. Do not apply fertilizer to the buffer strip or directly into the water. Sweep excess fertilizer from walks and drives back onto the lawn.
- **Keep compost piles and animal manure as far away from the shoreline as possible.** Place piles in a location where runoff will not flow into the water. This greater distance will also help prevent nutrients from percolating down to the groundwater, then traveling into lakes or streams. Never dump yard waste directly into the water.
- **Never burn yard waste along the shore.** The ashes contain phosphorus and other nutrients that can easily make their way into the lake and result in excess weed and algae growth.
- **When using pesticides, read the label carefully**. Some pesticides can be harmful to aquatic life and contain warnings about application near lakes and streams. Even some commonly used household pesticides can be dangerous along the shore.
- **Don't feed or encourage wildlife near the shore**. Waste produced by wildlife, particularly ducks, geese and swans, can be a significant source of bacteria and nutrients to the water. Feeding wildlife adds to the problem. Growing shrubs or taller plants along the shoreline discourages these waterfowl from congregating on the lawn or along the shoreline because they prefer the open, line-of-sight provided by an open lawn that extends to the water.

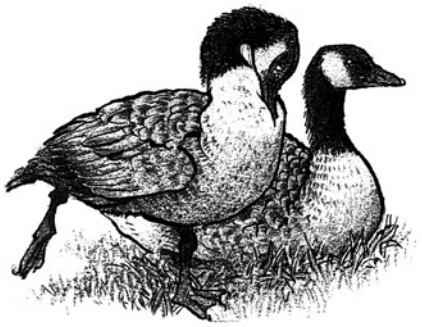

Figure 5. Restoring the vegetation along the shoreline discourages geese from lawn areas, reducing the potential for harmful bacteria and nutrients to enter the water.

✔ Assessment 2 – Reducing Risks from Shoreline Lawn and Landscape Maintenance

	1. Low risk/ recommended	2. Medium risk/ potential hazard	3. High risk/ unsafe situation	Your risk
Vegetative buffer strip or zone	Buffer strip 30 feet wide or greater of native plants and shrubs. Unfertilized.	Buffer strip of unmowed grass, 10 feet wide. Unfertilized.	No buffer strip, or lawn mowed to shoreline. Fertilized.	
Shoreline or riparian zone	Small plant-free swimming area; rest of beach contains natural shoreline vegetation, including emergent plants.		Shoreline entirely free of aquatic vegetation.	
Seawalls	Shoreline with original slope and native vegetation to water's edge.	Shoreline stabilized with rock riprap following natural contours.	Abrupt concrete, metal or wood seawall.	
Fertilizer type	Soil is tested prior to fertilization. Fertilizer contains phosphorus only if indicated by soil test. No fertilizer applied within 10 feet of shore.	Soil is not tested prior to fertilization. Fertilizer contains low or no phosphorus and/ or pesticides. No fertilizer applied within 10 feet of shore.	Soil is not tested prior to fertilization. Fertilizer containing phosphorus and/or pesticides applied near shore.	
Fall cleanup	Raking leaves and yard waste at least 30 feet away from the lake and composting them.	Composting leaves and yard waste at least 10 feet from shore.	Burning leaves and other yard waste along shore and washing ashes into the water.	

Part 3: Stormwater Management
*(supplement to Home*A*Syst Chapter 7)*

Water running off your property after storms potentially contains soil, nutrients, oil, chemicals and other contaminants. Lakes and streams are lower than the surrounding area, so they serve as collecting areas for runoff. They can also be contaminated by erosion along the water's edge. To prevent runoff from polluting your lake, take special care to manage the water from your property and the water running through your property from other sources.

The goal of managing stormwater runoff is to slow the water, filter it and allow it to seep into the ground slowly. Several methods, in addition to the suggestions in the stormwater chapter of the Home*A*Syst book, will accomplish this goal:

- **Minimize impervious surfaces on your property** such as paved areas, buildings and heavily compacted areas. The greater the percentage of your property that is impervious to water, the greater the likelihood that rain and snowmelt will carry contaminants to lakes or streams. Direct downspouts onto your lawn or landscaping instead of hard surfaces.
- **Dig small ponds in drainage ways**. These holding areas retain stormwater and allow sediment to settle and the water to seep into the ground rather than run off into surface water.
- **Install a rain barrel on your property to capture rooftop runoff that can be used for lawn and garden watering.** This allows you to reuse water that would otherwise run off, so that it can naturally soak back into the ground.
- **Plant a dense area of wetland plants such as cattails or wetland grasses in places where runoff enters the lake, stream or marsh**. These plants help filter the runoff.
- **Create meandering walkways made of porous paving materials to minimize hard surfaces**. Straight paths, especially those with lots of side walls or steps, concentrate runoff and can cause erosion. Designing paths that follow natural contours (slope) reduces risk and creates a more visually interesting landscape. Use porous, permeable paving materials that allow water infiltration, such as wood decking, bricks or interlocking stones instead of asphalt or concrete.

✔ Assessment 3 – Reducing Risks from Shoreline Stormwater Runoff and Erosion

	1. Low risk/ recommended	2. Medium risk/ potential hazard	3. High risk/ unsafe situation	Your risk
Paved surfaces	Paved driveway and walkway surfaces minimized. Alternatives such as wood chips or porous paving blocks used to allow water to soak into ground.	Some small areas paved for patios, driveways or basketball. Paved surfaces follow contours.	Large paved areas leading straight to water without regard to slope.	
Stormwater management	Runoff filtered through wetland or allowed to seep into the ground.	Runoff flows into temporary pond or depressions in the landscape and allowed to drain slowly away.	Runoff flows directly into water.	

✔ Action Checklist

Go back over the assessments in this supplement, then review the assessment charts in the corresponding chapters of the Home*A*Syst book. For each medium and high risk listed, write down the improvements you plan to make. Use recommendations from this supplement and other resources to decide on actions you are likely to complete. A target date will keep you on schedule. You don't have to do everything at once, but try to eliminate the most serious risks as soon as you can. Often it helps to tackle the inexpensive actions first.

Write all high and medium risks here.	What can you do to reduce the risk?	Target date for action:
Ex.: All shoreline and aquatic plants have been removed; waves batter the shore causing soil erosion and nutrient loss.	Create vegetative buffer strip with plantings both in water and out of water, leaving a zone for recreation.	May 10

*This Home*A*Syst supplement was developed by Dean Solomon, Michigan State University Extension. Updated by Bindu Bhakta, Michigan State University Extension, 2008.*

Resources

Lakescaping:
Restoring the Shore on Michigan Inland Lakes: www.shoreline.msu.edu

Landscaping for Water Quality: www.deq.state.mi.us/documents/deq-wb-nps-landscaping-for-water-quality.pdf

Lakescaping for Wildlife and Water Quality. Minnesota Department of Natural Resources: www.comm.media.state.mn.us/bookstore/bookstore.asp

Restore your Shore (CD-ROM). Minnesota Department of Natural Resources: www.comm.media.state.mn.us/bookstore/bookstore.asp

Minnesota Shoreline Management Resource Guide. University of Minnesota; (800) 657-3757: www.shorelandmanagement.org/index.html

Lake Management:
Your Lake and You! North American Lake Management Society: www.nalms.org. Phone (608) 233-2836, nalms@nalms.org.

Managing Lakes and Reservoirs. North American Lake Management Society: www.nalms.org. Phone (608) 233-2836, nalms@nalms.org.

Shoreline erosion:
Understanding, Living With, and Controlling Shoreline Erosion — A Guidebook for Shoreline Property Owners. Tip of the Mitt Watershed Council: www.watershedcouncil.org

Native plants:
Michigan Native Plant Producers Association: www.mnppa.org

Gateway to Michigan's Native Plants. Michigan Association of Conservation Districts: www.macd.org/nativeplants/nphome.html

Landscaping with Native Plants. U.S. Environmental Protection Agency: www.epa.gov/greenacres/wildones/

Septic systems:
Managing your Septic System, (WQ-39), Michigan State University Bulletin Office: www.emdc.msue.msu.edu

U.S. Environmental Protection Agency Septic (Onsite) Systems: cfpub.epa.gov/owm/septic/

Lawn care:
Lawn*A*Syst, An Environmental Risk Assessment Guide for Lawn Care Practices, (WQ-53). Michigan State University Bulletin Office: www.emdc.msue.msu.edu

Michigan State University Turfgrass Science: www.turf.msu.edu

Watershed Management:
U.S. Environmental Protection Agency Watershed Academy Web: www.epa.gov/watertrain/

U.S. Environmental Protection Agency Watershed Academy Web: www.epa.gov/watertrain