



# SHORELAND STEWARDS

# AMBASSADOR

## Toolkit



*Working together to protect our lakes.*

*April 2019*

## Dear MI Shoreland Steward Ambassador,

Michigan's 11,000 plus inland lakes are one of our greatest natural resources, and they are often taken for granted. They are faced with a myriad of threats every day, from invasive species and nonpoint source pollution, to overdevelopment and habitat loss. While there are many options for protecting our lakes, such as state-wide regulations and local zoning, perhaps the most important is outreach and education. Thankfully, the MI Shoreland Stewards Program can help. The program is designed to not only educate lakefront property owners about good shoreland stewardship, but also to recognize them for their lake-friendly actions. The MI Shoreland Stewards Program can make a positive impact if granted the support of those who can make a difference: shoreland property owners.

Now this is where you, a MI Shoreland Stewards Ambassador, can make a difference. Ambassadors are the vehicle for promoting the MI Shoreland Stewards Program within their lake associations and neighborhoods. Ambassadors are the local connection between the MI Shoreland Stewards Program and Michigan's inland lakes. With the help of this binder's contents, collectively known as the Ambassador Toolkit, we believe you can make a difference in your community and your lake.

On behalf of Michigan's inland lakes and those of us who work hard to protect them, thank you. Your willingness to serve as a MI Shoreland Stewards Ambassador is much appreciated.



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## Toolkit Introduction

Thank you for your interest in serving as a Michigan Shoreland Stewards (MiSS) Ambassador. We hope this Toolkit will be useful to you as you work with lakefront property owners and encourage their shoreland stewardship. The Toolkit includes worksheets you can use to record facts and stats about your lake and lake association, details about why the MiSS survey questions are weighted as they are, reports about the health of our country's inland lakes, ideas for promoting the Michigan Shoreland Stewards Program, and much more. Ultimately, this Toolkit should contain all the tools you need to support your efforts to promote the MI Shoreland Stewards Program.

**THANK YOU** for protecting Michigan's inland lakes through the MI Shoreland Stewards Program.



### THE MICHIGAN NATURAL SHORELINE PARTNERSHIP

#### **MISSION:**

*Protecting Michigan lakes through conservation and restoration of natural shorelines.*

The Michigan Natural Shoreline Partnership (MNSP), a collaboration of state agencies, academia, nonprofit organizations and private industry, was formed in 2008 with the belief that a change was necessary in shoreline development practices in Michigan from high impacting methods that alter the natural shoreline condition to practices that:

1. Restore/Preserve the ecological function of the shoreline.
2. Effectively stabilize shoreline erosion.
3. Are attractive to consumers as an option for lakefront use, to ensure the sustainable health of these resources.

The MNSP identified four major objectives and works to implement them through education, training, research, and policy initiatives. They are as follows:

#### Partnership Objectives:

1. Train contractors and landscape professionals about shoreline technologies and bioengineered erosion control.
2. Educate property owners about natural shorelines and technologies that benefit lake ecosystems.
3. Research, demonstrate, and develop natural shoreline technologies that benefit lake ecosystems.
4. Encourage local and state policies that promote natural shoreline management.



## THE MICHIGAN SHORELAND STEWARDS PROGRAM

The Michigan Shoreland Stewards Program (MiSS) is a program of the Michigan Natural Shoreline Partnership (MNSP). This statewide program was created to recognize lakefront property owners for maintaining shoreland property in a manner that reduces negative impacts on inland lakes.

This recognition program consists of a web-based questionnaire for inland lakefront property owners to assess their management practices. Many educational resources are provided throughout the process to encourage protection of Michigan’s inland lakes through best management practices.



The MiSS was launched in 2016. The MNSP set up the following initial goals to help track progress.

Goal	Year 1 (2017)	Year 5 (2021)
<b>Lake Associations Registered</b>	20	100
<b>Different Lakes Represented</b>	50	250
<b>Total Respondents (Including Anonymous)</b>	400	2500
<b>Registered Respondents</b>	200	2,000
<b>Total Achieving SS Status</b>	350	2,000
<b>Registered Achieving SS Status</b>	150	2,000
<b>Feet of Shoreline that are Shoreland Stewards</b>	10,000	50,000

Ambassadors will help to achieve these goals by promoting the program and being a local resource to answer questions.

## Serving as a Michigan Shoreland Stewards Ambassador

MI Shoreland Steward Ambassadors play an important role in helping to promote natural shorelines to lake residents.

### **Key elements to being an Ambassador:**

- Support and encourage neighbors to follow best practices on lakeshores.
- Understand the MiSS program and know how the survey works.
- Promote the MiSS program.
- Increase MiSS participation.
- Assist potential Shoreland Stewards with questions about the survey, ordering signs, and other needs.

### **Ambassador Commitments:**

1. A commitment of at least a one-year term as an Ambassador is highly recommended.
2. Allow your name and contact information to be associated with your lake association on the MiSS website.
3. Promote the MiSS Program to lake property owners and communities by:
  - a. Posting (and maintaining/monitoring) link to MiSS website along with other graphics, etc. on lake association website to increase visibility.
  - b. Provide information for local newspapers, community newsletters or other publications.
  - c. Talk with lake property owners.
  - d. Hand out promotional materials at meetings, festivals and other events.
4. Know and be able to communicate some basic information about your lake.
5. Keep your respective lake association up to date with your activities and MiSS results at least annually.
6. Respond to occasional surveys from MNSP that ask questions such as:
  - a. How many riparian property owners have you talked to about the MiSS program?
  - b. How many new Stewards from your lake have registered over the last six months?
  - c. What challenges have you had?
  - d. What suggestions can you offer?

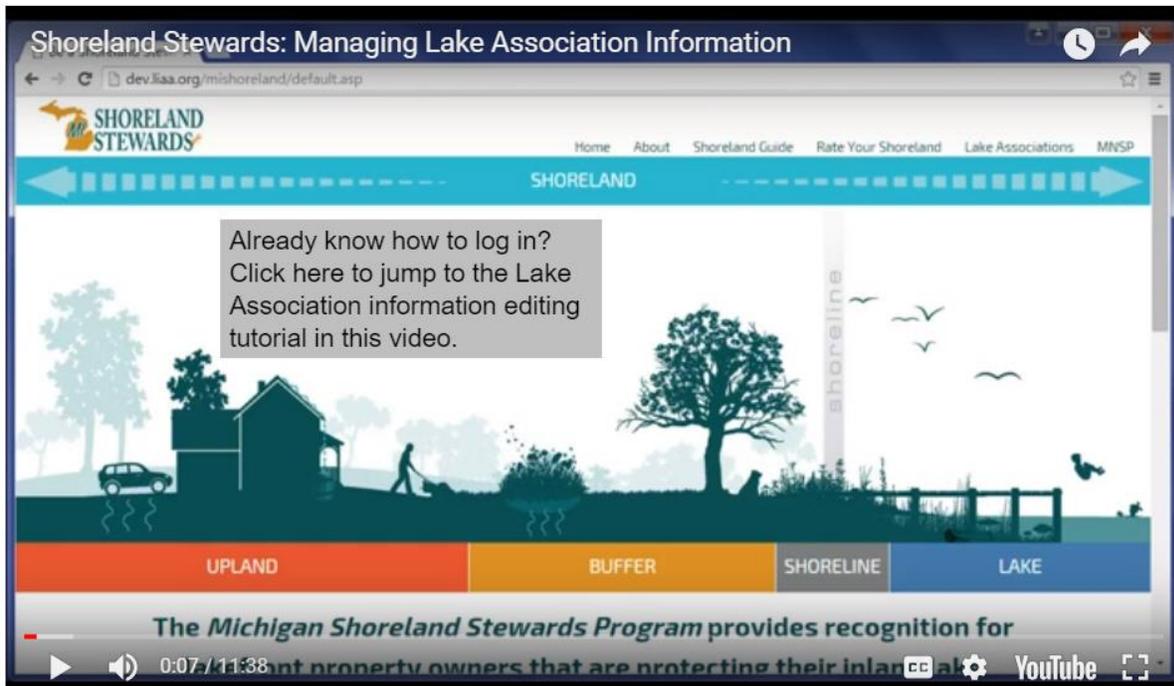
Getting Started on the MiSS Website: [www.mishorelandstewards.org](http://www.mishorelandstewards.org)

- Register your lake on the Shoreland Stewards website.
- Create a page for your lake on the Shoreland Stewards website.
- Customize and print your Ambassador badge. You may want to add your lake association's logo to the badge. (Found with the [Shoreland Stewards Promotional Materials](#))

If your lake is already registered:

- Update information as needed (keep in mind you might need the login information from the previous Ambassador).

For assistance on Managing Lake Association Information we have provided a video. You will have access to it once you login to the MiSS website as your lake association contact.



## AMBASSADOR CONTACT INFORMATION

Please record your information below so future Ambassadors may contact you for assistance or information. It will also serve as a record for your lake association.

<b>Name</b>	
<b>Address</b>	
<b>Phone</b>	
<b>Email</b>	
<b>Dates of Service</b>	<b>Began:</b> _____ <b>Ended:</b> _____
<b>Notes</b>	

<b>Name</b>	
<b>Address</b>	
<b>Phone</b>	
<b>Email</b>	
<b>Dates of Service</b>	<b>Began:</b> _____ <b>Ended:</b> _____
<b>Notes</b>	

## YOUR LAKE ASSOCIATION

Please use these pages as a quick reference for information about your lake and lake association. As a MI Shoreland Stewards Ambassador, you will not only be encouraging Shoreland Stewardship to lake residents, but also acting as a resource for information about your lake and lake association. Feel free to add information, insert maps, photos-or whatever you would like!

Lake Association Name	
Mission Statement	
Mailing Address	
Phone	
Email	
Website	
Facebook	
Membership (e.g. number of members, dues, etc.)	
Notable Events (e.g. annual meetings, committee meetings, fundraisers, etc.)	
Publications (e.g. newsletter: name, frequency of issue, availability, etc.)	

Lake Statistics			
Surface Area:	Shoreline Length:	Maximum Depth:	Volume:
Major Tributaries:		# of Shoreline Parcels/Properties:	
Trophic Status:		Other:	

Shoreline Survey Results <i>(Score the Shore or other appropriate model)</i>		
Percentage of Shoreline		
Good	Moderate	Poor
Goals for Shoreline Improvement (5 years)*		
Example: Improve scores on 10% of moderate shorelines.		
Goals for Shoreline Improvement (10+ years)*		
Example: Improve scores on 15% of poor shorelines. All good shorelines remain good.		

\*These are to be used as examples of ways to identify measures of success. You should come up with goals that fit your lake to track progress

## Your Lake's MiSS Stats

Year:			
Estimated # of Property Owners Engaged:			
# of Presentations/Events Where MiSS was Presented:			
# of Property Owners Who Took the Survey:			
# of Property Owners Who Qualified as Shoreland Stewards:			
# of Shoreline parcels that have improved their MiSS Score.			
# of Qualifying Shoreland Stewards by Level:			
Gold	Silver	Bronze	Starter

## Promotional Materials for the MI Shoreland Stewards Program

The MI Shoreland Stewards Program has created multiple promotional items for Ambassadors to use so you do not have to create your own. We encourage you to upload the information to your website, include it in your local newspapers and lake association newsletters, and distribute printed copies at meetings, festivals, and other events.

Promotional items include print, video and PowerPoint presentations. **All promotional resources are available at <http://www.mishorelinepartnership.org/ambassador-training-materials.html>.**

Promotional items can be used with the understanding that:

- They are not altered (except where site specific and contact information needs to be tailored to local information).
- Credit is provided to MNSP.
- They are not used for monetary gain.

### PRINT MATERIALS

- **MI Shoreland Stewards article for lake association newsletters**
  - The article may be used as a newsletter article or for other general information needs.
- **MI Shoreland Stewards press release**
  - The press release can be sent to local newspaper or used as a short article in lake association newsletter.
- **MI Shoreland Stewards promotional ads (1/2 page and 1/4 page ads.)**
  - The promotional ads come in two sizes and can be incorporated into lake association newsletters, local print news, or can be added to your group's website.



- **MI Shoreland Stewards mailer**

- The mailer can be used if you choose to contact lake residents by mail. The PDF file may be printed as is, or you may customize with your lake association’s logo and other information.

- **MI Shoreland Stewards letter from Ambassador to property owner**

- This letter template can be used to engage with property owners. Feel free to craft your own or use the example as a means to connect with lake residents.

### MI Shoreland Stewards Program Guide

- The Program Guide can be used to introduce the program to lake residents, but is also an important resource to step survey respondents through the online questionnaire. Hard copies may be available from the Michigan Department of Environment, Great Lakes and Energy (EGLE). Please contact District Nonpoint Source Staff. [www.mi.gov/nps](http://www.mi.gov/nps)



### Volunteer for Michigan’s Lakes Brochure

- The brochure can be used to promote volunteer programs, including the MI Shoreland Stewards Program, aimed at protecting Michigan’s inland lakes. Hard copies may be available from EGLE. Please contact District Nonpoint Source Staff. [www.mi.gov/nps](http://www.mi.gov/nps)
- This brochure also includes information on the Michigan Cooperative Lake Monitoring component Score the Shore. [www.micorps.net](http://www.micorps.net).
- In addition, print files are available on the [MNSP Ambassador webpage](#) if lake associations wish to print copies.



## VIDEOS

- **MI Shoreland Stewards program series**
  - MI Shoreland Stewards Program Overview
  - MI Shoreland Stewards Upland
  - MI Shoreland Stewards Buffer
  - MI Shoreland Stewards Shoreline
  - MI Shoreland Stewards Lake
- **MI Shoreland Stewards survey**

Two video tutorials will help you better understand how the survey works and the different features. The Survey Tutorial walks through the survey and highlights many areas where people might have some questions.

- Exploring the MiSS Website
- Exploring the MiSS Survey
- How to Manage the Lake Page video
- **Natural Shorelines: Living in Harmony at the Water's Edge**
  - [https://youtu.be/566bd\\_c\\_Ooc](https://youtu.be/566bd_c_Ooc)
- **Natural Shoreline Restoration/Bioengineering**
  - <https://youtu.be/qDPCPu-OcEo>
- **Larry the All-American Bullfrog**
  - [https://youtu.be/Ret\\_2agvDzg](https://youtu.be/Ret_2agvDzg)
- **Sebastian the Goose**
  - [https://youtu.be/gOef1C\\_kPNI](https://youtu.be/gOef1C_kPNI)

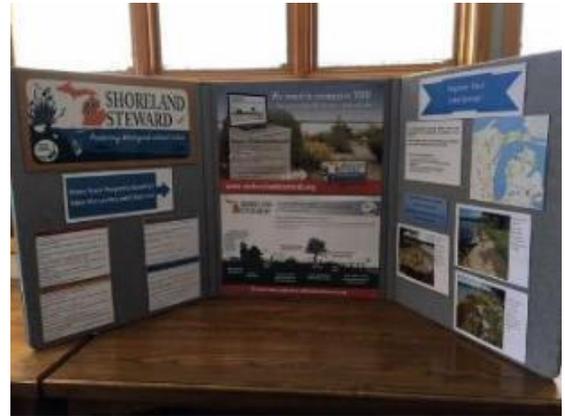
## ADDITIONAL SHORELAND STEWARDS RESOURCES

- **MI Shoreland Stewards PowerPoint presentations**
  - Part 1: Introduction
  - Part 2: What does an Ambassador do?
  - Part 3: MiSS for Ambassadors
  - Part 4: The Social Stuff
  - Part 5: Ambassadors in Action

- **Informational Display:**

Create an informational display to promote the program at events.

Here is an example of a display that includes a trifold with information and a display showing how natural shorelines create habitat and improve biodiversity.



## ENCOURAGING PARTICIPATION

### **Get Creative!**

- Create a contest with property owners on your lake.
  - Example contest: prettiest greenbelt, best decorations, etc.
- Host a block party to get to know your neighbors and show off your shoreline.
  - This could also be a great way to promote the MiSS Program.
- Raffle drawing for registered participants.
- Offer to purchase signs for registered Shoreland Stewards.
- Have your lake association organize a cost-share program for registered Shoreland Stewards.
  - Cost share program could be to create greenbelts, native plant gardens or rain gardens.
- Write personalized letters to riparian property owners.
- Hand out awards to registered Shoreland Stewards.
  - Awards could include most improved shoreline, largest greenbelt, etc.



## Connecting through Websites

If your lake association has a website, consider adding the following information about MiSS.

If your lake association does not have a website, consider creating one! There are some free web design platforms that are really easy to use.

### Your Lake Association Website:

- Create a page specifically for promoting healthy shoreland property management. Make it easy for people to find information.
- Provide a brief description of the Michigan Natural Shoreline Partnership, the link to their website ([www.mishorelinepartnership.org](http://www.mishorelinepartnership.org)), and the types of information they can find, such as native plant recommendations, certified natural shoreline contractors, etc.
- Provide a brief description of the MI Shoreland Stewards Program and a link to the website.
- An image of the Shoreland Stewards Promotional Card can be placed on your website.
- Information about your lake association's participation in the program.
- Provide links to the MI Shoreland Stewards Program video series.

### For Local Community/Organization websites:

- Provide the above information to Township/City/County sources to place on their websites if it isn't included.
- Provide the above information to local natural resource organizations to place on their websites if it isn't included.

## Connecting through Newsletters and Newspapers

- Provide an article for your lake association's newsletter.
- Find contacts for the local paper and connect with them about this information.

## Understanding the Michigan Shoreland Stewards Survey



The Michigan Shoreland Stewards Survey:

- **Provides recognition for inland lake property owners** for using best management practices to protect their lake.
- **Encourages** inland lake property owners to use **natural shoreland landscaping techniques and erosion control.**
- **Provides educational resources** to help manage a property for a healthy lake.

Participation in the MI Shoreland Stewards Program is easy and can be done from a computer or a mobile device. To take the survey individuals can either create an account or take the survey without one. We prefer that an account is created because that helps us better understand what is happening at your lake and can identify areas for improving the program and other lake protection efforts.

### **For Lake Associations:**

*Once your lake association is registered, the designated lake contact will only be able to see the results from the registered participants. The results from anonymous participants are in the system, but not readily available. Ambassadors can occasionally request a complete listing of all results for your lake from the website manager.*

- **Testing the survey:** If you have someone that wants to just try the survey anonymously, for whatever reason, have them enter “Test” as their lake name. This lets the site managers know this is not an official survey result and it can then be deleted.
- **Only one e-mail account for each survey can be used.**

## MICHIGAN SHORELAND STEWARDS LEVELS

Three different levels can be achieved: Gold, Silver, and Bronze. If a property doesn't qualify for these, a "Starter Level" will be indicated. The survey has an automated scoring system and the responses to the questions determine the recognition level. Practices such as maintaining high quality buffers, controlling erosion through lake friendly practices, maintaining woody structure and aquatic plants are weighted more heavily than questions such as picking up pet waste.

**GOLD:** A property at this level will have the most natural conditions with high levels of natural vegetation and very little lawn. Buildings may be difficult to see from the lake. The property will not have a seawall. Native aquatic plants will be in the lake (where they would naturally exist), stormwater runoff is not directly getting to the lake or causing any erosion problems. Access to the lake has been minimized.



**SILVER:** A property at this level will have high levels of natural vegetation and will not have a seawall. Though there may be more lawn than at the Gold level. Stormwater runoff is not getting directly to the lake or causing erosion problems. Erosion at the shoreline is managed in a lake healthy manner. Access to the lake has been minimized.



**BRONZE:** A property at this level may or may not have a seawall. If there is a seawall, best management practices are being used to reduce the negative impacts of seawalls. This property will have natural vegetation but may also have more lawn than a property at the silver or gold levels. Stormwater runoff has been minimized and is not causing erosion problems. Access to the lake has been minimized.



**STARTER:** Each property is different and some may not qualify for a certificate until some management practices are improved. If your property does not currently meet the criteria to become a MI Shoreland Steward you can take the survey again after improvements are made. Make sure you save your answers so you know which areas you can improve upon.

Remember, every parcel is different. Not every property will be able to qualify or reach the Gold level but everyone can do something to help your lake. **Please be aware that if a seawall is installed after December 31, 2018 this will negatively affect the score so much that any level above "Starter" will not be achieved and there will not be a certificate awarded.**



We created the different levels because lake protection is the primary goal. A Gold level property offers the most protection for the lake. A property that qualifies for the Gold level looks very different than a property that qualifies for the Bronze level. This is okay. Plus, there are some properties that may initially qualify at the Bronze level but could potentially make changes to and achieve a higher level. We are trying to improve property management for lake health. If a property qualifies at any level that should be honored. Remember, there are many properties that will never be able to qualify at all.

## RECOGNITION

- **MI Shoreland Stewards certificate**

Three versions (gold, silver, and bronze) of the MI Shoreland Stewards certificate are available. They may be provided to property owners who have completed the online survey and qualified as one of the three levels of the program.



- **MI Shoreland Stewards recognition sign**

Three versions (gold, silver, and bronze) of the MI Shoreland Stewards sign are available. They may be provided to property owners who have completed the online survey and qualified as one of the three levels of the program. In addition, your lake association or other sponsoring organization may customize the sign by adding a logo, name, or other brief information to the sign. However, the MNSP logo may not be removed, repositioned, or reduced in size. If you choose to customize the sign, the cost of fabrication is the responsibility of the property owner or sponsoring group.



## THE FOUR ZONES: UPLAND, BUFFER, SHORELINE, AND LAKE

The survey breaks down the respondent's property into four zones (upland, buffer, shoreline, lake). Other documents may have different terms that relate to these zones but we have tried to simplify the language and make it easy to understand the areas of the property being referred to. This also allows for the variability of lot size and shape. The descriptions for each of the zones can be applied to every property. The zones are color coded and have specific icons associated with them. Look for them throughout the survey.



Each survey section contains questions relevant to the property management of each zone. The various property management practices discussed in the questions are directly related to the water quality and ecosystem of the lake. Recommendations are provided to help understand what is best for the lake and still allow reasonable access and enjoyment at the lakeshore.

### **Questions are weighted**

The survey questions are weighted based on the potential impact to lake health. Accordingly, the property management practices that will have a greater negative impact on the lake will also have a greater negative impact on the respondent's stewardship level. The following pages discuss each zone of the survey, the questions included in the section, and a breakdown of the questions that will have a greater impact on the respondent's score.

While the questions address critical management practices for a healthier lake there is a lot of flexibility in what a lakefront property can look like and how it is used.

For example: Beach sanding is highly discouraged in the Lake and Shoreline Zones. Beach sanding in these Zones will have the greatest negative impact on the lake; however, if people want to create an

artificial beach, they should install it in the Buffer Zone, minimize its size, and put measures in place to keep the sand on the land instead of washing into the lake.

The survey results will be more negatively impacted if someone is adding sand to the Lake or Shoreline Zones than if there is a small artificial beach in the Buffer Zone.

**Color Coding of Questions:**

The questions for each zone have been color coded to help you better understand which questions can have the most positive or negative impact on a survey.

Least Impact on Stewardship Level	Medium Impact on Stewardship Level	Greatest Impact on Stewardship Level
-----------------------------------	------------------------------------	--------------------------------------



## Upland Zone

The Upland Zone typically includes the house, garage and other types of impervious surfaces that do not allow stormwater to soak into the ground. Usually, the majority of stormwater runoff is generated in the Upland Zone. Stormwater can create problems for your property and the lake.

Rain and water that is unable to soak into the ground picks up and mixes with what's on the ground:

- Oil, grease, metals and coolants from vehicles;
- Fertilizers, pesticides and other chemicals from residential, commercial, and agricultural landscapes;
- Bacteria from pet waste;
- Soil from construction sites and other bare ground;
- Soaps from car or equipment washing;
- Cigarette butts and other litter; and
- Accidental spills, leaky storage containers, and whatever else ends up on the ground.<sup>[1]</sup>

### Finding the Upland Zone

This is the part of the lakefront property that sets back from the lake after the first 35 feet (or after the Buffer Zone). The size of this Zone will vary greatly depending on the property. Some will have small upland areas and others will have very large upland areas.

**General Recommendations:** The questions dealing with impervious surfaces, stormwater runoff and vegetation are more heavily weighted. Best management practices to improve these areas should be emphasized as the most critical for property owners.

- Impervious surfaces should be minimized.
- Keep the natural vegetation.
- Stormwater should be captured and allowed to soak into the ground before it reaches the lake.
- Manage wastewater properly.
- Reduce pollutants such as pet waste, fertilizer, and pesticides.

**Table 1: Upland Zone Questions**

Upland Zone		
1	Do you pick up or remove animal waste in the upland as necessary to prevent it from washing into the lake?	Yes
		No
		I don't have any pets
2	What kind of waste water management do you have?	Sewer (Go to 5)
		Holding tank
		Septic
		Don't Know (Go to 5)
3	Do you pump according to BMPs (Holding tank)?	Yes
		No
4	Do you pump according to BMPs (Septic)?	Yes
		No
5	Do you ever use herbicides and/or pesticides in your Upland Zone to manage weeds, pests or invasive plants?	Broadcast
		Spot Treatment
		Never
6	Do you ever apply fertilizer on your Upland Zone lawn?	Yes, > 2 times per year (Go to 7)
		Yes, 2 or less times per year (Go to 7)
		No (Go to 8)
7	Are you using only phosphorus free fertilizers?	Yes
		No
8	Estimate the percentage of your Upland Zone that contains buildings, patios, driveways, parking areas, or other impervious surfaces.	0-24%
		25-49%
		50-74%
		75% or greater
9	Estimate the percentage of the Upland Zone that has trees, shrubs and ground-cover (other than lawn). Do not include buildings, driveways etc. in this estimation.	75% or greater
		50-74%
		25-49%
		1-24%
		0%
10	Is there stormwater runoff getting to the lake from your driveway, roof, pathways, patios or other hard surfaces or concentrated flows of stormwater?	Yes
		No (Go to 12)
11	How is stormwater from your hard surfaces getting to lake?	Collected and piped
		Some piped, some over the land
		Just over the land
12	Do you have eroding areas in your Upland Zone?	Yes
		No



## Buffer Zone

The Buffer Zone plays a critical role in protecting the lake ecosystem. It is important to note that every shoreline is different, and not every Buffer Zone will look the same.

Native plants in the Buffer Zone are important for shoreline protection. They help to keep the shoreline from eroding, as well as provide critical habitat for wildlife. Having a lawn up to the shoreline leads to erosion because grass has shallow roots, whereas native plants have deep roots. If designed properly, you can still have lake access areas and plenty of space for activities! Learn more during the survey about the importance of buffer vegetation and the problems that are created when it is replaced with lawn.

### Finding the Buffer Zone

The Buffer Zone begins at the top of the lake bank (edge of the Shoreline Zone) and is the first 35 feet of the lake front property adjacent to the lake.

**General Recommendations:** The questions dealing with percentage of vegetation, impervious surfaces and artificial beaches are more heavily weighted. Best management practices to make improvements in these areas should be emphasized as the most critical for property owners.

- This zone should be kept as natural as possible while still allowing a reasonable amount of recreational use and access to the lake.
- Control invasive species by spot treating with herbicides, only as needed, and re-establish native vegetation.
- No fertilization.

**Table 2: Buffer Zone Questions**

Buffer Zone		
13	Do you have any boats docks or hoists stored in your Buffer Zone?	Yes
		No (Go to 15)
14	Have you minimized amount of space they take up by stacking, vertical storage or elevating on blocks?	Yes
		No
15	Do you pick up or remove animal waste in your Buffer Zone to prevent it from washing into the lake?	Yes
		No
		I don't have a pet
16	Do you ever use herbicides and/or pesticides in your Buffer Zone to manage weeds, pests or invasive plants?	Broadcast Spraying
		Spot Treatment
		Never
17	Do you ever apply fertilizer in your Buffer Zone?	Yes
		No
18	What percentage of your Buffer Zone has trees, shrubs, flowers, native grasses (other than mowed lawn)?	<10%
		10-24%
		25-49%
		50-74%
		>75%
19	Do you have a variety of plants other than turf grass such as flowers, native grasses, shrubs, trees in your Buffer Zone?	Yes
		No
20	What percentage of your Buffer Zone is maintained/artificial beach?	0%
		1-10%
		11-25%
		26-50%
		50-74%
		>75%
21	What percentage of your Buffer Zone is impervious surfaces? (Impervious surfaces include boathouses, storage sheds, patios etc.)	0%
		1-10%
		11-25%
		26-50%
		50-74%
		>75%
22	Do you leave ashes from a fire pit or piles of leaves in your buffer area where they may wash into the lake?	Yes
		No



## Shoreline Zone

The Shoreline Zone is a transition zone from water to land and does not have an exact line between the land and aquatic zones. This Zone provides a transfer of water and nutrients from land to water and a place for wildlife that move back and forth between the land and water.

The toe (bottom) of the shoreline is the area that is most affected by wave action. An unstable, eroding toe may allow even well-vegetated upslope areas to slump and erode into the lake. While there are many causes of shoreline erosion the most common cause of erosion is the lack of native plants in the Buffer, Shoreline and Lake Zones.

### Finding the Shoreline Zone

The Shoreline Zone begins at the top of the bank and extends to the land-water interface. The shape, size and amount of vegetation depend on many factors such as the soils, shape and type of lake.

## Erosion Control

Seawalls were commonly seen as the only solution for erosion control; however, they cause erosion on neighboring properties, scouring of the lake bottom and create barriers for wildlife such as turtles. There are healthier erosion control options called bio-engineered erosion control. The solutions are very site specific and options range from very simple to highly complex. The Michigan Natural Shoreline Partnership maintains a list of professionals that have taken the Certified Natural Shoreline Professional training. See the Michigan Natural Shoreline Partnership website.

Can properties with seawalls qualify as a Shoreland Steward?

Some properties with existing seawalls can potentially qualify though it will be challenging. These properties were not completely excluded because we recognize the challenges of removing them; however, the smaller the lot size, the closer the house is to the lake and the more overbuilt the property is will all

*Seawalls installed after December 31, 2018 will have a significant negative to a survey score such that a Shoreland Steward Certificate will not be awarded.*



Example of a property with a seawall that would not qualify as a Shoreland Steward.

significantly reduce the possibility of qualifying. Larger lot sizes with little impervious surfaces and very little lawn have the most potential.

**General Recommendations:** The questions dealing with erosion control practices, other structures and shoreline use are more heavily weighted. Best management practices for healthy erosion control, removing shoreline structures where practical and feasible and reducing impacts on the shoreline should be emphasized as the most critical for property owners.

Note: It isn't always practical or feasible to remove a seawall. There are situations where it can be done; however, there are many factors that need to be evaluated in order to understand if that is the best approach. This evaluation needs to be done by a qualified professional.

- Bioengineering erosion control techniques
- Preventing and/or removing other shoreline structures where feasible.
- Reducing seawall impacts by using rip rap and plants in front of the seawall.

**Table 3: Shoreline Zone Questions**

Shoreline Zone		
23	Do you only use a small section of your Shoreline Zone to put boats in the water, swim or access the water?	10% or less
		11% or 25%
		26-50%
		51% or more
24	Do you have any boats, docks, hoists, etc. stored in your Shoreline Zone at any time?	Yes
		No
25	Have you minimized the amount of space they take up by stacking, vertical storage or elevating on blocks?	Yes
		No
26	Do you have erosion control structures in your Shoreline Zone?	Seawall (Go to 27)
		Combination
		Rock not bioengineered
		Rip rap - bioengineered
		Bioengineering soft erosion
		No erosion control structures but have erosion
27	Was your seawall put in after Dec 31st 2018?	Yes
		No
28	Has rip rap been added in front of your seawall?	Yes (Go to 29)
		No
29	Have you planted/allowed plants to grow in rip rap?	Yes - growing nicely
		Yes - but don't grow very well
		No
30	Has your Shoreline Zone been built on or altered with a boat house, permanent dock or boat well?	No
		Yes



## Lake Zone

The nearshore area or "littoral zone" is the final piece to having a healthy shoreland. The size of this area will vary depending on the lake. The size is determined mainly by the shape of the bottom of the lake (bathymetry). Some will have very large littoral zones with a lot of aquatic plants and some will have very small ones with few aquatic plants. A healthy littoral zone provides food, shelter, shade and areas to raise young for fish and wildlife.

There are many lakes that have a naturally sandy bottom but many do not. Attempting to change the type of lake bottom impacts the lake ecosystem.

**General Recommendations:** The questions dealing with aquatic plant and woody habitat removal are more heavily weighted. Best management practices should focus on maintaining aquatic plants and limiting removal of woody habitat.

- Only remove enough plants to get your boat through.
- Only remove enough plants for a small swim area. You can still have a swim area but we ask that you share it with the fish and wildlife that need a healthy littoral zone for survival!
- Keep additional sand out of the lake.
- Coordinate with the lake association for aquatic plant control. A permit is needed and should be done by a professional.

### Finding the Lake Zone

This starts at the toe of the shoreline zone and is the shallow part of the lake usually up to about 15' – 20' deep – where plants no longer have enough light to grow.

Table 4: Lake Zone Questions

		Lake Zone
31	How do you manage woody structures (fallen trees and branches) in the lake in front of your property?	I remove everything
		I limit removal
32	Do you remove native nearshore vegetation (bulrush, reeds, white water lily etc.)?	Yes
		No (Go to 34)
		NA
33	Do you limit the removal of native nearshore vegetation to small swim areas or to where access would otherwise be difficult?	Yes
		No
34	Do you as an individual smother plant growth with mats (benthic barriers), sand or other physical means?	Yes
		No
35	Are you (individually) controlling aquatic plants (invasive and/or native) or swimmers itch with chemicals?	Yes
		No (Go to 37)
36	Do you coordinate with your lake association about aquatic plant management?	Yes
		No
		My lake doesn't have a lake association
37	Do you throw leaves, lawn clippings or fire ashes into the lake?	Yes
		No
38	Do you add sand to your lake to create a swim area?	Yes
		No

## HELPING PROPERTY OWNERS UNDERSTAND THEIR RESULTS

When property owners register for an account and take the survey, they will be provided recommendations for areas of improvement based on their survey responses. Property owners are welcome to implement these recommendations and take the survey again to improve their results. Ambassadors can help property owners better understand which actions could affect their survey results the most.



For example, the picture shown above is a **Starter level**. The property owner wants to make some improvements to qualify as a Shoreland Steward but isn't quite sure where to begin. Based on these results there are some fairly simple changes the landowner can make immediately to help improve their rating but even these may not be enough to qualify them as a Shoreland Steward.

The changes that can have the most impact will be the ones that increase the native vegetation.

### Areas for Improvement

▸ Not picking up pet waste
▸ Broadcast Spraying
▸ Fertilizing in Upland 2 times or less per year
▸ Upland Vegetation 25%- 49%
▸ Fertilizing in Buffer Zone
▸ Buffer vegetation 10% or less
▸ No variety of native plants in the buffer
▸ Buffer 11% - 25% Artificial beach
▸ Buffer impervious 11%-25%
▸ Storing recreational equipment on the shoreline
▸ Rock Rip-Rap Not Bio-engineered
▸ Planting in the Rip-Rap
▸ Removing all woody structures from the lake

## IMPORTANT MICHIGAN INITIATIVES AND OPPORTUNITIES

### **PARTNERSHIPS**

#### **Michigan Natural Shoreline Partnership**

<http://www.mishorelinepartnership.org/>

Michigan Natural Shoreline Partnership (MNSP) is a collaboration of state agencies, academia, nonprofit organizations and private industry with the belief that shoreline development practices in Michigan are due for change from high impacting methods that alter the natural riparian condition to practices that restore and preserve the ecological function of the shoreline, effectively stabilize shoreline erosion and attract consumers as an option for lakefront use, to ensure the sustainable health of these resources.

- **The Shoreline & Shallows conference** is a biennial conference hosted by Michigan Natural Shoreline Partnership (MNSP) and its partners. Every other year the conference has featured topics on various ways to protect our shorelines.

#### **Michigan Inland Lakes Partnership**

<http://michiganlakes.msue.msu.edu/>

Michigan Inland Lakes Partnership (MILP) is a way for state and local agencies, Native American Nations, outreach institutions (universities and other educational institutions), non-governmental organizations, businesses, industries and citizens to collaborate and communicate to ensure the quality, sustainability and ecological diversity of lakes, while considering society's needs.

### **NONPROFIT ORGANIZATIONS**

#### **Michigan Lake Stewardship Associations**

<https://www.mymlsa.org/>

Michigan Lake and Stream Association (MLSA) is a non-profit, state-wide organization dedicated to the preservation, protection and wise management of Michigan's inland lakes. MLSA supports and assists lake, river and stream and watershed associations as well as individual riparian property owners in sustainable water resource techniques and methods of protecting their waterfront property.

#### **Michigan Chapter of the North American Lakes Management Society.**

[www.mcnalms.org](http://www.mcnalms.org)

The purpose of McNALMS is to promote understanding and comprehensive management of Michigan's inland lake ecosystems.

- Encourages cooperation and interaction among lake and watershed managers to address problems impacting Michigan's lakes.
- Promotes the sharing of information and experiences on scientific, financial, administrative, legal, and legislative aspects of lake and watershed management.
- Fosters the development of lake restoration and protection programs at local, state, and national levels.
- Promotes wise lake management by enhancing public awareness through education.
- Provides a forum for citizens and managers to share ideas and promote common objectives.

## **CITIZEN LAKE MONITORING**

### **The Michigan Clean Water Corps**

<https://micorps.net/>

The Michigan Clean Water Corps (MiCorps) is a network of volunteer water quality monitoring programs in Michigan. It was created to assist the Department of Environment, Great Lakes and Energy (EGLE) in collecting and sharing water quality data for use in water resources management and protection programs. MiCorps is administered by the Great Lakes Commission in partnership with EGLE, the Huron River Watershed Council, Michigan Lake Stewardship Associations, and Michigan State University.

- Score the Shore is a parameter of the MiCorps' statewide volunteer lake monitoring program. This new parameter is for lake associations, lake residents, and local governments to protect high quality shorelines and to be aware of degraded shorelines that could benefit from improvements.
- The Cooperative Lakes Monitoring Program (CLMP) is a program that helps citizen volunteers monitor indicators of water quality in their lake and document changes in lake quality over time. MiCorps' Cooperative Lakes Monitoring Program (CLMP) provides technical assistance, training, and other support to volunteer lake monitors in Michigan to ensure that they are collecting reliable, high-quality data.

## **TRAINING OPPORTUNITIES**

### **Certified Natural Shoreline Professional Training**

[www.mishorelinepartnership.org](http://www.mishorelinepartnership.org)

The Michigan Natural Shoreline Partnership offers training for contractors on the information and skills they need to implement natural shoreline technologies and bioengineered erosion control for healthier shorelines. This is a voluntary professional training program called the "Certified Natural Shoreline Professional (CNSP)". This training includes two classroom days, 1 field day and an exam. Professionals that adequately complete the training can become certified to indicate to potential clients that you provide lake-friendly, environmentally sound shoreline management solutions. A list of contractors that have successfully completed the training is maintained on the MNSP website.

### **Lake and Stream Leaders Institute**

[https://www.canr.msu.edu/michigan\\_lake\\_and\\_stream\\_leaders\\_institute/](https://www.canr.msu.edu/michigan_lake_and_stream_leaders_institute/)

Participants take part in classroom and field-based sessions designed to help them better understand local water resource management planning and program implementation. Expert presenters from academia, natural resource agencies, and local communities cover topics including watershed management, lake and stream ecology, environmental education, leadership, and working with local and state government. The Institute is conducted through five in-depth sessions held across Michigan.

### **Introduction to Lakes**

[http://www.canr.msu.edu/introduction\\_to\\_lakes\\_online/](http://www.canr.msu.edu/introduction_to_lakes_online/)

Introduction to Lakes is a six-week online course specially designed for citizens and professionals that are interested in learning about inland lakes. From the comfort of home or office, participants have 24/7 access to six online units complete with closed captioned video lectures, interactive activities, additional resources, discussion forums, quizzes and live chat sessions with classmates and Michigan State University Extension experts. Through this convenient format, participants increase their knowledge and understanding of the following topics:

- Lake ecology
- Lakes and their watersheds
- Shorelines
- Michigan water law
- Aquatic plant management
- Citizen involvement in lake stewardship

## SHORELAND STEWARDS GLOSSARY

**Benthic:** Lowest level/zone of the lake, referring to the bottom of the water body.

**Best Management Practice (BMP)** - Best Management Practice (BMP) means a practice, or combination of practices, that is determined to be an effective and practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals.

**Buffer/Greenbelt** - A greenbelt is a strip of diverse vegetation including trees, shrubs, grasses, and wildflowers that grow naturally or are planted along the shoreline. The MI Shoreland Stewards Program defines the buffer/greenbelt zone as the first 35 feet of the lakefront property.

**Emergent plants:** Plants are rooted on bottom of lake, but plant leaves and stems extend out of water.

**Erosion** - Erosion is the process that moves material, especially soil, from one location to another. Erosion is caused by the action of wind, water, or other forces working on the earth's surface.

**Eutrophic:** Water is high in nutrients, but has low oxygen levels.

**Herbicide** - A substance that is toxic to plants and is used to destroy unwanted vegetation.

**Impervious Surface** - An impervious surface is any surface or ground cover that has very limited or no capacity to absorb and/or infiltrate water. Traditional asphalt and concrete, mortared brick, and highly compacted soils are examples.

**Invasive Species** - An invasive species is a species that is not native and whose introduction causes harm, or is likely to cause harm to Michigan's economy, environment, or human health.

**Limiting nutrient:** Lowest nutrient in supply relative to the need for it.

**Limnology:** The study of bodies of freshwater.

**Littoral** - Relating to or situated on the shore of the sea or a lake.

**Low Impact Development** - Low Impact Development (LID) is a land development approach that emphasizes site design and planning techniques that mimic the natural infiltration-based hydrology of the historic landscape. LID techniques generally manage stormwater by retaining and infiltrating runoff on-site.

**Mesotrophic:** Medium levels of plant growth; between oligotrophic and eutrophic.

**Native Plants** - Plants which occurred in an area before disturbance by humans are considered to be native. When properly sited, native plants are adapted to the climate, pests, soil, and other

conditions. Native plants are often deep-rooted, which enhances the function of green infrastructure.

**Oligotrophic:** Water is low in nutrients, but has high oxygen levels.

**Permeable Pavement** - Permeable, pervious, or porous pavement includes several methods and materials that allow water and air to move through the pavement and into the underlying soil. Some examples of permeable pavement include specially designed and constructed concrete, asphalt, paving stones, or bricks.

**Pesticide** - A substance used for destroying insects or other organisms harmful to cultivated plants or to animals.

**Phosphorous Fertilizer** - Phosphorus is the nutrient most responsible for the pollution and premature aging of lakes in northern Michigan. The formula used for this phosphorus-free fertilizer is 20-0-10, with 20 representing the percentage of nitrogen, 0 the percentage of phosphorus, and 10 the percentage of potassium (water-soluble potash).

**Rain Garden** - A rain garden is a shallow landscape depression designed to capture and treat stormwater runoff. The plants and soil in the rain garden facilitate infiltration and pollution removal.

**Riparian** - Riparian refers to the land immediately adjacent to a waterbody such as a river, stream, wetland, or lake.

**Runoff** - Runoff is excess rainfall, snowmelt, or irrigation water that flows over the surface of the land. It will eventually infiltrate into the ground, evaporate, or flow into a storm drain system, stream, river, lake or other waterbody.

**Stormwater** - Stormwater is water from rainfall or snowmelt. Stormwater that does not immediately infiltrate into the soil becomes runoff.

**Substrate:** The material that makes up the bottom of the lake.

**Turbidity:** Cloudiness of water caused by water currents disturbing sediment on bottom.

**Watershed** - The land area from which water drains to a particular waterbody such as a stream, river, or lake is a watershed.

## COMMON WATER QUALITY PARAMETERS

**pH.** pH values provide a measurement of the acidity or alkalinity of water, ranging from 0-14, with 7 being neutral, levels below 7 indicating acidity, and levels above 7 indicating alkalinity. When pH is outside the range of 5.5 to 8.5, most aquatic organisms become stressed and populations of some species can become depressed or disappear entirely. State law requires that pH be maintained within a range of 6.5 to 9.0 in all waters of the state.

**Dissolved Oxygen.** Oxygen is required by almost all organisms, including those that live in the water. Oxygen dissolves into the water from the atmosphere (especially when there is turbulence) and through the photosynthesis of aquatic plants and algae. State law requires that a minimum of 7 parts per million (PPM) be maintained in lakes and 5 PPM in other waters.

**Conductivity.** Conductivity is a measure of the ability of water to conduct an electric current, which is dependent upon the concentration of charged particles (ions) dissolved in the water. If conductivity levels show a steady increase over a period of years, it may indicate that pollution is occurring.

**Chloride.** Chloride, a component of salt, is present naturally in Michigan surface waters at low levels (typically < 5 PPM) due to the marine origin of bedrock in Northern Michigan. Chloride is a "mobile ion," meaning it is not removed by chemical or biological processes in soil or water. Many products associated with human activities contain chloride (e.g. de-icing salts, water softener salts, bleach). Although most fish are not affected until chloride concentrations exceed 1,000 PPM, increasing chloride concentrations are indicative of other pollutants associated with human activity, such as automotive fluids from roads or nutrients/bacteria from septic systems, reaching our waterways.

**Total Phosphorous:** Phosphorus is the most important nutrient for plant productivity in surface waters because it is usually in shortest supply relative to nitrogen and carbon. A water body is considered phosphorous limited if the ratio of nitrogen to phosphorous is greater than 15:1. Although water quality standards have not been set for lakes, the US EPA recommends that total phosphorus concentrations in streams discharging into lakes not exceed 50 PPB. Phosphorus is normally found at concentrations less than 10 parts per billion (PPB) in high quality surface waters.

**Total Nitrogen:** Nitrogen is another essential nutrient for plant growth. It is very abundant element throughout the earth's surface and is a major component of all plant and animal matter. Some plants, including blue-green algae, can "fix" nitrogen directly from the atmosphere. As a result, nitrogen levels are highly variable in lakes and streams. Although nutrients occur naturally, nutrient pollution is usually the result of human activities (from things such as fertilizer, faulty septic systems, and stormwater runoff). For instance, septic tank effluent contains about 15,000 and 50,000 PPB of phosphorus and nitrogen respectively.

The density of water varies with temperature, such that relatively deep lakes vertically stratify into zones with different temperatures. During periods of stratification, vertical mixing does not occur

between zones. In stratified lakes, the surface waters may be much warmer than bottom waters in the summer, but in winter, surface water is slightly colder than bottom water. Oxygen content can also vary within a lake, depending on depth and season. During summer, oxygen in water near the bottom often drops to low levels or disappears entirely in all stratified lakes except those of the highest quality.

**Secchi Disc:** The Secchi Disc is a weighted disc (eight inches in diameter painted black and white in alternating quarters) that is used to measure water clarity. The disc is dropped down through the water column and the depth at which it disappears is noted. Using Secchi Disc measurements, we are able to determine the relative clarity of water, which is principally determined by the concentration of algae and/or sediment in the water. The clarity of water is a simple and valuable way to assess water quality. Lakes and rivers that are very clear usually contain lower levels of nutrients and sediments and, in most cases, boast high quality waters. Throughout the summer, different types of algae bloom during different times, causing clarity to vary greatly. Secchi disc depths have ranged from just a few feet in small inland lakes to 40-50 feet in large inland lakes and Great Lakes bays.

**Chlorophyll-a:** Chlorophyll-a is a pigment found in all green plants, including algae. Measuring the amount of Chlorophyll-a in the water provides a measure of the amount of phytoplankton, which is directly related to the nutrient level. The phytoplankton is extracted from the water with a filter device, and the filter membranes are analyzed in a laboratory for the amount of chlorophyll-a they contain.

**TSI Values:** Trophic Status Index (TSI) is a tool developed by PhD Bob Carlson from Kent State University to determine the biological productivity of a lake. Formulas developed to calculate the TSI value utilize Secchi Disc depth and chlorophyll-a measurements collected by our volunteers. TSI values range from 0 to 100, lower values (0-38) indicating an oligotrophic or low productive system, medium values (39-49) indicating a mesotrophic or moderately productive system, and higher values (50+) indicating a eutrophic or highly productive system. Lakes with greater water clarity and smaller phytoplankton populations would score on the low end of the scale, while lakes with greater turbidity and more phytoplankton would be on the high end. TSI values do not measure water quality, but simply place the lake on a scale of biological productivity. Lakes may be placed in the eutrophic category as a result of algal blooms, which are often a public concern and can be indicative of water pollution problems. On the other hand, low productivity of oligotrophic lakes may result in a lackluster fishery when compared to highly productive eutrophic lakes.

**Water Clarity:** Water clarity refers to how clear the water is, and is also described by terms like turbidity, cloudy, or muddy. The clarity of water is determined principally by the concentration of algae and/or sediment in the water. Lakes and rivers that are very clear usually contain lower levels of nutrients and sediments and, in most cases, boast high quality waters. Waters which are turbid or muddy may be less productive, because sunlight cannot penetrate deeply. Muddy waters also clog fish gills, smother spawning beds, inhibit the sight and feeding of many fishes, and can reduce

angling success. The clarity of water is a simple and valuable way to assess water quality. Water clarity is measured by lowering a Secchi Disc (a weighted disc eight inches in diameter painted black and white in alternating quarters) through the water column and noting the depth at which it disappears from sight. Water clarity is often highest in winter and early spring, when cold temperatures inhibit algae growth. Throughout the summer, different algae bloom during different times, causing clarity to vary greatly. Secchi disc depths have ranged from just a few feet in small inland lakes to 40-50 feet in large inland lakes and Great Lakes bays.

## Appendices

## APPENDIX A: LAKE AND WATERSHED CONTACTS

Resource/Company	Contact	Email	Phone
Local Government			
County Soil Erosion Office			
Conservation District			
Zoning Administrator			
Other			
Department of Natural Resources			
District Office			
Other			
Department of Environment Great Lakes and Energy			
District Office			
Other			
Local Nonprofits and Citizen Groups			
Michigan Natural Shoreline Partnership Certified Contractors			

## APPENDIX B: NATIVE PLANTS

**Between the water level and OHWM.** Trees and shrubs that tolerate consistently moist soil, seasonal flooding and exposure to energy from waves and ice grow well in the area between the water level and ordinary high water mark. Be sure to select only native trees and shrubs for this area. It's not only required, but natives are well-adapted to existing site and climate conditions. Some examples of readily available natives suited for this area include:

- **Buttonbush** (*Cephalanthus occidentalis*): 6' - Multi-stemmed shrub; unusual round, fragrant white flowers in summer; nectar source; ducks and other water birds and shorebirds consume the seeds; and full sun to part shade.
- **Redstemmed dogwood** (*Cornus sericea*): 10' – Multi-stemmed shrub; attractive clusters of white flowers in May; nice fall color; conspicuous red branches in winter; attracts mammals, butterflies and birds; and full sun to part shade.

Other suggestions include:

- Bog birch (*Betula pumila*)
- Silky dogwood (*Cornus amomum*)
- Swamp rose (*Rosa palustris*)
- Sandbar willow (*Salix interior*)
- Black willow (*Salix nigra*)

**Above the OHWM.** Trees and shrubs for this area tolerate soils that are consistently moist, but are less likely to flood. They do not like continuous stress resulting from waves and ice. Smart choices for lakefront landscapes include the following natives:

- **Winterberry** (*Ilex verticillata*): 6-12' – Multi-stemmed shrub; grows in wet or dry soils; shrubs are either male or female; brilliant fall and winter fruit display; readily attracts birds; and sun to partial shade.
- **Common ninebark** (*Physocarpus opulifolius*): 10' – Multi-stemmed shrub; tolerates wet to dry soils; clusters of whitish-pink flowers in May; attractive fruit capsule turns shades of red in early fall; and full sun to partial shade.
- **Red maple** (*Acer rubrum*): 75' – Shade tree with single or multiple trunks; red-orange fall color; select cultivars for consistent fall color; provides food for squirrels and some bird species; and full sun to shade.

Other suggestions include:

- Black chokeberry (*Aronia melanocarpa*)
- Yellow birch (*Betula alleghaniensis*)
- Hackberry (*Celtis occidentalis*)
- Honeylocust (*Gleditsia triacanthos*)

- Swamp white oak (*Quercus macrocarpa*)
- American elderberry (*Sambucus canadensis*)
- Arrowwood (*Viburnum dentatum*)
- Nannyberry (*Viburnum lentago*)

**Upland.** This planting area is further away from the high water mark and features drier soils. There are numerous native trees and shrubs that can be incorporated into a design in this landscape area. Some suggested natives include:

- **Shrubby cinquefoil** (*Potentilla fruticosa*): 4' – Multi-stemmed, rounded shrub; fine-textured foliage; long blooming yellow flowers from June until frost; easy to grow; and prefers full sun for best flowering.
- **Serviceberry** (*Amelanchier arborea*): 15' – Large shrub with white, wispy flowers in early spring; edible fruit in June; beautiful fall color; smooth gray bark; attracts game birds and songbirds; and full sun to shade.

Other suggestions include:

- New Jersey tea (*Ceanothus americana*)
- Eastern redbud (*Cercis canadensis*)
- Alternate-leaf dogwood (*Cornus alternifolia*)
- American hazelnut (*Corylus americana*)
- Diervilla (*Diervilla lonicera*)
- Ironwood (*Ostrya virginiana*)
- American elder (*Sambucus canadensis*)
- Red-berried elder (*Sambucus racemosa*)

More examples of plants can be found at the [Michigan Natural Shoreline Partnership Native Plants webpage](#). Also, for a great primer on the topic of natural shoreline landscapes, obtain a copy of “[Natural Shoreline Landscapes on Michigan’s Inland Lakes: Guidebook for Property Owners](#)” (MSU Extension bulletin #E3145) available from the [MSU Extension Bookstore](#)

## APPENDIX C: PERMIT INFORMATION

# SHORELINE EROSION PROTECTION

## ON INLAND LAKES AND STREAMS



Michigan law requires that a permit be applied for and received from the Department of Environmental Quality (DEQ) before conducting certain activities in inland lakes and streams. These activities include dredging, filling, constructing or placing a structure on bottomlands, constructing or reconfiguring a marina, interfering with the natural flow of water, or connecting a ditch or similar waterway to an inland lake or stream. The construction of shoreline protection is a common project that requires a permit from the DEQ.

The type of shoreline protection selected for a site should consider the cause and amount of erosion on-site, and include only the minimal amount of hardening necessary to address the erosion. Shoreline hardening eliminates vegetation and other habitat that is important for fish and wildlife and the filtering of pollutant runoff. The DEQ permitting process ensures that potential negative impacts to the public trust, riparian rights, and the environment are avoided and minimized as much as possible.

DEQ Environmental Assistance Center 800-662-9278 [www.michigan.gov/deq](http://www.michigan.gov/deq)

This Fact Sheet answers the following questions:

**Do I need a permit to control shoreline erosion on my property?**

**What is bioengineering and why is it a best management practice?**

**What type of shoreline protection is right for my property?**

**How do I apply for a permit for shoreline protection?**



**Michigan  
Department of  
Environmental  
Quality**

Water Resources Division

[www.mi.gov/wrd](http://www.mi.gov/wrd)

04/2018

Do I need a permit to control shoreline erosion on my property?

A permit is required to install or replace shoreline protection on inland lakes or streams, including:

- *New vertical walls* (e.g., steel, vinyl, or rock). Vertical walls are not recommended because they eliminate fish and wildlife habitat, lower water quality, and can cause erosion on neighboring properties, but they may be justifiable in certain high energy situations where there is limited space.
- *Seawall replacements*. Seawall replacements can be reviewed through an expedited permit process if certain criteria are met, including minimizing the footprint and including toe stone. Maintenance of a previously permitted seawall does not need a permit if it is in place and in kind with no design or materials modification, is only of the seawall facing or sheeting or support piling, and does not encompass more than 25 percent of the length. Seawall cap maintenance or replacement can be done on previously permitted seawalls without a permit.
- *Riprap*. Riprap shoreline protection can be reviewed through an expedited permit process if certain criteria are met including using properly-sized field stone or rock.
- *Bioengineering*. Bioengineering practices, which are considered a preferred best management practice, can be reviewed through expedited permit categories.

What is bioengineering and why is it a best management practice?

Bioengineering uses a combination of native plantings and natural or biodegradable materials to mimic or enhance a natural shoreline. It prevents erosion and restores shorelines, while protecting fish and wildlife habitat and lake health. More information on the types and benefits of bioengineering is available on DEQ's [shoreline protection](#) Web site.

What type of shoreline protection is right for my property?

The type of shoreline protection should be selected based on site specific factors including the cause and amount of erosion and wave energy occurring on-site, and include only the minimal amount of shoreline hardening necessary.

How do I apply for a permit for shoreline protection?

Applicants should use the DEQ Joint Permit Application:

- Permit applications should be submitted through the MiWaters online permit application system.
- Information on the permit application process and how to submit an application in MiWaters is available at [www.mi.gov/jointpermit](http://www.mi.gov/jointpermit).
- Expedited permit categories are available that have lower permit application fees and shorter processing timeframes.

For information or assistance on this publication, please contact the Water Resources Division through the DEQ Environmental Assistance Center at 800-662-9278. This publication is available in alternative formats upon request. The DEQ will not discriminate against any individual or group on the basis of race, sex, religion, age, national origin, color, marital status, disability, political beliefs, height, weight, genetic information, or sexual orientation. Questions or concerns should be directed to the Quality of Life Human Resources, P.O. Box 30473, Lansing, MI 48909-7973. This publication is intended for guidance only and may be impacted by changes in legislation, rules, policies, and procedures adopted after the date of publication. Although this publication makes every effort to teach users how to meet applicable compliance obligations, use of this publication does not constitute the rendering of legal advice.

# FLOODPLAIN INFORMATION

FOR PROPERTY OWNERS, REALTORS,  
AND POTENTIAL BUYERS



A river, stream, lake, or drain may on occasion overflow its banks and inundate adjacent land areas. The land that is inundated by water is defined as a floodplain. In Michigan, and nationally, the term floodplain has come to mean the land area that will be inundated by the overflow of water resulting from a 100-year flood (a flood which has a 1% chance of occurring any given year). The floodway is the area of active moving water.

Any occupation, construction, filling or grade changes within the 100-year floodplain of a river, stream or drain, requires a permit from the Department of Environmental Quality (DEQ) under state floodplain regulations. In general, construction and fill may be permitted in portions of the floodplain that are not floodway, provided local ordinances and building standards are met. Compensating excavation may be required to ensure that floodwater storage will be preserved. Activity in the floodway may require hydraulic modeling to verify the impacts to flood stages.

DEQ Environmental Assistance Center 800-662-9278 [www.michigan.gov/deq](http://www.michigan.gov/deq)

This Fact Sheet answers the following questions:

**How do I know if there is floodplain on the property?**

**What are some general restrictions for floodplain development?**

**What information do I need before applying for a permit to develop in a floodplain?**

**How do I apply for a permit for work in a floodplain?**



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How do I know if there is floodplain on the property?

Various sources are available to help determine if property is in the floodplain, including:

- The Federal Emergency Management Agency (FEMA) publishes maps in some communities which are available at [www.msc.fema.gov](http://www.msc.fema.gov). Your local community (City, Village, or Township), local library, or **DEQ Water Resources Division offices** may also have maps available.
- If a flood elevation has not been established by FEMA, you can also make a **request for a floodplain elevation** from the DEQ.

What are some general restrictions for floodplain development?

General restrictions for floodplain development include:

- Habitable structures are prohibited within the floodway.
- Non-habitable structures or fill may possibly be permitted in the floodway if it is shown through hydraulic modeling and reporting that they do not cause a harmful interference as defined by the statute.
- All buildings must have the lowest floor, including a basement, elevated 1 foot above the 100-year floodplain elevation.
- Compensating cut to offset the loss of floodplain storage for floodplain fills is generally required when the fill volume is above 300 cubic yards. (This requirement differs in some specific floodplains around the state.)

What information do I need before applying for a permit to develop in a floodplain?

After obtaining the regulatory flood elevation, you will need to:

- Hire a professional surveyor, or engineer to survey the existing grades.
- Survey information will provide the existing elevations in relation to the flood elevation.
- The survey will provide information to determine how much fill material is needed and how high to elevate the lowest floor.

How do I apply for a permit for work in a floodplain?

Applicants should use the DEQ Joint Permit Application when applying for development in a floodplain:

- Permit applications should be submitted through the MiWaters online permit application system.
- Information on the permit application process and how to submit an application in MiWaters is available at [www.mi.gov/jointpermit](http://www.mi.gov/jointpermit).

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# DOCKS, BOAT HOISTS, AND SWIM RAFTS

## ON INLAND LAKES AND STREAMS



Michigan law requires that a permit be applied for and received from the Department of Environmental Quality (DEQ) before conducting certain activities in inland lakes and streams. These activities include dredging, filling, constructing or placing a structure on bottomlands, constructing or reconfiguring a marina, interfering with the natural flow of water, or connecting a ditch or similar waterway to an inland lake or stream.

Docks, boat hoists, and swim rafts are common projects that may require permits from the DEQ, and should be installed to minimize impacts to navigation, use of the water, and the environment. The DEQ permitting process ensures that potential negative impacts to wetlands, lakes, streams, and other natural features, as well as impacts to use by the public and other property owners, are avoided and minimized as much as possible. The applicant must show the project will not adversely affect the public trust, riparian rights, or the environment.

DEQ Environmental Assistance Center 800-662-9278 [www.michigan.gov/deq](http://www.michigan.gov/deq)

This Fact Sheet answers the following questions:

**Do I need a permit to install a dock or boat hoist?**

**Do I need a permit to install a swim raft?**

**How do I apply for a permit for a dock or a boat hoist?**

**Can my dock or boat hoist permit application be expedited?**



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Do I need a permit to install a dock or boat hoist?

A permit is required to install a permanent dock or boat hoist in inland lakes or streams. A permit is not required for a seasonal dock or boat hoist that is placed in an inland lake or stream and removed at the end of the boating season, if the structure is for private, non-commercial recreational use, and placement does not unreasonably interfere with the use of the water by others or interfere with water flow. Public or commercial structures require a permit. Boardwalks in wetlands landward of the shoreline also require a permit.

Do I need a permit to install a swim raft?

Swim rafts are usually seasonal structures, put in at the beginning of the boating season and removed at the end of the season. Seasonal structures do not need a permit in inland lakes and streams, as long as they are for private non-commercial recreational use, and do not unreasonably interfere with the use of the water by others or interfere with water flow.

How do I apply for a permit for a dock or a boat hoist?

Applicants should use the DEQ Joint Permit Application:

- Permit applications should be submitted through the MiWaters online permit application system.
- Information on the permit application process and how to submit an application in MiWaters is available at [www.mi.gov/jointpermit](http://www.mi.gov/jointpermit).

Can my dock or boat hoist permit application be expedited?

Docks and boat hoists needing a permit can be reviewed through an expedited permit process if certain criteria are met, including:

- One permanent dock or two permanent boat hoists per single family residential property.
- The structure does not have roofs or sides.
- The structure cannot interfere with water flow or navigation.
- The structure is placed in the center of the property, or at least 1.5 times the dock length from any property lines.
- The structure is placed in or is a reasonable length to boatable water, or at a length from the shoreline that is not greater than the length of similar structures in the area, whichever is the minimum necessary.
- For docks, the dock does not exceed a width of four feet and is a linear single pier with no perpendicular extensions. For boat hoists, the boat hoist does not occupy more than 400 square feet, including a walkway 2 feet wide or less.

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# BEACH SANDING AND FILLS FOR SWIM AREAS

ON INLAND LAKES



Michigan law requires that a permit be applied for and received from the Department of Environmental Quality (DEQ) before conducting certain activities in inland lakes and streams. These activities include dredging, filling, constructing or placing a structure on bottomlands, constructing or reconfiguring a marina, interfering with the natural flow of water, or connecting a ditch or similar waterway to an inland lake or stream.

The placement of fill for swim areas in lakes and streams requires a permit from the DEQ. The DEQ permitting process ensures that potential negative impacts to wetlands, lakes, streams and other natural features, as well as impacts to use by the public and other property owners, are avoided and minimized as much as possible. The local unit of government may also have ordinances or regulations regarding beach sanding and fills for swim areas.

DEQ Environmental Assistance Center 800-662-9278 [www.michigan.gov/deq](http://www.michigan.gov/deq)

This Fact Sheet answers the following questions:

**Do I need a permit to place fill in the water for swim areas?**

**Do I need a permit to place beach sand above the water?**

**What potential impacts can beach sanding and swim fills have on my lake?**

**How do I apply for a permit for swim area fills?**



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Do I need a permit to place fill in the water for swim areas?

Yes, a permit is required to place fill in the water for swim areas under Part 301, Inland Lakes and Streams, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Decisions on whether a permit will be issued are based on criteria in Part 301 and the applicant must show the project will not adversely affect the public trust, riparian rights, or the environment.

Do I need a permit to place beach sand above the water?

A permit is not required under Part 301 for reasonable sanding of beaches to the existing water's edge by the riparian owner. A reasonable amount of sand may be placed landward of the water's edge without a permit as long as the sand does not shift the location of the existing ordinary high water mark or the shoreline contour. The sand cannot be placed in a wetland or floodplain, and must be free of organic material and pollutants. A 50/50 mix of clean sand and pea stone is recommended.

What potential impacts can beach sanding and swim fills have on my lake or stream?

Beach sanding and fills can have negative impacts on lakes and streams. Beach sanding and filling eliminates aquatic vegetation, reduces water quality, and reduces nearshore habitat for fish and other aquatic life (e.g., fish spawning areas, habitat for aquatic insects that are food for fish). Removing shoreline vegetation to create a beach can also result in increased erosion and property damage as this vegetation is critical for shoreline stabilization.

How do I apply for a permit for swim area fills?

Applicants should use the DEQ Joint Permit Application when applying for a swim area fill:

- Permit applications should be submitted through the MiWaters online permit application system.
- Information on the permit application process and how to submit an application in MiWaters is available at [www.mi.gov/jointpermit](http://www.mi.gov/jointpermit).
- Swim area fills in inland lakes or impoundments can be reviewed through an expedited permit process if certain criteria are met, including:
  - The area does not exceed 800 square feet, a maximum fill depth of six inches, or a water depth of four feet.
  - Fill consists of at least 50 percent peastone, with the balance being clean sand.
  - The width of the swim area is limited to half the lot width or 40 feet, whichever is smaller, and is not in wetland.

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# VEGETATION REMOVAL

## IN INLAND LAKES AND STREAMS



Michigan law requires that a permit be applied for and received from the Department of Environmental Quality (DEQ) before conducting certain activities in inland lakes and streams. These activities include dredging, filling, constructing or placing a structure on bottomlands, constructing or reconfiguring a marina, interfering with the natural flow of water, or connecting a ditch or similar waterway to an inland lake or stream. Vegetation removal (i.e., pulling vegetation out by its roots and disturbing bottom sediments) in inland lakes and streams is also regulated, and needs a permit in many cases.

Because shoreline vegetation provides protection against erosion and pollution and provides habitat for fish and wildlife, vegetation removal should be avoided and minimized as much as possible. The DEQ permitting process ensures that potential negative impacts are avoided and minimized, and that the project will not adversely affect the public trust, riparian rights, or the environment.

DEQ Environmental Assistance Center 800-662-9278 [www.michigan.gov/deq](http://www.michigan.gov/deq)

This Fact Sheet answers the following questions:

**Do I need a permit to pull or remove vegetation?**

**Do I need a permit for raking?**

**Do I need a permit to remove fallen trees?**

**How do I apply for a permit?**



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Do I need a permit to pull or remove vegetation?

A permit is not required for vegetation removal by the riparian owner in inland lakes and streams if:

- The plants are an aquatic nuisance as defined in state law,
- The removal is accomplished by hand-pulling without using a powered or mechanized tool, and
- All of the plant fragments are removed from the water and disposed of on upland.

The DEQ recommends that vegetation removal be minimized, as shoreline vegetation provides protection against erosion and pollution. Vegetation removal also negatively impacts recreational fishing, reptiles and amphibians, and other wildlife.

A permit is required for larger-scale removal of plants, removal using powered or mechanized tools, placing materials on the lake bottom for vegetation control, or removing vegetation in wetlands. Removal of vegetation assisted by a suction tool (Diver Assisted Suction Harvesting) requires a permit. Chemical control of aquatic plants requires an Aquatic Nuisance Control permit from the DEQ.

Do I need a permit for raking?

A permit is not required to rake lake bottom by a riparian owner as long as the raked areas are predominately composed of sand or pebbles and are unvegetated before raking, and the raking is performed without a powered or mechanized tool.

Do I need a permit to remove fallen trees?

If the tree is embedded in the lake or stream such that bottom sediments or the banks of the inland lake or stream will be disturbed during the removal of a fallen tree, a permit is required. Because fallen trees provide important fish and wildlife habitat, the DEQ recommends that as much of the tree remain in place as possible and that the embedded pieces of the tree be cut off to avoid disturbing the lake or river bottom and banks.

How do I apply for a permit?

Applicants should use the DEQ Joint Permit Application:

- Permit applications should be submitted through the MiWaters online permit application system.
- Information on the permit application process and how to submit an application in MiWaters is available at [www.mi.gov/jointpermit](http://www.mi.gov/jointpermit).

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# WETLAND INFORMATION

FOR PROPERTY OWNERS, REALTORS,  
AND POTENTIAL BUYERS



Due diligence for property transactions should include identification of federal, state, and local regulated features, including wetlands. Wetlands can be found in forests, shorelines, or open fields. Wetlands are often difficult to identify and do not necessarily contain visible water. For example, the picture above is of a forested wetland in summer that is dry on the surface.

Wetlands are a valuable habitat type that are protected by state and federal laws, requiring a Michigan Department of Environmental Quality permit for any excavation, filling, construction, drainage of surface water, or maintained use. Michigan Wetlands Protection Program information is available at [www.mi.gov/wetlands](http://www.mi.gov/wetlands).

DEQ Environmental Assistance Center 800-662-9278 [www.michigan.gov/deq](http://www.michigan.gov/deq)

This Fact Sheet answers the following questions:

**How do I know if there might be wetland on the property?**

**What are some important questions to ask during a property transaction?**

**What resources are available to gather more information?**

**What services does the DEQ provide to help?**



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How do I know if there might be wetland on the property?

Here are some clues that wetland might be present:

- The ground is soggy or has standing water, even for just part of the year.
- The soils are black or peaty.
- The property is lower than surrounding land.
- The land is flat without any grade changes.
- The trees are tipped over due to shallow roots.
- The property is near a pond, lake or stream.
- The property failed a perc test or an engineered septic system is required.
- The property is tax reverted.

What are some important questions to ask during a property transaction?

Does information already exist for this property on the presence of wetlands, such as:

- Are there wetland reports or delineations, or DEQ letters, permits, or denials for this property? A search of Site Map Explorer in the DEQ database **MiWaters** may help.
- Has a perc-test been done? If so, what were the results?
- Information from owners or neighbors about standing water, flooding, drainage, muddy spots, etc.

What resources are available to gather more information?

The DEQ offers information on our web sites to help get you started including:

- Maps of potential wetland areas on the **Wetlands Map Viewer**. This is a good place to start to get an idea what might be on the property. This map does not identify actual wetland, boundaries, or the need for a permit, so an on-site visit by a wetland professional is needed.
- A list of **Private Consultants** that you may hire to identify presence of wetlands and if they are regulated.
- **DEQ Staff Contacts** - Look for the Land/Water Permitting Staff Map. Staff for your County may have knowledge of the property and/or area, but cannot tell you for sure if wetland is present without a site visit.

What services does the DEQ provide to help?

The following DEQ services are available and detailed on the Wetlands Protection Program web site:

- **Pre-Application Meeting** is an official request to meet with DEQ staff to discuss a project and determine if a permit will be necessary.
- **Wetland Identification Program** offers wetland delineation services that includes a site visit to identify wetland boundaries and regulatory status.

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# GREAT LAKES SHORELINES

## INFORMATION FOR PERMIT APPLICANTS



With more than 3,000 miles of shoreline in Michigan, the Great Lakes form Michigan's geography and shape our economy, society, and environment. The waves shape our sandy beaches and rocky shorelines. The shallow bays and coastal wetlands provide habitat for wildlife and fish. Sand dunes tower over the shores. The shorelines are a recreational destination for property owners and tourists, and shoreline communities enjoy the economic base provided by their local Great Lake. The DEQ protects Great Lakes shorelines through regulatory oversight with programs that range from the permitting of homes and shore protection, to the protection of High Risk Erosion and Critical Dune Areas.

Beach walking is a popular pastime for residents and visitors. Walking is a legal activity along the Great Lakes shoreline regardless of who owns the property, but walkers cannot linger on another person's shoreline property without their permission. Linger includes sunbathing, camping, building fire pits, and other similar activities.

DEQ Environmental Assistance Center 800-662-9278 [www.michigan.gov/deg](http://www.michigan.gov/deg)

This Fact Sheet answers the following questions:

**Is my property in a High Risk Erosion or Critical Dune Area?**

**What activities require a permit in a High Risk Erosion or Critical Dune Area?**

**What are the best practices for addressing shoreline erosion?**

**How do I apply for a permit?**



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Is my property in a High Risk Erosion Area or a Critical Dune Area?

The DEQ offers information on its **High Risk Erosion Area** and **Critical Dune Area** web sites to help identify if your property is in a High Risk Erosion Area or Critical Dune Area:

- **High Risk Erosion Area maps** show the locations of High Risk Erosion Areas along the Great Lakes.
- The **Critical Dune Atlas** shows the locations of Critical Dune Areas along the Great Lakes.
- **MiWaters** Site Map Explorer can also help – type in the address, under Layers turn on Coastal then:
  - select the High Risk Erosion Zones layer, click nearby to see Projected Recession Distances OR
  - select the Critical Dune Area layer.

What activities require a permit in a High Risk Erosion Area or a Critical Dune Area?

The DEQ offers information on its web sites to help identify if a permit is needed including:

- A list of **common activities** that require a permit for High Risk Erosion and Critical Dune Areas, as well as **activities not requiring a permit in Critical Dune Areas**.
- If you are unsure whether your project requires a permit, then you may want to request a **Pre-Application Meeting**, which is an official request to meet with DEQ staff to discuss a project and determine if a permit will be necessary.

What are the best practices for addressing shoreline erosion?

The DEQ offers information on our web sites to help address shoreline erosion using best practices, including:

- **Living on the Coast** – Learn about living and working on the attractive edges of the dynamic Great Lakes.
- **Sand Dune Stabilization Best Management Practices** – How to live with moving sand.
- **Minor Project categories** – Information on regulations for small construction projects along the Great Lakes shorelines.

How do I apply for a permit?

Applicants should use the DEQ Joint Permit Application:

- Permit applications should be submitted through the MiWaters online permit application system.
- Information on the application process and how to submit an application is available at [www.mi.gov/jointpermit](http://www.mi.gov/jointpermit).
- The permit review process may take up to three or four months for activities on Great Lakes Shorelines.

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# National Lake Assessment (NLA) 2012 Michigan Results

In 2012, the U.S. Environmental Protection Agency (EPA) and its partners conducted a National Lake Assessment (NLA) to survey the water quality and ecological health of lakes, ponds, and reservoirs across the United States. The NLA is part of the National Aquatic Resource Surveys that help provide the public and decision-makers with nationally consistent and representative information on the conditions of the nation's waters. The NLA randomly surveyed a total of 1,038 inland lakes nationwide. Within the NLA 2012 survey, 38 of Michigan's lakes were sampled (18 of which were also sampled in 2007). The Michigan Department of Environmental Quality (MDEQ) has presented the NLA findings at the Michigan state level to compare statewide and national conclusions for chemical, recreational, biological, and physical indicators of the condition of Michigan's lakes. The survey also helps address how the conditions of Michigan's lakes change over time and what environmental stressors are most strongly associated with degraded biological conditions in the lakes.

NLA 2012 Michigan Sample Sites



## What are the conditions of Michigan's lakes?

**42%** Mercury in lake-bottom sediment can impact fish, wildlife, and recreation. In 2012, Michigan had a larger percentage of lakes in the most disturbed condition of mercury concentration (42%) compared to sampled lakes across the nation that are in the most disturbed condition (25%).

**48%** Riparian vegetation cover helps prevent erosion and maintain water quality. The NLA found that a higher percentage of Michigan lake (48%) riparian zones are in the most disturbed condition compared to previous Michigan lake assessments (31%) conducted in 2007.

**50%** Lake habitat complexity integrates data from riparian and littoral zones to estimate the amount and variety of all cover types at the water's edge. Lake habitat complexity indicators consider nearly 50% of Michigan lakes to be in the most disturbed condition.

**The NLA indicates that lake habitat complexity, mercury in lake-bottom sediment, and riparian vegetation cover are the three most widespread stressors in Michigan's lakes.**

# National Lake Assessment (NLA) 2012 Michigan Results

## What are the conditions of Michigan's lakes?

- <10%** Lake drawdown of water levels, whether by natural process or through direct manipulation, can adversely affect physical habitat conditions. Less than 10% of Michigan lakes fall in the most disturbed category in the NLA 2012. A majority of Michigan lakes fall in the least disturbed category.
- 9%** Nutrient Pollution is a widespread problem across the country. The NLA reported that only 9% of Michigan lakes are most disturbed by an excess of phosphorous compared to 38% of lakes across the nation.
- 29%** Microcystin is an algal toxin that was detected in 29% of Michigan lakes, but levels were always much below the levels of concern established by the World Health Organization.
- 13%** Atrazine is a herbicide that has sub-lethal effects on a number of fish and amphibian species. The NLA –Michigan finds that 13% of lakes contained atrazine although concentrations never exceeded USEPA levels of concern for freshwater plants.
- 52%** Benthic macroinvertebrate communities were found to be most disturbed in 52% of Michigan's lakes. Macroinvertebrate communities include small aquatic creatures like snails and mayflies. They are often used as indicators of water quality.



**NLA 2012 results for the extent of stressors and their prediction of conditions in Michigan's lakes**

## What's next?

The NLA 2012 Michigan results highlight the need for programs that encourage riparian and shoreline protection, improvement, and restoration to improve and maintain inland lake water quality. The results also highlight the need for actions that reduce mercury in inland lakes. The major source of mercury is considered to be atmospheric deposition (MDEQ 2016). Ongoing and future state and federal regulations, cleanup legacy sources, and regional and national efforts will reduce atmospheric deposition inputs over time. The next NLA survey is scheduled for summer 2017. The MDEQ will again participate in the survey and sample 50 randomly selected lakes in Michigan.



## The National Lakes Assessment (NLA) 2012

**L**akes and reservoirs provide many environmental, economic, and public health benefits. We use lakes for drinking water, energy production, food and recreation. Fish, birds and other wildlife rely on them for habitat and survival. In the [National Lakes Assessment \(NLA\)](#), the U.S. Environmental Protection Agency (EPA) and its partners surveyed a wide array of lakes representative of those found in the U.S., from small ponds and prairie potholes to large lakes and reservoirs. The NLA is part of the National Aquatic Resource Surveys, a series of statistically-based assessments designed to provide the public and decision-makers with nationally consistent and representative information on the condition of the nation's waters.

### What is the condition of lakes across the country?

**>35%** **Nutrient pollution:** Nutrient pollution is a widespread problem across the country. *About 1 in 3 lakes (35%) have excess nitrogen and 2 out of 5 lakes (40%) have excess phosphorus.* Too much of the nutrients nitrogen or phosphorus can contribute to algal blooms, low levels of oxygen, and harm to aquatic life.

**<1%** **Microcystin:** An algal toxin, microcystin, is detected in 39% of lakes, but *concentrations rarely reach moderate or high levels of concern* established by the World Health Organization (<1% of lakes).

**<1%** **Atrazine:** The herbicide atrazine is detected in 30% of lakes, but *concentrations rarely reach the EPA level of concern* for plants in freshwaters (<1% of lakes).

**31%** **Biological condition:** We find that *31% of lakes have degraded benthic macroinvertebrate communities, which include small aquatic creatures like snails and mayflies.* Analyses show an association between nutrients and biological condition. Lakes with high levels of phosphorus are 2.2 times as likely to have a degraded benthic macroinvertebrate community and lakes with high levels of nitrogen are 1.6 times as likely to have a degraded benthic macroinvertebrate community.

The margin of error for national results is approximately +/- 5%.

NLA 2012 Sampled Sites



*The NLA indicates that nutrient pollution is common in U.S. lakes. Compared to other measures, nutrient pollution is the most widespread stressor measured in the NLA and can contribute to blooms and affect recreational opportunities in lakes.*



## The National Lakes Assessment (NLA) 2012



### Are conditions getting better or worse?

A comparison of the 2007 and 2012 National Lakes Assessments indicates little change between surveys. In most cases, the percentage of lakes in degraded biological, chemical and physical condition did not change over this five year period, with a few notable exceptions.

**13% ↓** **Lake drawdown:** Drawdown of lake water levels, whether by natural process or through direct manipulation, can adversely affect physical habitat conditions. Between 2007 and 2012, the NLA shows improving conditions with *13% fewer lakes in the most disturbed condition.*

**8.3% ↑** **Cyanobacteria:** The NLA measured the density of cyanobacteria cells, which can produce cyanotoxins, as an indicator of toxic exposure risk. The analysis reveals worsening conditions, with *8.3% more lakes in the most disturbed condition in 2012 than in 2007.*

**9.5% ↑** **Microcystin:** The NLA shows a *9.5% increase in the detection of an algal toxin, microcystin.* However, concentrations of this algal toxin remain low and rarely exceeds World Health Organization recreational levels of concern (<1% of the population) in both assessments.

**Phosphorus:** In addition, a supplementary analysis of the NLA data finds that phosphorus has increased in lakes that were previously low in phosphorus. In 2012, there were *18.2% fewer low-phosphorus lakes than in 2007.*

### What are we doing to address problems?

The NLA indicates that our lakes are under stress. In particular, the NLA suggests a need to reduce nutrient pollution to improve lake conditions. EPA is working on many fronts to reduce the severity, extent, and impacts of nutrient pollution in our nation's lakes and other waters. These efforts involve overseeing regulatory programs, conducting outreach and engaging partners, providing technical and programmatic support to states, financing nutrient reduction activities, and conducting research and development. For more information on what EPA is doing to reduce nutrient pollution, visit [epa.gov/nutrientpollution](http://epa.gov/nutrientpollution).



The NLA offers a unique opportunity to frame discussions and plan strategies for the protection and restoration of lakes across the United States. Additional information from the NLA is available online at [epa.gov/national-aquatic-resource-surveys/nla](http://epa.gov/national-aquatic-resource-surveys/nla). Website visitors can explore NLA results with interactive dashboards, find assessments of regional conditions, examine differences between natural lakes and reservoirs, and more.