2016

Big Silver Lake Management Plan

Prepared in 2016 by staff from the Center for Watershed Science and Education
University of Wisconsin-Stevens Point

Center for Watershed Science and Education
College of Natural Resources
University of Wisconsin-Stevens Point

Big Silver Lake Management Plan

The Big Silver Lake Management Plan was developed with input from residents and lake users at a series of four public planning sessions held at the Waushara County Courthouse in Wautoma, Wisconsin in January through April 2016. The inclusive community sessions were designed to learn about and identify key community opportunities, assets, concerns, and priorities. Representatives of state and local agencies, as well as nonprofit organizations, also attended the planning sessions to offer their assistance to the group in developing a strategic lake management plan (LMP).

The plan was adopted by the Silver Lake Management District on October 10, 2016.
Date

The plan was approved by the Wisconsin Department of Natural Resources on _____.
Date

The plan was accepted by the Town of Marion on _____.
Date

The plan was accepted by Waushara County on _____.
Date

Any changes, updates or revisions to this document after the last date on this page do not reflect contributions made or approved by University of Wisconsin-Stevens Point.

A special thanks to all who helped to create the 2016 Big Silver Lake Management Plan and provided guidance during the plan's development.

2016 Big Silver Lake Management Planning Committee Members and Resources

Planning Committee

Bob Baker
Barbara Bartel
DuWayne Bartel
Lawrence Barzyk
Marty Dooley
Don Drover
Mary Drover
Harold Featherston
Bud Fenner
Bill Huck
Shirley Huck
Jim Hurley
Russell Kloehn
Verona Kloehn
Jim Kubasta
Don Maes
Bob Merriam
Susan Merriam
Bob Obma
Ross Peterson
Charles Plach
Dan Rigden
Mike Ruhland
Jim Schroeder
Todd Schroeder
Dale Schulman
Pat Seelman
Joe Seeman
Gary Stabelfeldt
Dave Stricker
Judy Stricker
Rick Thiele
Dave Washkoviak
Watson Woodruff

Waushara County

County Conservationist – Ed Hernandez
Land Conservation Department
Community, Natural Resources and Economic Development Agent—
Patrick Nehring, University of Wisconsin-Extension

University of Wisconsin – Stevens Point

Water Resources Specialist – Ryan Haney
Water Resources Scientist – Nancy Turyk
Center for Watershed Science and Education

Wisconsin Department of Natural Resources

Water Resources Management Specialist – Ted Johnson
Fisheries Biologists – Dave Bartz and Scott Bunde

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Wisconsin Department of Natural Resources Lake Protection Grant Program

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Overarching Vision for Big Silver Lake

Big Silver Lake will remain a clean, clear lake that is excellent for swimming, skiing, fishing and boating with a healthy balance of aquatic plants and recreational opportunities. It will be managed by an informed, proactive management district that maintains the lake's beauty and culture.

Introduction

Big Silver Lake is located in the township of Marion, east of the city of Wautoma. Access is provided to the public with three public boat launches which are located on its western, eastern and south sides. Big Silver Lake is a 328-acre seepage lake with groundwater and surface runoff contributing most of its water. Its maximum depth is 50 feet. The lakebed has a moderate slope with bottom sediments that are mostly sand with a small amount of gravel; muck is found in the deeper regions of Silver Lake.

Increasing abundance of nuisance plants and high recreational use has a resulted in a long history of conservation and management efforts. Various grants have been awarded in the past for projects on Big Silver Lake.

- Large scale lake planning grant for Silver Lake Sanitary District to complete a water quality and sedimentation study – 1994
- Large scale lake planning grant for Silver Lake Management District for Comprehensive Lake Study – 2004
- AIS control grant for Silver Lake Management District for EWM herbicide control – 2004
- Small scale lake planning grant for Silver Lake Management District to purchase a dissolved oxygen and temperature meter – 2007
- Lake protection grant for Waushara County to develop a County lake planning matrix – 2011
- Lake protection grant for Waushara County to characterize aquatic plant communities and water quality, identify critical landscape features, and develop tools for lake water quality planning related to land use for lakes within the County – 2012
- AIS control grant for Golden Sands RC&D to conduct Clean Boats, Clean Waters at one public boat landing on Big Silver - 2015
- A 5-year adaptive management plan for hybrid milfoil was developed by Onterra, LLC - 2015

In 2016, community members around Big Silver Lake came together again, to learn about and discuss the latest information about Big Silver Lake and to update its lake management plan. This document provides some background information about Big Silver Lake while laying out a framework for the protection and improvement of lake features identified as important to the community. This framework, or lake management plan, provides the guidance needed for citizens and others involved in lake or land management to achieve the vision of the Big Silver Lake community.

This planning process included a series of four public planning sessions held between January and April 2016 at the Waushara County Courthouse. Public participation in these sessions was invited via letters mailed to Big Silver Lake waterfront property owners and by press releases in the Argus. In addition, participants were sent emails about upcoming meetings which could be forwarded to others. In order to involve and collect input from as many people as possible, a survey was conducted prior to each planning session which sought feedback on the upcoming planning session's topic(s). The public was informed about the surveys via postcards (waterfront property owners) and press releases in local newspapers. The surveys could be completed anonymously online or on paper upon request. Survey questions and responses were shared at the planning sessions and can be found in the Appendix.

Guest experts and professionals were invited to attend the planning sessions to assist area residents, Big Silver Lake District members, lake users, and representatives of local municipalities with the development of the lake management plan. They presented information and participated in discussions with participants to provide context, insight and recommendations for the lake management plan, including environmental and regulatory considerations. Information provided by the professionals was organized into the same discussion topics as the surveys: the fishery and recreation, the aquatic plant community, water quality and land use, shoreland health, and communication. After learning about the current conditions of each topic, participants identified goals, objectives, and actions for the lake management plan that were then recorded by professionals from UW-Stevens Point. Planning session notes and presentations were posted to the Waushara County website.

Implementing the content within this lake management plan will enable citizens and other supporters to achieve the vision for Big Silver Lake now and in the years to come.

The Big Silver Lake Planning Management Committee consisted of property owners, recreational users and District board members. Technical assistance during the planning process was provided by the Waushara County Conservationist, the Waushara County Community, Natural Resources and Economic Development Extension Agent, and professionals from the Wisconsin Department of Natural Resources (WDNR), Golden Sands Resource Conservation and Development, Inc. (RC&D), University of Wisconsin-Extension (UWEX), and the University of Wisconsin-Stevens Point Center for Watershed Science and Education (CWSE).

This lake management plan (LMP) and the process used to create and update it allow the community to guide the health of its lake. It is a dynamic document that identifies goals and action items for the purpose of maintaining, protecting and/or creating desired conditions in a lake over the next 20 years. It will provide guidance for future boards, lake users, and technical experts by identifying which issues have been addressed and how successful previous efforts were. Each plan is unique, dependent upon the conditions of the lake, its watershed, and the interests of the stakeholders involved. The actions identified in a LMP can serve as a gateway for obtaining resources, including grant funding, to help implement activities outlined in the plan. Because many entities are involved in lake and land management, it can be challenging to navigate the roles, partnerships, and the resources that are available. From the beginning of this plan's development, efforts have been made to identify where key assistance exists and identify opportunities for ensuring that the lake's ecological, aesthetic, and recreational opportunities are plentiful into the future.

Who can use the Big Silver Lake Management Plan, and *how* can it be used?

- **Individuals**: Individuals can use this plan to learn about the lake they love and their connection to it. People living near Big Silver Lake can have the greatest influence on the lake by understanding and choosing lake-friendly options to manage their land and the lake.
- **Silver Lake Management District:** This plan provides the District with a well thought out plan for the whole lake and lists options that can easily be prioritized. Annual review of the plan will also help the District to realize its accomplishments. Resources and funding opportunities for District management activities are made more available by placement of goals into the lake management plan, and the District can identify partners to help achieve their goals for Big Silver Lake.
- **Neighboring lake groups, sporting and conservation clubs**: Neighboring groups with similar goals for lake stewardship can combine their efforts and provide each other with support, improve competitiveness for funding opportunities, and make efforts more fun.
- **The Town of Marion**: The town can utilize the visions, wishes, and goals documented in this lake management plan when considering town-level management planning or decisions within the watershed that may affect the lake.
- **Waushara County:** County professionals will better know how to identify needs, provide support, base decisions, and allocate resources to assist in lake-related efforts documented in this plan. This plan can also inform county board supervisors in decisions related to Waushara County lakes, streams, wetlands, and groundwater.
- **Wisconsin Department of Natural Resources**: Professionals working with lakes in Waushara County can use this plan as guidance for management activities and decisions related to the management of the resource, including the fishery, and invasive species. Lake management plans help the Wisconsin Department of Natural Resources to identify and prioritize needs within Wisconsin's lake community, and decide where to apply resources and funding. A well thought out lake management plan increases an application's competitiveness for funding from the State – if multiple Waushara County lakes have similar goals in their lake management plans, they can join together when seeking grant support to increase competitiveness for statewide resources.

Background

One of the first steps in creating this plan was to gather and compile data about the lake and its ecosystem to understand past and current lake conditions. This was done alongside 32 other lakes as part of the Waushara County Lakes Project. The Waushara County Lakes Project was initiated by citizens in the Waushara County Watershed Lakes Council who encouraged the Waushara County to work in partnership with personnel from UW-Stevens Point to assess 33 lakes in the county. This effort received funding from the Wisconsin Department of Natural Resources' Lake Protection Grant Program. Many of the lakes had insufficient data available to help evaluate current water quality, aquatic plant communities, invasive species, and shorelands, or had data obtained at differing frequencies or periods of time, making it difficult to compare lake conditions. Professionals and students from UW-Stevens Point and the Waushara County Land Conservation Department conducted the Waushara County Lakes Study and interpreted data for use in the development of lake management plans. Data collected by citizens, consultants, and professionals at the Wisconsin Department of Natural Resources were also incorporated into the planning process to provide a robust set of information from which informed decisions could be made. Sources of information used in the planning process are listed at the end of this document for future reference. The results of this project, including this plan, will assist citizens, municipalities, Waushara County, and State staff to efficiently manage water resources and help make informed decisions and policies that will affect their lakes now and for future generations.

Several reports from the Big Silver Lake Study and the materials associated with the planning process and reports can be found on the Waushara County website: http://www.co.waushara.wi.us/. Hover over the Departments tab, then Zoning and Land Conservation, Land Conservation, and finally click on Lake Management Planning. Unless otherwise noted, the data used in the development of this plan were detailed in the report *Waushara County Lake Study – Big Silver Lake 2010-2012*, University of Wisconsin-Stevens Point.

Goals, Objectives and Actions

The following goals, objectives, and associated actions were derived from the values and concerns of citizens and members of the Big Silver Lake Management Planning Committee, and the known science about Big Silver Lake, its ecosystem and the landscape within its watershed. Implementing and regularly updating the goals and actions in the Big Silver Lake Management Plan will ensure that the vision is supported and that changes or new challenges are incorporated into the plan. A management plan is a living document that changes over time to meet the current needs, challenges and desires of the lake and its community. **The goals, objectives and actions listed in this plan should be reviewed annually and updated with any necessary changes.**

Although each lake is different, to ensure a lake management plan considers the many aspects associated with a lake, the Wisconsin Department of Natural Resources requires that a comprehensive lake management plan address, at a minimum, a list of topics that affect the character of a lake, whether each topic has been identified as a priority or as simply something to preserve. These topics comprise the chapters in this plan. For the purposes of this plan, the chapters have been grouped as follows:

In-Lake Habitat and a Healthy Lake

Fish Community—fish species, abundance, size, important habitat and other needs
Aquatic Plant Community—habitat, food, health, native species, and invasive species
Critical Habitat—areas of special importance to the wildlife, fish, water quality, and aesthetics of the lake

Landscapes and the Lake

Water Quality and Quantity—water chemistry, clarity, contaminants, lake levels
Shorelands—habitat, erosion, contaminant filtering, water quality, vegetation, access
Watershed Land Use—land use, management practices, conservation programs

People and the Lake

Recreation—access, sharing the lake, informing lake users, rules
Communication and Organization—maintaining connections for partnerships, implementation, community involvement
Updates and Revisions—continuing the process
Governance—protection of the lake, constitution, state, county, local municipalities, Silver Lake Management District

List of Goals

Goal 1. Improve and enhance fish habitat, especially in near-shore areas of Big Silver Lake. 15
Goal 2. Protect the diversity of native plants in and around Big Silver Lake. 16
Goal 3. Eliminate or effectively manage AIS in Big Silver Lake. 21
Goal 4. Preserve existing high quality habitat in and near Big Silver Lake for abundant fish and wildlife. 22
Goal 5. Big Silver Lake will have good water quality. 26
Goal 6. Create a water quality dataset for Big Silver Lake to evaluate trends, including declines and improvements, over time. 27
Goal 7. Increase and enhance healthy shorelands around Big Silver Lake. 30
Goal 8. Watershed and shoreland property owners will know about and utilize resources for healthy land management practices. 34
Goal 9. Foster an environment of cordial recreational use. 37
Goal 10. Increase participation in lake stewardship. 38
Goal 11. Review this plan annually and update as needed. 39

Priority goals:

Goal 1. Improve and enhance fish habitat, especially in near-shore areas of Big Silver Lake.

Objective 1.1. Work to improve fish habitat along shoreland and near-shore areas and inform lake residents and users about fishery-related information and issues.

Goal 3. Eliminate or effectively manage AIS in Big Silver Lake.

Objective 3.1. Continue to aggressively control hybrid water milfoil using adaptive management techniques.

Goal 6. Create a robust dataset for Big Silver Lake to evaluate trends, including declines and improvements, over time.

Objective 6.1. Continue current monitoring initiatives and begin collecting data that are not routinely recorded.

Goal 10. Increase participation in lake stewardship.

Objective 10.1. Develop opportunities for education and outreach among full and part-time residents.

Lead persons and resources are given under each objective of this plan. These individuals and organizations are able to provide information, suggestions, or services to accomplish objectives and achieve goals. The following table lists organization names and their common acronyms used in this plan. This list should not be considered all-inclusive – assistance may also be provided by other entities, consultants, and organizations.

Resource	Acronym
Center for Watershed Science and Education	CWSE
Citizen Lake Monitoring Network	CLMN
Department of Agriculture, Trade and Consumer Protection	DATCP
Golden Sands Resource Conservation and Development	RC&D
North Central Conservancy Trust	NCCT
Natural Resource Conservation Service	NRCS
Silver Lake Management District	SLMD
University of Wisconsin-Stevens Point	UWSP
University of Wisconsin Extension	UWEX
Waushara County Land Conservation Department	WCLCD
Wisconsin Department of Natural Resources	WDNR
Wisconsin Department of Transportation	WDOT
Waushara County Watershed Lakes Council	WCWLC
Wisconsin Environmental Analysis Laboratory	WEAL

Contact information for organizations and individuals who support lake management in Waushara County can be found in Appendix A.

In-Lake Habitat and a Healthy Lake

Many lake users value Big Silver Lake for its fishing, wildlife, and good water quality. These attributes are all interrelated; the health of one part of the lake system affects the health of the rest of the plant and animal community, the experiences of the people seeking pleasure at the lake, and the quality and quantity of water in the lake. Habitat is the structure for a healthy fishery and wildlife community. It can provide shelter for some animals and food for others.

Lake habitat occurs within the lake, along all of its shorelands, and even extends into its watershed for some species. Many animals that live in and near the lake are only successful if their needs – food, a healthy environment, and shelter – are met. Native vegetation including wetlands along the shoreline and adjacent to the lake provides habitat for safety, reproduction, and food, and can improve water quality and balance water quantity. Some lake visitors such as birds, frogs, and turtles use limbs from trees that are sticking out of the water for perches or to warm themselves in the sun. Aquatic plants infuse oxygen into the water and provide food and shelter for waterfowl, small mammals, and people. The types and abundance of plants and animals that comprise the lake community also vary based on the water quality, and the health and characteristics of the shoreland and watershed. Healthy habitat in Big Silver Lake includes the aquatic plants, branches, and tree limbs above and below the water.

The Fish Community

A balanced fish community has a mix of predator and prey species, each with different food, habitat, nesting substrate, and water quality needs in order to flourish. Activities in and around a lake that can affect a fishery may involve disturbances to the native aquatic plant community or substrate, excessive additions of nutrients or harmful chemicals, removal of woody habitat, shoreline alterations, and/or an imbalance in the fishery. Shoreland erosion can cause sediment to settle onto the substrate, causing the deterioration of spawning habitat. Habitat can be improved by allowing shoreland vegetation to grow, minimizing the removal of aquatic plants, providing fallen trees or limbs in suitable areas, and protecting wetlands and other areas of critical habitat.

Photo courtesy of Limnology Center, UW Madison.

People are an important part of a sustainable fish community; their actions on the landscape and the numbers and sizes of fish taken out of the lake can influence the entire lake ecosystem. Putting appropriate fishing regulations in place and adhering to them can help to balance the fishery with healthy prey and predatory species, can be adjusted as the fish community changes, and can provide for excellent fishing.

Managing a lake for a balanced fishery can result in fewer expenses to lake stewards and the public. While some efforts may be needed to provide a more suitable environment to meet the needs of the fish, they usually do not have to be repeated on a frequently reoccurring basis. Protecting existing habitat such as emergent, aquatic, and shoreland vegetation, and allowing trees that naturally fall into the lake to remain

in the lake are free of cost. Alternatively, restoring habitat in and around a lake can have an up-front cost, but the effects will often continue for decades. Costs in time, travel, and other expenses are associated with routine efforts such as fish stocking and aeration. Ideally, a lake contains the habitat, water quality, and food necessary to support the fish communities that are present within the lake and provide fishing opportunities for people without a lot of supplemental effort and associated expenses to maintain these conditions.

The fishery in Big Silver Lake was last surveyed by biologists with the WDNR in the spring of 2015 using fyke netting and electrofishing. The following information was provided by Scott Bunde, WDNR Fisheries Technician, at the March 16, 2016 planning session:

- Northern pike were in fair abundance, with 73 captured during the survey, but the size structure was poor (RSD26=6%), growth was below average, only 26.2" after 8 years and the fish were in poor condition (thin).
- Walleye were in low abundance and all indications are that the fishery is comprised entirely of stocked fish with no evidence of reporduction.
- Largemouth bass were in good abundance with a capture rate of 91/hr for fish greater than 8" and good size structure (PSD12=52%, RSD14=28%, RSD15=17%); however growth was below average, averaging only 13.9" after 7 years.
- Bluegill were in high abundance at a capture rate of 720/hr; a preferred rate would be 400-500/hr. The size structure was fair and improving (2015 PSD6=26% and the 2004 PSD6 was 8%, the 2015 RSD7=5% and 2004 PSD7 was 3%). Growth was below average with bluegill taking 5 years to reach 6".
- Black crappies were observed in slightly high abundance with a fair growth rate. There is a particularly large class from 2012 which were 7" at 3 years of age.

Overall, the fishery in Big Silver was considered 'good' when compared with other lakes in Wisconsin. Mr. Bunde's primary recommendation was the enhancement of fish and invertebrate habitat in the near shore areas of the lake which may include tree drops/fish sticks, brush fastened under docks and piers, and encouraging and maintaining the development of emergent native plants. This structure, particularly at the shoreline, is essential for many fish and wildlife species to thrive.

Guiding Vision for the Fish Community

Big Silver Lake will have a healthy fish community for recreational fishing.

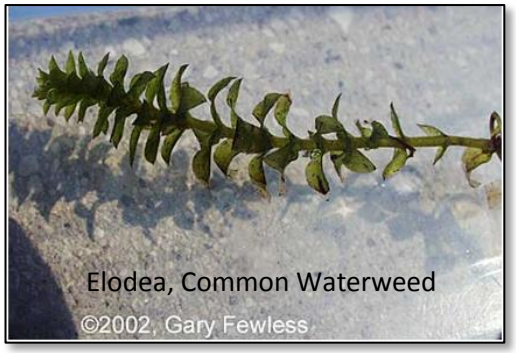
Goal 1. Improve and enhance fish habitat, especially in near-shore areas of Big Silver Lake.

Objective 1.1. Work to improve fish habitat along shoreland and near-shore areas and inform lake residents and users about fishery-related information and issues.

Actions	Lead person/group	Resources	Timeline
Work with WDNR to reestablish a connection to spawning areas across Highway 73 from Big Silver Lake.	SLMD	WDNR WDOT	Ongoing
Inform individuals about the importance of woody habitat in shallow water near-shore areas of Silver Lake and encourage placement in appropriate areas.	Dave Bartz, WDNR Fish Biologist SLMD	UWEX Lakes WCLCD	Ongoing
Continue to protect and restore shoreland areas and avoid shoreland alterations to improve fish habitat.	Shoreland property owners	WDNR Healthy Lakes Grants WDNR Fishery Biologist WCLCD	Ongoing

Aquatic Plants

Aquatic plants provide the forested landscape within Big Silver Lake. They provide food and habitat for spawning, breeding, and survival for a wide range of inhabitants and lake visitors including fish, waterfowl, turtles, amphibians, birds, as well as invertebrates and other animals. They improve water quality by releasing oxygen into the water and utilizing nutrients that would otherwise be used by algae.



A healthy lake typically has a variety of aquatic plant species which creates diversity that makes the aquatic plant community more resilient and can help to prevent the establishment of non-native aquatic species. Aquatic plants near shore and in shallows provide food, shelter and nesting material for shoreland mammals, shorebirds and waterfowl. It is not unusual for otters, beavers, muskrats, weasels, and deer to be seen along a shoreline in their search for food, water, or nesting material. The aquatic plants that attract the animals to these areas contribute to the beauty of the shoreland and lake.

During an August 2013 aquatic plant survey of Big Silver Lake, 77% (347 of 447) of the sampled sites had vegetative growth and approximately 30% of the sites sampled had dense vegetation. Twenty-three species of aquatic plants were found, with the greatest plant species diversity in the shallows bordering the lake. The most common species (45% of sites) was common waterweed followed by coontail (42%) and southern naiad (27%). Two invasive species, Eurasian watermilfoil and curly-leaf pondweed were also observed. More detailed

information can be found in the *2014 Big Silver Lake Aquatic Plant Report* or the *Big Silver Lake 2010-2012 Lake Study Report*.

Clearly, aquatic plants, both the abundance and the invasive species, were identified as some of the top challenges in Big Silver Lake. Many people around Big Silver Lake recognize the importance of aquatic plants to the fish and wildlife; however, most did not connect the benefits of healthy (not too sparse or dense) plant growth in the shallows to a healthy fishery. This near shore vegetation provides critical habitat for young fish, their food, and other species such as dragonfly larvae. Near shore aquatic plant growth also serves to break up waves, thus reducing negative impacts to the shoreline. Survey respondents felt the amount of plants in the lake are too great for fish, wildlife, and their enjoyment of the lake. July and August were identified as the months with nuisance-level growth. Forty-four percent of 80 survey respondents indicated that they use fertilizer on their property; this suggests that there is a disconnection in their understanding that fertilizer containing nitrogen and phosphorus can increase the growth of aquatic plants.

Guiding Vision for Aquatic Plants in Big Silver Lake

Big Silver Lake will have a healthy and diverse native plant community that supports a balanced fishery and promotes good water quality while maintaining swimming and recreational access.

Goal 2. Protect the diversity of native plants in and around Big Silver Lake.

Objective 2.1. Maintain the native aquatic plant community within Big Silver Lake while allowing for recreational use that is only minimally impeded by excessive aquatic plant growth. In general, as many aquatic plants should be left in place as is tolerable by the landowner. Regulations allow a landowner to clear up to a 30-foot diameter area around their dock and/or lake access.

Actions	Lead person/group	Resources	Timeline
Inform property owners of the importance of native aquatic vegetation to impede the establishment of additional AIS, provide food and habitat for wildlife, and protect the shoreline via educational materials provided at the annual meeting and in the spring newsletter.	SLMD	UWEX Lakes WCLWC	Ongoing
If plants severely impede recreation, consider hand-pulling small areas around private docks (within WDNR guidelines). Cleared lakebed is ideal habitat for AIS so be vigilant about watching for AIS in these areas.	Shoreland property owners	WDNR Lake Biologist	Ongoing
Reduce nutrients on the land to reduce plant growth in the lake. By reminding shoreland property owners about refraining from the application of herbicides/pesticides or fertilizers on shorelands at annual meeting and in newsletter.	SLMD	UWEX Lakes	Ongoing
Shoreland property owners that feel they need to apply fertilizer should first test their soil to determine if it is warranted.	Shoreland property owners	WC UWEX	As needed

Aquatic Invasive Species (AIS)

Aquatic invasives species are non-native aquatic plants and animals that are unintentionally introduced into a lake by lake users. This most commonly occurs on trailers, boats, equipment, and from the release of bait. In some lakes, aquatic invasive plant species can exist as a part of the plant community, while in other lakes populations explode, creating dense beds that can damage boat motors, make areas non-navigable, inhibit activities like swimming and fishing, and disrupt the lakes' ecosystems. If an invasive plant species not previously documented in Big Silver Lake is observed by any lake user, the lake user is encouraged to refer to Appendix C for more information on how to report it.

Zebra mussels

The zebra mussel (*Dreissena polymorpha*) is a tiny (1/8-inch to 2-inch) bottom-dwelling clam native to Europe and Asia. Zebra mussels were introduced into the Great Lakes in 1985 or 1986, and have been spreading throughout them since that time. They were most likely brought to North America as larvae in ballast water of ships that traveled from fresh-water Eurasian ports to the Great Lakes. Zebra mussels look like small clams with a yellowish or brownish D-shaped shell, usually with alternating dark- and light-colored stripes. They can be up to two inches long, but most are under an inch. Zebra mussels usually grow in clusters containing numerous individuals. Currently, there are no management strategies to control zebra mussels in the lake; however, strategies should be employed to ensure that recreationists in Big Silver Lake are not spreading zebra mussels to other lakes.

Curly-leaf pondweed

Curly-leaf pondweed (CLP) was first documented on Big Silver Lake in 2004, but it was not observed during the 2013 survey. This plant can live in harmony with the rest of the aquatic plant community but may become invasive. The die-off of large beds of CLP in June can contribute to nuisance algae blooms throughout the summer. In Big Silver Lake CLP should be monitored annually in early June, and if the beds expand, management should be considered.

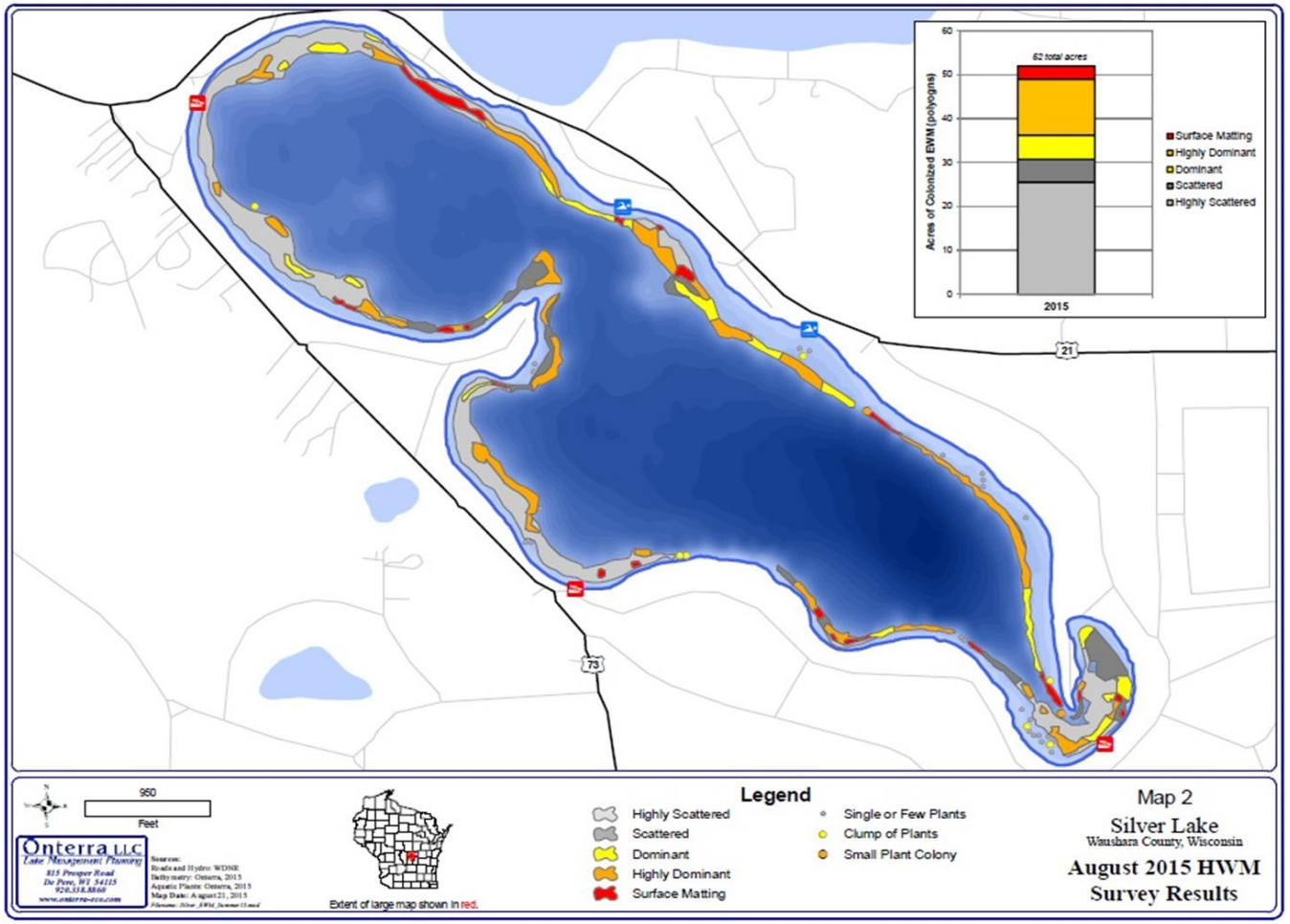
Eurasian water-milfoil

Eurasian water-milfoil (EWM) was first documented in Big Silver Lake in 1994. After its introduction, it quickly reached nuisance levels, resulting in reduced aesthetic value, recreational use and ecological health. Because of its increase in abundance and limited response to previously used herbicide treatments, in 2012 samples were tested and confirmed to be a hybrid between Eurasian and northern watermilfoils (HWM) by Green Valley State University. During the 2013 survey, EWM/HWM was present at 43% of vegetated areas and accounted for a large portion of the lake's plant biomass. It occurs primarily near the shoreline around the lake and is relatively abundant in Foxtail Bay.

A survey for hybrid water-milfoil was conducted in August 2015 by Onterra, LLC (see map). Approximately 52 acres of EWM/HWM were observed, with 21 acres considered 'dominant' or 'matted'.

EWM can exist as part of the plant community or it can create dense beds that can damage boat motors, make areas non-navigable, and inhibit activities like swimming and fishing. This plant produces viable seeds; however, it often spreads by fragmentation. Just a small fragment of the stem is enough to start a new plant, so spread can occur quickly if plants are located near points of activity such as beaches and boat launches.

Figure 1. Location and density of HWM, August 2015. Map and survey, Onterra LLC.



Often multiple approaches and adaptive year-to-year changes in approach are most successful in controlling EWM/HWM. The population of EWM/HWM should be evaluated before and after treatments to determine the effectiveness of an approach in a given year and strategies for the subsequent year should be adjusted accordingly. EWM management involves evolving scientific knowledge; therefore, the management strategies for the management of EWM/HWM in Big Silver Lake should be adapted as EWM/HWM populations in the lake change and as new information becomes available.

A 5-year management plan for hybrid milfoil, 2015 HWM Monitoring and Control Strategy Development Report, has been prepared by Onterra, LLC and is included in the Appendix. The following information originated from that plan. A *challenge test* can be conducted to determine which combination of chemicals will be effective in controlling that particular strain of HWM. Many different combinations of chemicals can potentially be used to treat HWM. Once hybrid was confirmed in 2013, 4 samples were analyzed through a PlanTEST Sonar Susceptibility Assay evaluation by SePRO. Based on the results of the herbicide screening, a rate of 6 ppb was determined to be effective in controlling the HWM in Big Silver Lake, with a recommended second and third reapplication (6ppb, 6ppb, 4ppb) (SePRO Corporation).

Since 2000, the chemical Navigate, which is a granular form of 2,4-D, has been applied annually to 10-20 acres of EWM in Silver Lake. In May 2013, this strategy changed to limited treatment around the boat landings only, because this form of 2,4-D did not seem to have an effect on hybrid NWM/EWM. Beginning in 2009, even with biannual treatment occurring in both spring and fall, management for EWM became increasingly less successful.

Table 1. Past chemical treatments in Big Silver Lake.

Date	Acres	Herbicide	Active Ingredient	Amount	Rate	Notes
5/21/2003	5	Navigate	Granular 2,4-d	675 lbs	135 lb/ac	
9/3/2003	13	Navigate	Granular 2,4-d	1713 lbs	131.75 lb/ac	
5/18/2004	9	Navigate	Granular 2,4-d	1200 lbs	133 lb/ac	
8/9/2004	0.06	Navigate	Granular 2,4-d	5.1 lbs	110 lb/ac	Private, single pier
9/13/2004	15.7	Navigate	Granular 2,4-d	2350 lbs	150 lb/ac	
11/4/2004	12	Navigate	Granular 2,4-d	1950 lbs	162 lb/ac	
6/1/2005	16.2	Navigate	Granular 2,4-d	3250 lbs	200 lb/ac	
10/1/2005	9.4	Navigate	Granular 2,4-d	1594 lbs	170 lb/ac	
5/23/2006	16	Navigate	Granular 2,4-d	3150 lbs	197 lb/ac	
6/1/2006	5	Navigate	Granular 2,4-d	1000 lbs	200 lb/ac	
10/20/2006	3.9	Navigate	Granular 2,4-d	600 lbs	150 lb/ac	
6/4/2009	19.4	Navigate	Granular 2,4-d	3485 lbs	180 lb/ac	
10/1/2009	2.3	Navigate	Granular 2,4-d	350 lbs	152 lb/ac	
10/27/2009	7.5	Navigate	Granular 2,4-d	1500 lbs	200 lb/ac	
7/14/2010	8.2	Navigate	Granular 2,4-d	1550 lbs	189 lb/ac	
9/29/2010	6.9	DMA-4	Liquid 2,4-d	105 gal	15.22 gal/ac	All in Foxtail Bay
8/18/2011	9.9	Navigate	Granular 2,4-d	1980 lbs	200 lb/ac	
9/13/2011	10	Navigate	Granular 2,4-d	2000 lbs	200 lb/ac	
10/3/2011	13.5	Navigate	Granular 2,4-d	2650 lbs	200 lb/ac	
5/31/2012	24.8	Navigate	Granular 2,4-d	4950 lbs	200 lb/ac	
5/31/2012	3.5	Navitrol	Liquid triclopyr	50 gal	~1.5 ppm	
6/4/2012	15.3	Navigate	Granular 2,4-d	3050 lbs	200 lb/ac	
8/1/2012	5.2	Navitrol DPF	Granular triclopyr	1100 lbs	~2.0 ppm	
6/2014	328	Renovate OTF	Granular triclopyr		180-200 ppb ae	
2015	NONE					
2016	328	SonarONE	Fluridone			

Guiding Vision for Aquatic Invasive Species

Big Silver Lake will not experience adverse impacts from invasive species.

Goal 3. Eliminate or effectively manage AIS in Big Silver Lake.

Objective 3.1. Continue to aggressively control hybrid water milfoil using adaptive management techniques.

Actions	Lead person/group	Resources	Timeline
Continue to implement the 5-year control strategy outlined in the attached Onterra aquatic plant management plan see Appendix) which includes a combination of herbicide treatment and manual removal techniques.	SLMD	WDNR Lake Manager Consultants	Ongoing Update in 2020
Consider working with other lakes to obtain a grant to hire divers (DASH) for manual removal of AIS from deeper areas of the lake.	SLMD	WDNR Lake Manager RC&D	As needed

Objective 3.2. Proactively defend the lake from further establishment of AIS.

Actions	Lead person/group	Resources	Timeline
Continue Clean Boat Clean Waters monitoring at boat landings during busy times.	SLMD	CBCW RC&D	Ongoing
Maintain an AIS monitoring and early detection program.	SLMD	Consultants RC&D	Ongoing
Inform residents and lake visitors about invasive species spread prevention. Consider organizing programs to train those interested in identification and removal techniques.	SLMD	Consultants RC&D WCWLC	Ongoing
If new AIS is suspected or observed, follow the guidance in Appendix C: Rapid Response Plan.			

Critical Habitat

Special areas harbor habitat that is essential to the health of a lake and its inhabitants. In Wisconsin, critical habitat areas are identified by biologists and other lake professionals from the Wisconsin Department of Natural Resources in order to protect features that are important to the overall health and integrity of the lake, including aquatic plants and animals. While every lake contains important natural features, not all lakes have official critical habitat designations. Designating areas of the lake as critical habitat enables these areas to be located on maps and information about their importance to be shared. Having a critical habitat designation on a lake can help lake groups and landowners plan waterfront projects that will minimize impact to important habitat, ultimately helping to ensure the long-term health of the lake.

Photo: Robert Korth

Photo: Eddie Heath

Although Big Silver Lake does not have an official critical habitat area designation, there are areas within Big Silver Lake that are important for fish and wildlife. Natural, minimally impacted areas with woody habitat such as logs, branches, and stumps; areas with emergent and other forms of aquatic vegetation; areas with overhanging vegetation; and wetlands are elements of good quality habitat. Identifying other important areas around the lake that are important habitat and informing lake users of their value can help raise awareness for the protection of these areas.

Guiding Vision Big Silver Lake's Critical Habitat

Unique and special sensitive areas in and near Big Silver Lake will be enhanced and protected from degradation.

Goal 4. Preserve existing high quality habitat in and near Big Silver Lake for abundant fish and wildlife.

Objective 4.1. Critical habitat in and near Big Silver Lake will be identified and protected.

Actions	Lead person/group	Resources	Start/end dates
Request critical habitat area designations from WDNR.	SLMD	WDNR Lake Specialists	2017
If critical habitat is designated on Big Silver Lake, communicate to visitors why these areas are important.	SLMD	WDNR Critical Habitat Report	Following critical habitat area designation

Landscapes and the Lake

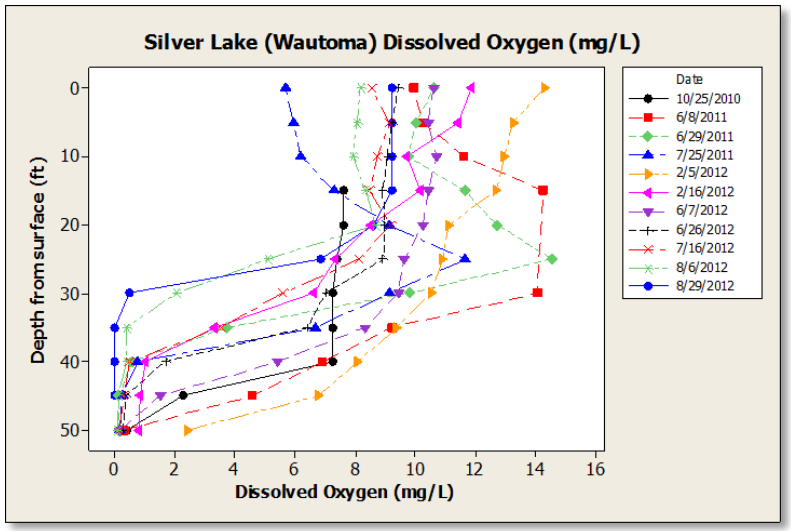
Land use and land management practices within a lake's watershed can affect both its water quantity and quality. While forests, grasslands, and wetlands allow a fair amount of precipitation to soak into the ground, resulting in more groundwater and good water quality, other types of land uses may result in increased runoff and less groundwater recharge, and may also be sources of pollutants that can impact the lake and its inhabitants. Areas of land with exposed soil can produce soil erosion. Soil entering the lake can make the water cloudy and cover fish spawning beds. Soil also contains nutrients that increase the growth of algae and aquatic plants. Development on the land may result in changes to natural drainage patterns and alterations to vegetation on the landscape, and may be a source of pollutants. Impervious (hard) surfaces such as roads, rooftops, and compacted soil prevent rainfall from soaking into the ground, which may result in more runoff that carries pollutants to the lake. Wisconsin State Highway 21 runs adjacent to Big Silver Lake from the northwest corner along most of its east side and contributes a large quantity of runoff with contaminants such as hydrocarbons and road salt. Additionally, a large parking area at the Silvercryst Supper Club drains to the lake without interception as do all three of the boat launches. Wastewater, animal waste, and fertilizers used on lawns, gardens, golf courses, and crops can contribute nutrients that enhance the growth of algae and aquatic plants in the lake. Land management practices can be put into place that better mimic some of the natural processes, and reduction or elimination of nutrients added to the landscape will help prevent the nutrients from reaching the water. In general, the land nearest the lake has the greatest impact on the lake water quality and habitat.

Shoreland vegetation is critical to a healthy lake's ecosystem. It helps improve the quality of the runoff that is flowing across the landscape towards the lake. It also provides habitat for many aquatic and terrestrial animals including birds, frogs, turtles, and many small and large mammals. Healthy shoreland vegetation includes a mix of tall grasses/flowers, shrubs, and trees which extend at least 35 feet landward from the ordinary high water mark. Shorelands include adjacent wetlands, which also serve the lake by allowing contaminants to settle out, providing shelter for fish and wildlife, and decreasing the hazard of shoreline erosion by providing a shoreland barrier from waves and wind.

The water quality in Big Silver Lake is the result of many factors, including the underlying geology, the climate, and land management practices. Since we have little control over the climate and cannot change the geology, changes to land management practices are the primary actions that can have positive impacts on the lake's water quality. The water quality in Big Silver Lake was assessed by measuring different characteristics including temperature, dissolved oxygen, water clarity, and water chemistry. All of these factors were taken into consideration when management planning decisions were made.

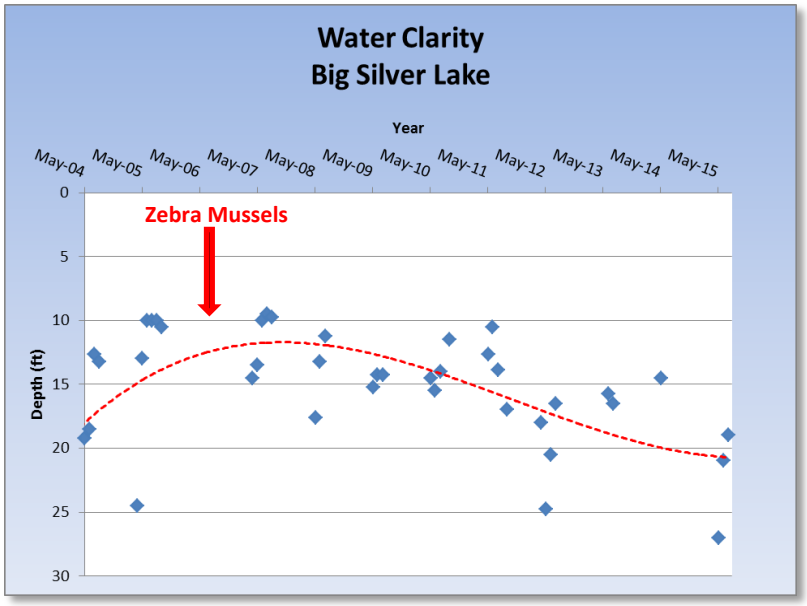
Water Quality

Most survey respondents felt that water quality had a major impact on both their personal enjoyment value and the economic value of their lake property, however, over half of the respondents felt that the water quality had declined during their time on Big Silver Lake with heavy recreation, fertilizers and water level changes being the primary culprits.



A variety of water chemistry measurements were used to characterize the water quality in Big Silver Lake. Water quality was assessed during the 2010-2012 lake study and involved a number of measures including temperature, dissolved oxygen, water chemistry, and nutrients (phosphorus and nitrogen). Nutrients are important measures of water quality in lakes because they are used for growth by algae and aquatic plants. Each of these interrelated measures plays a part in the lake's overall water quality. In addition, water quality data collected in past years was also reviewed to determine trends in Big Silver Lake's water quality.

Dissolved oxygen is an important measure in Big Silver Lake because a majority of organisms in the water depend on oxygen to survive. Oxygen is dissolved into the water from contact with air, which is increased by wind and wave action. Algae and aquatic plants also produce oxygen when sunlight enters the water, but the decomposition of dead plants and algae reduces oxygen in the lake. Sufficient oxygen for fish is present in the upper 25 feet throughout the year. Concentrations of dissolved oxygen were stratified throughout the summer. Periodically, spikes in dissolved oxygen concentrations were observed at depths between 12 feet and 32 feet, which is the result of oxygen production by algae blooms.



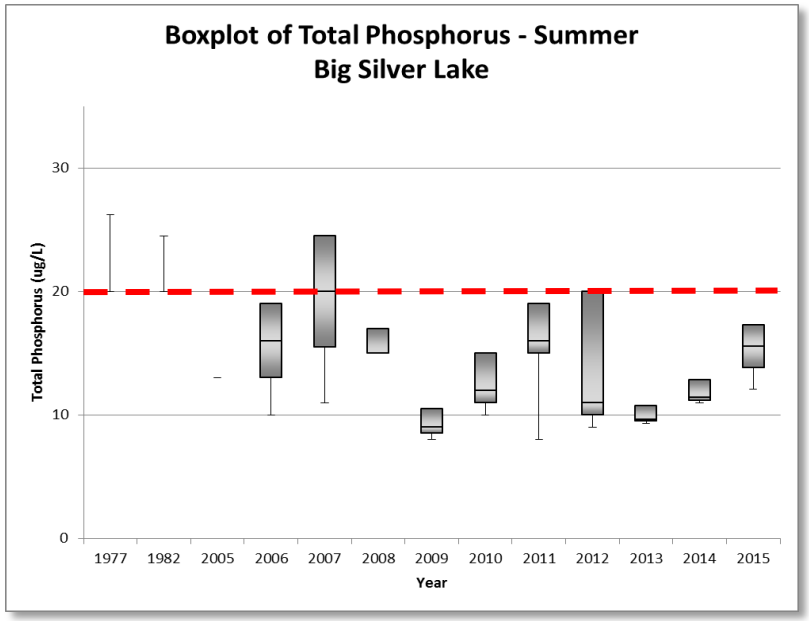
In Big Silver Lake, color was low, so the variability in transparency throughout the year is primarily due to fluctuating algae concentrations and/or re-suspended sediment following storms or heavy boating activity. Water clarity measured during the study was considered good, ranging from 10.5 feet to 28 feet. When compared with past data, the average water clarity measured during the study was better in all sampled months except for May, in which the clarity measurement was poorer. Generally, water clarity in Big Silver Lake was typically reduced during the late summer and early fall. The presence of zebra mussels contributes to increased water

clarity measurements as these organisms are voracious filter feeders of plankton and other microscopic organisms. However, while the water may have better clarity, the negative impacts outweigh this one positive benefit. Plankton comprise the base of the food chain and therefore, a reduction in their numbers can affect all species, including fish. Clearer water can also increase the area of the lakebed where aquatic plants can grow, which may not be the best thing for anglers, boaters, swimmers and other aquatic recreation users.

Chloride, sodium and potassium are commonly used as indicators of how a lake is being impacted by human activity. The presence of these compounds where they do not naturally occur indicates sources of water contaminants. Big Silver Lake had moderate average chloride and potassium concentrations and elevated average sodium concentrations over the monitoring period. Although these elements are not detrimental to the aquatic ecosystem, they indicate that sources of contaminants such as road salt, fertilizer, animal waste and/or legacy septic system effluent may be entering the lake from either surface runoff or via groundwater. Although septic systems around the lake were replaced with sanitary sewer in 1989-1990, the organic material in the drainfields can continue to leach nutrients for decades.

One pound of phosphorus entering a lake can result in up to 500 pounds of algal growth! (Vallentyne, 1974)

Phosphorus is an element that is essential in trace amounts to most living organisms, including aquatic plants and algae. Sources of phosphorus can include naturally-occurring phosphorus in soils and wetlands, and groundwater. Common sources from human activities include soil erosion, animal waste, fertilizers, and septic systems. Although a variety of compounds are important to biological growth, phosphorus receives so much attention because it is commonly the "limiting nutrient" in many Wisconsin lakes. Due to its relatively short supply compared to other substances necessary for growth, relatively small increases in phosphorus result in significant increases in aquatic plants and algae.



During the study, total phosphorus concentrations in Big Silver Lake ranged from a high of 29 ug/L in early August 2011 to a low of 10 ug/L in late August 2011. The median summer total phosphorus concentrations were 18 and 17 ug/L in 2011 and 2012, respectively. This is just below Wisconsin's phosphorus standard of 20 ug/L for deep seepage lakes. Inorganic nitrogen concentrations in Big Silver Lake were within the natural background range for lakes in Waushara County.

Managing nitrogen, phosphorus and soil erosion throughout the Big Silver Lake watershed is one of the keys to protecting the lake itself. Near shore activities that may increase the input of phosphorus to the lake include applying fertilizer, removing native vegetation (trees, bushes and native flowers/grasses), mowing vegetation, and increasing the amount of exposed soil. Nitrogen inputs to Big Silver Lake can result in increased aquatic plant growth. It can be controlled by using lake-

friendly land management decisions, such as the restoration of shoreland vegetation, use of deeply rooted native plants in landscaping, elimination/reduction of fertilizers, proper management of animal waste, and the use of water quality-based management practices. According to survey responses, 43% 84 respondents indicated that they utilize fertilizer on their property. Ceasing this use would help to reduce concentrations of phosphorus in Big Silver Lake along with aquatic plant growth. Many of the shoreland property owners have not tested their soil to determine if fertilizer addition is even warranted; therefore, testing soil through an impartial lab would be a good first step.

Guiding Vision for Water Quality in Big Silver Lake

Big Silver Lake will have excellent water quality that supports a healthy lake ecosystem and quality recreation.

Goal 5. Big Silver Lake will have good water quality.

Median concentrations of summer total phosphorus will be below the phosphorus standard of 20 mg/L and spring inorganic nitrogen concentrations below 0.3 mg/L.

Objective 5.1. Shoreland property owners will be knowledgeable about their role in the water quality of Big Silver Lake and will manage their land accordingly.

Actions	Lead person/group	Resources	Timeline
Inform shoreland property owners about the impacts of nutrients and land management on water quality through the distribution of a District newsletter.	SLMD	WCWLC	Ongoing
Refrain from the use of fertilizers on shoreland properties (see Shorelands section). Encourage soil testing to determine if fertilizer is warranted.	Shoreland property owners SLMD	WC UWEX	Ongoing
Encourage the restoration of unmowed vegetation to slow and absorb runoff and pollutants (see Shorelands section).	SLMD	WCLCD UWEX Lakes (info) WDNR Healthy Lakes Grants	Ongoing

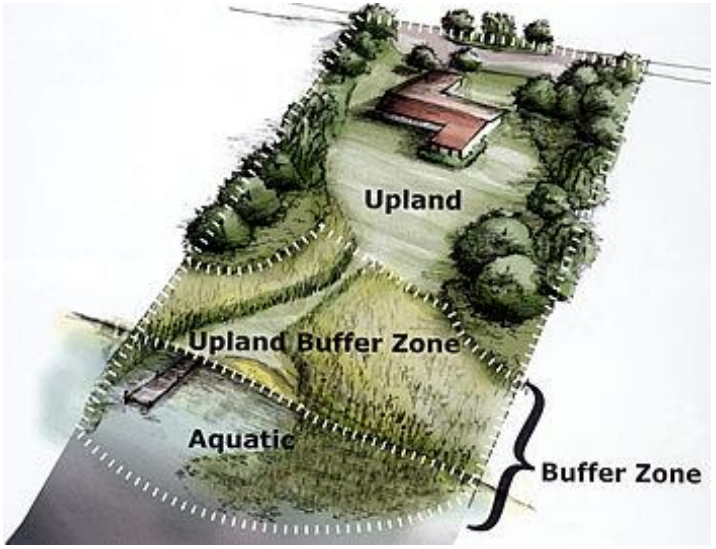
Goal 6. Create a water quality dataset for Big Silver Lake to evaluate trends, including declines and improvements, over time.

Objective 6.1. Continue current monitoring initiatives and begin collecting data that are not routinely recorded.

Actions	Lead person/group	Resources	Timeline
Regularly monitor water clarity (minimum 5 times/summer).	Trained volunteer	CLMN Coordinator	Ongoing – May-Sept
Continue monitoring water chemistry (total phosphorus and chlorophyll-*a*).	Trained volunteer	CLMN Coordinator	Ongoing – summer
Monitor the dates of ice on and ice off to relate to aquatic plant abundance over time.	Interested volunteer	CLMN Coordinator	Ongoing fall and spring
Submit all collected data to WDNR SWIMS database for long term storage, interpretation, and use.	Interested volunteer	CLMN Coordinator	As collected

Shorelands

Shoreland vegetation is critical to a healthy lake ecosystem. It provides habitat for many aquatic and terrestrial animals including birds, frogs, turtles, and small and large mammals. It also helps to improve the quality of the runoff that is flowing across the landscape towards the lake. Healthy shoreland vegetation includes a mix of unmowed grasses/flowers, shrubs, trees, and wetlands which extends at least 35 feet landward from the ordinary high water mark (OHWM).



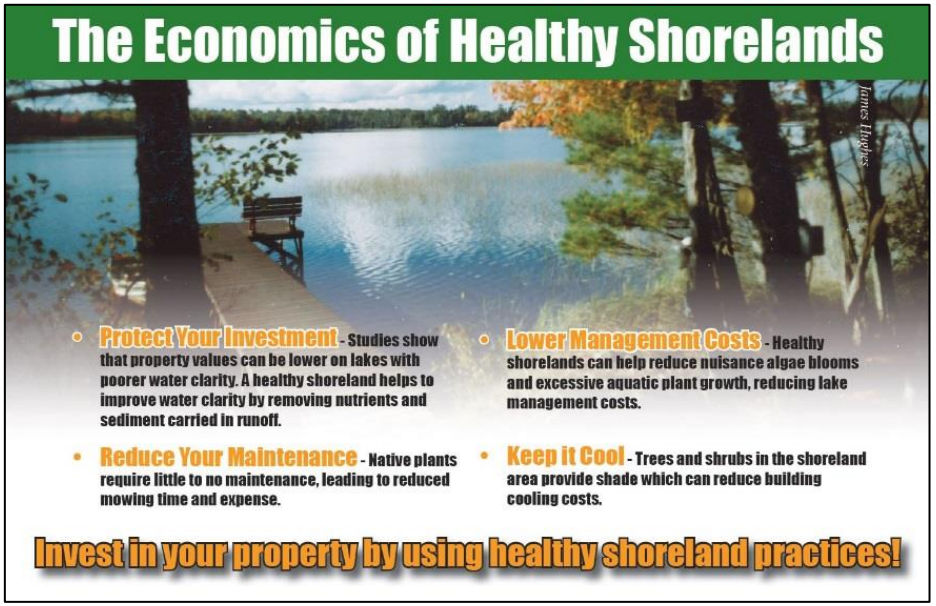
To better understand the health of the Waushara County lakes, shorelands were evaluated. The survey inventoried the type and extent of shoreland vegetation. Areas with erosion, rip-rap, barren ground, sea walls, structures and docks were also inventoried. A scoring system was developed for the collected data to provide a more holistic assessment. Areas that are healthy will need strategies to keep them healthy, and areas with potential problem areas and where management and conservation may be warranted may need strategies for improvement. The scoring system is based on the presence/absence and abundance of shoreline features, as well as their proximity to the water's edge. Values were tallied for each shoreline category and then summed to produce an overall score. Higher scores denote a healthier shoreline with good land management practices. These are areas where protection and/or conservation should be targeted. On the other hand, lower scores signify an ecologically unhealthy shoreline. These are areas where management and/or mitigation practices may be desirable for improving water quality and habitat.

The summary of scores for shorelands around Big Silver Lake is displayed on the map in the Appendix. A few portions of Big Silver Lake's shorelands are in moderately good condition; however, large portions of the shore have challenges that should be addressed to improve water quality, reduce aquatic plant growth, and increase property values.

Shoreland ordinances were enacted to improve water quality and habitat, and to protect our lakes. To protect our lakes, county and state (NR 115) shoreland ordinances state that vegetation should extend at least 35 feet inland from the ordinary high water mark, with the exception of an optional 30 foot viewing corridor for each shoreland lot. Although some properties were grandfathered in when the ordinance was initiated in 1966, following this guidance will benefit the health of the lake and its inhabitants.

There are a variety of written materials and websites that provide information about healthy shorelands. Many creative ways can also be used to get the word out and have some fun. Discussing topics in a meaningful way to the membership is a way to help keep them engaged and interested. Some of their interests were expressed in the answer to the survey question related to motivations for changing land management.


Would you rather look at this...
...or this?
Join your neighbors, use healthy shoreland practices


The Economics of Healthy Shorelands
James Hughes
Protect Your Investment - Studies show that property values can be lower on lakes with poorer water clarity. A healthy shoreland helps to improve water clarity by removing nutrients and sediment carried in runoff.
Lower Management Costs - Healthy shorelands can help reduce nuisance algae blooms and excessive aquatic plant growth, reducing lake management costs.
Reduce Your Maintenance - Native plants require little to no maintenance, leading to reduced mowing time and expense.
Keep it Cool - Trees and shrubs in the shoreland area provide shade which can reduce building cooling costs.
Invest in your property by using healthy shoreland practices!

Guiding Vision for Big Silver Lake's Shorelands

Big Silver Lake's shorelands will provide adequate habitat and water quality benefits to support a healthy lake.

Goal 7. Increase and enhance healthy shorelands around Big Silver Lake.

Objective 7.1. Maintain healthy, natural shorelands to minimize runoff, protect water quality, increase property values, and enhance natural beauty.

Actions	Lead person/group	Resources	Timeline
Inform property owners of the impacts of excessive nutrient to the lake. Decrease/eliminate the use of fertilizers on lawns around the lake to reduce inputs of nitrogen and phosphorus.	SLMD Shoreland property owners	UWEX Lakes	Ongoing
Identify and work with property owners interested in fish sticks or tree drops on their property. Adjacent property owners can work together to create an area of natural shoreline between them.	SLMD	WDNR Fisheries Biologist WDNR Healthy Lakes Grants	Ongoing
Minimize stormwater runoff by encouraging landowners to limit or mitigate impervious surfaces using options such as rain gardens/rain barrels, runoff diversion, and infiltration techniques.	SLMD	WCLCD WDNR Healthy Lakes Grants Consultants	Ongoing
Inform and encourage property owners to restore vegetation to their shorelines in the form of designed plantings or areas of no mowing.	SLMD	WCLCD WDNR Healthy Lakes Grants Consultants	Ongoing
Include information on how and why to create healthy shorelands in a welcome packet to new property owners.	WCWLC	WCLCD	Ongoing
Identify incentives to encourage the restoration of shorelands. Options may include mention in the newsletter or other award, competitions, etc.	SLMD WCWLC	UWEX Lakes	Ongoing

Objective 7.2. Provide opportunities for shoreland property owners to learn about healthy shoreland options.

Actions	Lead person/group	Resources	Timeline
Hold tours of healthy shorelands around the lake (e.g. "garden walks" – via boat or driving, progressive dinners, scavenger hunt style, etc.)	SLMD Shoreland property owners	Shoreland specialists	Annually
Ask a healthy shoreland specialist to walk some properties to make recommendations and invite others to participate.	SLMD	WCLCD Consultants UWEX Lakes Shoreland Specialist WDNR Healthy Lakes Grants	Ongoing
Identify incentives to encourage the restoration of shorelands. Options may include mention in the newsletter or other award, competitions, reductions in annual dues, etc. Notification of grants.	SLMD	UWEX Lakes Shoreland Specialist WDNR Healthy Lakes Grants	

Watershed Land Use

It is important to understand where Big Silver Lake's water originates in order to understand the lake's health. During snowmelt or rainstorms, water moves across the surface of the landscape (runoff) towards lower elevations such as lakes, streams, and wetlands. The land area that contributes runoff to a lake is called the surface watershed. Groundwater also feeds Big Silver Lake; its land area may be slightly different than the surface watershed.

The capacity of the landscape to shed or hold water and contribute or filter particles determines the amount of erosion that may occur, the amount of groundwater feeding a lake, and ultimately, the lake's water quality and quantity. Essentially, landscapes with greater capacities to hold water during rain events and snowmelt slow the delivery of the water to the lake. Less runoff is desirable because it allows more water to recharge the groundwater, which feeds the lake year-round - even during dry periods or when the lake is covered with ice. A variety of land management practices can be put in place to help reduce impacts to our lakes. Some practices are designed to reduce runoff. These include protecting/restoring wetlands, installing rain gardens, swales, rain barrels, and routing drainage from pavement and roofs away from the lake. Some practices are used to help reduce nutrients from moving across the landscape towards the lake. Examples include manure management practices, eliminating/reducing the use of fertilizers, increasing the distance between the lake and a septic drainfield, protecting/restoring wetlands and native vegetation in the shoreland, and using erosion control practices.

The surface watershed for Big Silver Lake is 2,938 acres. However, Big Silver is hydrologically connected to Irogami Lake, so its watershed periodically includes the adjacent Irogami Lake watershed. When this occurs, the lakes watershed swells to over 4,500 acres, but retains a

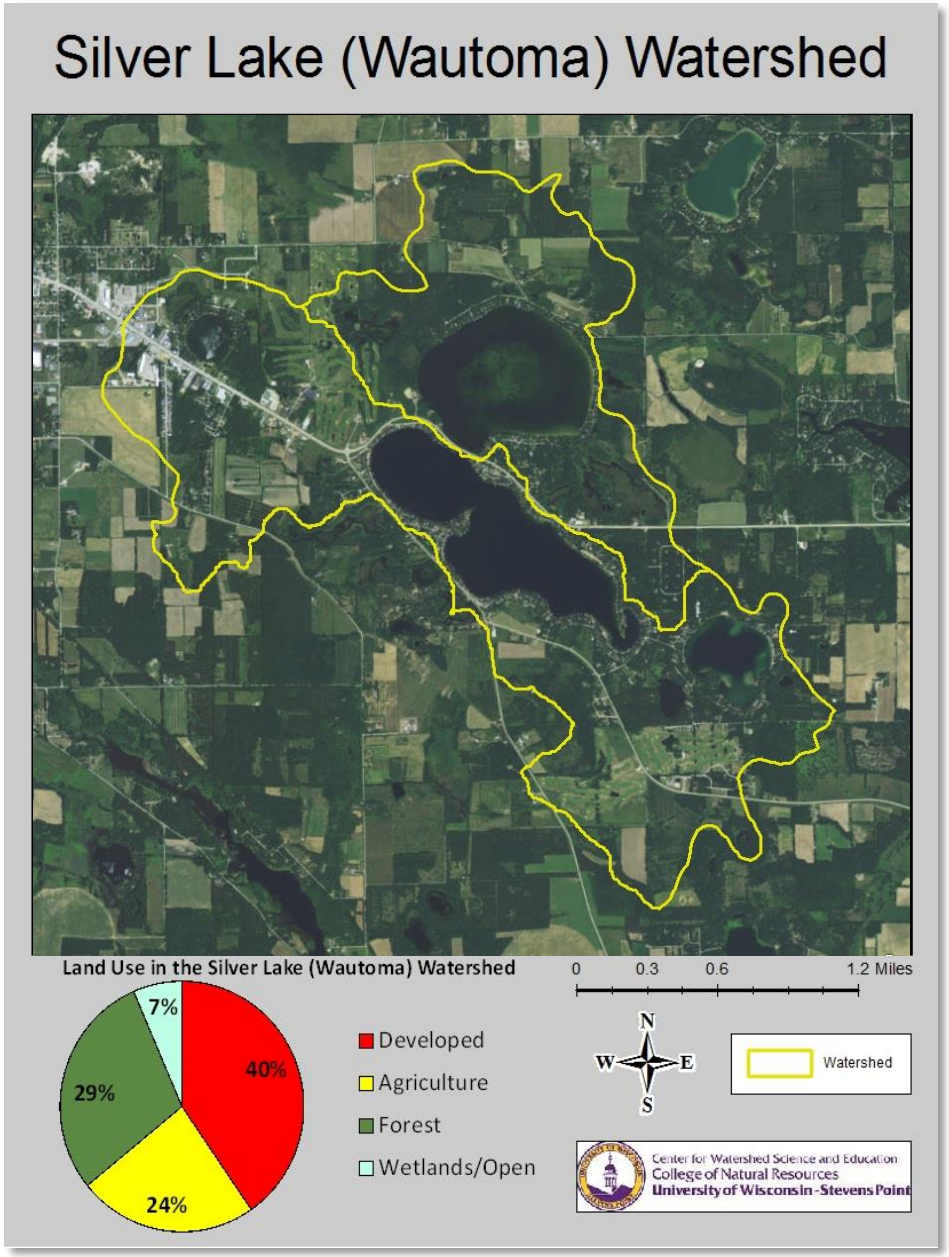
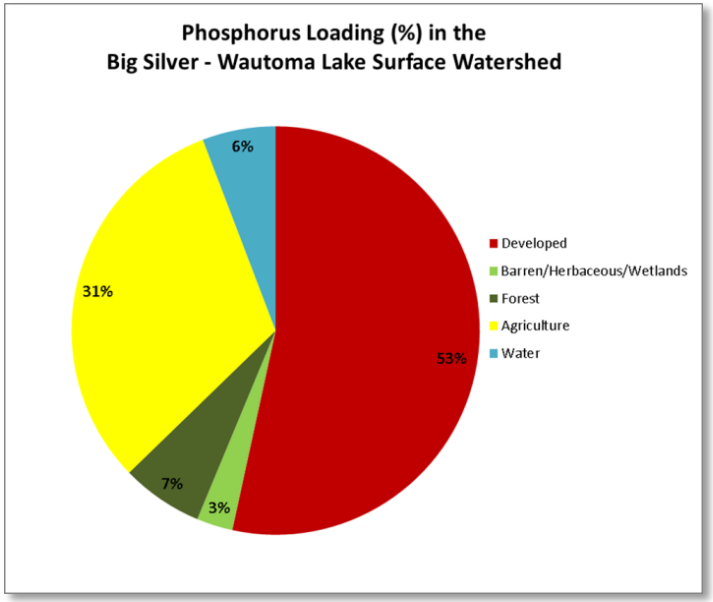


Figure 2. Surface watershed of Big Silver Lake.

similar land use distribution. The dominant types of land use in the watershed are developed land (40%), forests (29%), and agriculture (24%) (Figure 2). The lake's shoreland is surrounded primarily by developed land, wetlands, agriculture and forests. In general, the land closest to the lake has the greatest immediate impact on water quality.

Estimates of phosphorus from the landscape can help to understand the phosphorus sources to Big Silver Lake. Land use in the surface watershed was evaluated and used to populate the Wisconsin Lakes Modeling Suite (WILMS) model. In general, each type of land use contributes different amounts of phosphorus in runoff and groundwater. The types of land management practices that are used and their distances from the lake also affect the contributions to the lake from a parcel of land. Based on modeling results, developed land and agriculture had the greatest percentages of phosphorus contributions from the watershed to Big Silver Lake. The phosphorus export coefficients have been obtained from studies throughout Wisconsin (Panuska and Lillie, 1995). Based on modeling results, developed land and agriculture had the greatest percentages of phosphorus contributions from the watershed to Big Silver Lake.



Guiding Vision for Big Silver Lake's Watershed

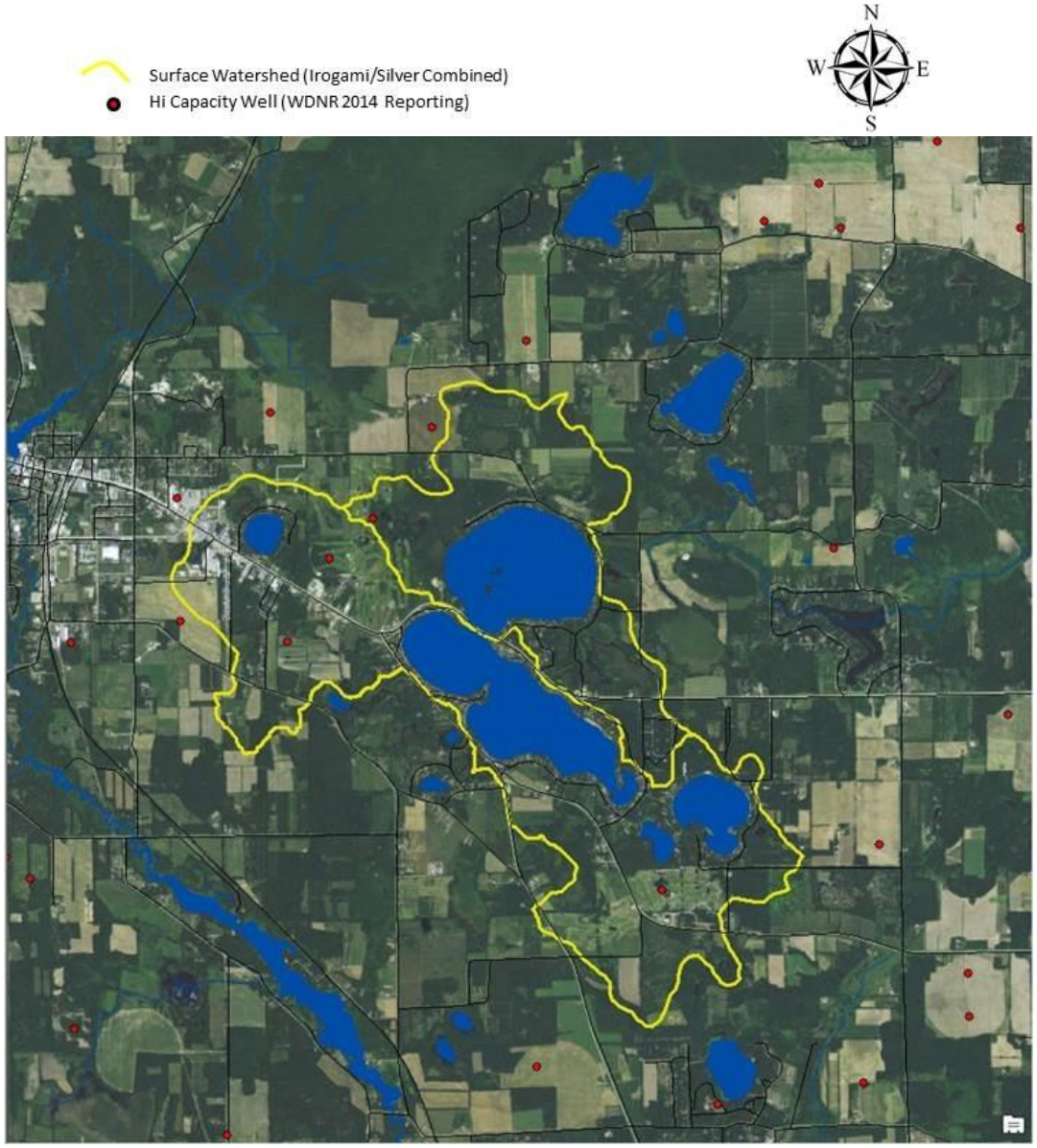
Land within the Big Silver Lake watershed will be managed in a way that supports clean water and a healthy lake.

Goal 8. Watershed and shoreland property owners will know about and utilize resources for healthy land management practices.

Objective 8.1. Support healthy land management activities in the Big Silver Lake watershed to reduce sediment/nutrient loading.

Actions	Lead person/group	Resources	Timeline
Encourage the County to support and follow-up with water quality-based best management practices (BMPs) within the watershed. Include BMPs that reduce application of excess nitrogen and pesticides that leach to groundwater.	WCLCD	NRCS DATCP County Board Supervisors UWEX Agricultural Agent	Ongoing
Support landowners interested in the protection of their land via a land conservation program (i.e. Conservation Easement, Purchase of Development Rights, or sale of land for protection).	Watershed property owners	NCCT WDNR Lake Protection grants Knowles-Nelson Stewardship funds	As needed
Encourage subdivisions and other new developments to manage stormwater on site and consider ways to minimize impacts to Big Silver Lake.	WC Planning & Zoning WCLCD	Town of Marion Developers	As needed
Encourage design of road and construction projects that will minimize impacts to Big Silver Lake.	SLMD	Town of Marion WC Highway Department WDOT	As needed
Explore implementation of deed restrictions (regarding limits on hi-cap wells and groundwater recharge areas) on large blocks of property within the lake's watershed. Consider purchase then resell with conservation easement.	SLMD Individual property owners	WC WDNR Lake Protection Grants	Ongoing

Silver Lake – Wautoma
Waushara County, Wisconsin



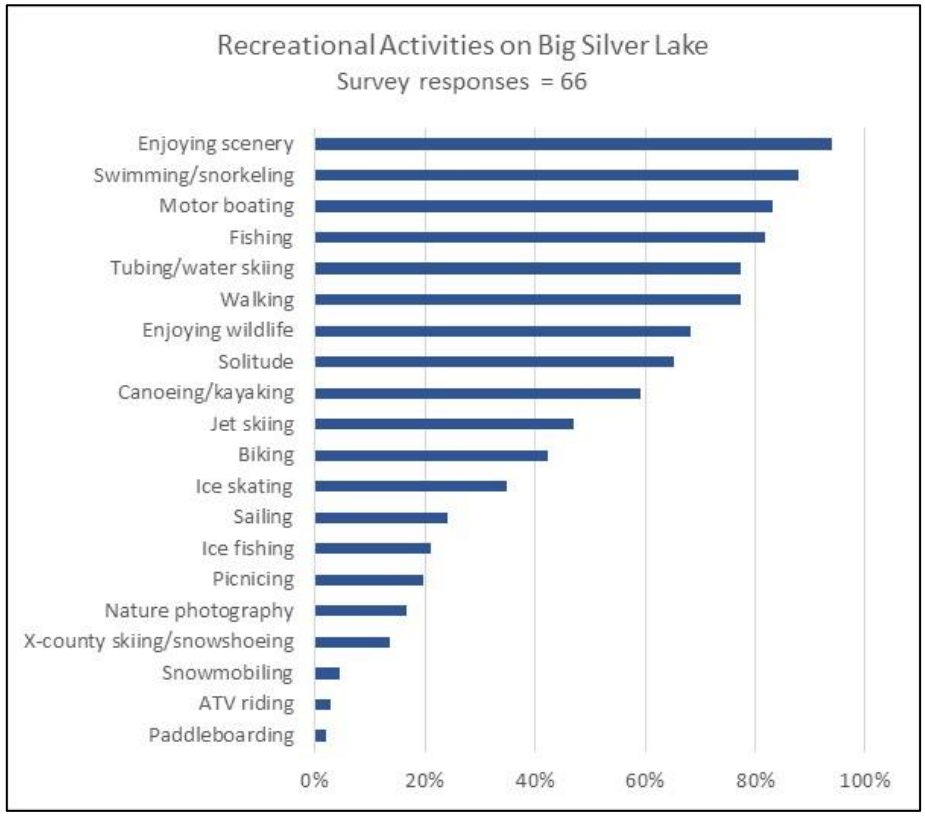
People and the Lake

The people that interact with the lake are a key component of the lake and its management. In essence, a lake management plan is a venue by which people decide how they would like people to positively impact the lake. The plan summarizes the decisions of the people to take proactive steps to improve their lake and their community. Individual decisions by lake residents and visitors can have a positive impact on the lake and on those who enjoy this common resource. Collaborative efforts may have a bigger positive impact; therefore, communication and cooperation between the Silver Lake Management District, community, and suite of lake users are essential to maximize the effects of plan implementation.

Boating hours, regulations, and fishing limits are examples of principles that are put into place to minimize conflicts between lake users and balance human activities with environmental considerations for the lake.

Recreation

Visitors have access to the lake via three boat landings which are located on its northwestern, western and southwestern sides. All three launches are owned and managed by the Town of Marion. No wake hours are between 8:30 pm and 6:00 am. Additionally, no wake speeds are always required in Foxtail Bay. A majority of survey respondents (80%) and all of those at the planning session liked the boating hours as they are. There is a $5 trailer-parking fee at the boat launches.



Big Silver Lake is visited by a number of people, who partake in a variety of recreational activities throughout the year. Based on survey responses, the most popular activities include enjoying scenery (94%), swimming/snorkeling (88%), motor boating (84%), fishing (82%), walking, and tubing/water skiing (74%). This mix of quiet activities and motorized, high speed and noisy activities can lead to user conflicts and safety issues. The mix of wake and no-wake hours can help to reduce the conflicts; however, this may or may not be the complete response to conflicts as use of Big Silver Lake increases in the future. During the winter, the lake is also enjoyed by people fishing, ice skating, and snowmobiling. Heavy recreational use was identified as one of the top threats to the fishery in Big Silver Lake.

Guiding Vision for Recreation

Big Silver Lake will host a variety of quality recreational opportunities.

Goal 9. Foster an environment of cordial recreational use.

Objective 9.1. Maintain a rule structure that promotes recreational harmony on the lake.

Actions	Lead person/group	Resources	Timeline
Continue Town water patrol (w/ DNR funding).	SLMD	WDNR	Ongoing
Maintain trailer parking fee for maintenance of landings.	SLMD	Town of Marion	Ongoing
Continue to implement and enforce current no wake hours (8:30pm-6am).	SLMD	WDNR Town of Marion Waushara County Sherriff's Dept.	Ongoing

Communication and Organization

Working together on common values will help to achieve the goals that are outlined in this plan. Many of the goals outlined in this plan focus on distributing information to lake and watershed residents and lake users in order to help them make informed decisions that will result in a healthy ecosystem in Big Silver Lake enjoyed by many people.

Guiding Vision for Communication

The Big Silver Lake community will be connected and informed in lake stewardship.

Goal 10. Increase participation in lake stewardship.

Objective 10.1. Develop opportunities for education and outreach among full and part-time residents.

Actions	Lead person/group	Resources	Timeline
Maintain the SLMD website to provide a common source of communication. http://townshipofmarion.com	SLMD	WC UWEX	Ongoing
Maintain an email list of shoreland property owners and others interested in Big Silver Lake.	SLMD	WC UWEX	Ongoing
Share minutes (or meeting notes) from annual meeting on website and/or fall newsletter.	SLMD		As needed
Continue to distribute a welcome packet/mailing to all new shoreland property owners with basic lake stewardship information/brochures.	WCWLC	WC UWEX	Ongoing
Communicate updates to lake management plan and management activities to residents and users of the lake via email list and/or newsletter.	SLMD	WC UWEX	Ongoing
Host an annual meeting to discuss lake management and opportunities for shoreland property owners.	SLMD		Annually
Host gatherings to learn about topics identified in this LMP. Invite speakers or conduct demonstrations.	SLMD		As needed

Objective 10.2 Communicate with the community and other lake stewards.

Actions	Lead person/group	Resources	Timeline
Communicate with other Waushara County lake groups by participating in the WCWLC.	SLMD	WCWLC WC UWEX	Ongoing
Encourage board members and others to attend the Wisconsin Lakes Convention.	SLMD	UWEX Lakes	Annually - spring
Encourage board members and others to attend the Lake Leaders Institute	SLMD	UWEX Lakes	Even numbered years
Encourage members to keep informed of statewide lake related topics by subscribing to Lake Tides quarterly newsletter.	SLMD	UWEX Lakes	Ongoing

Updates and Revisions

A management plan is a living document that changes over time to meet the current needs, challenges and desires of the lake and its community. The goals, objectives and actions listed in this plan should be reviewed annually and updated with any necessary changes.

Guiding Vision for Updates and Revisions

Big Silver Lake will have an up-to-date and relevant lake management plan.

Goal 11. Review this plan annually and update as needed.

Objective 11.1. Communicate updates with community members, members of the District, and others listed as leads in this plan.

Actions	Lead person/group	Resources	Timeline
Review plan at annual meeting and discuss accomplishments and identification of goals/objectives/actions for upcoming year. Include accomplishments by others listed in this plan.	SLMD	Leads and resources in this plan. WC UWEX	Annually
Formally update this LMP every 5 years or more frequently if needed.	SLMD	WC UWEX WCLCD Partners	2021

Governance

Written by Patrick Nehring, Community Agent, UW-Extension Waushara County.

Lake Management Plan Approval

The draft lake management plan will be completed by the lake association/district board, a committee, or a committee of the whole. The final draft of the lake management plan will be approved through a vote of the lake association/district membership or board. The final draft will be approved by the Wisconsin Department of Natural Resources (DNR) to have met the lake management plan requirements and grant requirements. If the DNR requires modifications or additional information before approving the plan, the plan will be changed to meet DNR requirements that are acceptable to the lake association/district. The completed plan that has been approved by the lake association/district and the DNR will be presented to the municipalities containing the lake and Waushara County. The municipality may reference the lake management plan or parts of the plan in their comprehensive plan to guide municipal or county decisions.

Lake Assistance

The lake management plan will enhance the ability of the lake to apply for financial assistance. The lake management plan will be considered as part of the application for grants through the Wisconsin Department of Natural Resources. Current listings of grants available from the DNR can be found at http://dnr.wi.gov/aid/. Waushara County offers technical and financial assistance through the Land Conservation and Zoning Department and University of Wisconsin-Extension Department. Additional assistance may be available from other agencies and organizations, including DNR, UW-Extension Lakes Program, Golden Sands RC&D, Wisconsin Wetlands Association, and Wisconsin Trout Unlimited.

Lake Regulations

The lake management plan is superseded by federal, state, county, and municipal laws and court rulings. However, the lake management plan may influence county and municipal ordinances and enforcement, which is why the lake management plan will be reviewed and included or referenced in the county and related municipal comprehensive plans. Federal laws contain regulations related to water quality, wetlands, dredging, and filling. State laws contain regulations related to water quality, water and lake use, aquatic plants and animals, shoreline vegetation, safety, and development. County laws contain regulations related to development, safety, use, and aquatic plants and animals. Municipal laws contain regulation of use and safety. The court system interprets these rules and regulations. The rules and regulations are primarily enforced by the US Army Corps of Engineers, the Wisconsin Department of Natural Resources, the Waushara County Sheriff Department, and the Waushara County Land Conservation and Zoning Office. If considering development near or on a lake, addressing problem plants or animals, or changing the lake bottom contact the Waushara County Land Conservation & Zoning Department at the Waushara County Courthouse (920) 787-0443 and/or the Wisconsin Department of Natural Resources (888) 936-7463.

Comprehensive Plans

The lake management plan and changes to the plan will be presented to the County and the Municipality for review and possible incorporation into their comprehensive plans. The comprehensive plan is intended to be used to guide future decision. Zoning, subdivision, and official mapping decisions must be consistent with the comprehensive plan.

Process for Inclusion in the Municipal Comprehensive Plan

The Municipal Plan Commission will review the lake management plan to determine if it is consistent with the municipality's comprehensive plan. If the lake management plan is found by the Municipal Plan Commission to not be consistent with the municipality's comprehensive plan, the plan commission may (a) recommend changes to the comprehensive plan or (b) ask that an aspect of the lake management plan be revisited. When the Municipal Plan Commission has reached a consensus that the lake management plan aligns with the municipality's vision, the Municipal Plan Commission will develop an amendment to the comprehensive plan referencing the lake management plan. This could include a reference to the lake management plan under local policies in the agricultural, natural and cultural resources background information and the addition of a recommendation to support the lake management plan and to implement the applicable recommendations contained in the lake management. The Municipal Plan Commission will recommend by resolution that the amendment to the comprehensive plan be adopted by the Municipal Board. A public hearing on the changes to the comprehensive plan will be held with a thirty-day class one notice. The Municipal Board will consider the recommendations from the Municipal Plan Commission. The Municipal Board may (a) adopt the recommendations to the comprehensive plan by ordinance, (b) adopt by ordinance the recommendations with changes, or (c) request the plan commission revisit the changes to the comprehensive plan.

Process for Inclusion in the County Comprehensive Plan

Waushara County Land Use Committee will review the updates to the municipality's comprehensive plan and the lake management plan as referenced by the municipality's comprehensive plan to determine if they are consistent with the County's comprehensive plan. If they are found by the land use committee to not be consistent with the municipality's comprehensive plan, the land use committee may (a) recommend changes to the County's comprehensive plan or (b) ask that an aspect of the lake management plan or municipality's comprehensive plan be revisited. When the Land Use Committee has reached a consensus that the updates to the municipality's comprehensive plan and the lake management plan aligns with the county's vision, and if it is not already consistent, it will develop an amendment to the County's comprehensive plan. The amendment may be include a reference to the lake management plan under local policies in the agricultural, natural and cultural resources background information and the addition of a recommendation to support the lake management plan and to implement the applicable recommendations contained in the lake management. The Land Use Committee will recommend the amendment to the comprehensive plan to the Land, Water, and Education Committee.

The Land, Water, and Education Committee will review the amendment and if it concurs with the recommendation from the Land Use Committee, it will make a recommendation to the Planning & Zoning Committee. The Planning & Zoning Committee will hold a public hearing with a thirty-day class one

notice. The Planning & Zoning Committee will recommend by resolution the amendment to the comprehensive plan or the amendment with changes be adopted by the County Board.

The County Board will consider the recommendations from the Planning & Zoning Committee. The County Board may (a) adopt the amendment to the comprehensive plan by ordinance, (b) adopt the amendment with changes, or (c) request the Land Use Committee or Planning & Zoning Committee revisit the changes to the comprehensive plan.

Use of the Comprehensive Plan

The lake management plans as referenced in the comprehensive plans will be used by the County and the Municipality to consider certain actions or in the implementation of zoning and other applicable regulations. The County Board of Adjustments and the County Planning and Zoning Committee may reference the lake management plans as referenced in the comprehensive plan when considering zone changes, variances, conditional uses, and suitable mitigation measures. The Municipality and County may take action as called for in the lake management plan as referenced in the comprehensive plan, including changes to zoning and other applicable regulations, shortly after the County's comprehensive plan has been updated or may take action as needed.

The lake organization, lake residents, riparian property owners, or other citizens may request that the Municipality or County take a specific action to implement aspects of the lake management plan as referenced in the comprehensive plan. The lake organization lake residents, riparian property owners, or other citizens may provide written or oral support to encourage the Municipality and County to reference the lake management plan when considering regulation or action that may impact the lake. The lake organization will inform the Municipality and the County when the lake management plan is updated and allow the Municipality and County an opportunity to participate in the update process.

References

Boat Ed, 2013. The Handbook of Wisconsin Boating Laws and Responsibilities. Approved by Wisconsin Department of Natural Resources. www.boat-ed.com

Borman, Susan, Robert Korth, and Jo Temte, 2001. Through the looking glass, a field guide to aquatic plants. Reindl Printing, Inc. Merrill, Wisconsin.

Haney, Ryan, 2016. Water Quality in Big Silver Lake. Presentation given February 24, 2016 at the Waushara County Courthouse.

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Panuska and Lillie, 1995. Phosphorus Loadings from Wisconsin Watershed: Recommended Phosphorus Export Coefficients for Agricultural and Forested Watersheds. Bulletin Number 38, Bureau of Research, Wisconsin Department of Natural Resources.

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Stantec Consulting, March 10, 2014. *Update to September 25, 2006 Aquatic Plant Management Plan for (Big) Silver Lake, Waushara County, Wisconsin*.

UW-Stevens Point Center for Watershed Science and Education, 2014. Waushara County Lake Study - Big Silver Lake 2010-2012. Final Report to Waushara County and Wisconsin Department of Natural Resources.

UW-Stevens Point Center for Watershed Science and Education, 2013. Waushara County Lake Study - Big Silver Lake 2010-2012 Mini-Report. Report to Waushara County and Wisconsin Department of Natural Resources. Planning Meeting Presentations

Vallentyne, J.R., 1974. The Algal Bowl-Lakes and Man. Ottawa Department of the Environment.

Wetzel, R.G., 2001. Limnology, Lake and River Ecosystems, Third Edition. Academic Press. San Diego, California.

Appendices

Appendix A: 2016 Waushara County Lake Information Directory

Algae - Blue-Green
Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov
Website: http://dnr.wi.gov/lakes/bluegreenalgae/

Contact: Wisconsin Department of Health Services
1 West Wilson Street, Madison, WI 53703
Phone: 608-267-3242
Website:
http://www.dhs.wisconsin.gov/eh/bluegreenalgae/contactus.htm

Aquatic Invasive Species/Clean Boats Clean Water
Contact: Golden Sands RC&D
1100 Main St., Suite 150, Stevens Point, WI 54481
Phone: 715-343-6215
Websites: www.goldensandsrcd.org
http://dnr.wi.gov/invasives/

Aquatic Plant Management (Native and Invasive)
Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov
Website: http://dnr.wi.gov/lakes/plants/

Aquatic Plant Identification
Contact: Golden Sands RC&D
1100 Main St., Suite 150, Stevens Point, WI 54481
Phone: 715-343-6215
Website: www.goldensandsrcd.org

Contact: Dr. Emmet Judziewicz
UWSP Freckmann Herbarium
TNR 301, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-4248
E-mail: ejudziew@uwsp.edu

Aquatic Plant Identification (cont'd)
Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov

Aquatic Plant Surveys/Management
Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov
Website: http://dnr.wi.gov/lakes/plants/

Best Management Practices (rain gardens, shoreland buffers, agricultural practices, runoff controls)
Contact: Ed Hernandez
Waushara County Land Conservation Department
PO Box 1109, Wautoma, WI 54982
Phone: 920-787-0453
E-mail: lcdzoning.courthouse@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/zoning.htm

Boat Landings (State)
Contact: Dave Bartz
Wisconsin Department of Natural Resources
Hwy 22N, Box 430, Montello, WI 53949
Phone: 608-635-4989
E-mail: David.Bartz@wisconsin.gov
Website:
http://dnr.wi.gov/org/land/facilities/boataccess/

Boat Landings (Town)
Marion Town Clerk: Alan Anderson
N1279 County Road Z
Wautoma, WI 54982
Phone: 920-566-2818
E-mail: marion013@centurytel.net

Conservation Easements
Contact: Gathering Waters Conservancy
211 S. Paterson St., Suite 270, Madison, WI 53703
Phone: 608-251-9131
E-mail: info@gatheringwaters.org
Website: http://gatheringwaters.org/

Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov

Contact: Patrick Sorge
Wisconsin Department of Natural Resources
PO Box 4001, Eau Claire, WI 54702
Phone: 715-839-3794
E-mail: Patrick.Sorge@wisconsin.gov

Contact: North Central Conservancy Trust
PO Box 124, Stevens Point, WI 54481
Phone: 715-344-1910
E-mail: info@ncctwi.org
Website: http://www.ncctwi.org/

Contact: NRCS Stevens Point Service Center
1462 Strongs Ave., Stevens Point, WI 54481
Phone: 715-346-1325

Critical Habitat and Sensitive Areas
Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov
Website: http://dnr.wi.gov/lakes/criticalhabitat/

Dams
Contact: Joe Behlen
Wisconsin Department of Natural Resources
473 Griffith Ave., Wisconsin Rapids, WI 54494
Phone: 715-421-9940
E-mail: joseph.behlen@wisconsin.gov
Website: http://dnr.wi.gov/org/water/wm/dsfm/dams/

Fertilizers/Soil Testing
Contact: Ken Williams
Waushara County UW- Extension
209 S St. Marie Street, PO Box 487, Wautoma, WI 54982
Phone: 920-787-0416
E-mail: ken.williams@ces.uwex.edu
Website:
http://waushara.uwex.edu/agriculture/services

Fisheries Biologist (management, habitat)
Contact: Dave Bartz
Wisconsin Department of Natural Resources
Hwy 22N, Box 430, Montello, WI 53949
Phone: 608-635-4989
E-mail: David.Bartz@wisconsin.gov
Website: http://dnr.wi.gov/fish/

Frog Monitoring—Citizen Based
Contact: Andrew Badje, Wisconsin Department of Natural Resources
Phone: 608-266-3336
E-mail: Andrew.badje@wisconsin.gov
E-mail: WFTS@wisconsin.gov

Grants
Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov
Website: http://dnr.wi.gov/Aid/Grants.html#tabx8

Contact: Ed Hernandez
Waushara County Land Conservation Department
PO Box 1109, Wautoma, WI 54982
Phone: 920-787-0453
E-mail: lcdzoning.courthouse@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/zoning.htm

Groundwater Quality
Contact: Kevin Masarik
UWSP Center for Watershed Science & Education
TNR 224, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-4276
E-mail: kmasarik@uwsp.edu
Website: http://www.uwsp.edu/cnr/watersheds/

Groundwater Levels/Quantity
Contact: Ed Hernandez
Waushara County Land Conservation Department
Address: PO Box 1109 Wautoma, WI 54982
Phone: 920-787-0453
E-mail: lcdzoning.courthouse@co.waushara.wi.us

Groundwater Levels/Quantity (Cont'd)
Contact: George Kraft
UWSP Center for Watershed Science & Education
TNR 224, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-2984
E-mail: george.kraft@uwsp.edu

Contact: Scott Provost
Wisconsin Department of Natural Resources
473 Griffith Ave., Wisconsin Rapids, WI 54494
Phone: 715-421-7881
E-mail: scott.provost@wisconsin.gov
Website:
http://prodoasext.dnr.wi.gov/inter1/hicap$.startup

Informational Packets
Contact: UWSP Center for Watershed Science & Education
TNR 224, 800 Reserve St. Stevens Point, WI 54481
Phone: 715-346-2497
E-mail: pclakes@uwsp.edu

Lake Groups – Friends, Associations, Districts
Contact: Ed Kissinger
Silver Lake Management District
N2102 Chicago Point Road
Wautoma, WI 54982
Phone: 920-787-3123
Email: ekissing@yahoo.com

Contact: Patrick Nehring
UWEX Economic Resource Development Agent
PO Box 487, Wautoma, WI 54982
Phone: 920-787-0416
E-mail: Patrick.nehring@ces.uwex.edu

Contact: Patrick Goggin
UWEX Lakes
TNR 203, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-365-8943
E-mail: pgoggin@uwsp.edu
Website:
http://www.uwsp.edu/cnr/uwexlakes/organizations/

Lake Groups – Friends, Associations, Districts
Contact: Eric Olson
UWEX Lakes
TNR 206, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-2192
E-mail: eolson@uwsp.edu
Website:
http://www.uwsp.edu/cnr/uwexlakes/organizations/

Contact: Susan Tesarik
Wisconsin Lakes
4513 Vernon Blvd., Suite 101, Madison, WI 53705
Phone: 1-800-542-5253
E-mail: lakeinfo@wisconsinlakes.org
Website: http://wisconsinlakes.org/

Lake Levels
See: Groundwater

Lake-Related Law Enforcement (no-wake, transporting invasives, etc.)
Contact: Ben Mott
State Conservation Warden
Wisconsin Department of Natural Resources
427 E. Tower Drive, Suite 100, Wautoma, WI 54982
Phone: 920-896-3383
Website: http://www.wigamewarden.com/

Land Use Plans and Zoning Ordinances
Contact: Terri Dopp-Paukstat
Waushara County Planning and Zoning
PO Box 1109, Wautoma, WI 54982
Phone: 920-787-0453
E-mail: lcdzoning.courthouse@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/zoning.htm

Contact: UWSP Center for Land Use Education
TNR 208, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-3783

E-mail: Center.for.Land.Use.Education@uwsp.edu
Website: http://www.uwsp.edu/cnr/landcenter/

Nutrient Management Plans
Contact: Ed Hernandez
Waushara County Land Conservation Department
PO Box 1109, Wautoma, WI 54982
Phone: 920-787-0453
E-mail: lcdzoning.courthouse@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/zoning.htm

Nutrient Management Plans (cont'd)
Contact: NRCS Stevens Point Service Center
1462 Strongs Ave., Stevens Point, WI 54481
Phone: 715-346-1325

Parks (County)
Contact: Scott Schuman
Waushara County Parks
PO Box 300, Wautoma, WI 54982
Phone: 920-787-7037
E-mail: wcparks.parks@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/parks.htm

Purchase of Development Rights
Contact: North Central Conservancy Trust
PO Box 124, Stevens Point, WI 54481
Phone: 715-341-7741
E-mail: info@ncctwi.org
Website: http://www.ncctwi.org/

Purchase of Land
Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov
Website: http://dnr.wi.gov/topic/stewardship/

Rain Barrels – Order
Contact: Golden Sands RC&D
1100 Main St., Suite 150, Stevens Point, WI 54481
Phone: 715-343-6215
Website: http://www.goldensandsrcd.org/store

Rain Gardens and Stormwater Runoff
Contact: Ed Hernandez
Waushara County Land Conservation Department
PO Box 1109, Wautoma, WI 54982
Phone: 920-787-0453
E-mail: lcdzoning.courthouse@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/zoning.htm

Septic Systems/Onsite Waste
Contact: Terri Dopp-Paukstat
Waushara County Planning and Zoning
PO Box 1109, Wautoma, WI 54982
Phone: 920-787-0453
E-mail: lcdzoning.courthouse@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/zoning.htm

Shoreland Management
Contact: Ed Hernandez
Waushara County Land Conservation Department
PO Box 1109, Wautoma, WI 54982
Phone: 920-787-0453
E-mail: lcdzoning.courthouse@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/zoning.htm

Shoreland Vegetation
http://dnr.wi.gov/topic/ShorelandZoning/

Shoreland Zoning Ordinances
See: Land Use Plans and Zoning Ordinances

Soil Fertility Testing
Contact: Ken Williams
Waushara County UW- Extension
209 S St. Marie Street, PO Box 487, Wautoma, WI 54982
Phone: 920-787-0416
E-mail: Ken.williams@ces.uwex.edu
Website: http://waushara.uwex.edu/index.html

Water Quality Monitoring
Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov

Water Quality Problems
Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov

Contact: Nancy Turyk
UWSP Center for Watershed Science and Education
TNR 216, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-4155
E-mail: nturyk@uwsp.edu

Wetlands
Contact: Keith Patrick
Wisconsin Department of Natural Resources
5301 Rib Mountain Drive, Wausau, WI 54401
Phone: 715-241-7502
E-mail: keith.patrick@wisconsin.gov
Website: http://dnr.wi.gov/wetlands/

Wetlands (cont'd)
Contact: Wisconsin Wetlands Association
214 N. Hamilton Street, #201, Madison, WI 53703
Phone: 608-250-9971
Email: info@wisconsinwetlands.org

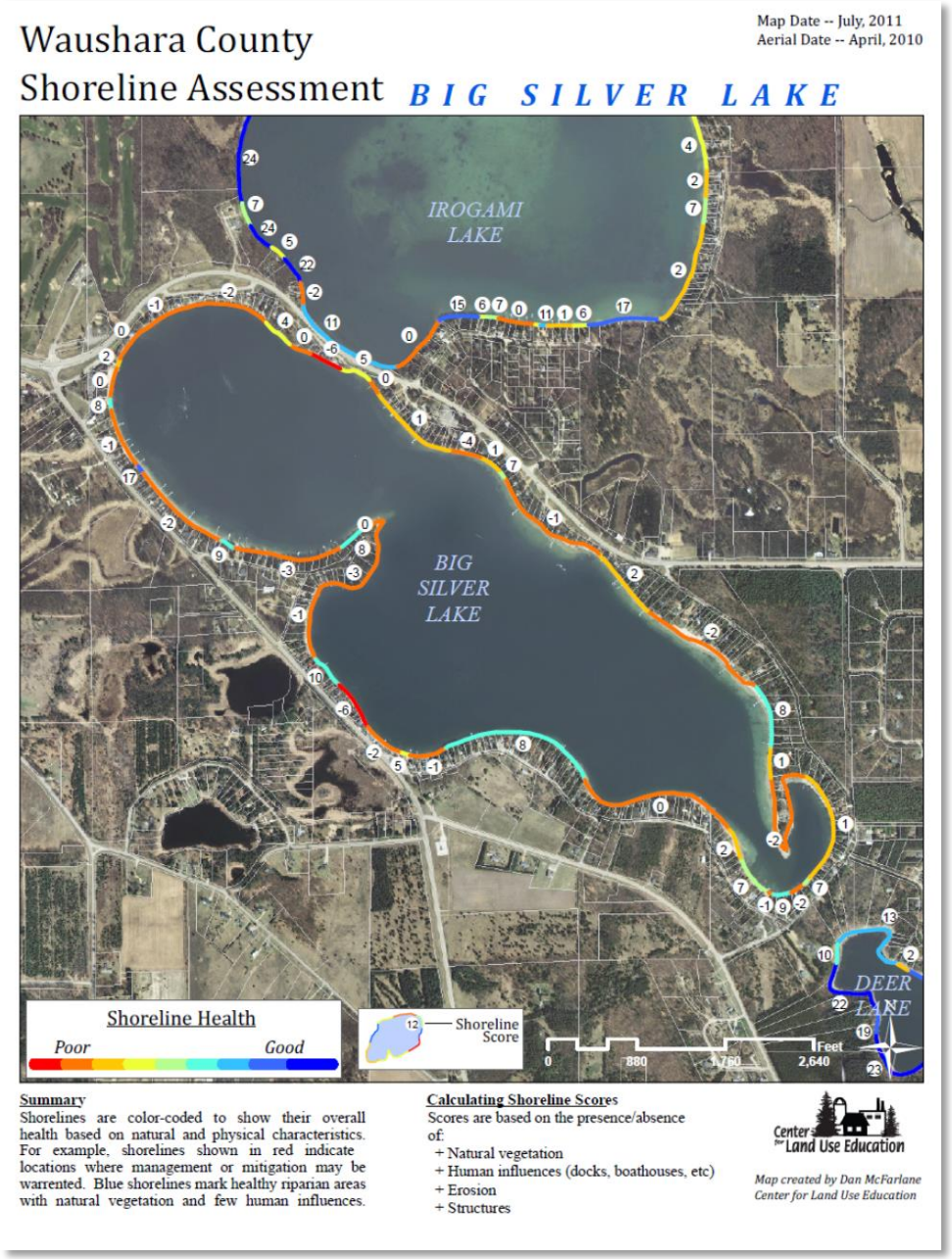
Wetland Inventory
Contact: Dr. Emmet Judziewicz
UWSP Freckmann Herbarium
TNR 301, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-4248
E-mail: ejudziew@uwsp.edu

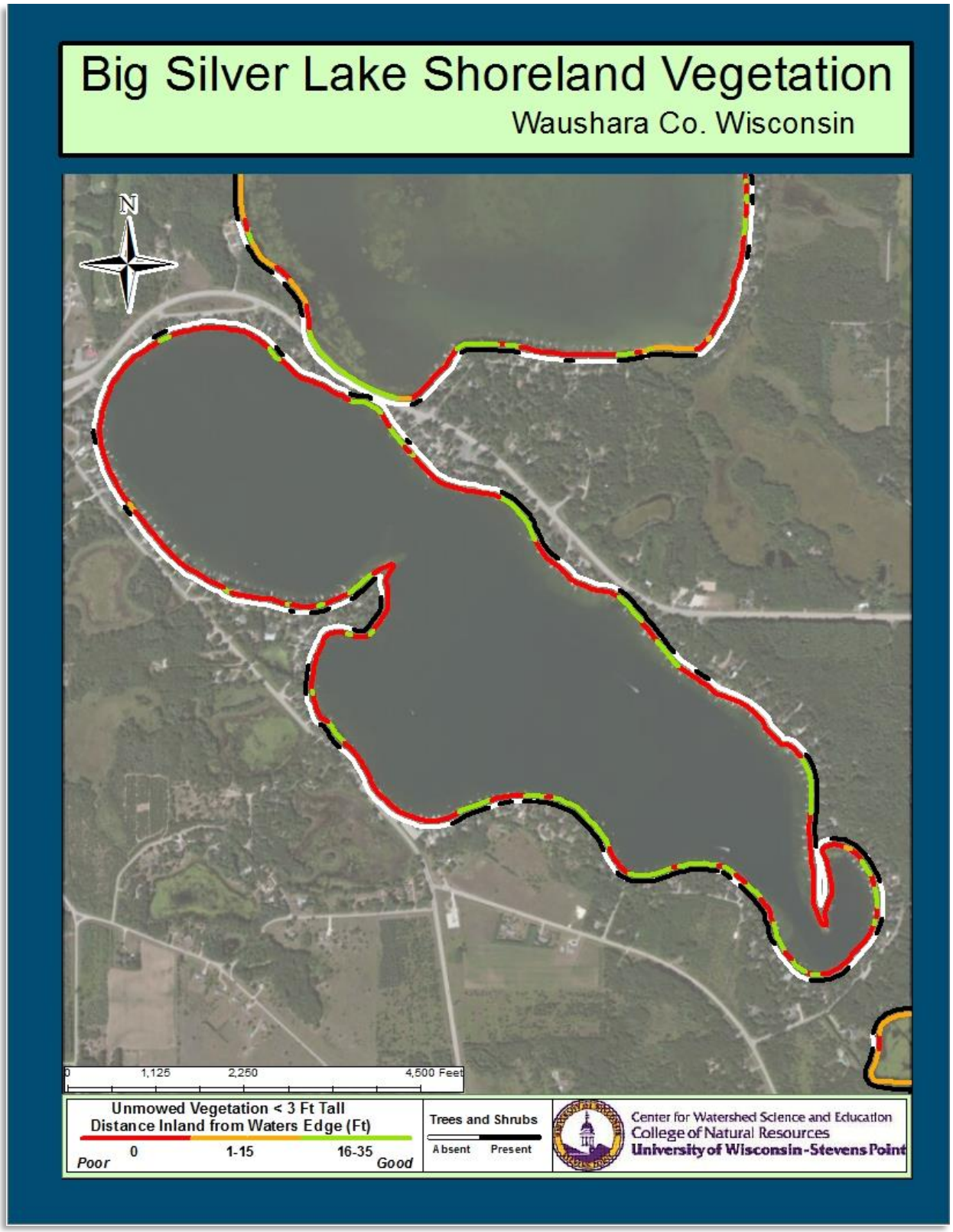
Woody Habitat
Contact: Dave Bartz, Wisconsin Department of Natural Resources
Phone:608-635-4989
Address: Hwy 22N Box 430, Montello, WI 53949
E-mail: David.Bartz@wisconsin.gov

Appendix B: Shoreland Survey – 2011

A scoring system was developed for the collected data to provide a more holistic assessment. Areas that are healthy will need strategies to keep them healthy, and areas with potential problem areas and where management and conservation may be warranted may need a different set of strategies for improvement. The scoring system is based on the presence/absence and abundance of shoreline features, as well as their proximity to the water's edge. Values were tallied for each shoreline category and then summed to produce an overall score. Higher scores denote a healthier shoreline with good land management practices. These are areas where protection and/or conservation should be targeted. On the other hand, lower scores signify an ecologically unhealthy shoreline. These are areas where management and/or mitigation practices may be desirable for improving water quality.

The summary of scores for shorelands around Big Silver Lake are displayed below. The shorelands were color-coded to show their overall health based on natural and physical characteristics. Blue shorelands identify healthy shorelands with sufficient vegetation and few disturbances. Red shorelands indicate locations where changes in management or mitigation may be warranted. A few portions of Big Silver Lake's shorelands are in moderately good condition; however, large portions of the shore have challenges that should be addressed. Much of Big Silver Lake's shoreland was ranked as poor.




Big Silver Lake Shoreland Vegetation
Waushara Co. Wisconsin
N
0
1,125
2,250
4,500 Feet
Unmowed Vegetation < 3 Ft Tall
Distance Inland from Waters Edge (Ft)
Poor
0
1-15
16-35
Good
Trees and Shrubs
Absent
Present
Center for Watershed Science and Education
College of Natural Resources
University of Wisconsin-Stevens Point

Appendix C: Rapid Response Plan

SURVEY/MONITOR

1. Learn how to survey/monitor the lake.	**Contacts:** **Water Resource Management Specialist** Wisconsin Department of Natural Resources Phone: E-Mail: **Regional Aquatic Invasive Species (AIS) Coordinator** Golden Sands RC&D 1100 Main St., Suite #150 Stevens Point, WI 54481 Phone: 715-343-6278 E-Mail: info@goldensandsrcd.org
2. Survey/monitor the lake monthly/seasonally/annually.	If you find a suspected invasive species, report it as soon as possible using the procedure below.

REPORTING A SUSPECTED INVASIVE SPECIES

1. Collect specimens or take photos. Regardless of the method used, provide as much information as possible. Try to include flowers, seeds or fruit, buds, full leaves, stems, roots and other distinctive features. In photos, place a coin, pencil or ruler for scale. Deliver or send specimen ASAP.	Collect, press and dry a complete sample. This method is best because a plant expert can then examine the specimen. **-OR-** Collect a fresh sample. Enclose in a plastic bag with a moist paper towel and refrigerate. **-OR-** Take detailed photos (digital or film).
2. Note the location where the specimen was found. If possible, give the exact geographic location using a GPS (global positioning system) unit, topographic map, or the Wisconsin Gazetteer map book. If using a map, include a photocopy with a dot showing the plant's location. You can use TopoZone.com to find the precise location on a digital topographic map. Click the cursor on the exact collection site and note the coordinates (choose UTM or Latitude/Longitude).	Provide one or more of the following: • Latitude & Longitude • UTM (Universal Transverse Mercator) coordinates • County, Township, Range, Section, Part-section • Precise written site description, noting nearest city & road names, landmarks, local topography

3. Gather information to aid in positive species identification.	• Collection date and county • Your name, address, phone, email • Exact location (Latitude/Longitude or UTM preferred, or Township/Range/Section) • Plant name (common or scientific) • Land ownership (if known) • Population description (estimated number of plants and area covered) • Habitat type(s) where found (forest, field, prairie, wetland, open water)
4. Mail or bring specimens and information to any of the following locations: Digital photos may be emailed.	**Wisconsin Dept. Natural Resources** 427 E. Tower Drive, Suite 100 Wautoma, WI 54982 Phone: (920) 787-4686 **Regional AIS Coordinator** Golden Sands RC&D 1100 Main St., Suite #150 Stevens Point, WI 54481 Phone: 715-343-6214 E-Mail : info@goldensandsrcd.org **UW-Stevens Point Herbarium** 301 Trainer Natural Resources Building 800 Reserve Street Stevens Point, WI 54481 Phone: 715-346-4248 E-Mail: ejudziew@uwsp.edu **Wisconsin Invasive Plants Reporting & Prevention Project** Herbarium-UW-Madison 430 Lincoln Drive Madison, WI 53706 Phone: (608) 267-7612 E-Mail: invasiveplants@mailplus.wisc.edu
5. Once the specimen is dropped off or sent for positive identification, be sure to contact:	**Regional AIS Coordinator** Golden Sands RC&D 1100 Main St., Suite #150 Stevens Point, WI 54481 Phone: 715-343-6214 E-Mail : info@goldensandsrcd.org

If an invasive species is confirmed, the Regional AIS Coordinator will make the following public information contacts:

- **Wisconsin Department of Natural Resources**
  427 E. Tower Drive, Suite 100
  Wautoma, WI 54982
  Phone: (920) 787-4686

  The town board(s) in which the water body is located

  Town of: Marion

- **The Silver Lake Management District**
  Contact: Ed Kissinger, President
  Phone: 920-787-3123

- **University of Wisconsin-Stevens Point**
  Water Resource Scientist
  Nancy Turyk
  Trainer Natural Resources Building
  800 Reserve Street
  Stevens Point, WI 54481Telephone: 715-346-4155
  E-mail: nturyk@uwsp.edu

- **Local Residents**

If an invasive species is confirmed the secretary of the Silver Lake Management District will make the following public information contacts:

- **Newspapers**: The Argus, The Resorter

Contact the WDNR to post notice(s) at the access point(s) to the water body.

Appendix D: APM (Onterra 2015)

Appendix E: Lake User Survey Results