2015

Fish Lake, Waushara County, Wisconsin
Lake Management Plan

Prepared in 2015 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

2015 Lake Management Plan for Fish Lake, Waushara County, Wisconsin

The Fish Lake Management Plan was developed with input from residents and lake users at a series of four public planning sessions held at the Hancock Community Center in Hancock, Wisconsin during June-September 2014. 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 Fish Lake Management District on: July 3, 2015 .
Date

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Date

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Date

The plan was adopted by Waushara County on: January 6, 2016 .
Date

The plan was approved by the Wisconsin Department of Natural Resources on: April 7, 2017 .
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 2015 Fish Lake Management Plan and provided guidance during the plan's development.

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Overarching Vision for Fish Lake

Fish Lake will remain a clean, peaceful place for a variety of recreational activities and provide a respite for residents, visitors, and wildlife alike. Excellent water clarity, good fishing and navigability will continue to be assets of the lake, and will be maintained by the collaborative lake stewardship of Fish Lake community members.

Introduction

Fish Lake is a two-lobed 164-acre lake located near Hancock, Wisconsin. Land in the Town of Hancock, Town of Deerfield, and the Village of Hancock are located within the Fish Lake watershed. There are several public areas around the lake. Hancock Park is located on the northwestern side of the lake and the Tomorrow Wood Campground is located on the southeastern end. Although the lake is relatively developed, the area has a rural character and is surrounded by shady lots providing peace and tranquility to lake residents. Many lake users value the lake's water quality and cleanliness, good fishing, and the many forms of recreation available. Some also value the lack of recreational overcrowding. These values, along with others, inspired Fish Lake community members to come together in partnership with Waushara County and technical professionals to develop this lake management plan (LMP).

The objective of this plan is to provide a framework for the protection and improvement of Fish Lake. Implementing the content of this LMP will enable citizens and other supporters to achieve the vision for Fish Lake now and in the years to come. The plan was developed by community members who learned about the lake and identified features important to the Fish Lake community to help guide the fate of the 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 and identifies steps to correct past problems, improve on current conditions, and provide guidance for future boards, lake users, and technical experts. Because many entities are involved in lake and land management, it can be challenging to navigate the roles, partnerships and resources that are available; the planning process and content of this plan have been designed to identify where some key assistance exists. The actions identified in this LMP can serve as a gateway for obtaining grant funding and other resources to help implement activities outlined in the plan.

Who can use the Fish 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 Fish Lake can have the greatest influence on the lake by understanding and choosing lake-friendly options to manage their land and the lake.
- **Fish Lake Management District (FLMD):** 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 LMP, and the District can identify partners to help achieve their goals for Fish 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 enjoyable.
- **The Towns of Deerfield and Hancock and the Village of Hancock**: The municipalities can consider the visions, wishes and goals documented in this LMP when considering municipal-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. LMPs 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 LMP increases an application's competitiveness for funding from the State – if multiple Waushara County lakes have similar goals in their LMPs, 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 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. There was insufficient data available for many of the lakes to evaluate current water quality, aquatic plant communities, invasive species, and shorelands. The data that were available had been collected 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 LMPs. 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.

Several reports from the Fish 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/ (select "Departments", "Zoning and Land Conservation", "Land Conservation", and "Lake Management Planning"). Unless otherwise noted, the data used in the development of this plan were detailed in the 2014 report *Waushara County Lakes Study - Fish Lake*, University of Wisconsin-Stevens Point.

The Planning Process

The planning process included a series of four public planning sessions held between June and September 2014 at the Hancock Community Center. The Fish Lake Management Planning Committee consisted of property owners, recreational users, and members of the Fish Lake Management District. 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 & Development Council, Inc. (RC&D), University of Wisconsin-Extension (UWEX), and the University of Wisconsin-Stevens Point Center for Watershed Science and Education (CWSE).

Participation in the planning process was open to everyone and was encouraged by letters sent directly to Fish Lake waterfront property owners and by press releases in local newspapers. In addition, planning committee members were provided with emails about upcoming meetings which could be forwarded to others. To involve and collect input from as many people as possible, a topic-specific survey related to the subject of each upcoming planning session was made available prior to each planning session. Property owners and interested lake users were notified about the surveys and how to access them (via postcards mailed to waterfront property owners and press releases in local newspapers). The surveys could be filled out anonymously online, or paper copies were available upon request. Survey questions and responses were shared at the planning sessions and can be found in Appendix E. Lake User Survey Results.

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

Guest experts and professionals attended the planning sessions. They presented information and participated in discussions with participants to provide context, insight and recommendations for the LMP, including environmental and regulatory considerations. This information was organized with the survey results into discussion topics, which included: 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, planning committee members identified goals, objectives and actions for the LMP that were then recorded by professionals from UW-Stevens Point. Planning session notes and presentations are available on the Waushara County website.

Goals, Objectives and Actions

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

Although each lake is different, the Wisconsin Department of Natural Resources requires that each comprehensive LMP address a specific list of topics affecting the character of a lake, whether each topic has been identified as a priority or as simply something to preserve. In this way, every LMP considers the many aspects associated with lakes. These topics comprise the chapters in this plan and 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, Fish Lake Management District

List of Goals

Goal 1. The game and panfish communities in Fish Lake will have a healthy size structure.
Goal 2. Protect native plants in and around Fish Lake.
Goal 3. Eurasian watermilfoil (EWM) and curly-leaf pondweed (CLP) will be controlled or eliminated in Fish Lake.
Goal 4. Preserve and redevelop high quality habitat for fish and wildlife.
Goal 5. Improve the quality of water in Fish Lake.
Goal 6. Fish Lake will have water levels with natural fluctuations.
Goal 7. Shorelands around Fish Lake will become increasingly healthy over time.
Goal 8. Support water-friendly land management practices around the lake throughout the watershed.
Goal 9. Ensure safe access to Fish Lake.
Goal 10. Increase participation in lake stewardship.
Goal 11. Review this plan annually and update as needed.

The following were identified as 'High priority' goals/objectives for Fish Lake:

Goal 1. The game and panfish communities in Fish Lake will have a healthy size structure.

Objective 1.1. Reduce abundance of largemouth bass.
Explore reducing the size limit of largemouth bass on Fish Lake from 15" to 13".
Participate in the listening sessions regarding any new fishery regulations recommended by the WDNR.

Objective 1.2. Enhance and restore fish habitat.
Lakeshore property owners will avoid removing aquatic plants from the lake other than what is needed to access docks or swimming.
Inform riparian landowners about the importance of woody habitat in shallow water in near shore areas of Fish Lake and encourage its placement in appropriate areas.
Encourage property owners with docks to safely place woody habitat beneath them to create additional habitat.
Encourage landowners to leave any fallen woody habitat in the lake.
Put woody habitat back in the lake.
Continue to explore options for dredging the connection between the lake's two basins to ensure access by fish.
Continue fish crib project. Evaluate (qualitatively and via discussions with Fishery Biologist) positive and negative impacts of the cribs, annually.

Objective 1.3. Continue to develop the fishery and fish populations in the lake.
Continue fish stocking program. Make adjustments based on annual qualitative review and discussions with the WDNR Fishery Biologist.

Goal 5. Improve the quality of water in Fish Lake.

Objective 5.2. Continue current monitoring initiatives and begin collecting data has not routinely been recorded.

Continue monitoring water clarity. Connect with the Citizen Lake Monitoring Network (CLMN) Coordinator for Waushara County for training.
Monitor water chemistry each year. Total phosphorus 3 samples/summer. Continue spring and fall overturn sampling for phosphorus and nitrogen.
Encourage private well owners to have their well water tested for nitrates and atrazine.
Monitor ice on/ice off to evaluate changes in the growing season.
Track water levels over time by monitoring the groundwater monitoring well near Fish Lake.

Lead persons and resources are given for each objective in 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
Clean Boats, Clean Waters	CBCW
WDNR Citizen Lake Monitoring Network	CLMN
UWSP Center for Watershed Science and Education	CWSE
Wisconsin Department of Agriculture, Trade and Consumer Protection	DATCP
Fish Lake Management District	FLMD
North Central Conservancy Trust	NCCT
USDA Natural Resources Conservation Service	NRCS
Golden Sands Resource Conservation & Development Council, Inc.	RC&D
University of Wisconsin Extension	UWEX
University of Wisconsin-Stevens Point	UWSP
Waushara County Land Conservation Department	WCLCD
Waushara County Watershed Lakes Council	WCWLC
Wisconsin Department of Natural Resources	WDNR
Wisconsin Department of Transportation	WDOT
UWSP Water and Environmental Analysis Lab	WEAL

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

In-Lake Habitat and a Healthy Lake


Photo courtesy of Peggy Katzner

Many lake users value Fish 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 Fish Lake includes the aquatic plants, branches, and tree limbs above and below the water.

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.

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.

Locally, Fish Lake is known for having some of the better fishing in the area, although approximately one-half of the survey respondents believed the fishing had declined during the time they had been fishing there. They suspected reduced water levels were the major cause. The Fish Lake Management District (FLMD) has been stocking fish for many years.

Fish Lake is currently on an eight-year rotational survey schedule with WDNR fisheries biologists. These surveys are conducted to assess the current recreational fish community and provide direction for future management. The most recent survey was a spring fyke-netting and boom shocking survey in May 2013. The next survey is tentatively scheduled for 2021. Fish survey results from 2013 indicated that largemouth bass, walleye, and northern pike are the dominant predatory game fish in Fish Lake. Largemouth bass caught during the survey exhibited good abundance and size structure; northern pike had an average abundance and poor size structure; and, walleye exhibited an average abundance with good size structure. Bluegill and crappie were the dominant panfish species sampled, with a good abundance of bluegill with poor size structure and a good abundance of black crappie. Other fish encountered during the survey included pumpkinseed, yellow perch, rock bass, yellow bullhead, black bullhead, white sucker, green sunfish, and golden shiners.

Fish cribs have been installed at various locations in both basins over the past five or so years by the Hancock Sportsmen's Club. They must be installed deep enough to avoid becoming a hazard to lake users, but shallow enough to be useful to the fish. Cribs often do not improve the fishery; the addition of woody structure near shore would be more beneficial to young fish and their prey in Fish Lake.

Fish movement between the lake's two basins is well documented. While the west basin offers better spawning habitat, the east basin's depth provides a potential refuge from late winter low dissolved oxygen conditions. Decreasing water levels, in addition to erosion of the sandy soils, have made the connection between the basins extremely shallow. There is some concern that fish may be confined to a single basin if the connection becomes completely closed.

Dave Bartz, Fisheries Biologist with the WDNR, spoke with planning participants at the fishery and recreation planning session held on July 22, 2014. Conclusions based on discussions during the meeting were:

- Increase near-shore habitat including woody habitat (leaving logs, stumps, etc. in the water and/or enhancing the wood) in both the east and west basins and restore vegetation in and around the east basin.
- Dredge the connection between the two basins to enhance the fishery and alleviate winter kills by allowing movement to the east basin.
- Shoreland residents and lake visitors should keep their boats clean when entering and leaving the lake to diminish the possibility of spreading aquatic invasive species.

Guiding Vision for the Fish Community

Fish Lake will have a thriving fishery enjoyed by anglers, nature lovers and other wildlife.

Goal 1. The game and panfish communities in Fish Lake will have a healthy size structure.

Objective 1.1. Reduce abundance of largemouth bass.

Actions	Lead person/group	Resources	Timeline
Explore reducing the size limit of largemouth bass on Fish Lake from 15" to 13".	FLMD	WDNR Fisheries Biologist WI Conservation Congress Hancock Sportsmen's Club	
Participate in the listening sessions regarding any new fishery regulations recommended by the WDNR.	FLMD Local fishing clubs	WDNR Fisheries Biologist WI Conservation Congress spring hearing	Ongoing April each year

Objective 1.2. Enhance and restore fish habitat.

Actions	Lead person/group	Resources	Timeline
Lake shore property owners will avoid removing aquatic plants from the lake other than what is needed to access docks or swimming.	Shoreland property owners	UWEX Lakes (informational material) FLMD	Ongoing
Inform shoreland property owners about the importance of woody habitat in shallow water near shore areas of Fish Lake and encourage its placement in appropriate areas.	FLMD	UWEX Lakes (informational material)	Ongoing
Encourage property owners with docks to safely place woody habitat beneath them to create additional habitat.	FLMD	UWEX Lakes (informational material)	Ongoing
Encourage landowners to leave any fallen woody habitat in the lake	FLMD	UWEX Lakes (informational material)	Ongoing
Put woody habitat back in the lake	Shoreland property owners	WDNR Fisheries Biologist Local fishing clubs	Ongoing
Continue to explore options for dredging the connection between the lake's two basins to ensure access by fish.	FLMD	WDNR Lake Management Spec. WDNR Fisheries Biologist	
Continue fish crib project. Evaluate (qualitatively and via discussions with Fisheries Biologist) positive or negative impacts of the cribs.	Hancock Sportsmen's Club	WDNR Fisheries Biologist	Ongoing - annually

Objective 1.3. Continue to develop the fishery and fish populations in the lake.

Actions	Lead person/group	Resources	Timeline
Continue fish stocking program. Make adjustments based on annual qualitative review and discussions with the WDNR Fisheries Biologist.	FLMD	WDNR Fisheries Biologist Local fishing clubs	Ongoing

Aquatic Plant Community

Aquatic plants provide the forested landscape within Fish 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, 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.

During an aquatic plant survey conducted in August 2013, twenty species of aquatic plants were observed in Fish Lake, which was slightly above average compared to the other lakes in the Waushara County Lakes Study (Golden Sands Resource Conservation & Development Council, Inc. (RC&D)). The dominant plant species found in Fish Lake were muskgrasses, followed by coontail and southern naiad. The survey also documented one invasive plant species, curly-leaf pondweed (CLP). Eurasian watermilfoil (EWM) has also been documented in the lake and was observed during a special Aquatic Invasive Species (AIS) survey conducted by RC&D later in 2013.

Aquatic plants play another critical role in the lake's ecosystem by using nutrients that would otherwise be available to algae. Management activities should be planned to minimize the disturbance of native species in the water and on shore in order to maintain the balance between aquatic plants and algae. In addition, care should be taken to minimize raking the lakebed and pulling plants, since disturbing these valuable open spaces may allow invasive plants such as EWM to establish. More detailed information can be found in Appendix B. Aquatic Plants, *Aquatic Macrophyte Survey of Fish Lake, Waushara County, Wisconsin*; and, *Waushara County Lakes Study – Fish Lake.*

Guiding Vision for Aquatic Plants in Fish Lake

Fish Lake will host a healthy aquatic plant community with minimal disturbance by invasive species.

Goal 2. Protect native plants in and around Fish Lake.

Objective 2.1. Avoid disturbing the native aquatic plant community when possible.

Actions	Lead person/group	Resources	Timeline
Minimize removal and disturbance of native vegetation via informational materials provided in annual mailing, website re: mitigation methods available.	FLMD	UWEX Lakes WCLWC	Ongoing
If aquatic plants severely impede recreation, approach with limited hand-pulling in small areas around the dock.	Shoreland property owners	WDNR Lakes Specialist	Ongoing
Encourage shoreland property owners to refrain from using fertilizers to help prevent the growth of dense plant beds (see Shoreland Section of this plan).	FLMD	UWEX Lakes	Ongoing

Aquatic Invasive Species (AIS)

Aquatic invasive species are non-native aquatic plants and animals that are most often unintentionally introduced into lakes 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.

Curly-leaf pondweed (CLP)

According to WDNR files, CLP was first documented in Fish Lake in 2009. It was identified in one location in the east lobe during the 2013 aquatic plant survey (**Error! Reference source not found.**). 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 Fish Lake, CLP should be monitored annually in early June, and management should be considered if the beds expand.

Eurasian watermilfoil (EWM)

Eurasian watermilfoil (EWM) has been confirmed in Fish Lake since 2009. In 2010, the FLMD received a grant to initiate control of EWM, which included pre-and post-treatment surveys, mapping, chemical treatment of EWM, and implementing prevention strategies including an educational initiative. Although it was not encountered in the 2013 point-intercept aquatic plant survey, it was documented and removed in July 2013 during a different survey conducted by RC&D staff. Monitoring and educational initiatives should continue, as the plant may still exist in smaller populations in the lake.

EWM can exist as part of the aquatic plant community or it can create dense beds that can alter habitat, 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.

Each lake is different and the response to EWM control may vary from lake to lake; therefore, no single approach will be appropriate for all lakes. Often, multiple approaches and adaptive year-to-year changes in approach are most successful. The EWM population should be evaluated using a 'point-intercept' method (accompanied by more thorough observations) before and after treatments to determine the effectiveness of an approach. Based on level of success, strategies for the subsequent year should be adjusted accordingly. EWM management involves evolving scientific knowledge; therefore, the management strategies for EWM in Fish Lake should be adapted as EWM populations change and as new information becomes available.

Hybrid watermilfoil (HWM) results from a hybridization of native watermilfoils with Eurasian watermilfoil. HWM tends to be more resilient and less affected by chemical treatment. HWM may be suspected in a lake if 1) the plant's appearance is different than EWM; 2) management with chemicals becomes difficult or ineffective; and, 3) the lake is near other lakes with HWM. If these criteria are met, plant samples should be submitted to a lab for confirmation. Once HWM is confirmed, a *challenge test* should be conducted to determine which combination of chemicals will be effective in controlling that particular strain of HWM. Many combinations of chemicals may be used to treat HWM – the only way to know the appropriate combination is by sending samples to be challenge tested. Treating HWM without knowing the appropriate combination of chemicals can result in an even more resilient strain in the lake, damage to the native aquatic plant population, and a waste of money.

<u>Summary of Aquatic Plant Management Planning Session Discussion – September 23, 2014</u>

Management options will change depending upon the amount of EWM, presence of HWM, and abundance of CLP in Fish Lake; therefore, routine annual monitoring of these species is essential. The presence of AIS will also define the type of aquatic plant management that can be conducted to address

recreational impediments. The following aquatic plant management options were determined to be the most practical and effective options that would minimize impacts to Fish Lake as a whole. A strategy in a given year may include one or several of these options.

- ***Manual removal.*** **(Native plants, EWM or CLP)** This is essentially being done now by properly trained individual lakefront property owners while they are removing plants (in an area up to 30' around their dock) for boat and swimming access to open water. Improper removal techniques can lead to the spread of EWM. Those trained to properly identify and remove EWM and other aquatic invasive species can remove those plants manually anywhere in the lake, at any time of year, without a permit. Trained divers can be hired to manually remove AIS in deeper parts of the lake. **With the small populations of EWM currently in Fish Lake, this is the preferred approach for removal.**

- ***Chemical spot treatment.*** **(EWM or CLP)** Results of recent studies of the effectiveness of chemical spot treatment suggest the treatment is less effective than previously thought and may actually promote chemically-resistant forms of EWM; however, chemical spot treatments may still be appropriate in certain conditions to control EWM. If a hybrid milfoil (HWM) is determined to be present, the type of chemical should be based on the specific type of hybrid. This can be determined through DNA testing. If EWM is found to not be a hybrid, and is typically less than 5 acres, a contact herbicide such as endothall or diquat should be used. Systemic herbicides should not be used. Treatment should occur early in the season, prior to emergence of native plants. Typically, this is when water temperatures are less than 60° F. To reduce the chance of developing resilient strains of EWM, different treatments should be used in consecutive years.

- ***Milfoil weevils.*** **(EWM)** This option could be considered in areas of the lake with healthy shorelands and where chemicals are not being used. Milfoil weevils are commercially available, but are expensive. Obtaining a starter population and rearing them in predator-free conditions can be desirable from a financial standpoint. Professional assistance should be sought if stocking or rearing is pursued.

- ***Do nothing.*** **(EWM)** With the aquatic plants in the lake in an already 'choked' state, planning committee members felt the density of aquatic plants cannot get much worse. **This is not applicable in the current conditions of EWM in Fish Lake, but is appropriate for CLP.**

- ***Mechanical harvesting.*** **(CLP, Native plants)** A harvester could be purchased or hired to cut access lanes through dense vegetation to provide boating access and improve fish habitat. EWM can be spread through fragmentation, so EWM populations may be increased by mechanical harvesting; therefore, mechanical harvesting should not be used in areas where EWM is present. At the time mechanical harvesting is pursued, a detailed harvesting plan should be developed and a permit should be obtained.

- Techniques applied within the watershed and on shoreland property can reduce the nutrient loading responsible for aquatic plant growth in the lake. This is discussed further in the Shoreland and Watershed sections.

Guiding Vision for Aquatic Invasive Species

The fishery, recreation, water quality and native plant communities of Fish Lake will be minimally disturbed by aquatic invasive species (AIS).

Goal 3. Eurasian watermilfoil (EWM) and curly-leaf pondweed (CLP) will be controlled or eliminated in Fish Lake.

Objective 3.1. Reduce or eliminate populations of EWM and CLP in Fish Lake.

Actions	Lead person/group	Resources	Timeline
Encourage property owners to refrain from removing native aquatic vegetation to reduce the colonization by AIS.	FLMD	RC&D UWEX Lakes – informational materials WCLWC	Ongoing: spring- fall
Re-evaluate plant community routinely to determine the next steps (or no action) in management of EWM and CLP.	FLMD	WDNR Lake Manager RC&D Consultant	Annually CLP survey – early June
Consider the possibility of no action if CLP population is not expanding, causing a nuisance, or disrupting the native plant community.	FLMD	WDNR Lake Manager	Ongoing
Inform shoreland property owners they should be trained in proper hand-pulling techniques for EWM.	FLMD	RC&D	Annually or as needed
Work with other area lake groups to apply jointly for a grant to hire divers to hand-pull EWM.	FLMD	WDNR Lake Manager RC&D	As needed
If EWM populations exceed what is manageable by hand-pulling, consider using herbicides in areas of denser infestation.	FLMD	WDNR Lake Manager Consultant	As needed
Prior to chemical use, test milfoil to see if hybrid watermilfoil (HWM) exists in Fish Lake.	FLMD	RC&D	Summer 2015
If HWM exists, conduct challenge tests to determine the correct combinations of chemicals for successful treatment.	FLMD	RC&D	
Explore the use of milfoil weevils to combat EWM, particularly at the western end of the west lobe.	FLMD	RC&D	As needed

Objective 3.2. Prevent the establishment of new species of AIS in Fish Lake.

Actions	Lead person/group	Resources	Timeline
Use signs, newsletters, and other methods to inform lake visitors about invasives and removing aquatic hitchhikers.	FLMD Town of Hancock Town of Deerfield	UWEX Lakes – informational materials	Ongoing
Inform property owners of the importance of aquatic vegetation and to refrain from removing native aquatic vegetation to reduce AIS colonization.	FLMD	UWEX Lakes – informational materials	Ongoing
Learn to identify AIS and routinely look for it.	Shoreland property owners Lake users	RC&D	Ongoing
Routinely monitor for AIS in Fish Lake.	Shoreland property owners Lake users	WDNR Lake Specialist RC&D	Ongoing
If new species are identified, work with area lakes to apply jointly for a grant to hire divers to remove plants by hand-pulling.	FLMD	WDNR Lake Specialist RC&D	As needed

Critical Habitat

Critical habitat areas are designated by the WDNR to protect features in a lake that are important to the overall health of the aquatic plants, animals, and lake itself. Every lake contains important natural features, but not all lakes have official critical habitat designations. Designating areas of the lake in this way creates special protections for these areas, and recognizes these areas by mapping and sharing information about them so many can know the locations and importance of areas that could be vulnerable to damage by human activity. Critical habitat designations on a lake can help lake groups and landowners plan waterfront projects to protect habitat that will help to ensure the long-term health of the lake.


Photo courtesy of Doris Russell

Although Fish Lake does not have an official critical habitat area designation, largely natural areas such as the far western shore of Fish Lake are important for fish and wildlife. Key elements of good quality habitat include 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. Identifying other important habitat areas around the lake and informing lake users of their value can help raise awareness for the protection of these areas.

Guiding Vision for Fish Lake's Critical Habitat

Sensitive areas on Fish Lake will be enhanced and protected from degradation.

Goal 4. Preserve and redevelop high quality habitat for fish and wildlife.

Objective 4.1. Identify critical habitat on Fish Lake.

Actions	Lead person/group	Resources	Timeline
Request a Critical Habitat Designation from WDNR.	FLMD	WDNR Lake Manager	
Support landowners around the lake who express interest in placing undeveloped land into a conservation program (conservation easements, sale of land for protection, deed restriction, purchase of development rights, etc.).	FLMD	NCCT WDNR Lake Protection Grant Knowles-Nelson Stewardship Fund	As needed

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. Wastewater, animal waste, and fertilizers used on lawns, gardens and crops can contribute nutrients that enhance the growth of algae and aquatic plants in our lakes. 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 water's edge. 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 Fish 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 Fish Lake was assessed by measuring different characteristics including temperature, dissolved oxygen, water clarity, water chemistry, and algae. All of these factors were taken into consideration when management planning decisions were made.

Water Quality

All respondents to the Fish Lake citizen survey indicated water quality had an impact on their personal enjoyment and economic value of the lake. Sixty percent of respondents believed water quality had deteriorated during their time visiting or living at the lake, with water level changes, agriculture, fertilizers, and heavy recreational use being the most commonly identified reasons.

A variety of water chemistry measurements were used to characterize the water quality in Fish 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. Water quality data collected in past years was also reviewed to determine trends in Fish Lake's water quality.

Dissolved oxygen is an important measure in Fish 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. Water temperature and dissolved temperature were measured in the east lobe of Fish Lake from top to bottom at the time of sample collection. During spring and fall, data indicated the lake mixed from top to bottom, bringing nutrients and minerals to the top and replenishing oxygen towards the bottom. Fish Lake was stratified (layered) by June during both study years. In the east lobe, the water column contained enough oxygen to support the fish community year-round. On occasion, the west basin is at risk for winter fish kills; however, fish may seek refuge from low oxygen concentrations in the west lobe by traveling to the east lobe (Bartz and Bunde, 2013). It would be beneficial to monitor dissolved oxygen concentrations during the winter to alert biologists if problematic concentrations are occurring.

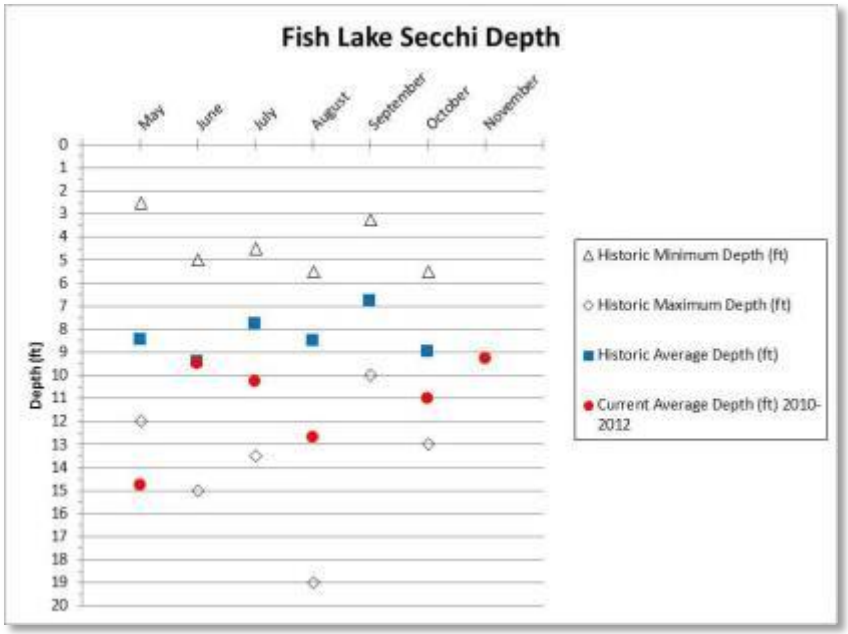


Figure 1. Water clarity in Fish Lake. Historic data range was 1991-2001.

In general, water clarity measured in Fish Lake was considered good. Water clarity ranged from 4.7 feet on November 16, 2010 to 20 feet on August 7, 2012. When compared with past average monthly water clarity (1991-2001), the average water clarity measured during the 2010-2012 study was better for all months sampled except June, when the averages were similar.

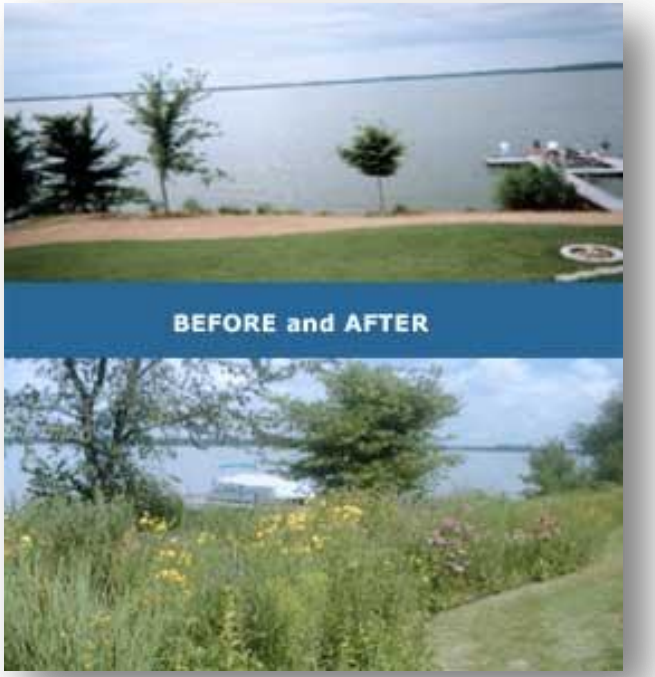
Chloride, sodium and potassium concentrations are commonly used as indicators of how a lake is being impacted by human activity. The presence of these compounds where they do not naturally occur indicates sources of water contaminants. Fish Lake had slightly elevated chloride and sodium concentrations 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, land animal waste and/or septic system effluent may be entering the lake from either surface runoff or via groundwater.

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

Atrazine, an herbicide commonly used on corn, was found in Fish Lake (0.05 µg/L and 0.1 µg/L DACT). Some toxicity studies have indicated that reproductive system abnormalities can occur in frogs at these levels (Hayes et al., 2003). The presence of this chemical suggested agricultural activities in the surrounding landscape may be impacting the lake. Private well owners should consider testing their well water, as there are health concerns associated with atrazine

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 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. The summer median total phosphorus concentrations were 13 µg/L and 10 µg/L in 2011 and 2012, respectively. This is below Wisconsin's phosphorus standard of 20 µg/L for deep seepage lakes.



Estimates of phosphorus from the landscape can help to understand the phosphorus sources to Fish 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 through groundwater. The types of land management practices that are used and the distance 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 Fish Lake. The phosphorus contributions by land use category, called phosphorus export coefficients, are shown in Appendix C. Phosphorus Modeling. The phosphorus export coefficients were obtained from studies throughout Wisconsin (Panuska and Lillie, 1995). Although sources of phosphorus from agriculture and development exist in the Fish Lake watershed, hard water (from calcium in the groundwater) in Fish Lake has helped to buffer the effects. This was evidenced by the lower measures of algae and the general low density of aquatic plants observed during the survey.

Nitrogen is another primary nutrient required for algal and aquatic plant growth. It enters lakes in runoff or groundwater from human-related sources such as fertilizer, septic systems, animal waste, and soil erosion. Inorganic nitrogen includes forms of nitrogen that are most readily available for use by plants. In Fish Lake, concentrations of inorganic nitrogen measured during the study were elevated with average concentrations of 0.3 mg/L during the spring. In spring, concentrations above 0.3 mg/L are sufficient to fuel algal blooms throughout the summer (Shaw et al., 2000).

Reducing runoff and managing nitrogen, phosphorus and soil erosion throughout the Fish Lake watershed is one of the keys to protecting the lake itself. Near shore activities that may reduce runoff and nutrients to the lake include the use of lake-friendly land management decisions, such as maintaining healthy shoreland vegetation, eliminating/reducing use of fertilizers, proper management of animal waste and septic systems, controlling runoff from impervious surfaces and the use of water quality-based management practices. Over-application of chemicals and nutrients should be avoided. Landowners throughout the watershed should be made aware of their connection to Fish Lake and should work to reduce their impacts through the implementation of best management practices.

Guiding Vision for Water Quality in Fish Lake

Fish Lake will remain a lake with clean, clear water with minimal contaminants.

Goal 5. Improve the quality of water in Fish Lake.

Improve (decrease) current inorganic nitrogen concentrations (0.29), and maintain below 0.3 mg/L. Maintain summer median phosphorus concentrations below 15 ug/L.

Objective 5.1. Make changes in land management practices that lead to improved water quality in Fish Lake.

Actions	Lead person/group	Resources	Timeline
County staff will offer support to property owners for water quality-based best management practices near shore and in the Fish Lake watershed.	WCLCD	Funding from County, DATCP, and other grants NRCS	Ongoing
Support property owners who wish to install rain gardens, pervious surfaces, rain barrels, and other shoreland best management practices.	FLMD Shoreland property owners	WCLCD WDNR Healthy Lakes grants	Ongoing
Minimize any new impervious surfaces near the lake and mitigate what is already in place.	FLMD Shoreland property owners	WCLCD WDNR Healthy Lakes grants	Ongoing
Test soil to determine if fertilizer is needed and limit applications to test recommendations (near shore and in the watershed).	Individuals	WC UWEX	Ongoing
Limit the use of chemicals on the landscape and avoid over-application to reduce impacts to Fish Lake. Emphasis should be placed on reducing excess nitrogen and herbicide/pesticide leaching to groundwater.	FLMD Individuals	WCLCD WC UWEX Ag Agent NRCS	Ongoing

Objective 5.1. Continue current monitoring initiatives and begin collecting data has not routinely been recorded.

Actions	Lead person/group	Resources	Timeline
Continue monitoring water clarity. Work with the Citizen Lake Monitoring Network (CLMN) Coordinator for Waushara County for training.	FLMD	CLMN Coordinator	Ongoing 5 times/summer
Monitor water chemistry each year (total phosphorus 3 samples/summer). Continue spring and fall overturn sampling for phosphorus and nitrogen.	FLMD	CLMN Coordinator WEAL or other state-certified lab	2016 and ongoing
Encourage private well owners to have their well water tested for nitrates and atrazine.	FLMD	WEAL or other state-certified labs	Annually (different seasons)
Monitor dissolved oxygen (with depth) during the winter to determine if problem conditions exist. Work with WDNR fishery biologist to identify thresholds to contact them about low concentrations.	FLMD	WCLCD (dissolved oxygen meter) WDNR Fisheries Biologist	End of winter
Monitor ice on/ice off to evaluate changes in the growing season.	FLMD	CLMN	Spring and Fall
Track water levels over time by monitoring the groundwater monitoring well near Fish Lake.	FLMD	WCLCD	Ongoing
Submit collected data to WDNR for storage and evaluation.	FLMD	FMLD	Ongoing

Objective 5.2. Minimize impacts to Fish Lake from nearby septic systems.

Actions	Lead person/group	Resources	Timeline
Remind lake residents to regularly pump their septic systems and have them inspected. Support the County in enforcement.	FLMD	WC Planning & Zoning	Every 3 years
Refrain from flushing hazardous chemicals or cleaning products (scrubbing bubbles, motor oil, pesticides, etc.) down the drain.	FLMD	UWEX Lakes – informational materials	Ongoing

Water Quantity

Fish Lake has experienced declining water levels in recent years, which is of concern to Fish Lake residents and visitors. The annual precipitation for Wautoma has been average and in some years above average since 2006 (Kraft et al., 2014). In Waushara County, some of the seepage lakes have historically experienced fluctuations in water levels, and plants have adapted to these fluctuations for survival. Excess withdrawal of groundwater can add to these natural fluctuations, affecting the extent and duration of low water levels (Kraft, 2014). The planning committee for Fish Lake envisions improved water levels in Fish Lake through the maintenance of groundwater levels and limitations on groundwater withdrawals in the surrounding area.

When water levels are low, lakebed (anything below the ordinary high water mark) is often exposed. Exposed lakebeds remain public property; however, shoreland property owners can access this area. These are fragile areas, which provide habitat when water levels rebound. Therefore, care

should be taken to avoid "cleaning up" the exposed area, especially woody structure. In Waushara County, the endangered species, Facette's Locoweed grows on some of the lakes' exposed shorelines, including Huron. Care should be taken to protect these unique species. Activities such as cutting an area larger than 30 feet wide, driving a motor vehicle on the lakebed, tilling, and chemically treating vegetation if the area is wet should be avoided, if possible. If there is reason for one of these activities, a permit from the WDNR is required. In addition to water quality and habitat benefits, maintaining healthy shoreland vegetation will help to keep the shoreline from eroding during periods of low water.

Guiding Vision for Water Quantity

Fish Lake will have typical historic water levels at or near the ordinary high water mark.

Goal 6. Fish Lake will have water levels with natural fluctuations.

Objective 6.1. Minimize impacts to Fish Lake during times of low water levels.

Actions	Lead person/group	Resources	Timeline
Refrain from the removal and disturbance of exposed lakebed vegetation and/or woody habitat (sticks, logs, etc.), especially during periods of low water.	Shoreland property owners	WCWLC UWEX Lakes – info materials	As needed
Minimize disturbance to the exposed lakebed. Refrain from driving on it, raking it, burning fires, "cleaning up", etc.	Shoreland property owners	WCWLC UWEX Lakes – info materials	As needed

Objective 6.2. Understand water fluctuations (natural vs. manmade) in and near Fish Lake.

Actions	Lead person/group	Resources	Timeline
Provide information to FLMD members via website and/or email on what is currently happening with water withdrawals and impacts on lake levels.	FLMD	UWEX – info materials	Ongoing
Continue monitoring lake levels (via monitoring well installed in 2014) in Fish Lake, share information with FLMD members.	FLMD	WCLCD	Ongoing

Objective 6.3. Work with citizens and elected officials to ensure that Fish Lake has "normal" lake levels.

Actions	Lead person/group	Resources	Timeline
Connect with other lake groups and organizations in the area focused on water level/groundwater issues in Central Wisconsin.	FMLD	WCWLC Friend of Central Sands Wisconsin Lakes	Ongoing-as needed

Work with other lake organizations/lake residents/agriculture on groundwater legislation and to reduce groundwater withdrawals.	FLMD	WCWLC Friends of Central Sands Wisconsin Lakes	Ongoing
Work with local legislators on groundwater legislation; give legislators more support and representation at discussions on groundwater issues related to water withdrawal.	FMLD	Town, Village, County elected officials State and Federal legislators	Ongoing

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 water's edge.

To better understand the health of Waushara County lakes, shorelands were evaluated. The survey inventoried the type and extent of shoreland vegetation. Areas with disturbance such as erosion, rip-rap, barren ground, seawalls, structures and docks were also inventoried. A scoring system was developed by the County for the collected data to provide an overall score. This plan identifies strategies to keep healthy shoreland healthy and suggestions to improve areas with potential problems. 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. Lower scores signify aspects of a less healthy shoreline. These are areas where adjustments in management and/or mitigation practices may be employed to improve water quality and habitat.

The summary of scores for shorelands around Fish Lake is displayed on the map in Appendix D. Shoreland Survey – 2011, along with a more complete description of the shoreland survey. Much of the southern shoreland of Fish Lake is in good to moderately good shape, but several segments along the northern shore have challenges that should be addressed. A few short segments along the northern shore of Fish Lake were ranked as poor.

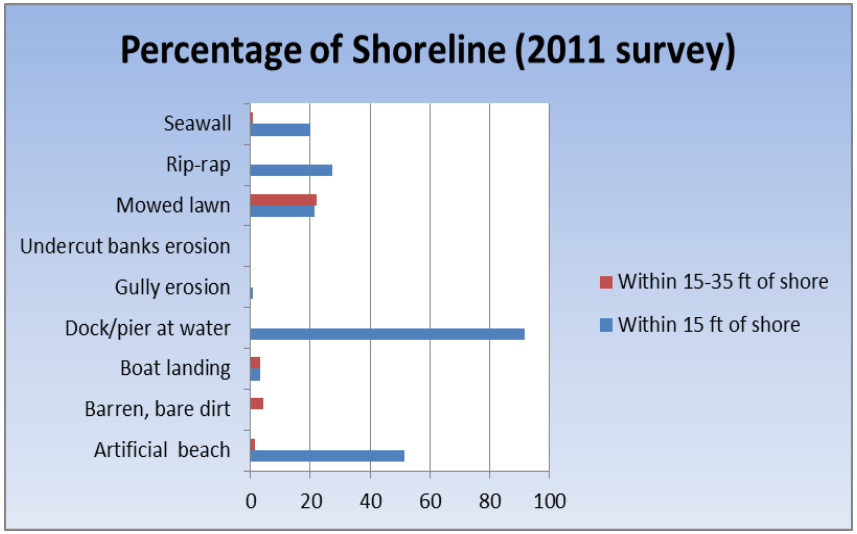


Figure 2. Percent of shoreland disturbance around Fish Lake, 2011.

Shoreland ordinances were enacted to improve water quality and habitat, and to protect our lakes. State (NR 115) shoreland ordinances declare that vegetation should extend at least 35 feet inland from the water's edge, with an optional 30-foot wide access corridor allowed for each shoreland lot. With a total of 105 lakefront lots around Fish Lake, 3,150 feet (16%) of shoreland access would be permitted. Based on the 2011 shoreland inventory, 4,245 feet (21%) of the shoreland was mowed to the water's edge.

Guiding Vision for Fish Lake's Shorelands

Fish Lake will have a shoreland that provides aesthetic beauty, and benefits water quality and habitat for birds, frogs, and other animals that use or live near shore.

Goal 7. Shorelands around Fish Lake will become increasingly healthy over time.

Approximately 1,095 feet of shoreland are currently in need of restoration; over the next five years, 30% (329 feet) of mowed shoreland will be restored.

Objective 7.1. Fish Lake shoreland property owners will be knowledgeable about and make good decisions about shoreland practices that result in good water quality and habitat.

Actions	Lead person/group	Resources	Timeline
Provide informational materials to all shoreland property owners about basic lake stewardship including healthy shorelands and their composition (wildflowers, shrubs, trees, etc.).	FLMD	WCWLC UWEX Lakes – info materials	Ongoing
Encourage and support shoreland property owners interested in shoreland restoration.	FLMD Shoreland property owners	UWEX Lakes – info materials WCLCD Consultants WDNR Healthy Lakes Grants	Ongoing
Consider restoring and showcasing a "demonstration site" with a sign at the water's edge about shoreland restoration and/or hosting a "shoreland tour".	FLMD Town of Deerfield Town of Hancock Shoreland property owners	WCLCD UWEX Lakes Consultants	2016
Host a speaker/demonstration: how to restore your shoreline.	FLMD	WCLCD UWEX Lakes-Patrick Goggin Consultants	2016
Encourage those interested in shoreland restorations to contact the WCLCD for available resources.	FLMD	WCLCD WDNR Healthy Lakes Grants	Ongoing

Watershed Land Use

It is important to understand where Fish 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 Fish 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 used 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, using cover crops, strategic crop rotation, reduced tilling, 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 drain field, protecting/restoring wetlands and native vegetation in the shoreland, and using erosion control practices.

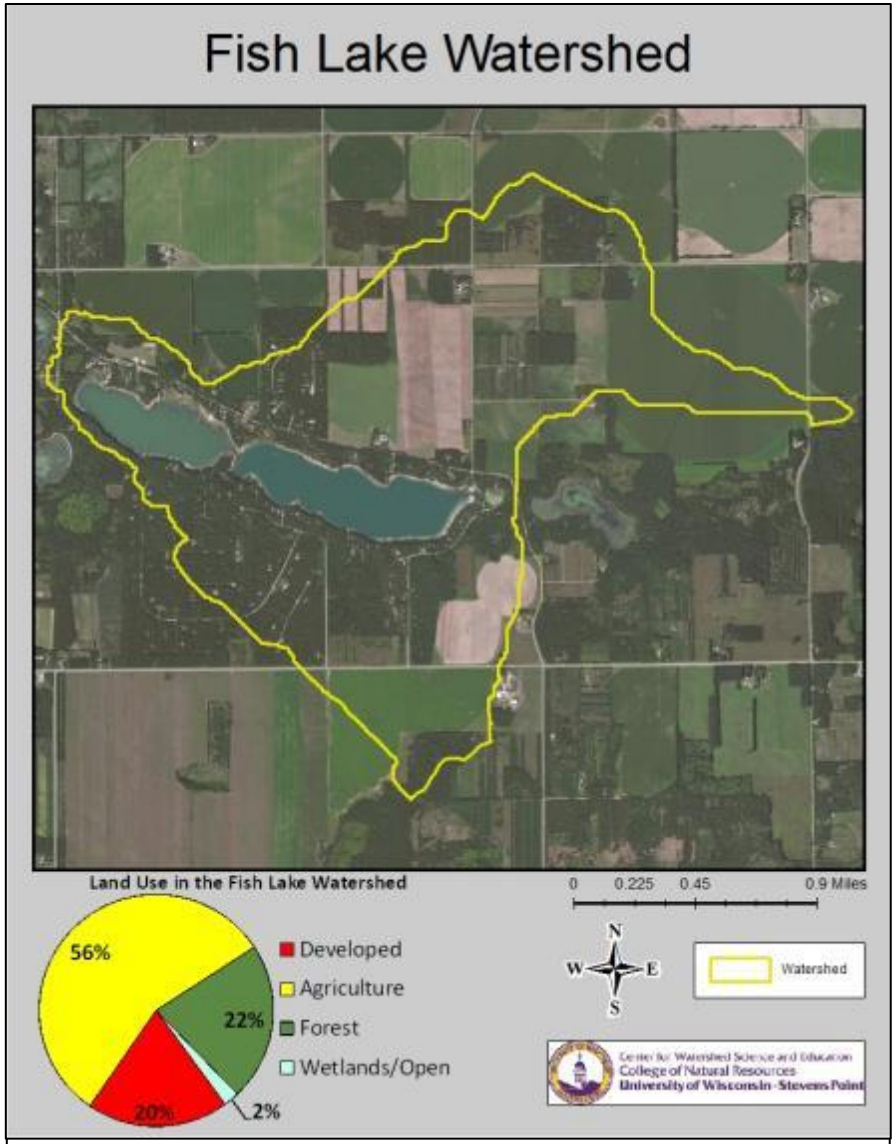


Figure 3. Surface watershed of Fish Lake.

The surface watershed for Fish Lake is approximately 2,112 acres. The primary land use is agriculture followed by forests and developed land (Figure 3). The lake's shoreland is surrounded primarily by developed land, forest, and wetlands. In general, the land closest to the lake has the greatest immediate impact on water quality. Modeling results suggest that developed land and agriculture have the greatest contributions of phosphorus in the lake (see Appendix C. Phosphorus Modeling).

Guiding Vision for Fish Lake's Watershed

Land use practices in the Fish Lake watershed will be conducted in ways that minimize impacts to Fish Lake.

Goal 8. Support water-friendly land management practices around the lake throughout the watershed.

Objective 8.1. Citizens, and staff from the County, Towns and local municipalities will work together to encourage land management practices that are beneficial to Fish Lake.

Actions	Lead person/group	Resources	Timeline
Waushara County will provide support for water-quality based best management practices within the watershed.	WCLCD	County board supervisors Funding from County, DATCP, and grants NRCS	Ongoing
Encourage the county and towns to work with developers to consider conservation-friendly options (conservation design, density bonus, etc.).	FLMD	WCLCD WC Planning and Zoning Towns of Deerfield and Hancock	As needed
The County, Towns, and Village will engineer roads near the lake to better protect lake water quality by reducing direct runoff to the lake (swales, etc.).	WC Highway Dept. Towns of Deerfield and Hancock Village of Hancock	WCLCD FLMD	As needed
Support property owners that are interested in the placement of private land into conservation programs such as conservancy easements, purchase of development rights, and sale of land for protection.	FLMD	NCCT WDNR Lake Protection Grants Wisconsin's Knowles-Nelson Stewardship Funds	Ongoing
Encourage all property owners in the watershed to test their soil before applying fertilizer.	FLMD WCWLC	WC UWEX	Ongoing

Objective 8.2. Support the health of watershed residents by identifying or reporting where potentially harmful chemicals are being used.

Actions	Lead person/group	Resources	Timeline
Contact the County Health Department with concerns regarding aerial broadcast chemical applications near homes.	Individuals	WC Health Department DATCP	Ongoing
Encourage private well owners to test their well water for nitrates and atrazine.	Individuals FMLD	WEAL or other certified lab UWEX Groundwater Educator	Annually (different seasons)

People and the Lake

Fish Lake has attracted people for centuries. Whistler Mound Group and Enclosure, a sacred site and burial grounds, is located on the western end of Fish Lake. The people that interact with the lake are a key component of the lake and its management. In essence, a lake plan is a venue by which people decide how they would like people to have a positive influence on the lake. This plan summarizes the decisions of the people about how to take proactive steps to improve their lake individually and as a community. Individual decisions by lake residents and visitors can have positive impacts on the lake and on those who enjoy this common resource. Collective or collaborative efforts may have even greater positive impacts; therefore, communication and cooperation between the FLMD, community, land, water, and wildlife managers, elected officials, and suite of lake users are essential to maximize the effects of plan implementation.

There are many ways to build a lake community and the collective knowledge about good lake stewardship. This plan identifies a variety of means to communication which include disseminating Information through mailings, websites, demonstration projects, speakers, and meetings of lake residents and/or other lake enthusiasts. Social events such as picnics or outings are other community-building examples. 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.


Photo courtesy of Doris Russell

Recreation

Fish Lake provides a setting which is enjoyed by family, friends, and individuals who swim, boat, fish, and appreciate its beauty. Wildlife watching, nature, tranquility, and family heritage were qualities about Fish Lake that were identified by committee members and survey respondents. In addition to the fishing that is its namesake, many visitors enjoy the sandy beach and clear water.

Public boat launches are located on each of the lake's two basins; they are owned and managed by the Town of Deerfield and the Town of Hancock. No wake boating hours

are from 4 p.m. to 10 a.m., and are posted at the public boat landings. A clear majority of survey respondents liked the current boating hours. There is no designated speed limit; however, nearly one-half of respondents felt there probably should be one. Many people did not experience a lot of conflicts with others on the lake, but some indicated they are uncomfortable with jet skis and/or fast boats. It was also clear, both in survey responses and in discussions with participants at the July 22, 2014 fishery and recreation planning session, that the shallowness of the connection between the two basins had greatly altered the recreational character of the lake. Current conditions limit navigation through this channel by most boats, which has effectively cut the lake in half and reduced the use of the overall acreage.

Guiding Vision for Recreation

Fish Lake will be valued for its great boating and fishing opportunities, swimming, paddling and relaxation.

Goal 9. Ensure safe access to Fish Lake.

Objective 9.1. Improve lake access, particularly with regard to lowering water levels and the east basin.

Actions	Lead person/group	Resources	Timeline
Explore options for extending boat ramp and/or creating a channel for boats to launch. Consider construction using alternative materials to concrete (such as gravel).	FLMD Town of Deerfield	Local fishing clubs WDNR Fisheries Biologist	
Continue to explore options for dredging the connection between the lake's two basins to ensure access by boats.	FLMD	WDNR Lake Specialist WDNR Fisheries Biologist	

Objective 9.2. Nurture an environment of minimal conflict amongst lake users.

Actions	Lead person/group	Resources	Timeline
Work with the Towns to ensure the continuation of boat patrol on the lake, especially during busy times.	FLMD Town of Deerfield Town of Hancock	WC Sheriff WDNR Warden	Ongoing
Post signage at public accesses emphasizing respectful use of Fish Lake and information about wake hours.	Town of Deerfield Town of Hancock	FLMD	As needed
Develop a neighborhood watch and Inform residents who to contact if they observe something that impacts public safety.	FLMD	WC Sheriff WDNR Warden	Ongoing
Work with Hancock Trailer Park to develop lake association membership amongst its campers/renters to encourage inclusiveness and a stake in lake health for all residents.	FLMD		Ongoing

Communication and Organization

Working together on common values will help to achieve the goals that are outlined in this plan. Maintaining communication among the FLMD member, with other lake groups and specialists in and beyond Waushara County is essential for the implementation of this plan. Many of the goals outlined in this plan focus on sharing 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 Fish Lake enjoyed by many people. Social events attract more people and help to build community.

Fish Lake is unique in that four different organizations are involved with the lake: the Fish Lake Management District, the Greenwood Acres Association, Inc., the Hancock Pine Lake Association, and the Village of Hancock. The Fish Lake Management District hosts a website that is currently excellently maintained, with meeting minutes, photos of the lake (present and historic), information on lake levels, fish survey information, and more.

Guiding Vision for Communication

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

Goal 10. Increase participation in lake stewardship.

Objective 10.1. Develop opportunities for exchange of ideas and information among full and part-time residents of Fish Lake.

Actions	Lead person/group	Resources	Timeline
Maintain the FLMD website to provide a common source of communication (www.fishlakemanagement.org).	FLMD		Ongoing
Maintain an email list of shoreland property owners and others interested in Fish Lake. Solicit participation in email list at annual meeting and on website.	FLMD	WC UWEX	Ongoing
Continue to distribute a welcome packet/mailing to all new shoreland property owners with basic lake stewardship information/brochures.	WC	WCWLC UWEX Lakes	Ongoing
Host an annual meeting to discuss lake management and opportunities for shoreland property owners.	FLMD	Varies by topic	Annually
Host gatherings to learn about topics identified in this LMP. Invite speakers or conduct demonstrations.	FLMD	Varies by topic	Annually
Communicate about updates to this LMP and management activities to residents, lake users, and other organizations interested in Fish Lake.	FLMD	WCLCD WDNR Lake Manager	Ongoing

Objective 10.2. Achieve good communication with clubs, municipalities, agency staff, elected officials, and organizations interested in Fish Lake or lake health.

Actions	Lead person/group	Resources	Timeline
Network with other lake groups in Waushara County by having Fish Lake represented on the WCWLC.	FLMD	WC UWEX WCWLC	Quarterly
Encourage FLMD members to subscribe to "Lake Tides" Newsletter.	FLMD	UWEX Lakes	
Network with other lakes in the state to learn lake management strategies, etc. by having a representative attend the Wisconsin Lakes Convention.	FLMD	UWEX Lakes	Annually in spring
Encourage FLMD members to attend the Lake Leaders Institute.	FLMD	UWEX Lakes	Bi-annually – even numbered years

Updates and Revisions

This 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

Fish Lake will have an up-to-date, accurate and comprehensive LMP that is reviewed annually and documents all management activities and results.

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

Objective 11.1. Communicate updates with community members and members of the Association.

Actions	Lead person/group	Resources	Timeline
Communicate with land and lake managers, municipalities, and others identified in this LMP to obtain updates and identify upcoming projects.	FLMD	WCLCD, WC UWEX, Municipalities WDNR Lake Specialist and Fisheries Biologist	As needed
Review plan at annual meeting and discuss accomplishments and identification of goals for upcoming year.	FLMD		Annually
Formally update this LMP every 5 years.	FLMD	WCWLC WC UWEX	2019

Governance

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

LMP Approval

The draft LMP will be completed by the lake association/district board, a committee, or a committee of the whole. The final draft of the LMP 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 LMP 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 LMP or parts of the plan in their comprehensive plan to guide municipal or county decisions.

Lake Assistance

The LMP will enhance the ability of the lake to apply for financial assistance. The LMP 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 LMP is superseded by federal, state, county, and municipal laws and court rulings. However, the LMP may influence county and municipal ordinances and enforcement, which is why the LMP 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 LMP 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 LMP to determine if it is consistent with the municipality's comprehensive plan. If the LMP 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 LMP be revisited. When the Municipal Plan Commission has reached a consensus that the LMP aligns with the municipality's vision, the Municipal Plan Commission will develop an amendment to the comprehensive plan referencing the LMP. This could include a reference to the LMP under local policies in the agricultural, natural and cultural resources background information and the addition of a recommendation to support the LMP 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 LMP 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 LMP 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 LMP 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 include a reference to the LMP under local policies in the agricultural, natural and cultural resources background information and the addition of a recommendation to support the LMP 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 LMPs 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 LMPs 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 LMP 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 LMP 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 LMP when considering regulation or action that may impact the lake. The lake organization will inform the Municipality and the County when the LMP is updated and allow the Municipality and County an opportunity to participate in the update process.

References

Bartz, Dave and S. Bunde, 2013. Fish Lake Fisheries Survey Summary Report—2013. Wisconsin Department of Natural Resources.

Bartz, David, 2014. Fisheries of Fish and Pine Lakes. Presentation given at the Hancock Community Center on July 22, 2014.

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.

Golden Sands Resource Conservation & Development Council, Inc., 2014. Aquatic Macrophyte Survey of Fish Lake, Waushara County, Wisconsin.

Haney, Ryan, 2014. Water Quality in Fish and Pine Lakes. Presentation given at the Hancock Community Center on August 21, 2014.

Hayes, T., K. Haston, M. Tsui, A. Hoang, C. Haeffele and A. Vonk. 2003. *Atrazine-Induced Hermaphroditism at 0.1 PPB in American Leopard Frogs (Rana pipiens): Laboratory and Field Evidence.* Environmental Health Perspectives 111: 568-575.

Hayes, T.K. A. Collins, M, L., Magdelena Mendoza, N. Noriega, A. A. Stuart, and A. Vonk. 2001. *Hermaphroditic, demasculinized frogs after exposure to the herbicide atrazine at low ecologically relevant doses*. National Academy of Sciences vol. 99 no. 8, 5476–5480.

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Kraft, G., D. Mechenich, and J. Haucke. 2014. *Information Support for Groundwater Management in the Wisconsin Central Sands, 2011-2013*. University of Wisconsin – Stevens Point / Extension.

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.

Shaw, B., C. Mechenich, and L. Klessig, 2000. *Understanding Lake Data*. University of Wisconsin-Extension, Stevens Point. 20 pp.

Stushek, Kaycie, 2014. AIS in Fish and Pine Lakes. Presentation given at the Hancock Community Center on September 23, 2014.

Turyk, Nancy, 2014. Healthy Land = Healthy Water. Presentation given at the Hancock Community Center on August 21, 2014.

Turyk, Nancy, 2014. The Aquatic Plants of Fish and Pine Lakes. Presentation given at the Hancock Community Center on September 23, 2014.

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

UW-Stevens Point Center for Watershed Science and Education, 2013. Waushara County Lakes Study - Fish Lake Summary. 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. 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

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, Signage, Permissions (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

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)

Contact the clerk for the specific town/village in which the boat landing is located.

Citizen Lake Monitoring Network
Contact: Brenda Nordin
Wisconsin Department of Natural Resources
Phone: 920-662-5141
E-mail: brenda.nordin@wisconsin.gov

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 St, PO Box 487, Wautoma, WI 54982
Phone: 920-787-0416
E-mail: ken.williams@ces.uwex.edu
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

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

Groundwater Levels/Quantity (cont'd)

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
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: 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/

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

Land Use Plans and Zoning Ordinances (cont'd)

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

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/

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

If you are looking for any information that is not listed in this directory, please contact:
Ryan Haney (wclakes@uwsp.edu)
UWSP Center for Watershed Science and Education
TNR 224, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-2497

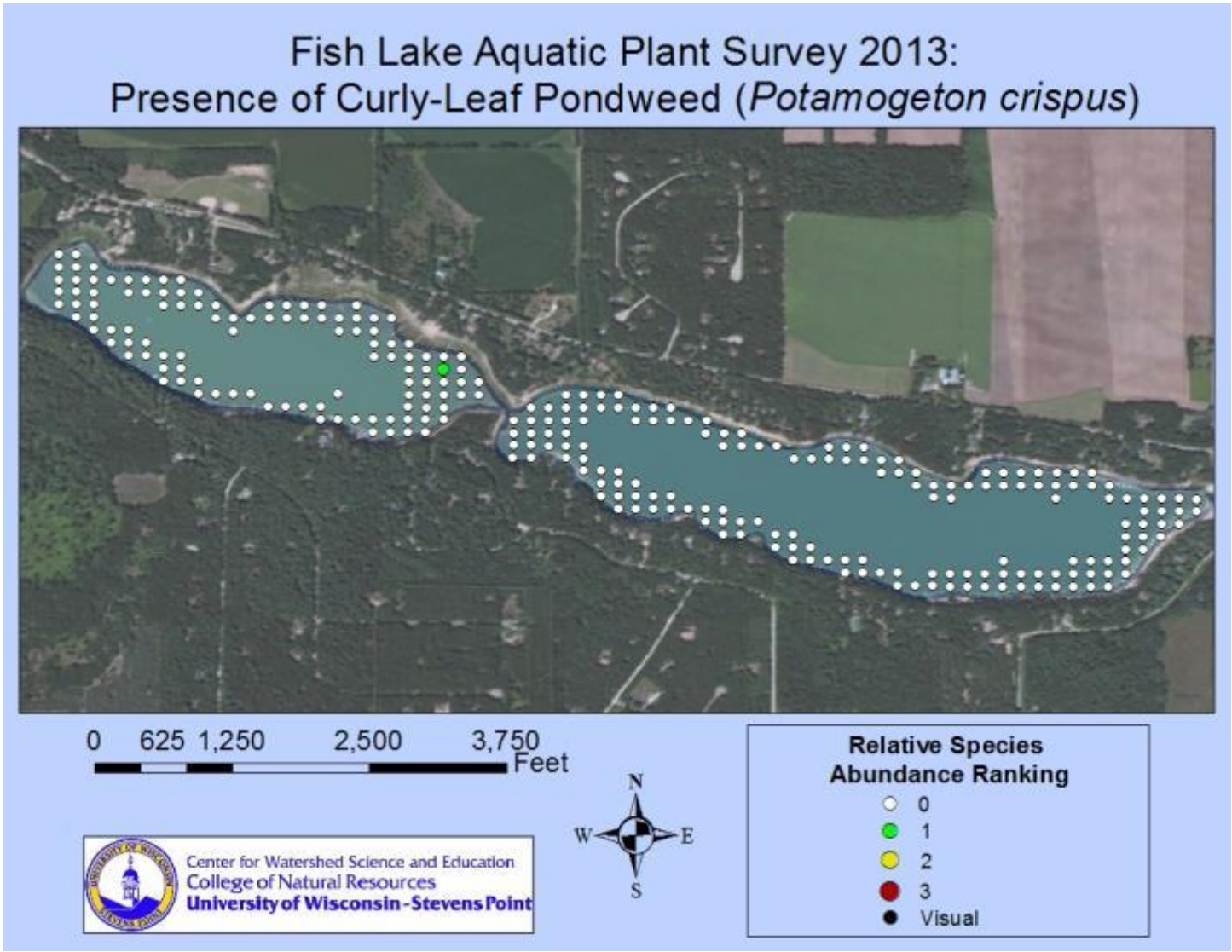
Appendix B. Aquatic Plants

Fish Lake aquatic plant survey summary, 2013.

	Lake Average	Statewide Average	North Central Hardwood Forests Ecoregion Average
Littoral Frequency of Occurrence (%)	82.33	74.3	76
Maximum Depth of Plant Growth (ft)	26	15.3	15.9
Species Richness (Including visuals)	20	16.8	16.2
Floristic Quality Index (FQI)	24	24.1	23.3

Frequency of occurrence of aquatic plant species observed in Fish Lake, 2013.

Scientific Name	Common Name	Coefficient of Conservatism Value (C Value)	2013 % Frequency of Occurrence
Floating Leaf Species			
Nymphaea odorata	White water lily	6	0.46
Submergent Species			
Chara	Muskgrasses	7	55.25
Ceratophyllum demersum	Coontail	3	36.99
Najas guadalupensis	Southern naiad	8	26.48
Vallisneria americana	Wild celery	6	26.03
Potamogeton richardsonii	Clasping-leaf pondweed	5	17.81
Potamogeton friesii	Fries' pondweed	8	11.87
Potamogeton zosteriformis	Flat-stem pondweed	6	10.96
Najas flexilis	Slender naiad	6	9.13
Potamogeton gramineus	Variable pondweed	7	7.76
Stuckenia pectinata	Sago pondweed	3	7.31
Potamogeton strictifolius	Stiff pondweed	8	2.74
Elodea canadensis	Common waterweed	3	2.28
Potamogeton foliosus	Leafy pondweed	6	1.83
Myriophyllum sibiricum	Northern watermilfoil	6	0.91
Potamogeton crispus	curly-leaf pondweed	0	0.46
Potamogeton praelongus	White-stem pondweed	8	0.46



Location of curly-leaf pondweed encountered in the 2013 aquatic plant survey conducted by Golden Sands Resource Conservation & Development Council, Inc.

General recommendations:

- Reduce nutrients traveling to the lake from the landscape.
- Avoid increasing algal blooms by maintaining a healthy amount of aquatic plants.
- Don't denude the lakebed.
    - Increases potential for aquatic invasive species establishment.
    - Sediments can add phosphorus to the water which may lead to increased algal growth.
- Choose options that are appropriate for your lake's situation.
- Monitor and adjust your strategies if you are not making headway!

List of Aquatic Plant Management Options (selection of options varies with situation):

No Action

ADVANTAGES	LIMITATIONS
∗ No associated cost. ∗ Least disruptive to lake ecosystem.	∗ May not be effective in achieving aquatic plant management objectives.

Hand Pulling

ADVANTAGES	LIMITATIONS
∗ Can be used for thinning aquatic plants around docks. ∗ Can target specific plants - with proper training. ∗ Can be effective in controlling small infestations of aquatic invasive species. ∗ No associated cost.	∗ Removes near-shore wildlife and fish habitat. ∗ Opens up areas where invasives can become established. ∗ If aquatic invasive species are not pulled properly, could worsen the problem.

Hand Pulling Using Suction

ADVANTAGES	LIMITATIONS
∗ Can be used for thinning plants around docks. ∗ Can be used in deeper areas (with divers). ∗ Can target specific plants with proper training. ∗ Can be effective in controlling small infestations of aquatic invasive species. ∗ May be useful in helping to remove upper root mass of aquatic invasive species.	∗ Costs associated with hiring a diver may be comparable to chemical treatment expenses. ∗ Currently an experimental treatment – not readily available. ∗ If aquatic invasive species are not pulled properly, could worsen the problem.

Mechanical Harvesting

ADVANTAGES	LIMITATIONS
∗ Removes plant material and nutrients. ∗ Can target specific locations. ∗ Used to manage larger areas for recreational access or fishery management.	∗ Not used in water depths less than 3 feet. ∗ Some harm to aquatic organisms. ∗ Is a temporary control. ∗ Risk of introduction of new aquatic invasive species (on a hired harvester) or spread of some existing invasive species. ∗ Hired cost at least $150/hr.

Water Level Manipulation

ADVANTAGES	LIMITATIONS
∗ Controls aquatic plants in shallower, near-shore areas. ∗ Can be low cost.	∗ Requires a controlling structure on the lake. ∗ May cause undesired stress on ecosystem. ∗ Cannot be used frequently.

Milfoil Weevils

ADVANTAGES	LIMITATIONS
∗ Natural, native maintenance of native and exotic milfoils. ∗ Prefers the aquatic invasive Eurasian Watermilfoil. ∗ Some lakes may already have a native population; need a professional stem count and assessment of shoreland health, structure of fishery, etc. ∗ Doesn't harm lake ecosystem.	∗ Require healthy shoreline habitat for overwintering. ∗ Cannot survive in areas of mechanical harvesting or herbicide application. ∗ Effectiveness highly variable between lakes (only works well for some lakes). ∗ Limited access to weevils for purchase in WI. ∗ Still considered experimental.

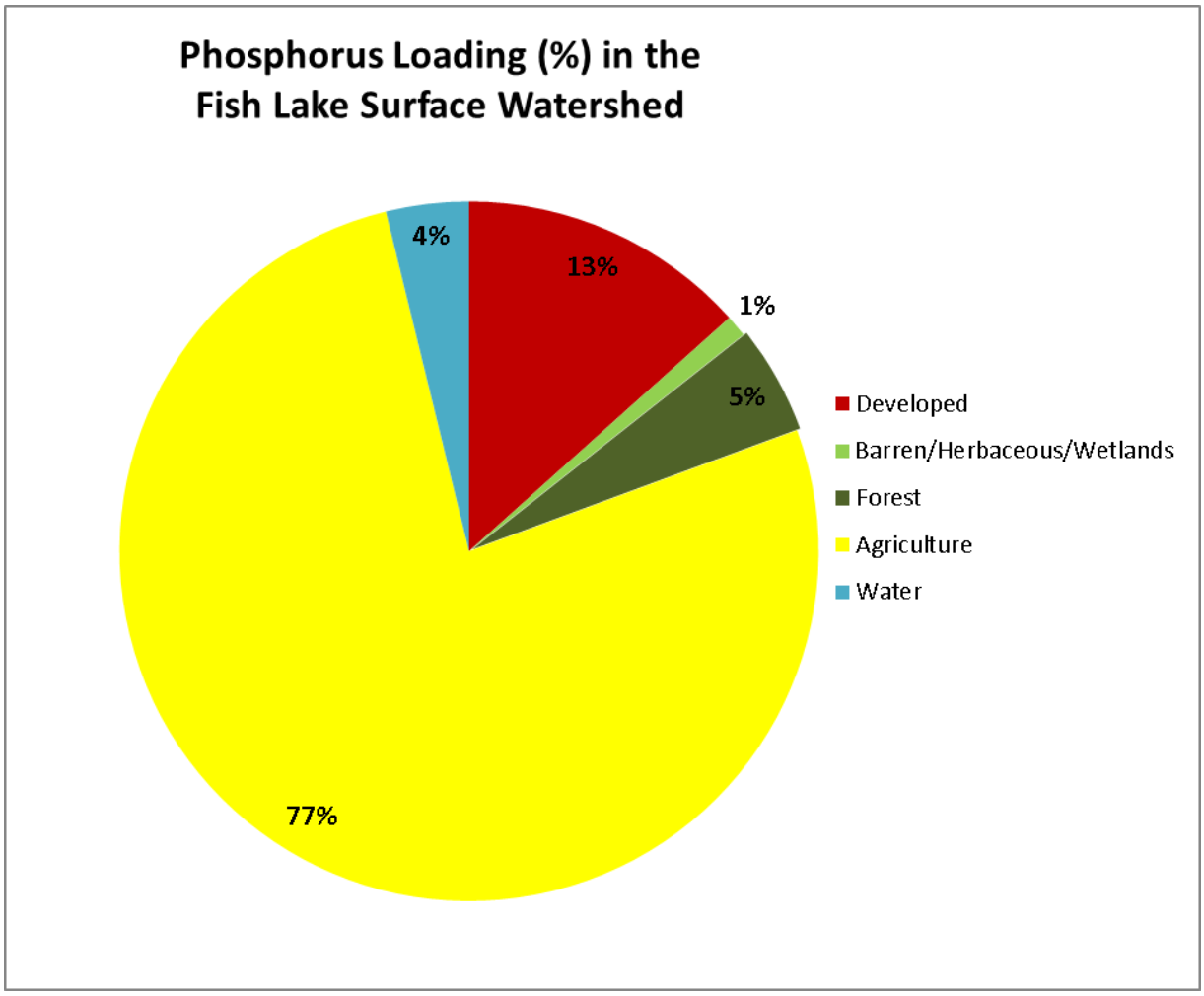
Chemical Treatment: Spot

ADVANTAGES	LIMITATIONS
∗ May be less destructive to lake ecosystem than lake-wide treatment.	∗ Only considered in lakes with aquatic invasive plants. ∗ Usually not fully effective in eradicating target species. ∗ Contaminants may remain in sediment. ∗ Effects on lake ecosystem not fully understood. ∗ Does not remove dead vegetation, which depletes oxygen and releases nutrients, adds to build-up of muck. ∗ Extra nutrients may spur additional aquatic plant and algae growth.

Chemical Treatment: Lake-wide

ADVANTAGES	LIMITATIONS
∗ May reduce aquatic invasives for a time. ∗ Treatment not needed as frequently.	∗ Only considered in lakes with aquatic invasive plants. ∗ Usually not fully effective in eradicating target species. ∗ Contaminants may remain in sediment. ∗ Does not remove dead vegetation, which depletes oxygen and releases nutrients, adds to build-up of muck. ∗ Extra nutrients may spur additional aquatic plant and algae growth. ∗ Negatively affects native vegetation. ∗ Effects on lake ecosystem not fully understood. ∗ Opens up space once taken up by natives for invasive species to colonize once again. ∗ ~$4000 per 5 acres.

Appendix C. Phosphorus Modeling



Estimated phosphorus loads from land uses in the Fish Lake watershed.

Modeling data used to estimate phosphorus inputs from land uses in the Fish Lake watershed (low and most likely coefficients used to calculate range in pounds).

Fish Lake Land Use	Phosphorus Export Coefficient (lbs/acre-yr)	Land Use Area Within the Watershed		Estimated Phosphorus Load	
		Acres	Percent	Pounds	Percent
Water	0.1	165	**8**	15-44	**4**
Developed	0.13	381	**18**	51-170	**14**
Barren/Herbaceous/Wetland	0.09	43	**2**	4-11	**1**
Forest	0.04	428	**20**	19-35	**5**
Cultivated Agriculture	0.45	1094	**52**	293-780	**80**
*Values are not exact due to rounding and conversion.					

Appendix D. 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 Fish Lake are displayed on the next page (Figure 2). 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. Much of the southern shoreland of Fish Lake is in good to moderately-good shape, but several segments along the northern shore have challenges that should be addressed. A few short segments along the northern shore of Fish Lake are ranked as poor. For a more complete understanding of the ranking, an interactive map showing results of the shoreland surveys can be found on Waushara County's website at http://gis.co.waushara.wi.us/ShorelineViewer/.

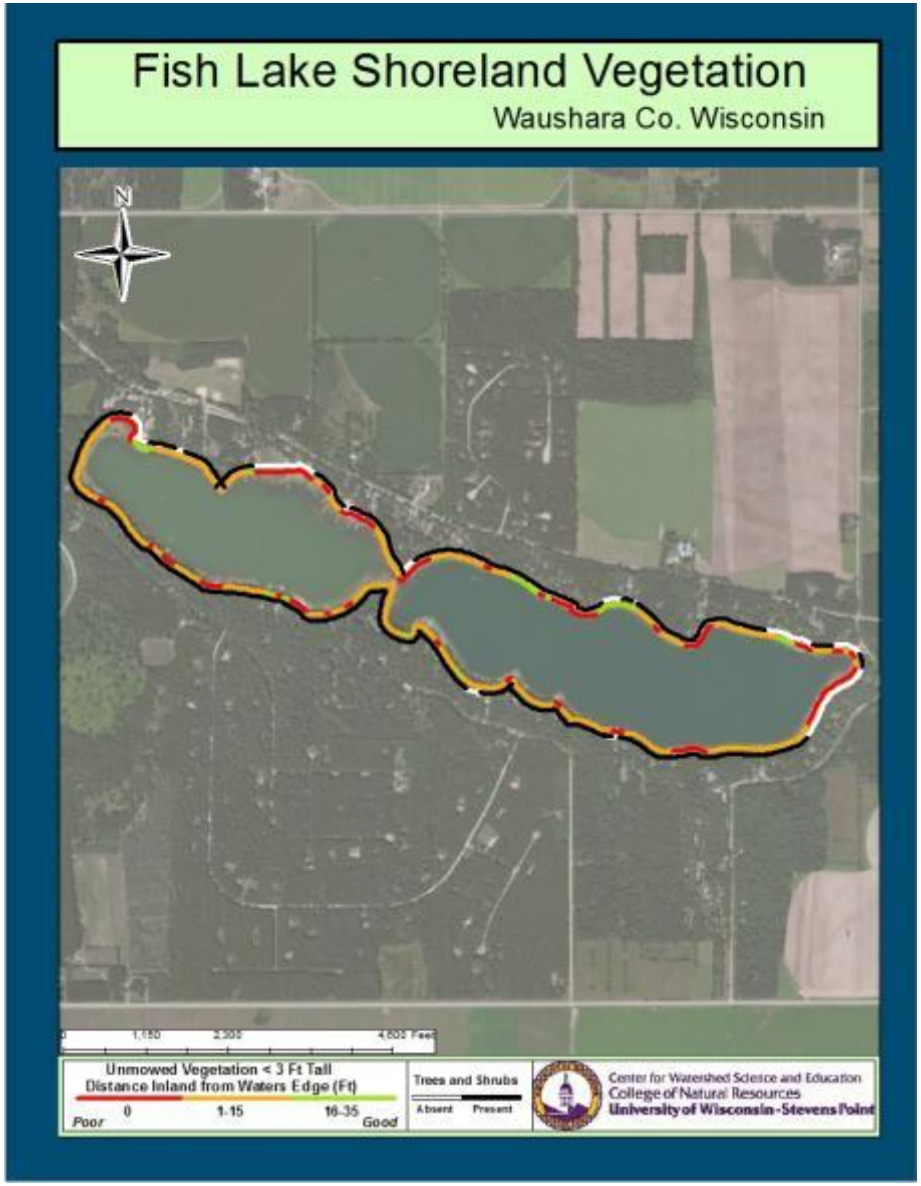


Figure 1. Shoreland vegetation around Fish Lake, 2011.

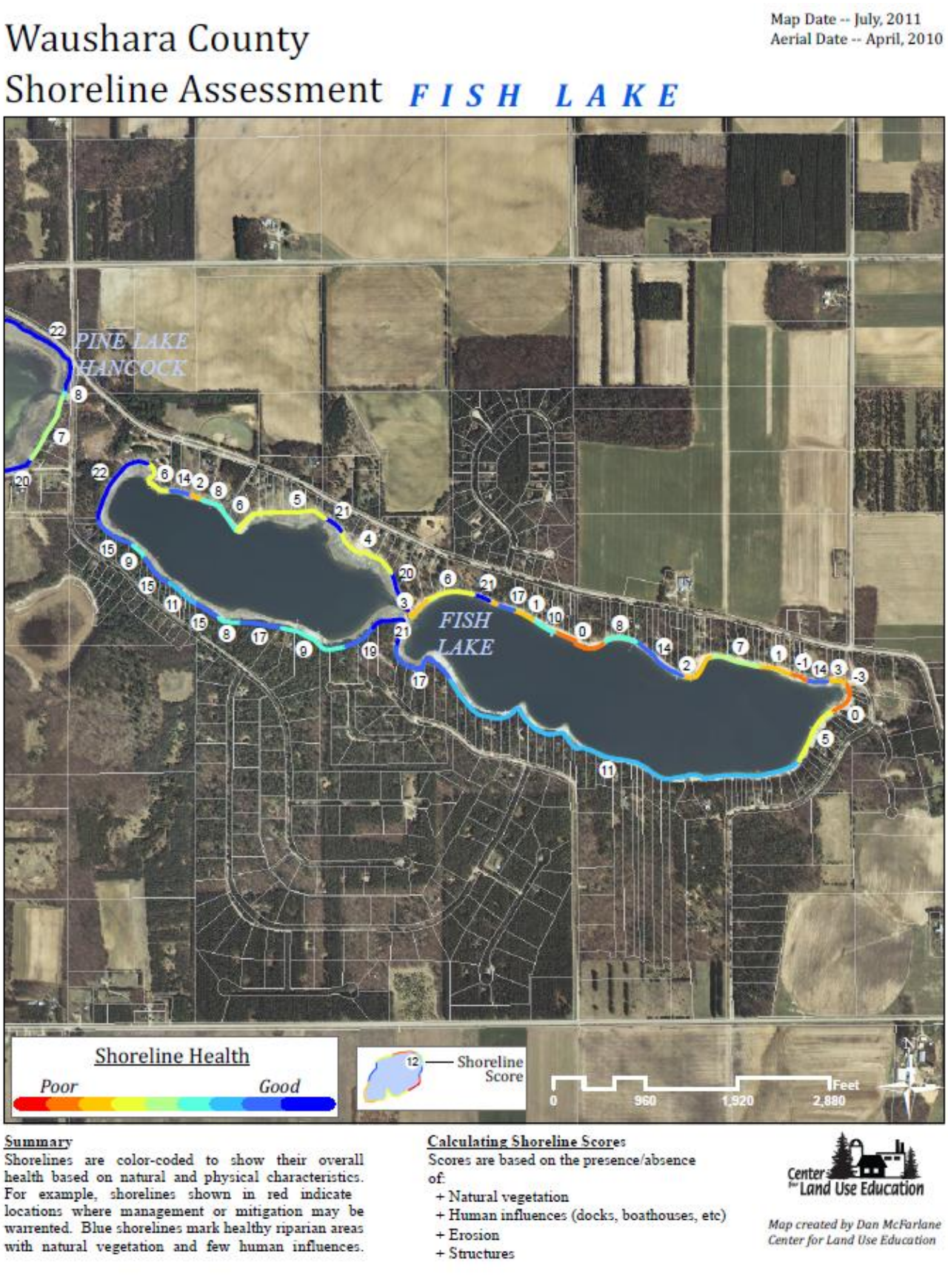


Figure 2. 2011 Shoreland survey scores for Fish Lake.

Appendix E. Lake User Survey Results