Lake Owen

Comprehensive Lake Management Plan

Background May 2024

Photo by Owen Louis

Sponsored by:

Lake Owen Association, Inc.

Consulting Partners:

Harmony Environmental
Finding a balance
People Land Water

With Grant Support from:

Wisconsin Dept. of Natural Resources

Ecosystem Society Economy
Ecological Integrity Service, LLC

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Nathan Thomas, Wisconsin Department of Natural Resources

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Introduction

This Comprehensive Lake Management Plan for Lake Owen, Bayfield County Wisconsin (WBIC: 2900200) provides direction for preserving lake water quality and native habitats, preventing introduction of invasive species, and supporting the long-term ecological health of the lake. The plan presents data about water quality, land cover within the watershed, shoreland conditions, and the aquatic plant community of Lake Owen. To guide planning for Lake Owen, property owners on the lake completed a survey to share their concerns, perspectives, priorities, and management recommendations. The results from this survey are summarized in the report. Finally, a strategic implementation action plan is provided to direct future management actions.

This plan will guide the Lake Owen Association (LOA) in lake management from 2025 - 2035. The plan is an update of a plan prepared for the LOA by Northland College in 2015.

The Lake Owen Association initiated the planning process by securing Wisconsin Department of Natural Resources (WDNR) grants early in 2023. The grants funded data gathering and the plan development process.

Institutional Framework for Planning

Lake Management Goals

1) Prevent the introduction and establishment of invasive species.
2) Preserve water quality.
3) Protect and restore in-lake, near shore, and shoreland habitat.
4) Monitor lake- related public policy and regulations and inform stakeholders.
5) Inspire active stakeholder involvement.
6) Retain best in class lake management.
7) Establish sustainable financial resources.

The above goals were developed during LOA board strategic planning in 2019 and 2023 and reviewed during this planning process.

Plan Stakeholders Input

Advisory Meetings

The LOA held (three to four) meetings to guide plan development. Advisory meetings were structured to gather input, review and discuss data, identify concerns, present recommendations, and develop strategies to address concerns. The advisory committee was composed of board members from the Lake Owen Association (LOA), lake residents, area businesses, and town board officials from the Town of Drummond and Town of Cable. Additional advisory assistance was provided by staff from Bayfield County, the Wisconsin Department of Natural Resources (WDNR), the US Forest Service, and Ecological Integrity Services. Meetings were organized by subject area with appropriate representatives invited to attend. They were held via Zoom.

Public Review and Comment

A draft plan will be made available to the public by posting on the LOA website[2] with notification sent to lake residents and published in the Sawyer County Record the week of August 12, 2024. The public review period will ended September 15, 2024.

Property Owner Survey

The LOA conducted a survey of lake residents in 2022 prior to initiating the lake management planning process. A series of focus group discussion preceded the survey to guide the survey questions. The

[2] https://lakeowen.org/

survey provided information about participant demographics, communication preferences, participation in lake activities, views of lake management issues, and support for LOA current and potential activities.

The survey link and instructions were emailed or mailed to 334 Lake Owen property owners. A total of 121 surveys were completed with a final survey response rate of 38%. A summary report of survey methods and results is included as Appendix A. Results from a few of the 12 questions are highlighted below.[3] Additional results were used in plan development and implementation.

Respondents were asked about the frequency of engagement in activities on or around Lake Owen. The top four activities LOA residents participated in frequently were relaxing by the water (91%), socializing with family (81%), observing wildlife (79%), and boating/cruising (77%).

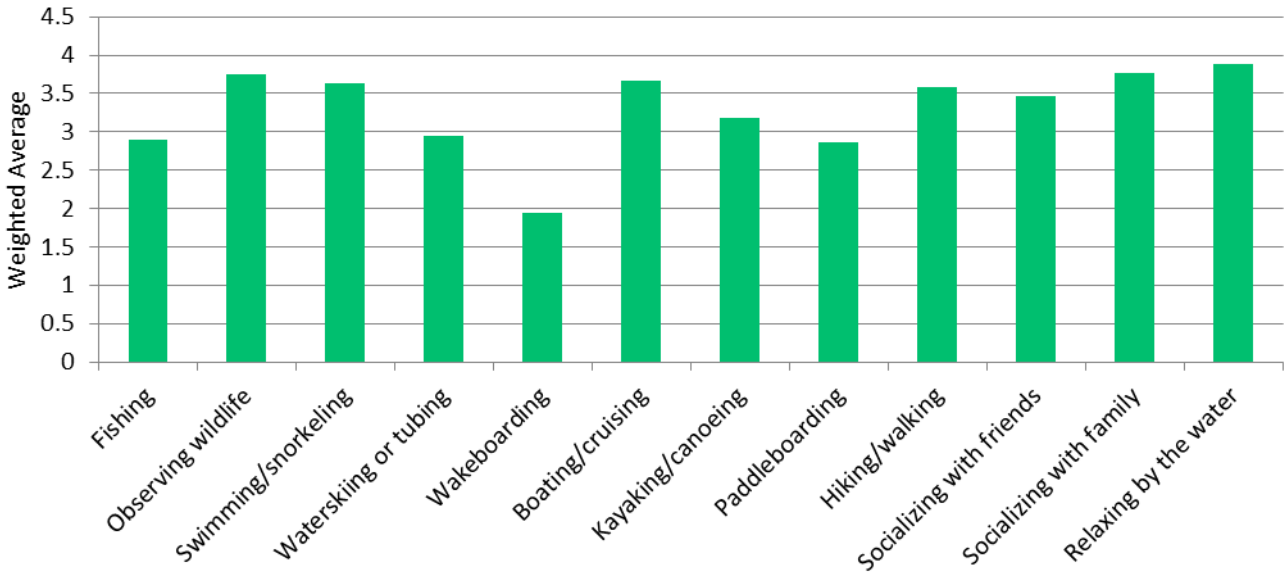

FIGURE 1. FREQUENCY OF LAKE ACTIVITY PARTICIPATION

[3] For the questions reported here the "Weighted Average" is based on the following:

- The positive choices are assigned the highest number of points (e.g., "Very Important," "Frequently," "Strongly Agree," etc.).
- The negative choices are assigned only 1 point (e.g., "Not Wanted," "Strongly Disagree," etc.).

Respondents were asked to rank the importance of various issues concerning Lake Owen. The three issues that were ranked as the most important were preventing invasive species, preserving natural shoreline, limiting fertilizer in runoff, and improving water quality.

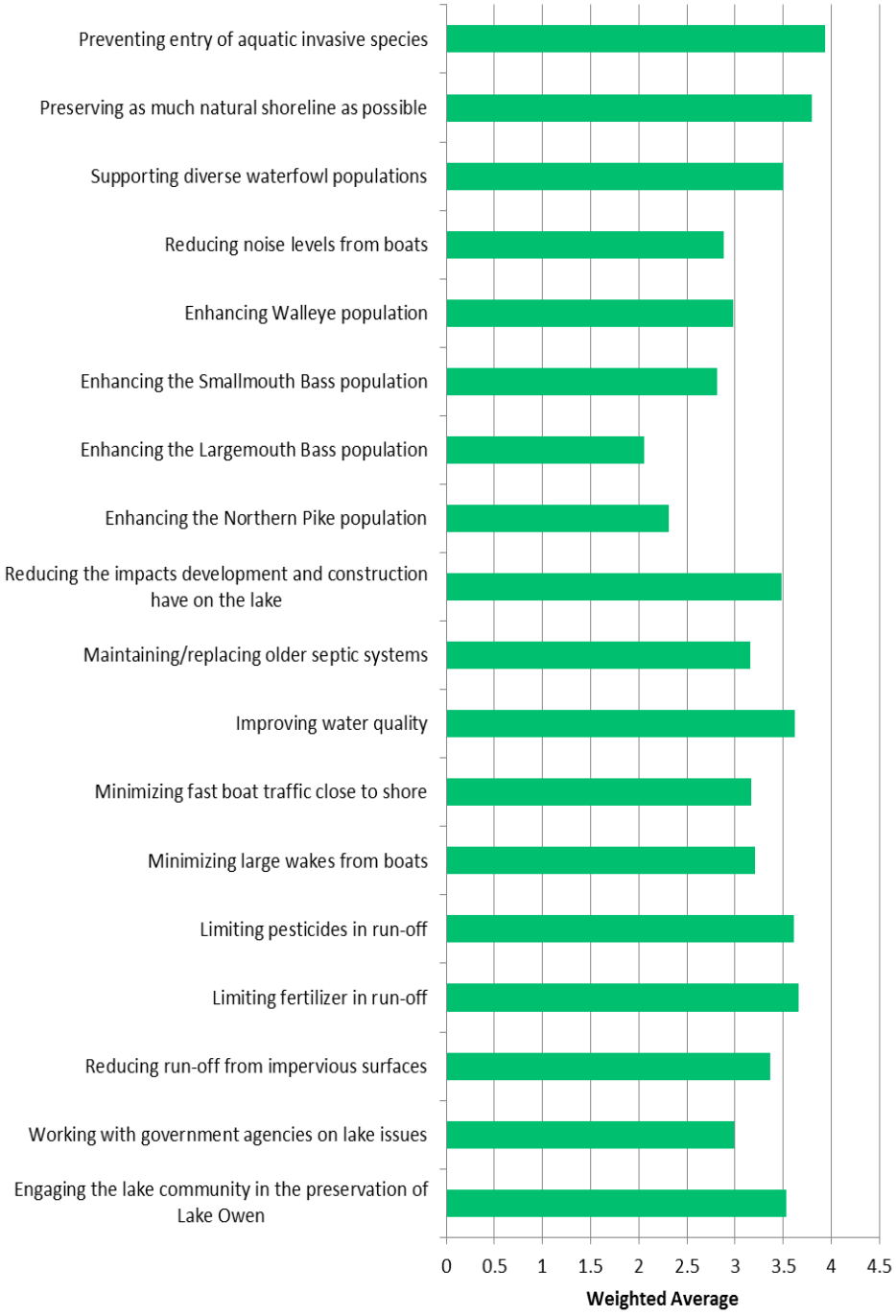

FIGURE 2. IMPORTANCE OF LAKE ISSUES

Organizational Capacity

The Lake Owen Association (LOA) was founded in 2002. The LOA has 501(c)(3) status which allows for tax deductions of contributions made to the organization.

Vision for Lake Owen

A pristine refuge sustained by an engaged community

Mission of the Lake Owen Association

Preserve and Protect Lake Owen

Lake Owen Association Programming

The LOA is guided by a volunteer board of directors, lake manager, and lake scientist. LOA partners include the US Forest Service, the Wisconsin DNR, Towns of Drummond and Cable, University of Wisconsin Extension, Bayfield County, and Wisconsin Lakes. The LOA conducts a variety of activities to preserve and protect Lake Owen.

Aquatic Invasive Species Prevention and Management

- Clean Boats, Clean Waters inspections are conducted at US Forest Service –owned landings at the North Outlet and Two Lakes Campground.
- A hot water, high pressure boat washing station is staffed at the North Outlet landing 7-days/week from June – September.
- A bleach decontamination station is present at the Two Lakes Campground landing.
- Aquatic invasive species meander surveys screen Lake Owen monthly from May to September.
- Yellow iris is removed each year through manual and chemical control measures.
- Zebra Mussel monitoring devices are installed at the public boat landings.

Lake Study

- Water quality is measured in three Lake Owen locations and dissolved oxygen and temperature profiles are taken in four locations.
- A thermistor string automatically monitors the temperature profile in the deep hole.
- Comprehensive lake, watershed, and groundwater studies were completed (2018 – 2022).
- A water quality study, land use analysis, aquatic plant survey, and shoreland habitat inventory was completed by Northland College in preparation for the 2015 plan (2013-14).

Aquatic Plants and Habitat

- The aquatic plant point intercept survey was updated (2019).
- Important plant habitat areas in the lake were identified and shared with lake residents (2022).

Fisheries

- LOA and DNR fisheries are investigating and scoping a potential fisheries food-web study as part of this planning process (2024).

Lake Planning

- A series of focus groups followed by an on-line survey gathered input from lake property owners (2022).
- LOA board strategic planning guides LOA activities (2019 and 2023)

Community-Building

- A series of educational and social activities including annual meetings, pontoon classrooms, guided hikes, raft-ups, golf charity events, annual picnics, next generation events, boat parades and concerts build Lake Owen community.
- A web site, email list serve, and member directory are maintained.
- The board established an endowment fund for continued support of lake management efforts in 2022. Fund-raising efforts continue.

Plan Partners and Related Ordinances and Plans

Wisconsin Department of Natural Resources

The Wisconsin Department of Natural Resources provides support to the LOA for many functions including technical and financial assistance for the development of this plan and support for programs including the Clean Boats, Clean Waters Program, standardized inventory and monitoring methods, regulatory permitting and enforcement, and fisheries management.

The Wisconsin Department of Natural Resources also regulates boating in the state:[4]

Slow, no wake speed is required for a vessel operating within 100 feet of the shoreline, a swimmer, dock, raft, or pier. *Slow-no wake speed means a speed at which a vessel moves as slowly as possible while still maintaining steerage control.* In addition, personal watercraft may not be operated at faster than slow, no wake speed within:

- 100 feet of any vessel on any waterbody
- 200 feet of shore on any lake.

The Department of Natural Resources regulates stormwater and erosion control through required plans and permits. A landowner is required to obtain a construction site stormwater runoff permit from the WDNR[5] when there will be one acre or more of disturbance.

A **stormwater plan** describes how runoff water will be contained and treated when development is complete.

An **erosion control plan** specifies how soil erosion will be limited during construction.

United States Forest Service

The Washburn Ranger District manages the Lake Owen Recreation Area. This includes a swim beach and shelter/chalet (Picnic Grounds) at the northern end of the lake on Forest Road 213 (Lake Owen Drive). There is access to the North Country Trail from this recreation area as well as the Drummond Recreation Trails across the road.

There is also a boat landing that provides access to the lake on Forest Road 216 (Lake Owen Station Road) just before you get to the swim beach and picnic area. The boat landing has a vault toilet, picnic tables and pedestal grills.

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[4] *The Handbook of Boating Laws and Responsibilities.* Approved by the Wisconsin Department of Natural Resources. Boat Ed – a Division of Kalkomey Enterprises, LLC. 2020.

[5] The current WDNR stormwater contact for Bayfield County is Matthew Jacobson (Matthew.Jacobson@wisconsin.gov, 715-928-0485).

Two Lakes Recreation Area Campground is operated by a concessionaire under a special use permit with the US Forest Service. This popular campground with 94 sites is nestled between Lake Owen and Bass Lake.

Bayfield County Land and Water Conservation Department

The Land and Water Conservation Department provides technical assistance and cost-share incentives to help landowners protect, enhance, and restore native habitats. Protection is achieved through implementation of conservation practices designed to control non-point sources of pollution.

Technical assistance:

- Conservation Planning and Watershed Analysis
- Conservation Practice Design
- Shoreland Restoration and Erosion Control
- Non-metallic Mining Reclamation Plan review

Conservation education:

- Aquatic Invasive Species (AIS)
- (AIS) Contractors Seminar
- Shoreland Owners Nutrient Management
- Youth Conservation Camp
- Presentations

Financial assistance is provided to landowners for installation of conservation practices that reduce sediments and nutrients in our waterways while improving habitat. The LWCD is guided by the goals identified in the Bayfield County Land and Water Resource Management Plan. Funding is provided by various state and federal agencies.[6]

Bayfield County Planning and Zoning

Bayfield County Planning and Zoning is the enforcement branch for county plans and ordinances that regulate land use. The Bayfield County Shoreland Zoning Ordinance regulates development within one thousand feet of the lake. Bayfield County adopted a zoning code that is implemented by the Planning and Zoning Department for the purpose of:

- Promoting and protecting the public health, safety, convenience, and welfare
- To further the maintenance of safe and healthful conditions
- To prevent and control water pollution
- To protect spawning grounds, fish, and aquatic life
- To control building sites, placement of structures, and land uses
- To prevent overcrowding of any natural resource such as a lake, river, or stream
- To preserve shore cover and natural beauty
- To promote the better uses of scenic resources

[6] https://www.bayfieldcounty.wi.gov/DocumentCenter/View/14509/LWCD-Brochure-?bidId=

Towns of Drummond and Cable

Lake Owen is located mostly in the Town of Drummond with its southern end (less than 10% of the lake shoreline) in the Town of Cable. The Towns are responsible for enforcing the construction site erosion control provisions within the state Uniform Dwelling Code. These provisions apply to one and two family dwellings. Towns contract with building inspectors for on-site inspections.

Towns have the authority to enact ordinances covering the use and operation of boats on waters within their jurisdiction (WI Stat 30.77). Where the lake is at least 60% within a first town and all remaining shoreline is in a second town, the first town may pass an ordinance covering the entire lake, but it must conduct notification and public hearing (30.77)(3)(aw)(1 and 2).

Additional related ordinances and plans are summarized in Appendix B.

Baseline Data and Assessments

Lakes Description

Lake Owen (WBIC: 2900200) is located in Bayfield County, Wisconsin in the Town of Drummond (T44N R07W) and the Town of Cable (T43N R07W). It is a spring-fed lake with the main inflow from groundwater and outflow through the Long Lake Branch of the White River. This substantial stream flows from the four-foot head dam at the outlet from Lake Owen.[7] Lake characteristics are described in Table 1. The maximum depth is 95 feet, and the mean depth of 27 feet. Surface water flows to the lake from the mostly-forested, 2,123-acre watershed that drains directly to the lake. The land area that contributes to groundwater flow is much larger at 13,763 acres.

TABLE 1. LAKE OWEN CHARACTERISTICS

Area (acres)	**Maximum Depth** (ft.)	**Mean Depth** (ft.)	**Trophic State**
1,250	95	27	Oligotrophic

Public Use

Lake Owen has two public boat landings owned by the US Forest Service. The North Outlet Landing has a concrete boat ramp and parking lot on Lake Owen Station Road. The USFS landing at the Two Lakes Campground also has a concrete ramp and parking lot. Lake Owen Association landing monitors recorded 621 boats entering at the North Outlet Landing and 335 boats entering at the Two Lakes Campground when monitors were present in 2023. A private boat landing access is present at Otter Bay Resort at the south end of Lake Owen.

[7] https://apps.dnr.wi.gov/water/waterDetail.aspx?key=1494187

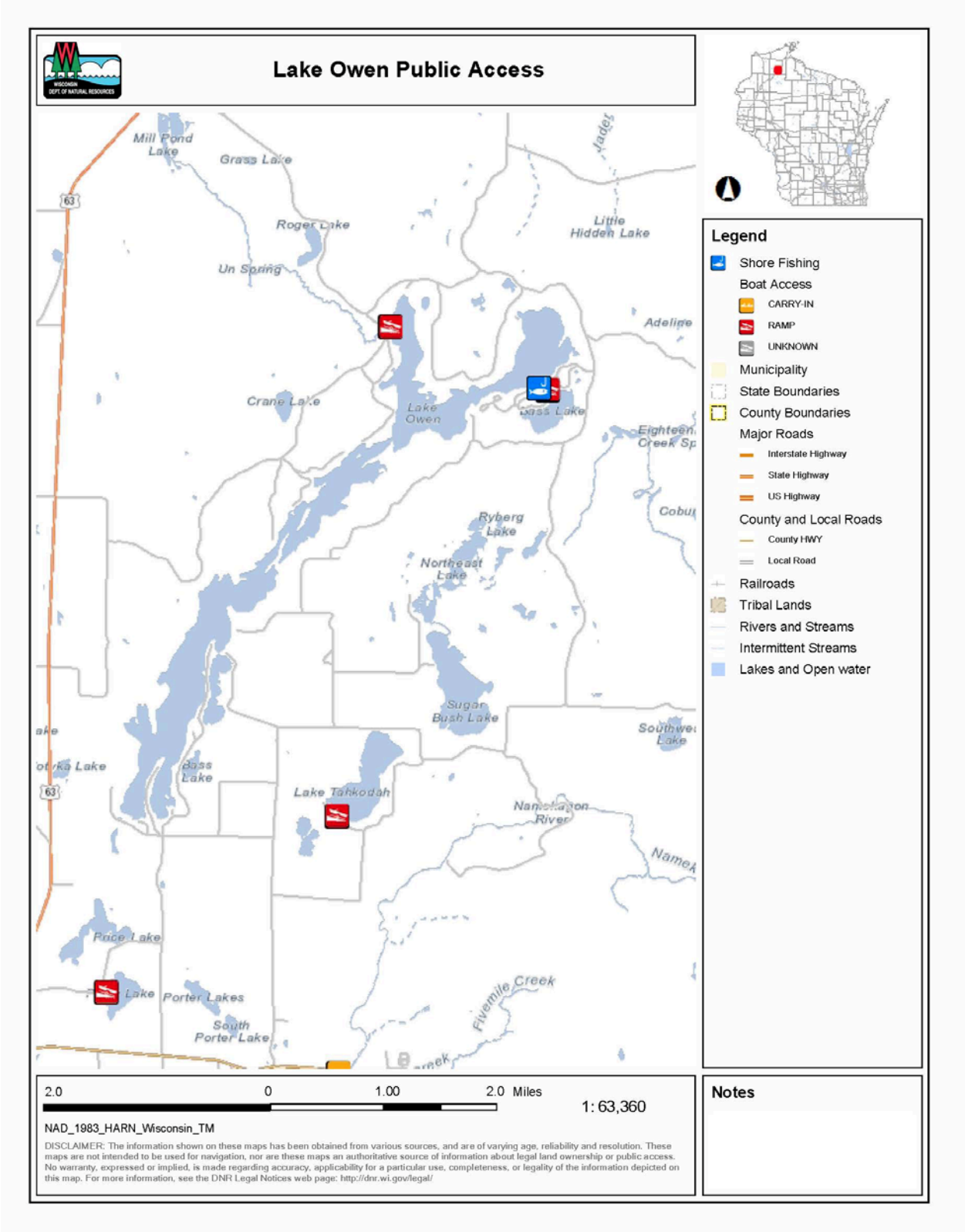
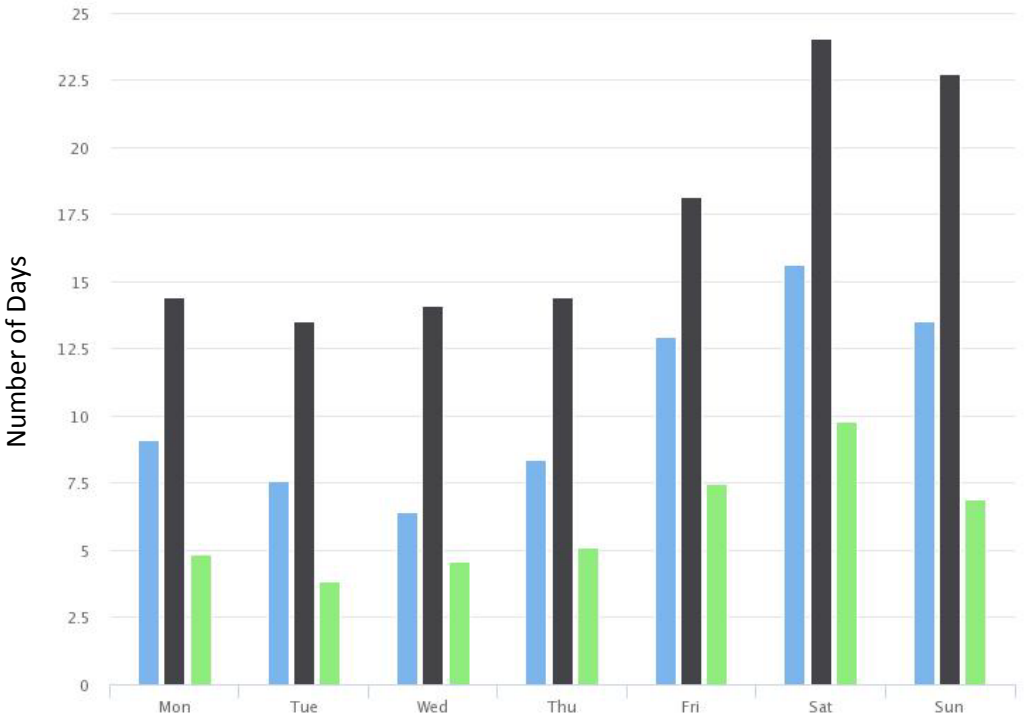


FIGURE 3. LAKE OWEN PUBLIC ACCESS

Boat landing use was measured with a TrafX data recorder in 2023, and results are summarized in Figure 4.[8] The LOA generally staffed the North Outlet landing 7 days/week in 2023: from 8am-4pm, Monday to Friday and 6:30am-5:30pm, Saturday and Sunday. The campground landing was generally staffed Friday 10-8, Saturday 7-2, and Sunday 10-6.



Site Name	Average	Median	STDV	Min	Max
LO Campground Landing (FD)	10.5	9.1	3.2	6.4	15.6
LO North Landing (FD)	17.3	14.4	4.1	13.5	24.1
LO Otter Bay Landing (AFD)	6.1	5.1	1.9	3.8	9.8

(A) = adjustment applied (D) = divide by 2 applied (F) = filtering applied

Figure 4. Lake Owen Boat Landing Use by Days of the Week (June 1– Oct 11, 2023)

[8] TrafX records data when a heavy metal object (such as a vehicle with trailer) is present at a landing. TrafX is set to record every 5 minutes, the approximate time it takes to load or unload a boat. Results presented have been divided by 2 because both loading and unloading are captured. These data may over-count boats landing because any vehicle present would be recorded, but results should be comparable between landings.

A contour map of lake depth and a substrate map are presented in Figures 5 and 6.

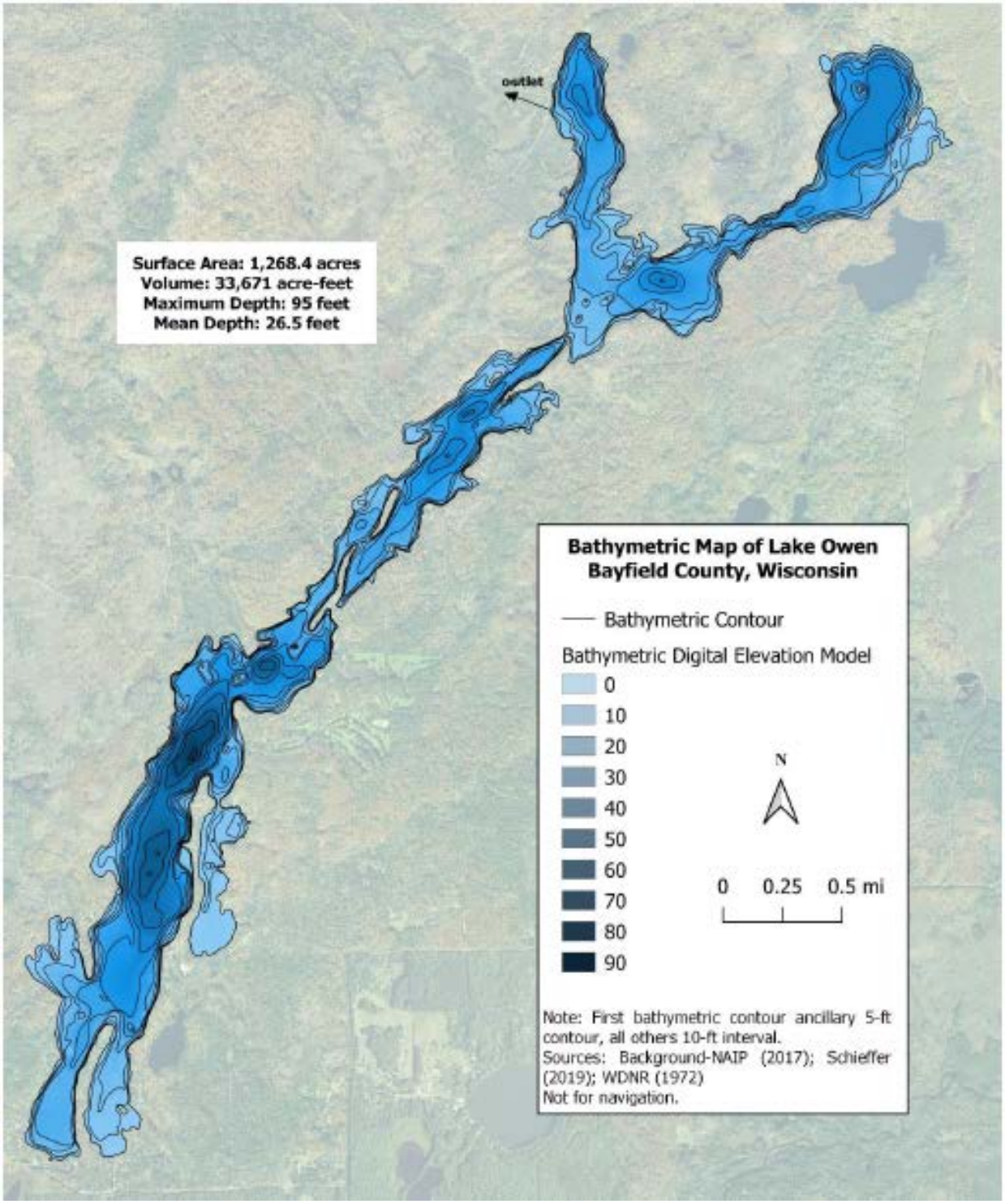


FIGURE 5. LAKE DEPTH CONTOUR MAP

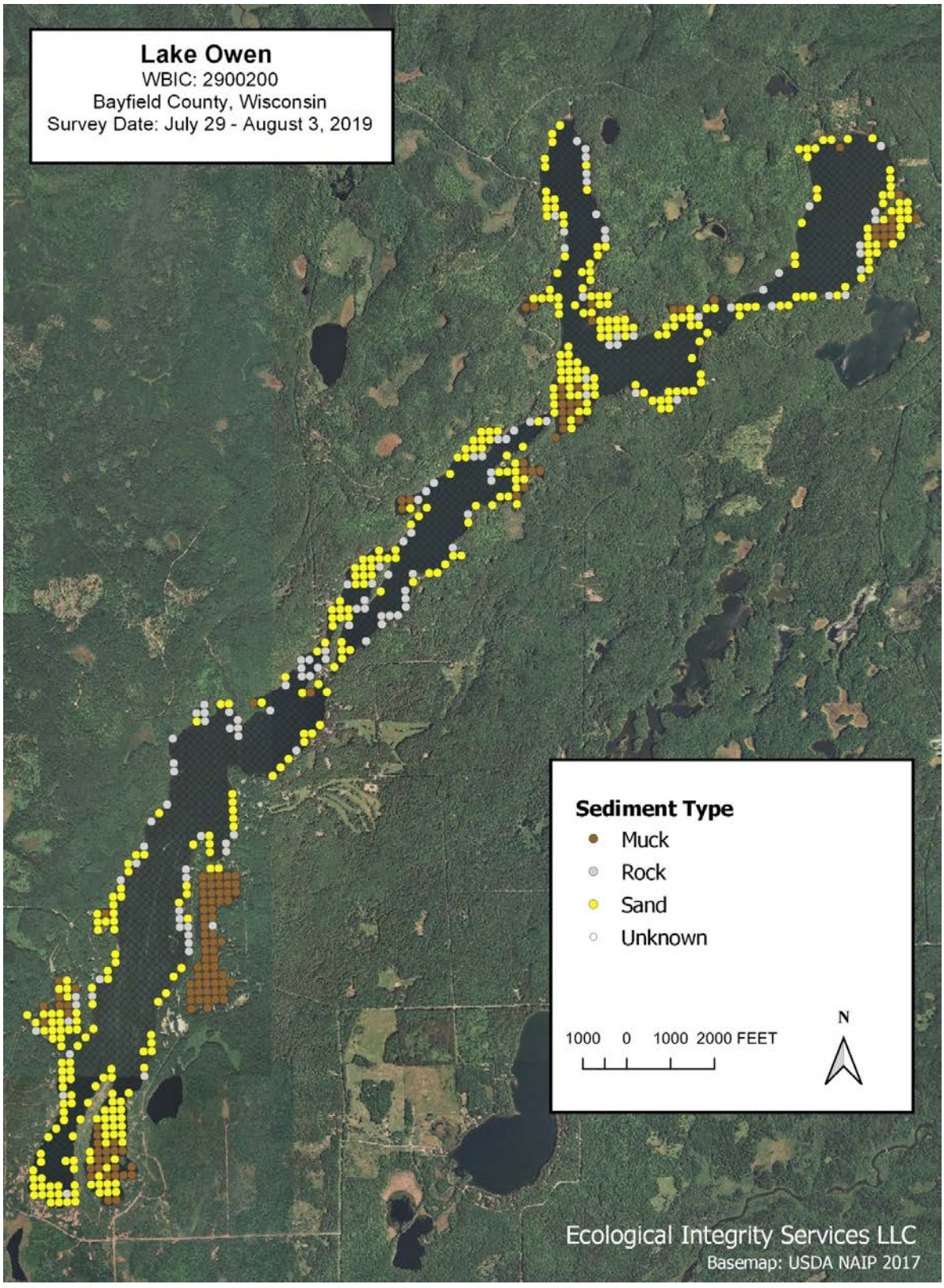


FIGURE 6. LAKE OWEN SUBSTRATE (SCHIEFFER, 2019)

Lake Owen Water Quality

Wisconsin DNR (WDNR) lake condition reports for Lake Owen yield stunning results. The lake is classified as a stratified, two-story fishery lake.[9,10] The Wisconsin DNR sets water quality standards based on lakes classification. Standards for a stratified, two-story fishery lake are listed in Table 2. Lake Owen clearly meets phosphorus and chlorophyll-a standards for this lakes classification (Table 3). The WI DNR ranks lakes according to standards for recreation, fish and aquatic life, and fish consumption. Lake Owen ranks excellent in all of these categories as shown in Figure 7.

Lake Owen is further designated as an Outstanding Resource Water (ORW) by the WDNR. An ORW is defined as a lake or stream which has excellent water quality, high recreational and aesthetic value, high-quality fishing, and is free from point source and nonpoint source pollution (NR 102.11, Wis. Adm. Code).

Lake Owen is also designated by WDNR Healthy Watersheds, High-Quality Waters modeling and assessment as a high-quality water. Its watershed is a statewide protection priority ranked as one of the healthiest watersheds.[11]

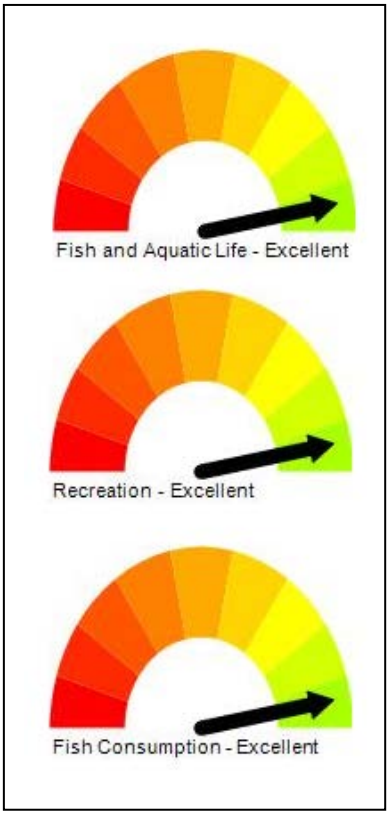


FIGURE 7. LAKE OWEN DNR WATER QUALITY RANKINGS

TABLE 2. WDNR LAKES CLASS IMPAIRMENT THRESHOLDS TWO-STORY FISHERY[12]

	Recreation Threshold	Aquatic Life Threshold	Lake Owen Mean (2013 – 2023)
Total Phosphorus	≥15 µg/L	≥15 µg/L	9.01 µg/L
Chlorophyll-a	>5% of days with moderate algae levels (20 µg/L)	≥10 µg/L	1.4 µg/L

TABLE 3. WDNR LAKES CLASSIFICATION AND STATUS[13]

Lake Classification	Recreation	Fish and Aquatic Life
Two-Story Fishery	Excellent - Clearly Meets	Excellent - Clearly Meets

[9] Wisconsin Two-Story Fishery List. March 2021. https://dnr.wisconsin.gov/topic/SurfaceWater/UseDesignations.html

[10] "Stratified two−story fishery lake" means a stratified lake which has supported a cold water fishery in its lower depths within the last 50 years (NR012.06(2)(i)).

[11] https://dnr.wisconsin.gov/topic/SurfaceWater/HQW.html

[12] For more information, see Wisconsin Consolidated Assessment and Listing Methodology (WDNR, 2022).

[13] Wisconsin Department of Natural Resources Comprehensive 2020 Water Quality Assessment Spreadsheet.

Lake Owen Water Clarity

Lake Owen Association consulting scientists set out to answer some basic questions about Lake Owen water clarity in 2019. Their work was supported by donations of LOA board members and lake residents and a grant from the WDNR. This summary provides an overview of lake science to help understand the study results. The full report is also available (Schieffer, 2019).

The study set out to answer the following questions:

Why is the water of Lake Owen so clear?

Does the phosphorus that builds up in the lake bottom reach to near the surface where algae can grow? If not, why not?

We knew from a past study completed by Northland College that high levels of the nutrient phosphorus build up at the bottom of the lake. Measurements of the total phosphorus to nitrogen ratio in 2021 confirmed that phosphorus is responsible for algae growth in Lake Owen.

The 2019 study took comprehensive measurements at various depths and locations in Lake Owen to better understand the source of high water clarity in Lake Owen. The following were measured:

- *Phosphorus:* the nutrient that triggers algae growth; bioavailable phosphorus is in a form that algae can consume,
- *Chlorophyll a:* a pigment found in plants and algae; chlorophyll a concentration provides a measure of algae growth,
- *Temperature:* establishes layers of lake water based on density,
- *Dissolved oxygen:* when oxygen levels are low, phosphorus can be released from deep lake sediments; lake mixing can be detected with changes in dissolved oxygen.
- *Conductivity:* measures the amount of charged particles in the water including nutrients; conductivity changes can be an indication of mixing of lake layers,
- *Light or PAR (photosynthetic active radiation):* measures how deep there is adequate light for algae growth,
- *Zooplankton numbers:* these tiny animals eat algae, and their numbers might explain lack of algae when there is enough phosphorus for algae to grow, and
- *Secchi depth:* a measure of lake clarity. The Secchi depth indicates when the 7" black and white disk is no longer visible when lowered into the water.

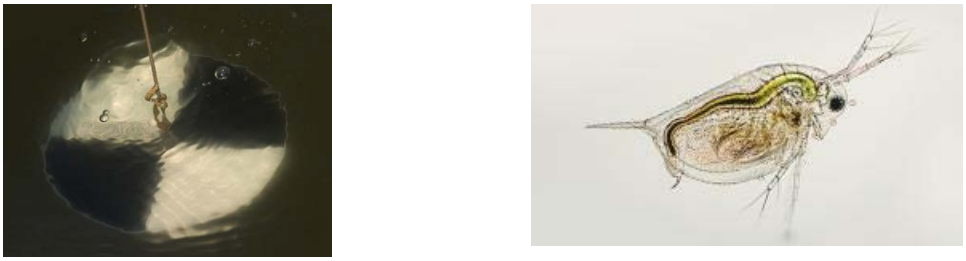
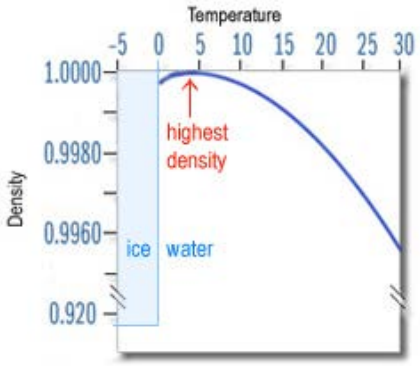
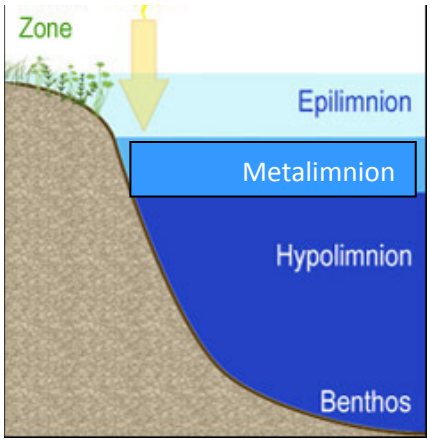


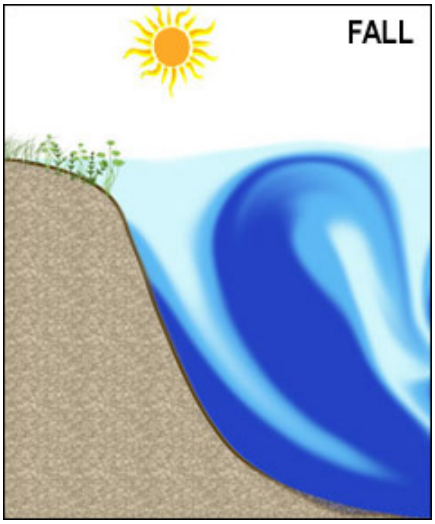
FIGURE 8. SECCHI DISK AND ZOOPLANKTON (DAPHNIA)

To understand the answers to our lake study questions, a brief primer on lake science follows.

Lake Science Primer: Stratification and Mixing[14]







Water Density
Lake stratification depends upon the relationship between water density and temperature. Water is unique in that it is denser as a liquid than a solid; therefore, ice floats. Water is most dense at 4 degrees Celsius (39° F). As water warms or cools from 39°F it gets less dense. Denser water is heavier and will be at the bottom of a lake while less dense water will generally be at the top of the lake.

Summer Stratification
In the summer, the sun heats the top layer of a lake, the **epilimnion**, which causes it to become less dense. The bottom layer of the lake, the **hypolimnion**, does not receive sunlight and therefore remains cold. Since the epilimnion is less dense, it remains on top of the hypolimnion and the two do not mix. The **metalimnion** or thermocline is the dividing area between the top and bottom layers where temperature changes dramatically in stratified lakes.

In most lakes, the epilimnion is the only part of the lake where sunlight can penetrate, and it is where plants and algae grow. *Our study found that with Lake Owen's clear water, light adequate for algae growth penetrates well into the metalimnion.*

When algae and zooplankton die, they sink to the bottom of the lake. Invertebrates and microbes living in the benthos or lake sediments recycle and decompose this dead material and use up oxygen. Since the lake does not mix during the summer, the hypolimnion does not receive a fresh supply of oxygen. The hypolimnion also lacks oxygen because it is too deep for plants and algae which release oxygen during photosynthesis. Therefore, the hypolimnion can become anoxic (void of oxygen) during the summer. Phosphorus is released from lake sediments when there is no oxygen present.

Fall Turnover
In the fall, the epilimnion cools off. As the water in the epilimnion cools, the density difference between the epilimnion and hypolimnion is not as great. The layers then become less stable, and are readily mixed by the wind. In addition, when the epilimnion cools it becomes denser and sinks to the hypolimnion, mixing the layers. This mixing allows oxygen and nutrients to be distributed across the entire water column. In some years Lake Owen mixes completely in late Fall, in other years, the lake only partially mixes.

[14] https://www.rmbel.info/primer/stratification-and-mixing/

Study Results

Lake Mixing

Lake Owen was strongly stratified into layers from June until mid to late October throughout the lake in depths 30 feet and greater in 2019. We know this from measuring dissolved oxygen, temperature, and conductivity at various depths from the lake surface to near the bottom. Recall that strong stratification means that phosphorus released from the lake bottom doesn't reach the surface where algae can grow.

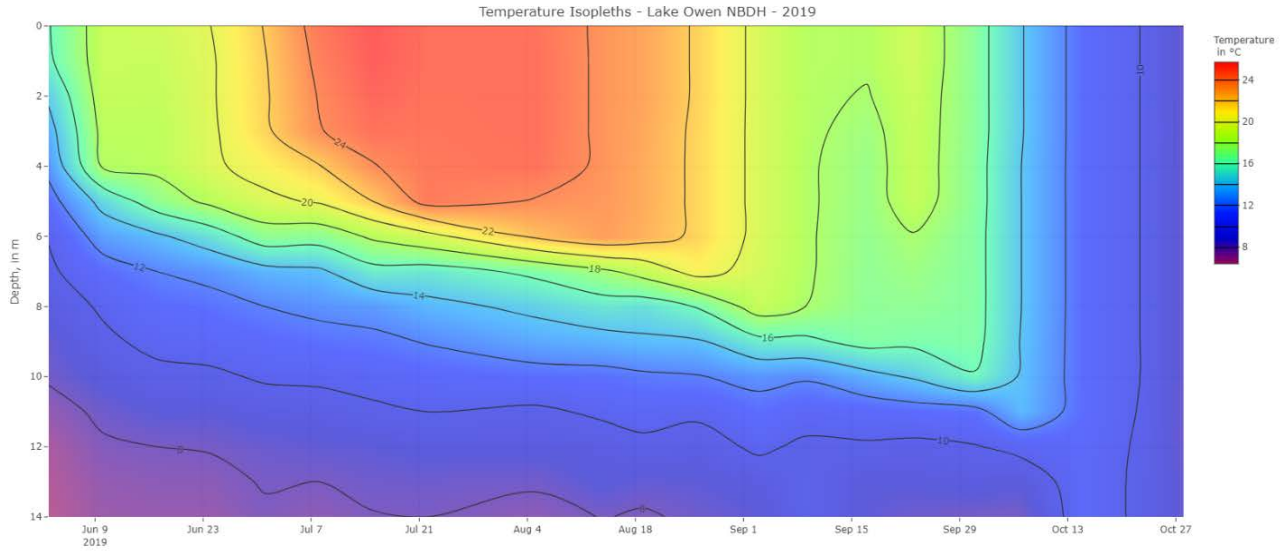


FIGURE 9. TEMPERATURES IN LAKE OWEN FROM THE SURFACE DOWN TO 14 METERS FROM JUNE TO OCTOBER 2019

In fact, Lake Owen is not expected to mix until late-October to early-November based on models that calculate susceptibility to mixing using water temperature (and therefore density) at various depths and other factors. A calculation known as Wedderburn's number indicates that even in high winds (up to 50 miles per hour 6 feet above the lake), the lake will not mix during the summer months. When Lake Owen does mix in spring and fall, it does not mix completely in most years, with excess phosphorus remaining in the bottom layer. There was evidence of mixing in November 2021 and 2022. Partial mixing may have occurred in July and August 2022 in the other, shallower basins.

Phosphorus and Algae Growth

Increases in algae growth generally decrease water clarity. Lake Owen has high water clarity as measured by Secchi depth because there is little algae growth in the epilimnion throughout the growing season. Results presented here are from the South Basin Deep Hole in 2019 although results from other basins were similar.

There appeared to be an external source of phosphorus into the epilimnion in June and July 2019. An external source of phosphorus simply means that it came from outside of the lake. This external source could be pine pollen and/or runoff from a large rain event in late June. In fact, estimates of the potential pine pollen load account for the measured increase in phosphorus from May to June.

The thermocline is deep in Lake Owen, reaching 30 feet in August 2019. The thermocline was deeper than the Secchi depth from late July to October (Figure 11). Because of clear water, light penetrates very deeply in Lake Owen – into and sometimes beyond the metalimnion. That light penetration allows plants and algae to grow deep in the water column

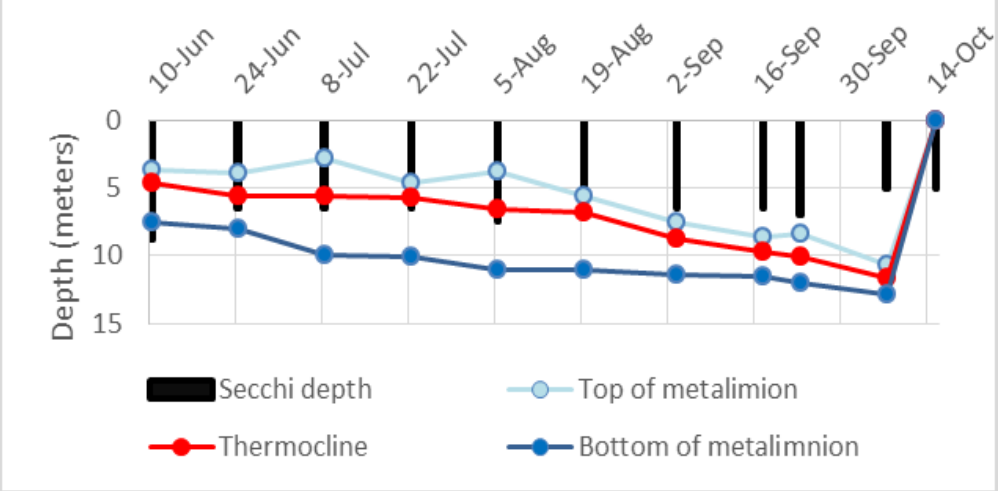


FIGURE 11. METALIMNION DEPTHS AND SECCHI DEPTHS (2019)

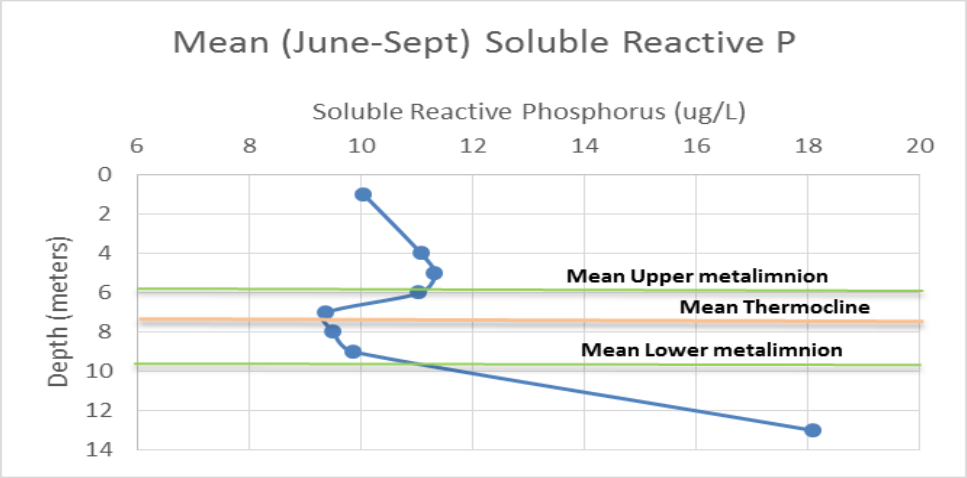


FIGURE 10. SOLUBLE REACTIVE PHOSPHORUS (JUNE- SEPT MEAN, 2019)

Phosphorus in a form available for algae growth (bioavailable) is low most of the summer in the epilimnion limiting algae production. Algae production was highest in the metalimnion, likely due to more bioavailable phosphorus from diffusion from the hypolimnion combined with light available there.

More algae growth (as measured by chlorophyll) would have been expected based on the bioavailable phosphorus (SRP) present in June and July 2019. This, coupled with an increase in zooplankton as the summer progressed, suggests zooplankton were consuming algae and therefore reducing chlorophyll in the water.

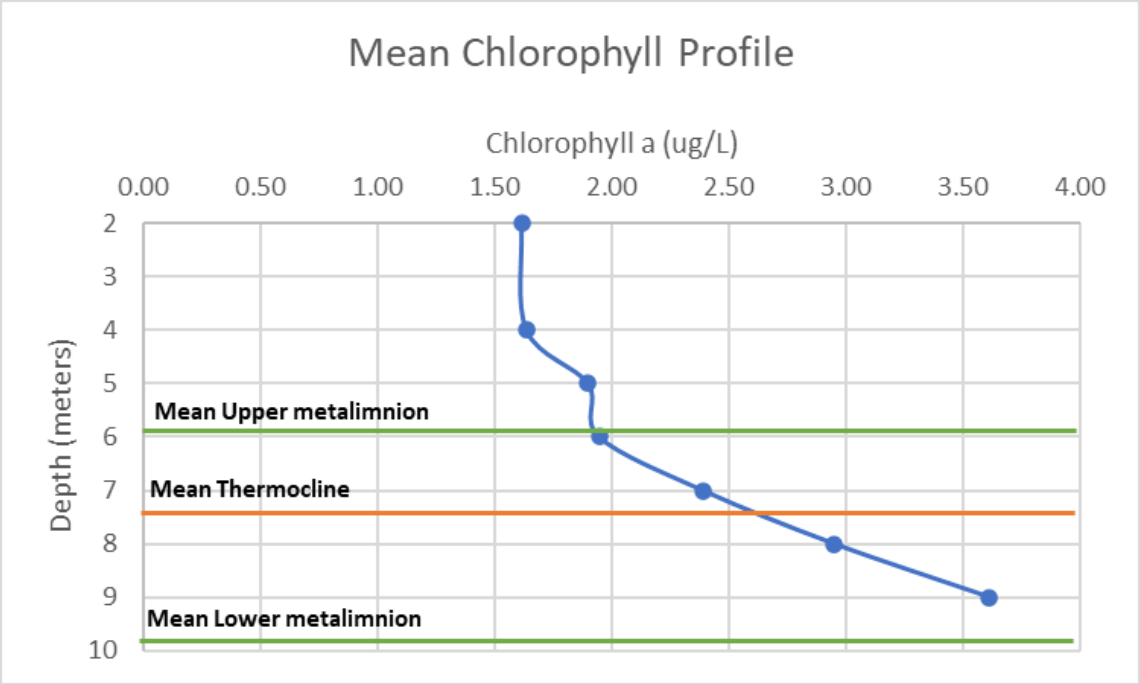


FIGURE 12. MEAN CHLOROPHYLL PROFILE (2019)

Water Quality Monitoring Results (2020 – 2023)

Water quality monitoring continued from 2020 – 2023 with a somewhat reduced intensity. As in 2019, monitoring occurred at 4 locations in 2020 (Figure 13). Water chemistry monitoring was dropped for the Mid-Basin beginning in 2021, although temperature and oxygen profiles continued.

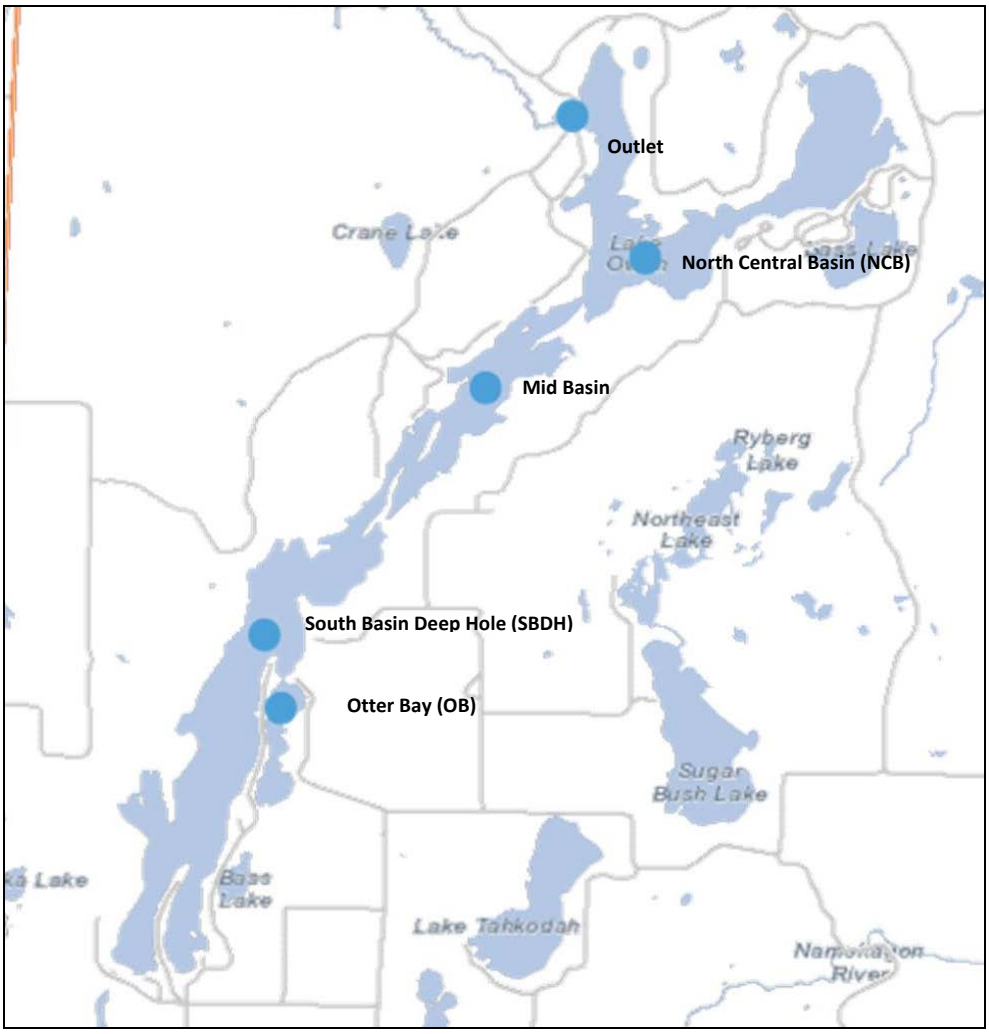


FIGURE 13. LAKE OWEN WATER QUALITY MONITORING LOCATIONS

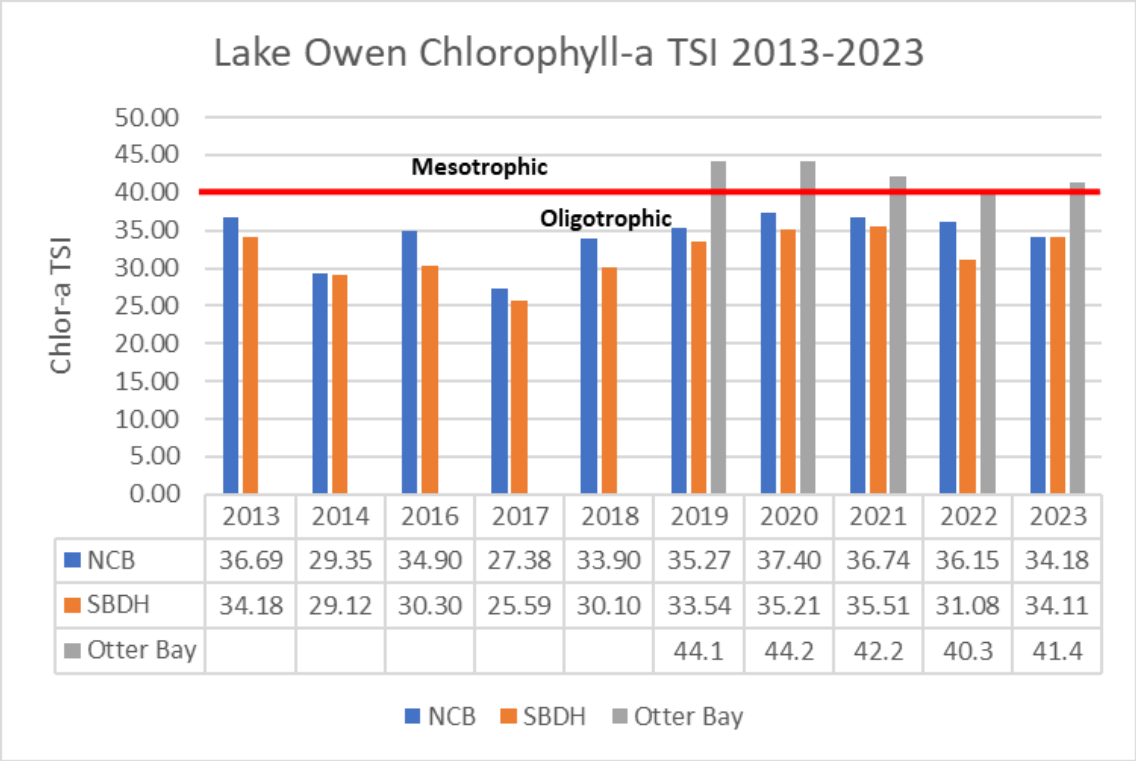
TROPHIC STATE INDEX (TSI)

The Carlson Trophic State Index (TSI) is a measure of lake productivity or nutrient level. Higher trophic state index values indicate the lake has more nutrients which results in more algae growth. Various parameters (total phosphorus, chlorophyll-a, and Secchi depth) are used to calculate a TSI, and ranges of TSI value represent a particular trophic state. A lower TSI reflects low nutrient levels and less algae growth.

30-40	Oligotrophic = very low nutrients and productivity
40-50	Mesotrophic = moderate nutrients and productivity
50-60	Mild Eutrophic =moderately high nutrients and productivity
60-70	Eutrophic = high nutrients and productivity
70-80	Hyper Eutrophic = very high nutrients and productivity

The North American Lake Management Society recommends focusing on chlorophyll-a TSI to evaluate the trophic state of a lake, because this variable is the most accurate of the three at predicting algal biomass. According to Carlson (1977), transparency (Secchi depth) should only be used if there are no better methods available.[15]

Figures 14 graphs the trophic state in various basins of Lake Owen since 2013. Monitoring results are available for Otter Bay beginning in 2019. Lowest algae growth, as measured by chlorophyll-a, was found in the South Basin Deep Hole followed by the North Central Basin. Both of these basins are consistently in the oligotrophic trophic state range while Otter Bay is generally just into the mesotrophic range.



	2013	2014	2016	2017	2018	2019	2020	2021	2022	2023
NCB	36.69	29.35	34.90	27.38	33.90	35.27	37.40	36.74	36.15	34.18
SBDH	34.18	29.12	30.30	25.59	30.10	33.54	35.21	35.51	31.08	34.11
Otter Bay						44.1	44.2	42.2	40.3	41.4

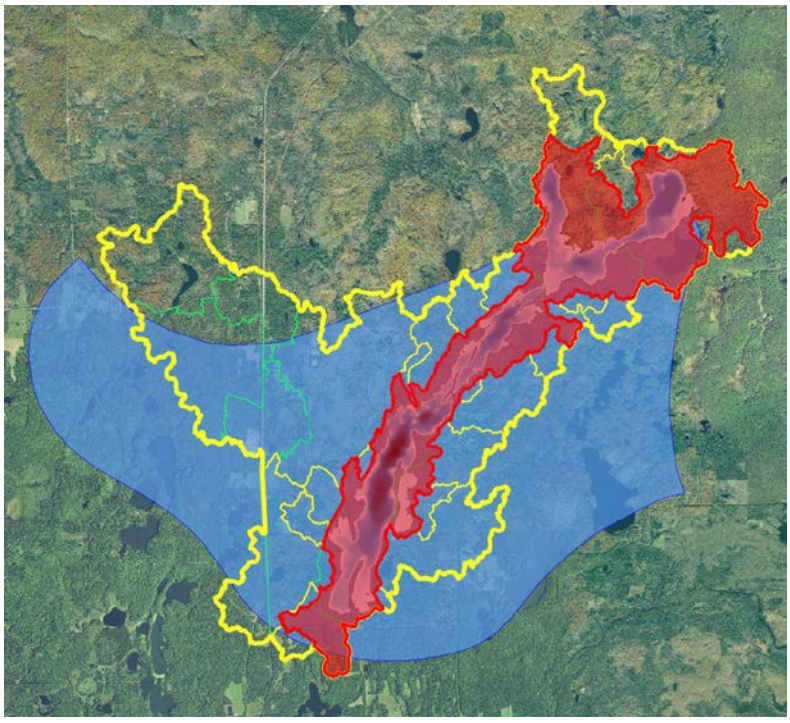
FIGURE 14. ANNUAL LAKE OWEN CHLOROPHYLL-A TSI 2013 – 2023

[15] https://www.nalms.org/secchidipin/monitoring-methods/trophic-state-equations/

Lake Owen Watershed

A study examined watershed land cover and inputs and outputs of both water and nutrients to make predictions regarding development impacts. The full study reports and summaries are available at Water Quality | Lake Owen Association. The study reports describe data collection and analysis methods and provide more detailed results (Schieffer 2020).

The area contributing groundwater flow to Lake Owen was examined in more detail in a follow-up study (Macholl, 2021). The area contributing groundwater to Lake Owen was found to be slightly larger than previously estimated. The model, which also estimated the volume of groundwater flow into Lake Owen, can be used to evaluate human activities that could affect the groundwater flow and quality. These include large withdrawal of groundwater through high-capacity wells and pollution sources that could affect the groundwater quality. Since Lake Owen is primarily fed by groundwater, understanding the groundwater flow into the lake is essential for future management. It is especially significant if development and commercial activities increase in ways that can adversely affect groundwater. Finally, the groundwater water and nutrient inputs estimated with the 2020 study matched this second modeling effort extremely well, so no changes to the lake water and nutrient budgets from the 2020 study were needed.



A **watershed** is the area of land that drains to a waterbody. Lake Owen's **direct drainage area**, shown in red, flows directly to the lake.

Runoff from the larger watershed, shown in yellow, is captured in ponds and wetlands (is internally drained), thereby not influencing Lake Owen directly.

The blue area is the watershed from which **groundwater** flows to Lake Owen.

Water volume and nutrient concentrations in runoff are influenced by the land cover in the watershed.

FIGURE 15. LAKE OWEN WATERSHED

Watershed Land Cover

Watershed land cover is illustrated in Figures 16 and 17. The high percentage of forested land in the watershed protects Lake Owen because runoff from this land cover tends to be low in volume with low nutrient concentrations. In contrast, developed areas with impervious surfaces such as roofs, driveways, and parking areas result in more runoff with higher nutrient concentrations.

Well-vegetated areas slow runoff flow and encourage infiltration. A protective buffer of natural vegetation between residential development and the lake can slow and absorb runoff and related nutrient and sediment deposition. National Forest Service and State Natural Areas preserve forest land within the Lake Owen surface water and groundwater watershed boundaries. These areas are illustrated in Figure 18.

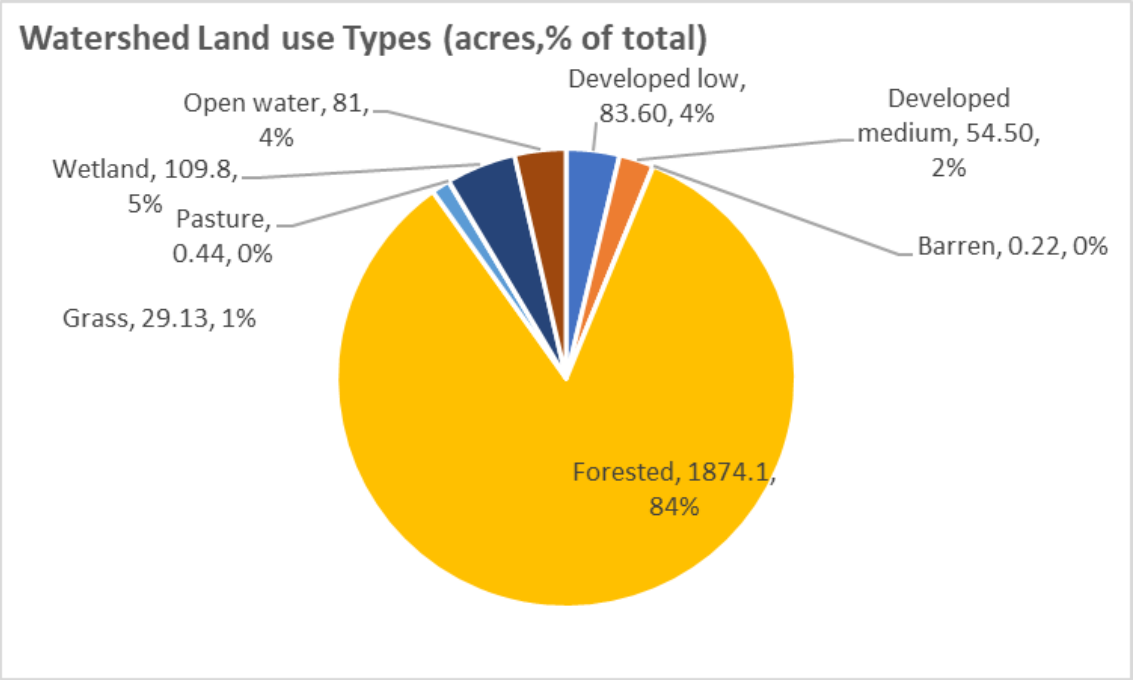


FIGURE 16. WATERSHED LAND COVER –DIRECT DRAINAGE AREA

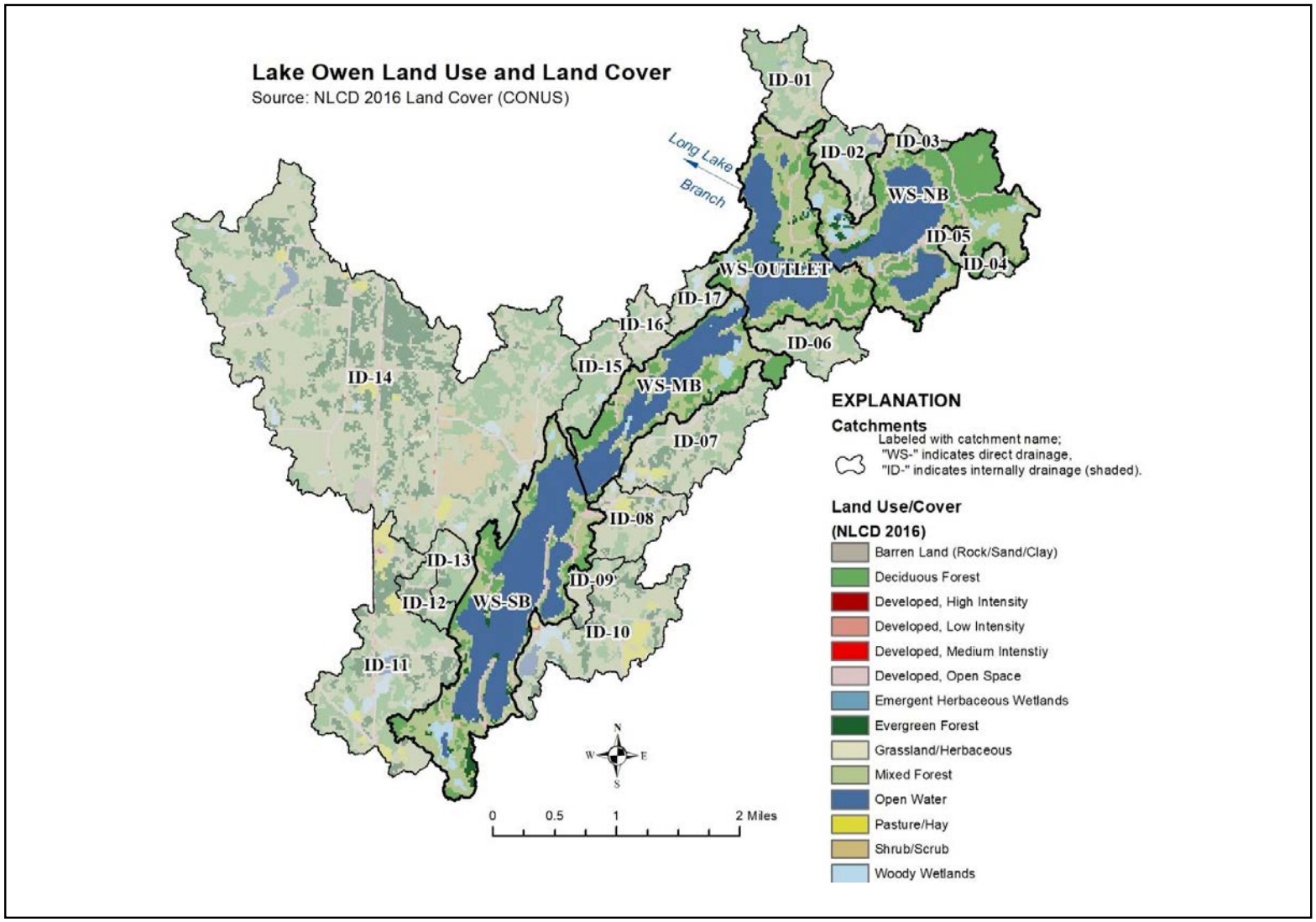


FIGURE 17. WATERSHED LAND COVER MAP

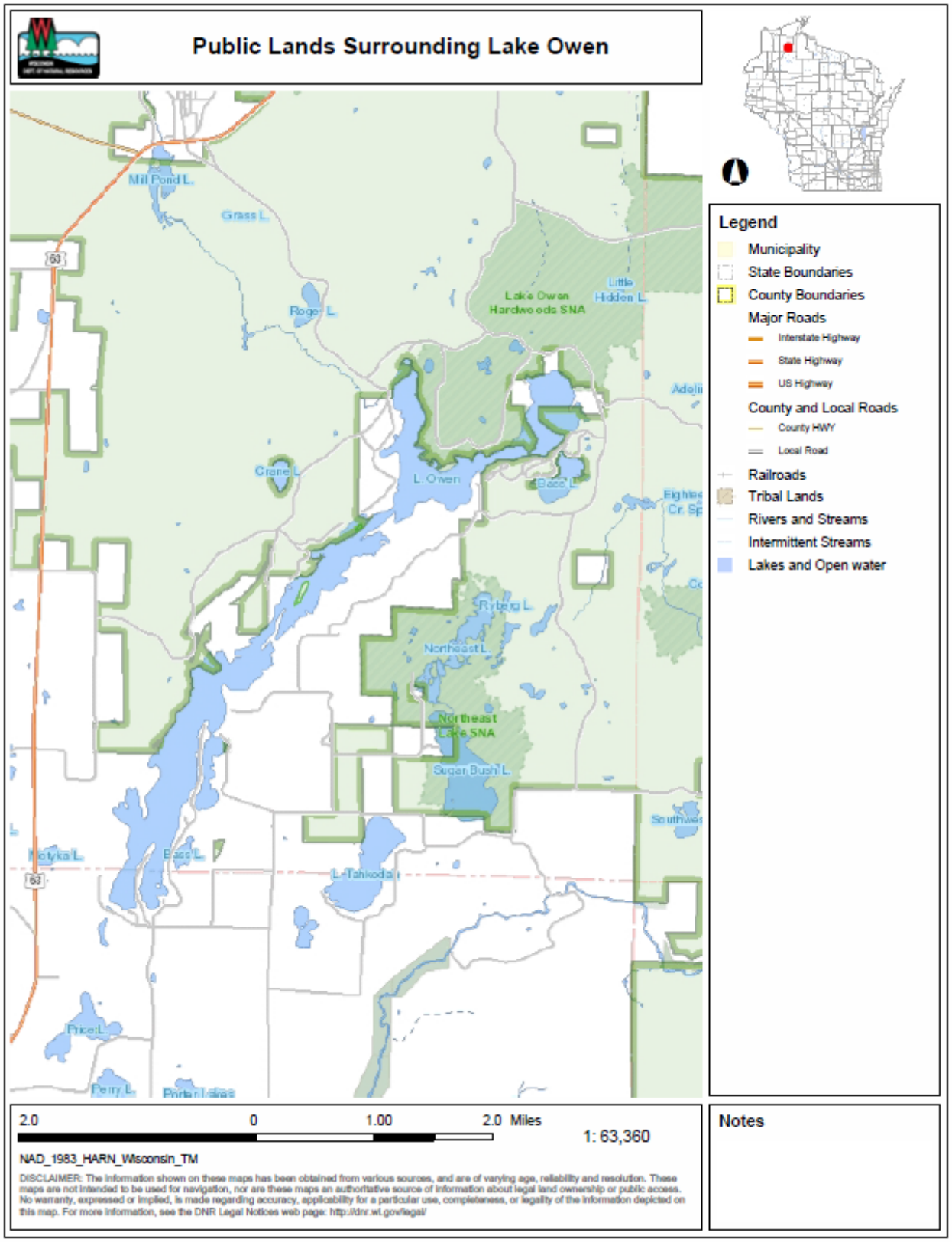


FIGURE 18. PUBLIC LANDS SURROUNDING LAKE OWEN

Water Budget

Water enters the lake from runoff from the watershed, precipitation on the lake surface, and the groundwater. It leaves the lake in the outlet stream, evaporates from the lake surface, and flows out in groundwater. The largest source of water to Lake Owen is groundwater. Groundwater is relatively low in nutrients when compared with other water sources.

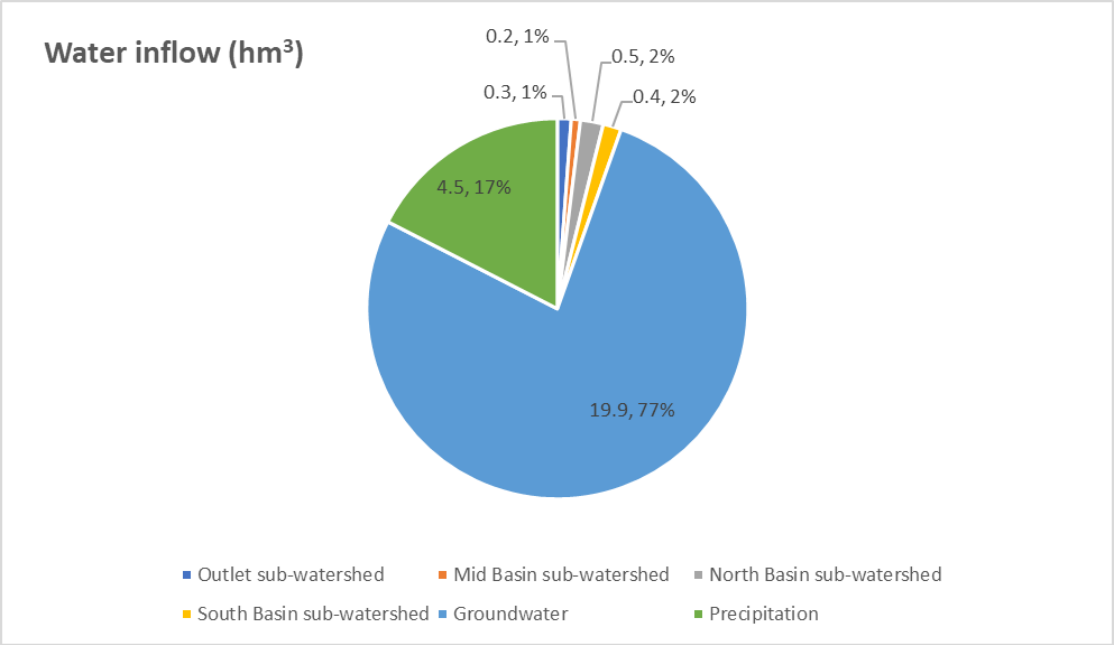


FIGURE 19. WATER INFLOW TO LAKE OWEN

Nutrient Budget

Phosphorus is the nutrient of concern for Lake Owen because it is the limiting factor for algae growth in the lake. Because of the large volume of water, groundwater carries the most phosphorus to the lake (42%). When all portions of the watershed are combined, they make up the next largest source (31%). Atmospheric deposition, likely from tree pollen, is 21% of the phosphorus budget, followed by septic systems (5%).

Limiting phosphorus inputs will limit algae growth in Lake Owen. Controllable sources of phosphorus include runoff from the watershed and septic systems. The South Basin (WS-SB in Figure 17) has the largest estimated current input of phosphorus, largely because of medium density residential resort and condominium development on the south end of the lake.

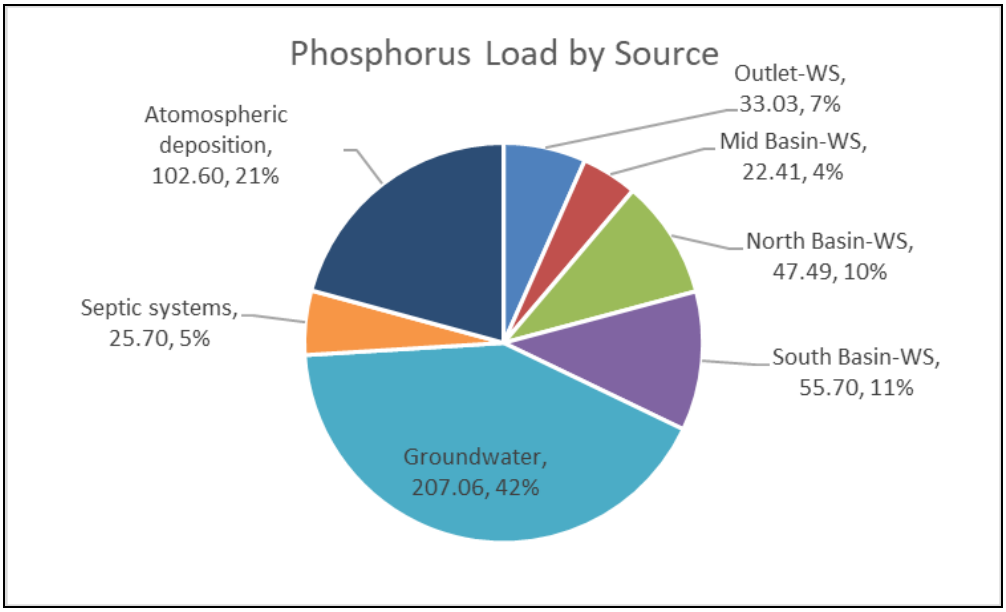


FIGURE 20. PHOSPHORUS LOAD BY SOURCE

Impacts of Land Use Changes

A mathematical model, based on the water and nutrient data collected, was used to predict changes in lake water quality that would result from changes in the watershed. Of the 2,298-acre direct drainage watershed, an estimated 717 acres is available for future development. The lake model predicts that if 25% of the forest land available for development is converted to residential land, the Secchi depth (water clarity) will decrease from 6.8m (22.3ft) to 5.4m (17.7ft). If 50% is developed, Secchi depth will decrease from 6.8m (22.3ft) to 4.5m (14.8ft).

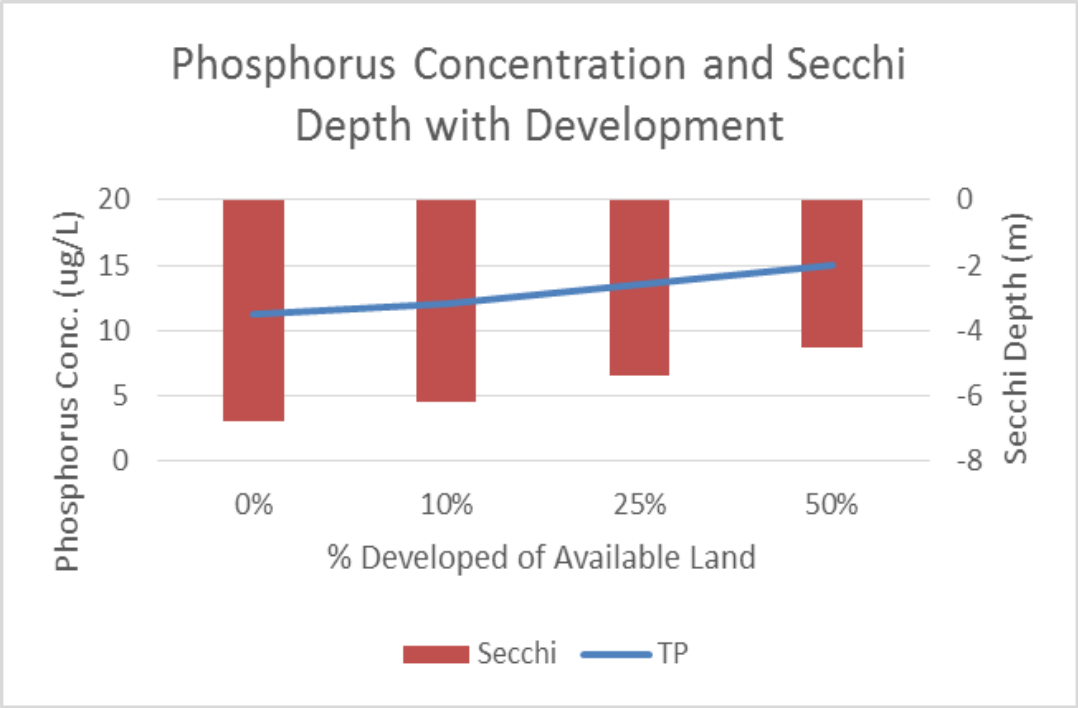


FIGURE 21. PREDICTED CHANGES IN WATER CLARITY WITH POTENTIAL DEVELOPMENT

Climate Change Impacts

Analyses of observed historical climate trends, as well as new climate projections for Wisconsin predict climate change over the coming century. Future projections under a low-end emissions scenario suggest Wisconsin will continue to warm into the middle of the 21st century, including a tripling in frequency of extreme heat days. Wisconsin is also likely to become wetter in the coming century, with robust increases in winter, spring, and fall. Extreme precipitation events are likely to increase in frequency and magnitude (UW Madison and WI DNR, 2020). Figures 22 through 24 illustrate these changes.

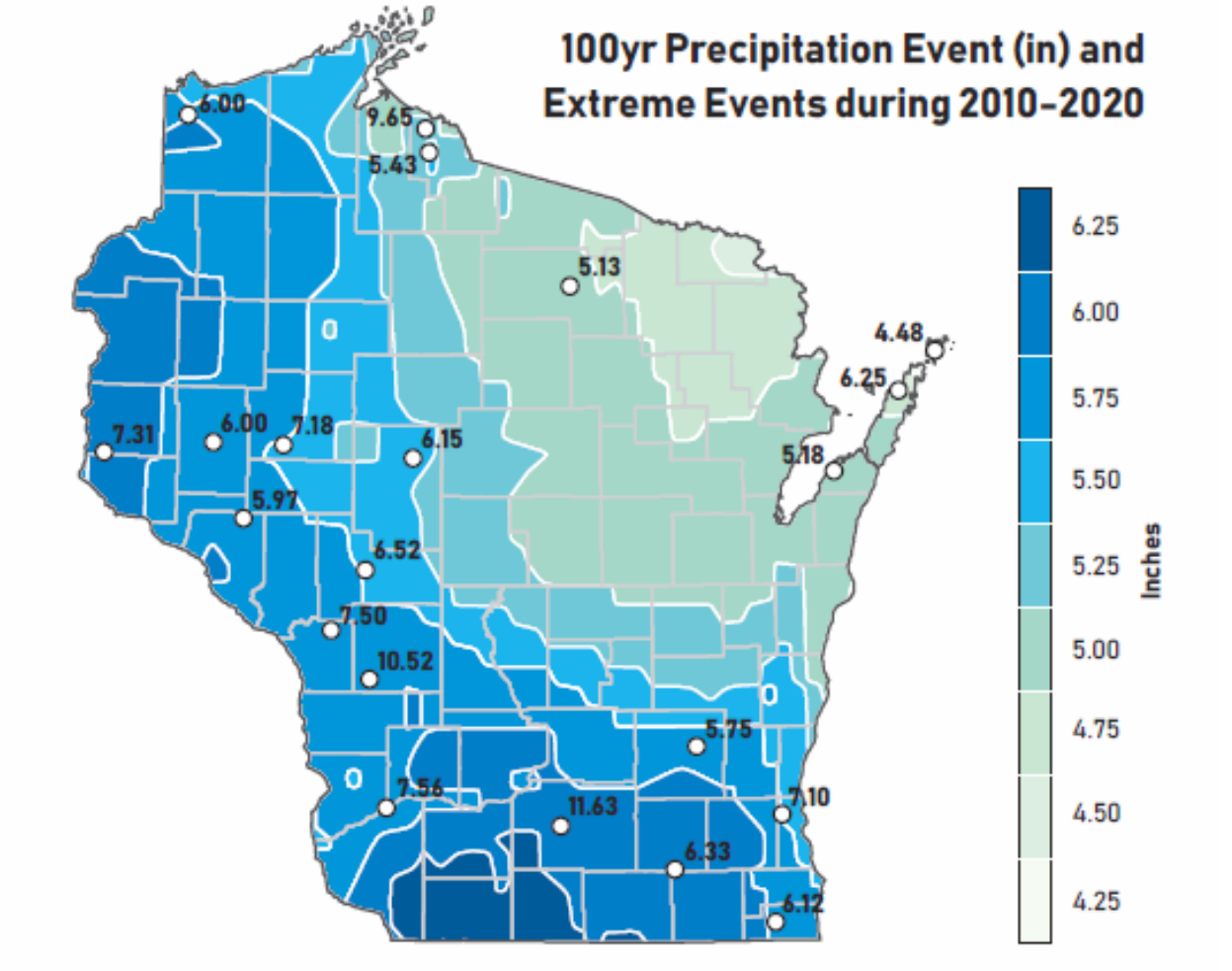


FIGURE 22. 100 YR PRECIPITATION EVENTS IN WISCONSIN 2010-2020

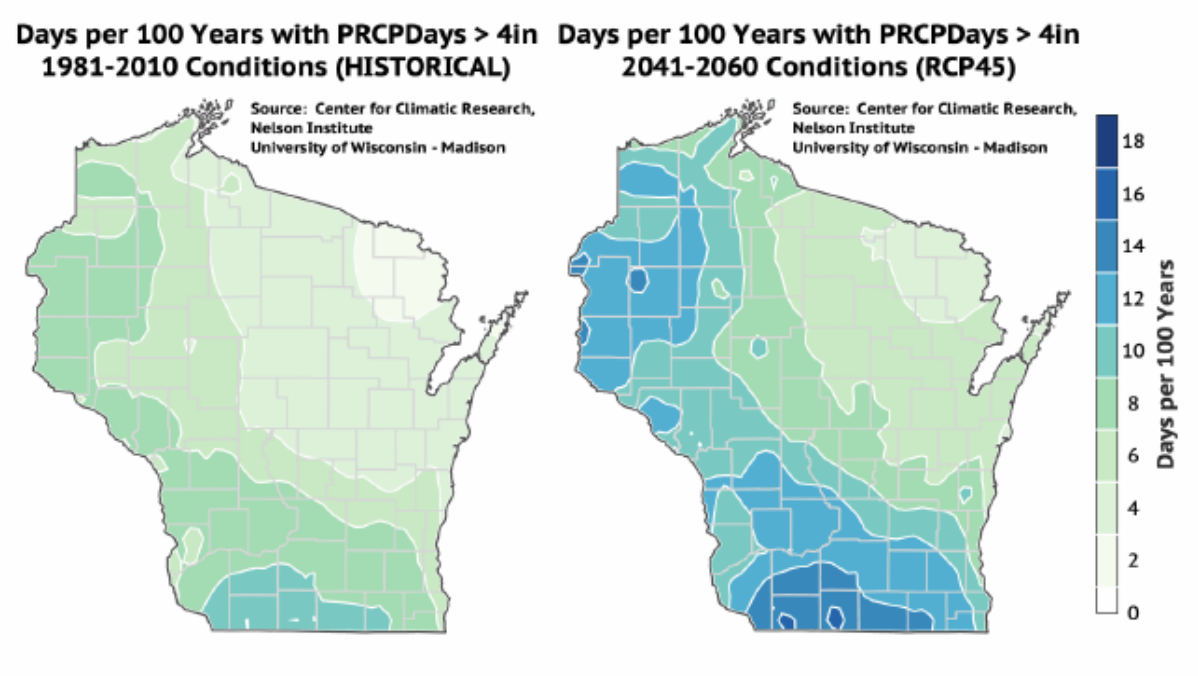


FIGURE 23. PROJECTED CHANGES IN MID-21ST CENTURY EXTREME PRECIPITATION EVENTS

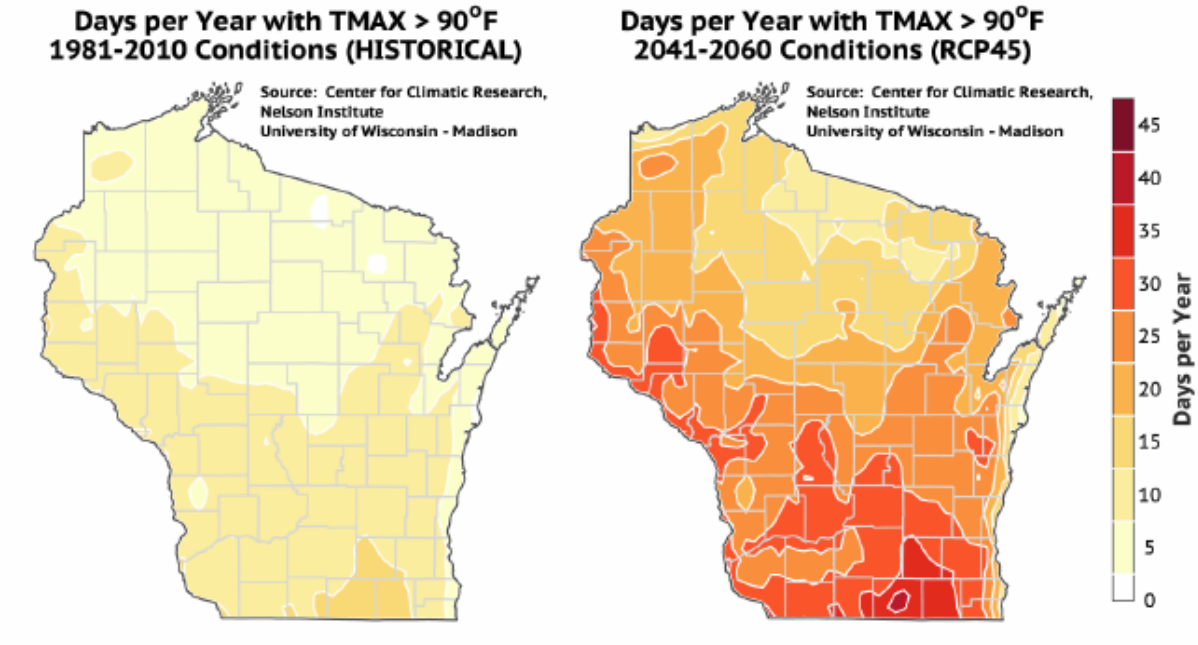


FIGURE 24. ANNUAL HISTORICAL AND MID-21ST CENTURY PREDICTED EXTREME HEAT FREQUENCY

Protecting Lake Owen Water Quality

While Lake Owen is a resilient, deep-water lake fed by groundwater and protected by a largely forested watershed, human development and use have the potential to negatively impact the lake. In addition to potential overall lake impacts, runoff and erosion from developed areas can have localized impacts. Increased runoff can increase the temperature of the water. Erosion resulting from runoff can increase sedimentation and change bottom habitat for fish and other organisms by filling in space between rocks with fine sediments. Sediment build-up can also provide habitat more conducive for invasive species such as Eurasian watermilfoil.

Reduced stratification (resulting in nutrient-rich water rising to where algae can grow) during the growing season also has potential for increasing algae growth and lowering water clarity in Lake Owen. The thermocline extends from 15 to 30 feet (depending upon location and time of year) in Lake Owen, with lake stratification more stable than in shallower lakes. However, de-stratification resulting from changes in water temperature is not manageable. There is also speculation that boat motor down-thrust may reach depths that could disturb stratification in Lake Owen. [Add U of M report results when available.]

Threats to Lake Owen Water Quality

- Runoff of sediment and nutrients from densely-developed areas to the lake – especially to Otter Bay and the South Basin.
- Septic systems installed prior to July 1, 2000. Many older systems (20 years or older) are "grandfathered" and do not have to meet requirements of the current code, which can be problematic.
- Conversion of currently forested areas to residential and/or commercial use. This transition would increase impervious surfaces and resulting runoff of sediment and nutrients.
- Erosion and resulting sedimentation that occurs during construction – including remodeling, landscaping, and new construction.
- Climate change that results in higher-intensity, large storm events would generate increased runoff and loading of nutrients. Warmer temperatures along with intense storm events could destabilize lake stratification.
- Sediment disturbance and de-stratification from boat motor propeller wash. Wake boats have the most potential to disturb sediments and cause destratification with propeller wash reaching more than 20 feet when operating in surf mode (Terra Vigilis Environmental Services, 2022). A University of Minnesota study of propeller wash from wake boats is scheduled to be released in the spring of 2024.[16]

[16] https://sites.google.com/umn.edu/healthywatersinitiative/phase-ii-research?authuser=0

Recommendations to Protect Water Quality

The watershed study recommends focusing LOA resources on reducing runoff of sediment and nutrients from developed areas in the South Basin and around Otter Bay. Technical and financial support provided for projects such as diversions, rain gardens, and rock infiltration areas can encourage mitigation measures. These measures can protect Lake Owen and provide a measure of safety to guard against impacts of future development. Because of the benefits provided by natural vegetation between development and the lake, the LOA could also offer assistance to owners around the lake who are interested in enhancing this protective buffer.

Potential sources of increased future loading should be examined because the lake model predicts that increases in phosphorus loading will to lead to water quality declines.

Climate change, which is bringing more intense storms events, could increase runoff significantly. Furthermore, more intense storm systems and greater heating of Lake Owen could lead to lake mixing and higher internal loading. Both could result in degradation in water quality with more nutrients and potential algae growth. Since residents and lake users cannot directly control these potential changes, the implementation of management practices to reduce runoff could mitigate climate change impacts.

Recommendations Related to Climate Change

Among the recommendations in a 2020 report to the Governor to protect Wisconsin lakes against climate change, the following are especially relevant to Lake Owen:

- ***Protect and restore lake and river shoreland areas*** *to make them more resilient to changing water levels and minimize property damage.*
- **Improve urban stormwater management** practices to reduce flooding by incentivizing green infrastructure such as bioswales, rain gardens, natural fences, and rain barrels, along with pervious pavers in paved roads and parking lots.
- **Prevent the spread of invasive species** by all methods.
- **Maintain minimum lake levels during drought** by limiting groundwater extraction and directing agricultural drain water into wetlands and other infiltration areas to facilitate groundwater recharge.
- **Continue outreach efforts to maintain 100% compliance with aquatic invasive species** prevention efforts.
- **Expand youth education** and community-based social marketing to achieve higher compliance rates.
- **Provide education and outreach aimed at shifting cultural norms** regarding idyllic lake shorelines to include natural vegetation and minimize human structures.

Watershed Recommendations

1. ***Implement best management practices (BMPs) in the near-shore areas.*** *The focus for mitigation should be areas with large impervious surfaces, buildings, and manicured lawns in the Otter Bay and South Basins. Potential best management practices include infiltration devices (especially adjacent to impervious surfaces), rain gardens, and/or shoreline buffers.*

    a. Education regarding shoreline restoration and best management practices (BMPs) for lake property
    b. Technical assistance
    c. Financial assistance (WDNR Healthy Lakes Program)
    d. Implementation of Bayfield County Shoreland Zoning land use permit mitigation requirements

2. **Identify methods to mitigate loading from future development.** Future development might include conversion of forest land to residential or commercial land or increased density of existing residential development. An investigation of ownership of currently undeveloped parcels and identification of those parcels that are critical for watershed protection is recommended. The LOA could take an active role in the purchase of title or conservation easements to preserve such properties.

    a. Identify and prioritize areas for conservation set aside. Examine and chose best methods to preserve undeveloped, forested land.
    b. Support effective development of and compliance with local ordinances and state regulations that limit impacts of shoreline development
    c. Implement BMPs in near-shore areas (see #1)
    d. The LOA could help to ensure that the requirements of local and state stormwater and construction site erosion control regulations are carried out by educating owners about erosion control best practices and/or informing the WDNR or Town building inspectors about potential stormwater and erosion control violations.

3. ***Identify septic systems installed prior to July 1, 2001, and provide incentives for upgrades for these systems.***

4. ***Review and establish a long-term water quality monitoring program.***
Consistent monitoring will help to identify trends and evaluate management practices. Current monitoring includes monthly, near-surface total phosphorus, chlorophyll-a, and Secchi depth at three basins. Dissolved oxygen and temperature profiles occur monthly in all four lake basins.

Review of Existing Management and Alternatives

Support for Best Management Practice Installation

Free shoreland evaluations were offered to all lake residents, and a total of twelve were completed under a recent DNR Lake Protection Grant project (2019-2022). Lake Manager, Cheryl Clemens provided recommendations for native plantings and runoff reduction verbally during visits and in writing following the visits and offered cost sharing through the grant when potential projects were identified. Densely-developed resort areas on the south end of the lake were given priority for technical assistance. Detailed design drawings were provided for one condo association and specific recommendations provided to another. However, both organizations decided not to participate in the grant funding at least partly because of the cost sharing requirements which included registering an agreement requiring a 20-year maintenance period with the Bayfield County Register of Deeds Office. A few additional property owners completed native plantings, but also chose not to seek grant reimbursement.

Technical assistance and outreach for native plantings and runoff reduction are supported by a current DNR planning grant which runs through the end of 2025. The Lake Owen Association could consider offering financial assistance for project installation because of concerns related to requirements for DNR grant funding support for installation.

Conservation Set-Aside

Large tracts of undeveloped land are present around Lake Owen. They are owned by the federal government (US Forest Service), state government (state natural areas), and private owners. Privately-owned land may be susceptible to development with changes in ownership from sale or generational transfer. The Lake Owen Association may want to consider working with families to encourage and support conservation set- aside through donation or sale of conservation easements or property. Land trust organizations such as the Landmark Conservancy are potential partners for such an effort.

Water Quality Monitoring

The LOA monitoring program, while scaled back a bit from the initial study (2018 – 2020), is robust enough to identify any water quality changes and guide potential management into the future.

Present monitoring costs are approximately $7,400 per year. This includes labor, lab analysis, and travel. If spring and fall turnover monitoring were eliminated, the cost would be about $5,800 annually. Monitoring costs could be reduced if needed. Use of limited financial resources to mitigate potential impacts of climate change through best management practices to reduce runoff is recommended over expanded monitoring.

TABLE 4. CURRENT LAKE OWEN WATER QUALITY MONITORING

Spring and fall turnover phosphorus profiles.
May through Sept., **monthly phosphorus and chlorophyll-a** near surface in three basins, metalimnion and hypolimnion in one basin (the deep hole).
Outflow volume and lake stage (LOA owns the transducer).
Temperature profiled twice per day from surface to near bottom in deep hole (LOA owns thermistor string).
Dissolved oxygen profiles in 4 basins monthly (May through Sept.) and spring and fall turnover (LOA owns DO/temperature sonde).
Water clarity (Secchi depth) monthly (May to Sept.) and spring and fall turnover.
Annual report of water quality implications and management issues. Three year summary report of all data collected.
Thermistor data summary and comparison to previous years.
Annual cost: $7,400 without flow and $8,000 with flow. Covered by DNR grant 2023 to 2025. Monitoring program and costs will be re-examined for 2026 and beyond.

Aquatic Habitats

Lake Owen Fisheries

According a 2007 WDNR Fisheries Report, Lake Owen has a diverse fishery consisting of walleye, northern pike, largemouth bass, smallmouth bass, bluegill, pumpkinseed, rock bass, black crappie, yellow perch, white sucker, Iowa darter, bluntnose minnow, central mud minnow, cisco, and lake whitefish. Rainbow trout were stocked in the 1970s and 80s in an attempt to establish a two-story fishery and provide additional angling opportunities. Trout stocking was discontinued after 1987 due to little carry over and lack of public demand (Kamke 1989). It was assumed rainbow trout no longer existed in Lake Owen as early as 2007.

TABLE 5. FISH SPECIES OF LAKE OWEN

Species (Common name)	**Scientific name**
Walleye	*Sander vitreus*
Northern pike	*Esox lucius*
Smallmouth bass	*Micropterus dolomieu*
Largemouth bass	*Micropterus salmoides*
Bluegill	*Lepomis macrochirus*
Pumpkinseed	*Lepomis gibbosus*
Black crappie	*Pomoxis nigromaculatus*
Yellow perch	*Perca flavescens*
White sucker	*Catostomus commersoni*
Lake whitefish	Coregonus clupeaformis
Cisco	*Coregonus artedi*
Rock bass	*Ambloplites rupestris*
Logperch	*Percina caprodes*
Iowa darter	*Etheostoma exile*
Bluntnose minnow	*Pimephales notatus*
Central mud minnow	*Umbra limi*

Wisconsin DNR completed a fisheries management report for Lake Owen in 2014, and information is presented here from that report (Olson, 2015) and data collected during a comprehensive fishery survey in 2019.

Lake Owen is a low productivity lake that supports a popular smallmouth bass, largemouth bass, and walleye fishery. From the late 1980s to the early 2000s walleye abundance declined while largemouth bass abundance increased from the early 1990s to mid-2010s. This shift may be the result of overexploitation of walleye, negative interactions between walleye and largemouth bass, or changes in

habitat conditions (e.g., temperature, productivity). Since the last fisheries report (Toshner, 2008), several fisheries surveys have been completed including a mark-recapture walleye population estimate (2013 and 2019), annual fall juvenile walleye recruitment surveys and late spring stocking success and bass relative abundance surveys.

Concerns over Lake Owen's shifting gamefish community have resulted in several changes to fisheries management in Lake Owen. Between 2009 and 2011, regulations intended to reduce harvest of walleye were implemented, minimum length limits for smallmouth and largemouth bass were removed, and the stocking density of large fingerling walleye was increased. In addition, the model used to assign walleye harvest quotas was changed to more accurately reflect the recruitment status of Lake Owen's walleye population. This resulted in reduced harvest quotas in years when the model was used to calculate safe harvest levels.

Since these changes have been implemented, modest changes to the gamefish community have occurred. Since 2014, both largemouth and smallmouth bass abundance declined and recruitment of age-0 walleye increased. Adult walleye density has stayed relatively stable since 2003 at a low level around 1 fish/acre.

The results indicate that increased stocking of large fingerling walleye had limited impact on adult walleye abundance. In 2013, only 8% of the adult population could be attributed to stocking efforts. In 2019, an estimated 17% of the age-5 cohort were stocked fish. From the 2019 survey, survival of stocked fish to age-5 was only 0.33% equating to a cost-per-age-5 adult of $318. Additionally, we did not detect a significant increase in juvenile recruitment in years when stocking occurred. Lake Owen's oligotrophic nature and abundance of predators may be limiting the success of stocking.

Results from the 2019 creel survey results indicate there were some changes in angler harvest since new regulations were implemented from 2009-2011. Compared to the 2007 creel survey results, harvest in 2019 was drastically reduced by about 85% for walleye, 90% for largemouth and 97% for smallmouth. Harvest was also reduced for other species that did get regulation changes from 2009-2011 indicating these changes could also be a result of anglers voluntarily shifting away from harvesting. However, the significant decrease in walleye and bass harvest was likely driven mostly by the restrictive regulations put in place from 2009-2011.

Recommendations

DNR management recommendations are: 1) Evaluate contribution of several years of stocking large fingerings to the adult population during the next walleye population estimate 2) cease stocking activities after the next walleye population assessment if stocked fish do not contribute at least 20%, on average, to each stocked cohort between age 4 and 10 or if the mean cost per stocked age 4 and 5 recruit is greater than $250, 3) maintain smallmouth bass relative abundance > 10 fish/mile and largemouth bass relative abundance < 5 fish/mile.[17]

The following fishery recommendations are selected from a Wisconsin climate change report ((UW Madison and WI DNR, 2020).

- Develop shovel-ready habitat enhancement plans ("fish sticks"/tree drops and gravel/cobble additions) to maintain important spawning and refuge habitat for fishes when lake water levels drop.
- Manage land use to reduce runoff and implement agricultural, urban, and riparian best management practices that are best suited to withstand intense precipitation and flooding.
- Reduce nutrient loading to deeper lakes that mix from top to bottom twice a year to help ensure that habitat remains accessible to sensitive species during times of high heat.
- Adjust stocking and management of the fishery to favor species that are best suited for current conditions and prevent spread or increase of warm water species in undesirable locations.
- Adjust fishing seasons to reflect timing changes in spawning, set appropriate harvest control rules, and reduce fish mortality.
- Improve effectiveness of invasive species control measures.

FIGURE 25. SMALLMOUTH BASS (BY SELINE)

[17] Recommendations from 2015 Lake Owen Fisheries Report were updated by Nathan Thomas, DNR Fisheries Biologist. Email communication February 7, 2024. He also added data from the 2019 Lake Owen Fisheries Survey to the information above.

Table 6. WI DNR Walleye Stocking in Lake Owen

Year	Age Class	Number Stocked	Average Length (Inches)
2022	LARGE FINGERLING	12,499	6.2
2020	LARGE FINGERLING	12,625	7
2018	LARGE FINGERLING	12,495	6.3
2016	LARGE FINGERLING	12,532	7.43
2014	LARGE FINGERLING	12,943	6.35
2013	LARGE FINGERLING	4,960	6
2013	LARGE FINGERLING	6,615	6.5
2012	LARGE FINGERLING	6,614	7.7
2011	LARGE FINGERLING	4,319	6
2011	LARGE FINGERLING	6,615	6.2
2009	LARGE FINGERLING	2,500	6.7
2009	LARGE FINGERLING	4,847	5.6
2008	LARGE FINGERLING	6,146	6.5
2007	LARGE FINGERLING	2,581	5.8
1994	FINGERLING	57,477	2
1994	FRY	9,801	2.9
1993	FRY	70,000	1
1992	FINGERLING	70,773	2.6
1991	FINGERLING	16,956	4
1988	FINGERLING	49,731	3
1985	FINGERLING	8,357	3
1983	FINGERLING	62,240	3
1982	FINGERLING	62,268	3.67
1981	FINGERLING	62,494	2.33
1980	FRY	130,0000	

Table 7. Rainbow Trout Stocking in Lake Owen

Year	Age Class	Number Stocked	Average Length (Inches)
1987	YEARLING	9,000	9
1983	YEARLING	7,652	7
1979	YEARLING	3,500	
1978	YEARLING	3,500	
1977	YEARLING	3,500	

Plant Community

Functions and Values of Native Aquatic Plants

Naturally occurring native plants are extremely beneficial to lakes. They provide a diversity of habitats, help maintain water quality, sustain fish populations, and support common lakeshore wildlife such as loons and frogs.

Water Quality

Aquatic plants can improve water quality by absorbing phosphorus, nitrogen, and other nutrients from the water that could otherwise fuel nuisance algal growth. Some plants can even filter and break down pollutants. Plant roots and underground stems help to prevent re-suspension of sediments from the lake bottom. Stands of emergent plants (whose stems protrude above the water surface) and floating plants help to blunt wave action and prevent erosion of the shoreline.

Fishing

Habitat created by aquatic plants provides food and shelter for both young and adult fish. Plankton and invertebrates living on or beneath plants are a primary food source for many species of fish. Other fish such as bluegills graze directly on the plants themselves. Plant beds in shallow water provide important spawning habitat for many fish species.

Waterfowl

Plants offer food, shelter, and nesting material for waterfowl. Birds eat both the invertebrates that live on plants and the plants themselves.[18]

Protection against Invasive Species

Non-native aquatic invasive species (AIS) threaten native plants in Northern Wisconsin. The most common are Eurasian water milfoil (EWM) and Curly-leaf pondweed (CLP). These species are described as opportunistic invaders. This means that they take over openings in the lake bottom where native plants have been removed. Without competition from other plants, these invasive species may successfully become established and spread in the lake. This concept of opportunistic invasion can also be observed on land in areas where bare soil is quickly taken over by weeds.

Removal of native vegetation not only diminishes the natural qualities of a lake, but it increases the risk of non-native species invasion and establishment. The presence of invasive species can change many of the natural features of a lake and often leads to expensive annual control plans. Allowing native plants to grow may not guarantee protection against invasive plants, but it can discourage their establishment. Native plants may cause localized concerns to some users, but as a natural feature of lakes, they generally do not cause harm.[19]

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[18] Above paragraphs summarized from *Through the Looking Glass*. Borman et al. 1997.

[19] *Aquatic Plant Management Strategy*. DNR Northern Region. Summer 2007.

Aquatic Plants in Lake Owen

Lake Owen aquatic plant inventories were completed in 2013 (Northland College, 2015) and 2019 (Schieffer, 2019) using the WDNR-specified point intercept method. The survey and data analysis methods and detailed results for the aquatic plant survey are found in the reports, and definitions are provided on the following page. A brief summary of the aquatic plant survey results follow.

Aquatic Plant Survey Results

Lake Owen has a high diversity of plants, with plants growing in deep water because of high water clarity. However, areas with steep drop-offs limit plant growth. The 2019 plant survey sampled 42 different native species compared to 38 species in 2013. Plants were found at 68.3% of the sample points within the depth of the defined littoral zone (depths at which plants grow) and at 27.9% of the sample points across the entire lake. Plants were sampled in water up to 27.2 feet deep with a mean depth of 8.35 feet.

There were statistically significant increases in nine species and statistically significant decreases in two species between the 2013 and 2019 plant surveys. Measures of plant diversity (the Simpson's diversity index and the Floristic Quality Index) increased slightly from 2013 to 2019. The Simpson's diversity index was 0.91 in 2013 and 0.93 in 2019. The Floristic Quality Index (FQI) was 38.5 in 2013 and 43.0 in 2019.

No one species dominated the plant community, and the most frequent plants are common species of Wisconsin lakes.

Special Concern Species

Two species of special concern were sampled: *Littorella uniflora* (littorella) *and Najas gracillima* (northern naiad). Species of special concern are species with limited distribution or specific habitat needs. These species are typically sensitive to changes in the lake that may be attributed to human activity.

Plants are assigned conservatism values for the Floristic Quality Index, which represent how tolerant they are to changes in habitat. Those with high conservatism values are considered more sensitive. A large number of species with high conservatism values were sampled in Lake Owen.

Definitions

Rake Fullness: Is a measure of the quantity of plants found at a sample point when pulled up by a rake as shown in Figure 26. The rake fullness ranges from 0 to 3. Total rake fullness and rake fullness for individual species are recorded for each sample point.

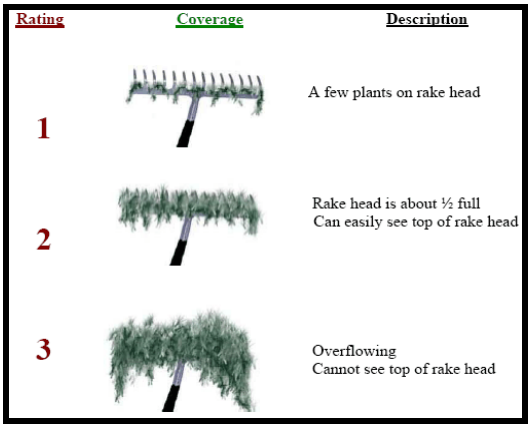

FIGURE 26. RAKE FULLNESS RATINGS

Littoral Zone: The area of the lake that extends to the deepest point at which plants will grow. Not all sample points in the littoral zone have vegetation. In clear lakes, such as Lake Owen, plants may be found at depths of over 20 feet, while in stained or turbid locations, they may only be found in up to a few feet of water. While some species can tolerate very low light conditions, others are only found near the surface where there is good light.

Simpson's Diversity Index: The Simpson's Diversity Index value represents the probability that two randomly selected, individual plants will be different species. The index values range from 0 to 1 where 0 indicates that all the plants sampled are the same species, to 1 where none of the plants sampled are the same species. The greater the index value, the higher the diversity in a given location. Although many natural variables like lake size, depth, dissolved minerals, water clarity, mean temperature, etc. can affect diversity, in general, a more diverse lake indicates a healthier ecosystem. Perhaps most importantly, plant communities with high diversity also tend to be more resistant to invasion by exotic species.

Floristic Quality Index (FQI): This index measures the impact of human development on a lake's aquatic plants. The 124 species in the index are assigned a Coefficient of Conservatism (C) which ranges from 1 to 10. The higher the value assigned, the more likely the plant is to be negatively impacted by human activities relating to water quality or habitat modifications. Plants with low values are tolerant of human habitat modifications, and they often exploit these changes to the point where they may crowd out other species. The higher the index value, the healthier the lake's plant community is assumed to be. Nichols (1999) identified four eco-regions in Wisconsin: Northern Lakes and Forests, North Central Hardwood Forests, Driftless Area, and Southeastern Wisconsin Till Plain. He recommended making comparisons of lakes within ecoregions to determine the target lake's relative diversity and health. Lake Owen is in the Northern Lakes and Forests Ecoregion.

TABLE 8. LAKE OWEN MACROPHYTE PI SURVEY SUMMARY-2019

Total number of sites whole lake grid	1556
Total number of sites with vegetation	435
Total number of sites shallower than the maximum depth of plants (less than 27.2 ft)	637
Frequency of occurrence at sites shallower than the maximum depth of plants	68.3%
Frequency of occurrence in the entire lake	27.9%
Simpson Diversity Index	0.93
Maximum depth of plants	27.20 ft.
Mean depth of plants	8.35 ft.
The average number of all species per site (shallower than maximum depth with plants)	1.85
The average number of all species per site (vegetated sites only)	2.73
Species Richness	42
Species Richness (including visuals)	43

TABLE 9. COMMON SPECIES OF LAKE OWEN

Species	**FOO-veg**	**FOO-littoral**	**Rel. freq.**	**Number sampled**	**Mean density**
Vallisneria americana, Wild celery	33.79	23.08	12.35	147	1.05
Elodea canadensis, Common waterweed	28.05	19.15	10.25	122	1.05
Potamogeton robbinsii, Fern pondweed	25.29	17.27	9.24	110	1.07
Potamogeton gramineus, Variable pondweed	23.91	16.33	8.74	104	1.02
Myriophyllum sibiricum, Northern water-milfoil	23.45	16.01	8.57	102	1.11

FOO – Frequency of Occurrence

TABLE 10. COMPARISON OF 2019 AND 2013 LAKE OWEN PLANT SURVEYS

	Lake Owen 2013	Lake Owen 2019
Species richness	38	42
Simpson's diversity index	0.91	0.93
Maximum depth with plants	22.9 ft	27.2 ft
Mean conservatism value	6.81	6.80
Floristic quality index	38.50	43.00
Sample points with plants	393	435

FIGURE 27. SPECIAL CONCERN SPECIES PRESENT IN LAKE OWEN: *LITTORELLA UNIFLORA* (LEFT) AND *NAJAS GRACILLIMA* (RIGHT) **(SKAWINSKI)**

Invasive Aquatic/Riparian Plants

No aquatic invasive plant species were sampled or viewed during the plant survey rake samples, but three invasive species were observed in a boat survey. These species were *Iris pseudacorus* (yellow iris), *Myosotis scorpioides* **(**aquatic for-get-me-not) and *Phragmites australis ssp. australis* (common reed). All of these are riparian plants that grow along the shoreline.

FIGURE 28. YELLOW IRIS (LEFT) AND AQUATIC FORGET-ME-NOT (MIDDLE) AND NON-NATIVE COMMON REED (RIGHT). PHOTOS FROM WISCONSIN DNR WEBSITE-INVASIVE SPECIES.

Some areas of Lake Owen are more susceptible to introduction and establishment of aquatic invasive species (AIS). These locations, based upon factors such as sediment type and coverage of plants, should be the focus for AIS monitoring. Areas of high concern for AIS susceptibility are shown in Figure 29.

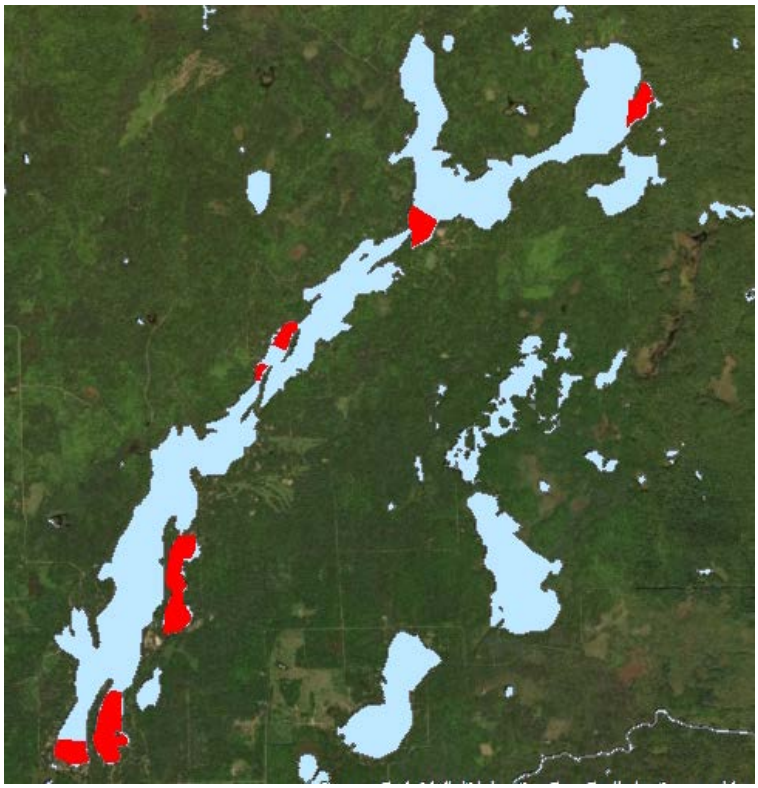

FIGURE 29. AREAS OF HIGH CONCERN FOR AIS SUSCEPTIBILITY

IMPORTANT PLANT HABITAT

Additional areas of the lake are a focus for management because they provide important aquatic plant habitat. Important Lake Owen aquatic plant habitat areas are identified where there is a high diversity of plant species, floating-leaved and emergent plants, and sensitive plant species present (Figure 30). More detailed maps and species information is included in the important plant habitat summary report (Schieffer S., 2022).

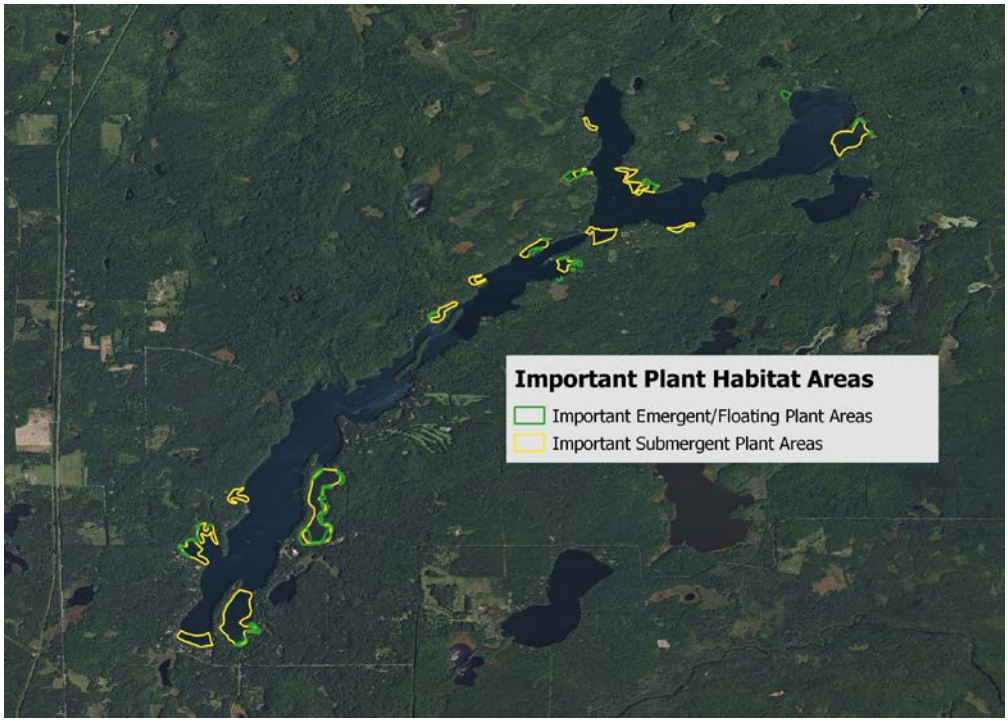

FIGURE 30. IMPORTANT PLANT HABITAT AREAS

Emergent plants

Emergent plants are plants that have leaves that extend above the water surface. They typically grow in shallow water, but some can thrive in more than 1 foot of water. Some smaller, narrow-leaved emergent plants such as arrowheads can also grow submersed in shallow water. Emergent plants provide vital habitats for invertebrates, fish, amphibians, reptiles, birds, and mammals. These plants have extensive spongy tissue and air spaces that make them buoyant and serve as nesting material for various organisms, such as loons or muskrats. The buoyant nests float up and down with changing water levels. Emergent plants can also reduce the energy in waves that protect shorelines from bank erosion and help stabilize lake bottom sediments with extensive root/rhizome networks. Emergent plants are also adapted with flexible reproductive strategies. In low water, they reproduce with seeds dispersed in the exposed sediment. In high water times, they spread their roots and/or rhizomes.

Floating Plants

Floating plants have leaves that float on the water surface. These leaves emerge from a rhizome that is in the lake sediment. The floating leaves are typically round or oval with smooth edges to reduce tearing in wind or waves. These plants provide shade for fish and a habitat for invertebrates, frogs, and fish. The leaves can reduce the energy in waves before they reach the lake bank, helping reduce erosion. The rhizomes can also help stabilize the lake's bottom sediment through an extensive network under the sediment surface. Many floating-leaved plants have fragrant flowers that provide nectar for insects. They also are aesthetically pleasing to many.

Threats to Lake Owen Aquatic Habitat

1. Introduction of aquatic invasive species (AIS).
    - Challenges: hiring, retaining, and training Clean Boats, Clean Waters and decontamination staff. Landings are not always staffed.
2. Disturbance of shallow lake sediments.
3. Removal of native aquatic plants.

Aquatic Habitat Recommendations/Alternatives

1. ***Continue regular AIS surveys*** *to identify introduced species early and allow for rapid response.*
    a. *Review and update AIS Rapid Response Protocol.*

2. ***Continue AIS prevention activities*** *including the Clean Boats, Clean Waters Program and AIS decontamination at Lake Owen Boat Landings.*

    a. *Look for ways to increase efficiency and effectiveness of decontamination operations.*

3. ***Preserve existing native plant communities, especially Important Plant Habitat Areas.***
    a. *Minimize disturbance from boat propeller down thrust by restricting areas where wake boats may be used via Town ordinances.*
    b. *Educate lake residents and visitors about the importance of limiting wakes near the shore.*
    c. *Educate lake residents about critical aquatic plant habitats and the ways to protect them.*

4. ***Use outreach methods to share recommendations for lake users/riparian owners:***
    - Refrain from removing or reducing aquatic vegetation, especially floating and emergent species.
    - Leave coarse woody habitat that fall into the water (if a tree falls, leave it be).
    - Leave snag or cavity trees standing (if they do not pose a threat to property).
    - Restore manicured lawn/developed shoreline to native vegetation.
    - Familiarize yourself with the important plant habitat areas in Lake Owen and their significance.
    - Do not disturb wildlife utilizing various habitats around Lake Owen.

Review of Existing Management and Alternatives

Aquatic Invasive Species Monitoring

The LOA Lake Scientist conducts aquatic Invasive species (AIS) meander surveys searching the areas where plants grow along the entire Lake Owen Shoreline in June, July, August, and September each year. Special attention is paid to locating and mapping yellow iris in the June survey. Manual and chemical yellow iris control measures are implemented with owner permission following the June survey. Additional aquatic/riparian invasive species are located and mapped. These species currently include aquatic forget-me-not, narrow-leaved cattail, and common reed grass. From 2018 – 2023 no new aquatic invasive species were located, but new sites were mapped. The number of yellow iris sites declined from 19 sites in 2019 to 2 in 2023. Zebra mussel monitoring devices are installed at the public boat landings.

Aquatic Invasive Species Prevention

Clean Boats, Clean Waters inspections are conducted at US Forest Service-owned landings at the North Outlet and Two Lakes Campground. Staffed AIS decontamination stations are located at the North Outlet Landing where a hot-water washing station is present and at the Two Lakes Campground where a bleach station with hand tools is present.

The LOA opened a hot water AIS decontamination station at the USFS North Outlet Landing in September 2020. Boat washing stations use hot water and/or high pressure to remove potential aquatic invasive species from boats, trailers, and equipment. The hot water kills the AIS, and the high pressure removes them. At 140°F, a hot water rinse for 10 seconds in each spot will kill all adult mussels and most other AIS. At 120°F, a contact time of two minutes is needed to destroy zebra mussels (MNDNR 2017). We established inspection and screening questions (including those asked for the Clean Boats, Clean Waters Program) based on a model provided by Minnesota DNR. The objective is to spend time decontaminating boats that are most likely to transport AIS.

A second decontamination station was set up at the USFS Two Lakes Campground in 2021. This station uses a mild bleach solution and tools to remove plants and debris. For the bleach decontamination station, a solution of 2.5 tablespoons of household bleach/gallon of water is sprayed on boats and trailers. A contact time of ten minutes is required when using this solution. The bleach solution must be replaced regularly – daily replacement is preferred. Signage is installed to provide instructions for and to encourage use of the station (NW WI ZM Team 2018). Use of decontamination stations is voluntary in Wisconsin unless there is a local ordinance that requires decontamination. Bayfield County passed an ordinance in July 2020 which requires decontamination if offered at a public or private water access.

In 2023, the LOA generally staffed the North Outlet landing 7 days/week: from 8am-4pm, M-F and 6:30am-5:30pm, Sat and Sun. The campground landing was generally staffed Friday 10-8, Saturday 7-2, and Sunday 10-6. Hours staffed were, in part, due to staff availability. For both landings, about 0.75 boats/hour were inspected entering the lake. Staffing was added at Otter Bay Landing Friday and Saturdays in 2024.

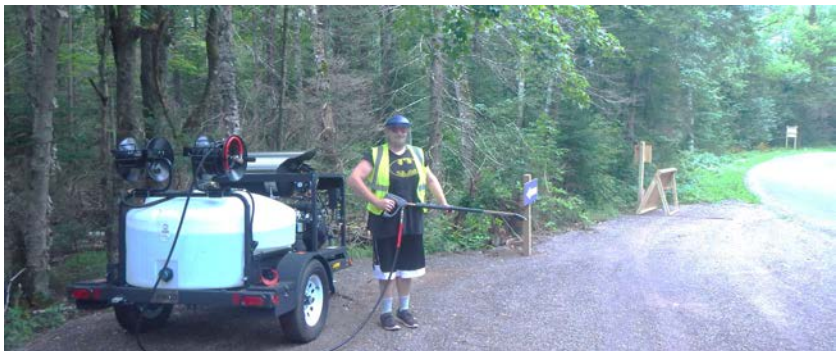

FIGURE 31. LAKE OWEN DECONTAMINATION STATIONS

North Outlet Results

The north landing was staffed from 5/26/23 through 10/2/23. In 2023, 158 boats were decontaminated at the Lake Owen North Outlet hot water, high pressure decontamination station. This represents 25% of boats that entered Lake Owen when the landing was staffed, up from 13% in 2022. The last lake visited for decontaminated boats included Namakagon – 27 boats (where hybrid Eurasian water milfoil – EWM is present), Lake Superior – 17 boats, (EWM, Zebra Mussels- ZM), St. Croix River and Deer Lake (ZM), Middle Eau Claire – 11 boats (curly leaf pondweed), Lake Hayward, Chippewa Flowage (7 boats), and Round Lake (both with EWM). In 2022, 54 boats were decontaminated at the station. In 2021, 22 boats were decontaminated.

Campground Results

The campground landing was staffed from 6/8/23 to 9/24/23. Most frequent lake of concern for boats that entered at the campground landing in 2023 was Lake Namakagon (HWM), followed by Lake Superior (EWM, Zebra Mussels). Other lakes of concern reported: Sissabagama (EWM), Chippewa Flowage (EWM), Eau Claire Lakes (CLP), Lake Wissota (CLP, EWM). Most of the boaters (43%) report coming from Bass Lake which is across the road. In 2023, staff reported that 20 boats were decontaminated using the bleach station.

Additional AIS Prevention Options

Landing Surveillance Cameras

Some lake organizations use video cameras at public landings to record landing activity. Environmental Sentry Protection is a company that provides landing camera systems. Internet Landing Installed Device Sensor (I-LIDS) is a self-contained, solar powered system installed at boat launches to prevent aquatic invasive species (AIS) through video capture and remote inspection of launching boats/trailers, and audio education of boaters using a lake. The system detects movement which triggers the capture of images which are then uploaded through a 3G/4G modem to a remote server. The server processes these images into a video clip which is date/time stamped on a remote server for authorized users to view. At the same time motion is detected, an audio message is played reminding boaters to inspect for AIS prior to launch and after pull-out. Videos are reviewed, and if watercraft are launched with vegetation attached, enforcement action may be initiated. Violations of the county ordinance and state rule which prohibits transporting and launching boats and trailers with vegetation attached can be enforced by local law enforcement officers. I-LIDS surveillance cameras are in place at nearby Lake Namakagon in Bayfield County. WDNR grants can be used to support camera installation. Maintenance and video/photo review are not grant-eligible expenses.

Some lake organizations are using surveillance cameras that record but do not count activity at boat landings. These systems are considerably cheaper to install and maintain.

FIGURE 32. I-LIDS AIS SURVEILLANCE CAMERA SYSTEM

Self-service Decontamination Stations

Self-service commercial systems for boat decontamination are also available. CD3 systems include a large sign board structure, vacuum, blower, and hand tools. CD3 Systems are equipped with technology that logs tool use and provides automatic reports and maintenance alerts. These systems are installed at Bone Lake, Balsam Lake, and Half Moon Lake in Polk County.

Bone Lake in Polk County, WI has both an I-LIDs camera and CD3 station at its north landing. This allows comparison of CD3 station use to the number of boat launches to the. In 2023, the CD3 unit recorded a minimum of 779 uses for the season of May- November.[20] The I-LIDs camera at the ramp recorded 2,067 discrete launches during the same time period, so 37.6% of boats launched used the CD3 unit. Clean Boats, Clean Waters staff observed that more people used the CD3 station when leaving rather than entering the lake.[21]

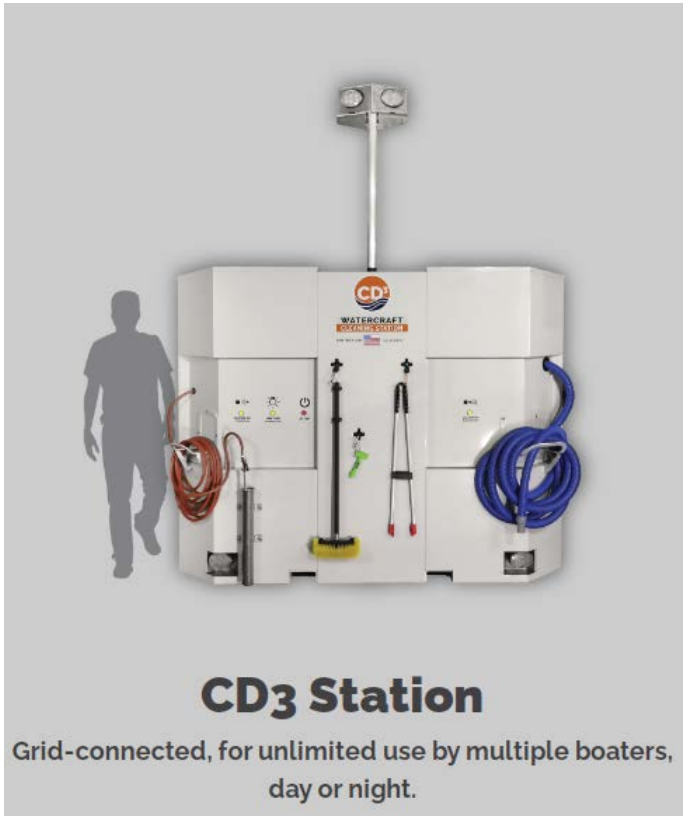

FIGURE 33. CD3 AIS DECONTAMINATION SYSTEM

[20]The air tool use was the measure of uses of the CD3 station. The uses for each tool are recorded, but it isn't possible to break out use of one tool versus multiple tools on each visit.

[21] Email grant reported submitted to WDNR by Cary Olson, Chair, Bone Lake Management District. 1/17/2024.

TABLE 11. AQUATIC INVASIVE SPECIES PREVENTION OPTIONS (2023 COSTS)

Method	Installation Cost	Expected Lifetime	Annual Cost	Labor	Advantages	Disadvantages	WDNR Grants
ILIDS Camera	$16,000	6 years	$2,500 (not grant eligible)	Volunteers to view video (optional)	Doesn't require staff Audio and video reminders Threat of enforcement Provide visit counts	Moderate/high cost	*Funding available up to $24,000 (depreciated), 75% funding
Security Camera	$2,000				Low cost May be installed for other purposes	Security Camera	Funding eligibility uncertain
Decontamination Station: CD3 system (signs, hand tools, blower, vacuum)	$36,000 - $40,000 + site prep.	8 years	$1,500 (not grant eligible)	$0	Doesn't require staff	High cost May not dry enough to remove zebra mussels	*Funding available up to $24,000 (depreciated), 75% funding

*DEPRECIATION REEQUIREMENTS APPLY - All equipment that has a useful life of greater than one year and a cost of $5,000 or more per unit must be depreciated and prorated for the duration of the grant period (up to 4 years for prevention grants).

Example: Grantee builds a decontamination unit for AIS prevention at a cost of $8,800. The life of the decontamination unit is 10 years. Therefore, the amount that can be claimed each year in reimbursement requests for the decontamination unit is $880 ($8,800 divided by 10 years = $880 each year). If the life of the grant is 3 years, under this scenario, the grantee would be eligible to claim a total of $2,640 ($880/year x 3 years = $2,640) towards the purchase of the decontamination unit. Depreciation applies in the following cases:

- If the grantee receives a donated piece of equipment that has a value of $5,000 or more.
- If one unit of equipment is purchased at a cost of $5,000 or more.
- If the total cost of components of a customized piece of equipment is $5,000 or more.

Aquatic Invasive Species Considerations

Is the LOA using best available AIS prevention methods?

Is there a means to increase effectiveness and efficiency of operations?

Native Aquatic Plant Preservation

Messages to discourage disturbance of lake sediments and aquatic plants are included in a flyer that is posted on the website and distributed at the boat landings. A summary of Important Aquatic Plant Habitats with maps is posted on the LOA website.[22] This information was shared at the 2022 Lake Owen Association Annual Meeting and on Lake Owen Association pontoon tours.

[22] https://lakeowen.org/emergent-and-floating-plant-habitat-overview/

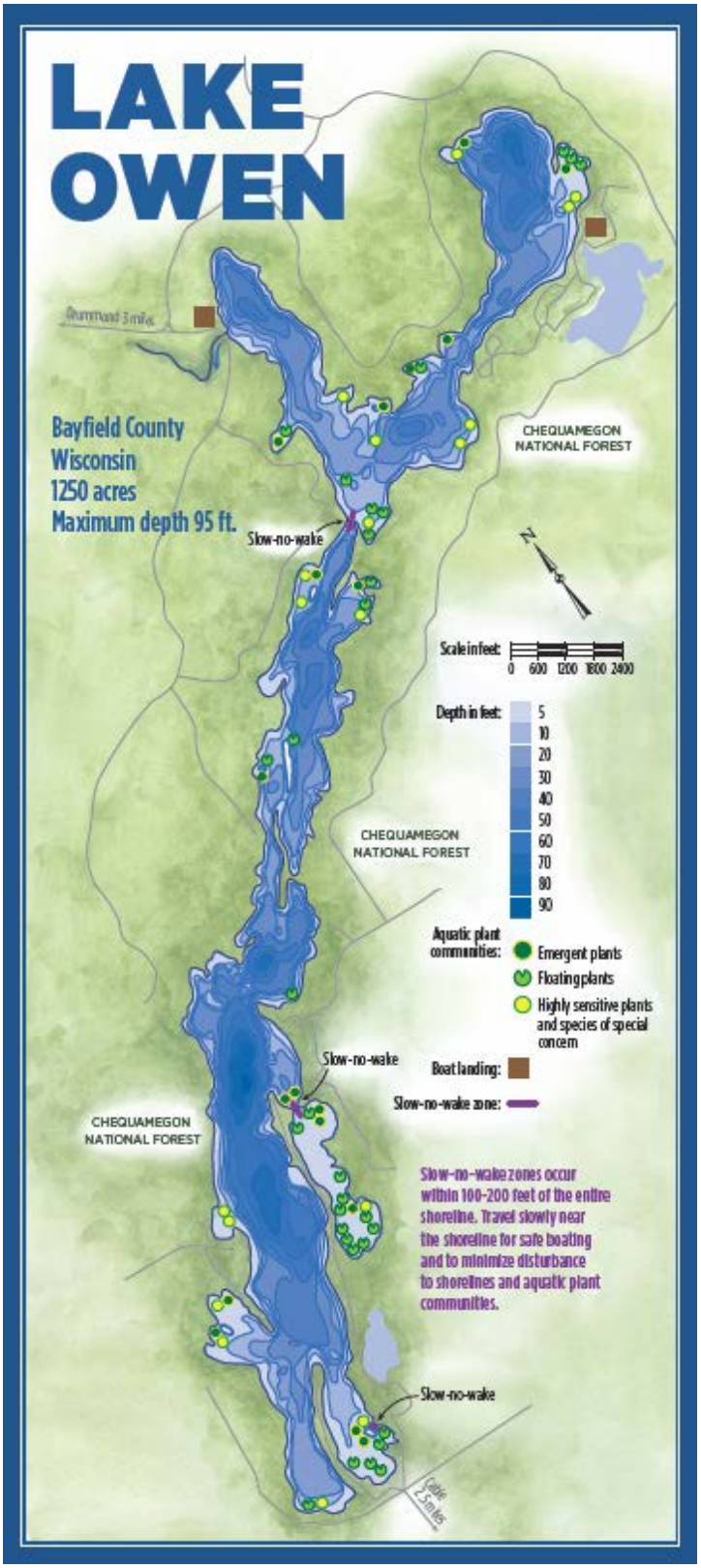

FIGURE 34. LAKE OWEN MAP WITH IMPORTANT PLANT HABITAT AREAS

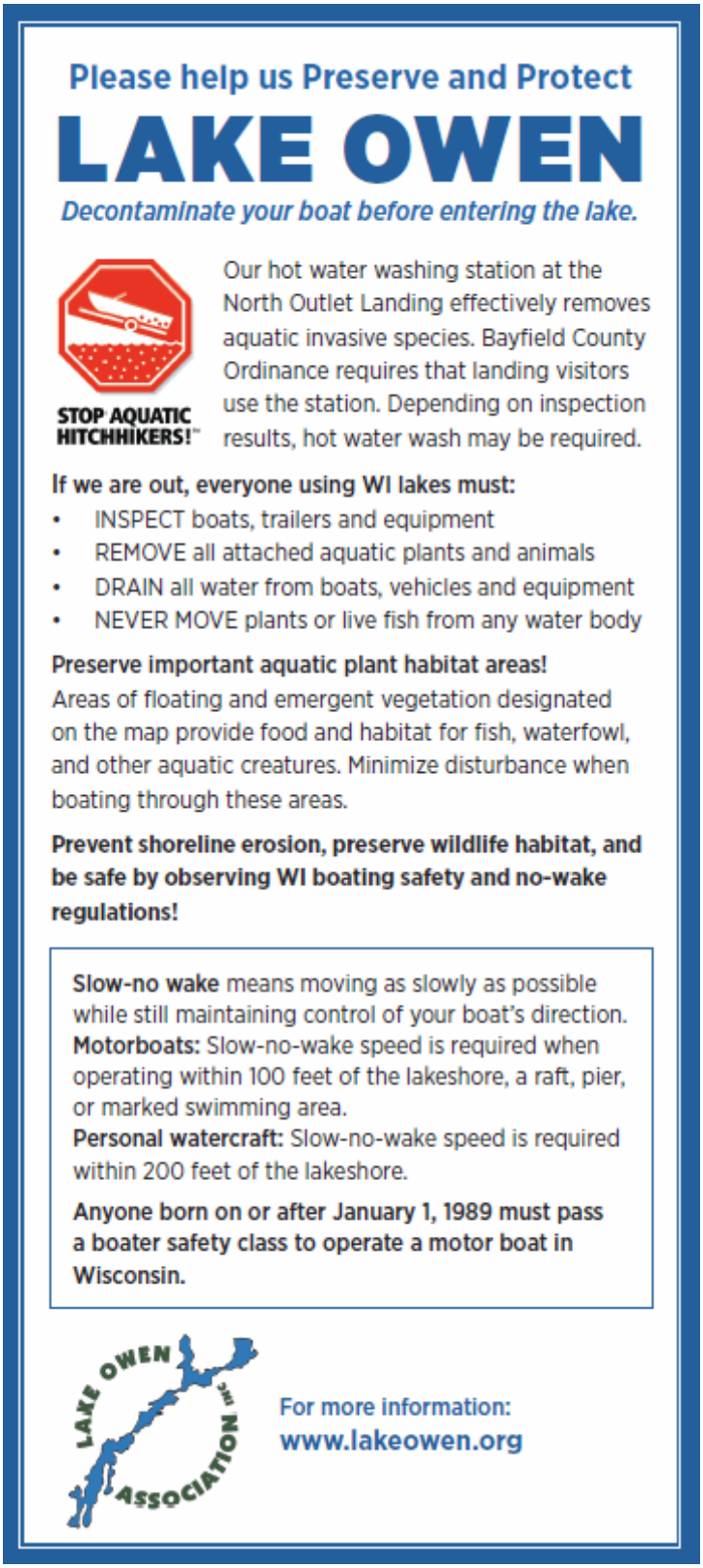

FIGURE 35. BACK OF LAKE OWEN MAP WITH AIS AND PLANT HABITAT MESSAGES

LAKE MANAGEMENT PLANNING

Goals and Objectives

The Lake Owen Association used the 2015 Comprehensive Lake Management Plan to develop a Lake Owen Association Strategic Plan in 2019. The Lake Owen Association Board updated the Strategic Plan late in 2023. The 2024 Comprehensive Lake Management Plan update provides an opportunity to review the goals (identified as objectives in the strategic plan) and the best means to achieve the goals. For this plan, goals and objectives are defined as follows:

Goals are broad statements of desired results. ~~Goals are listed in order of priority established by the advisory committee.~~

Objectives are the measurable accomplishments toward achieving a goal. Methods to evaluate progress toward plan objectives are listed below the objectives and are included in the implementation plan as "Evaluation Actions."

Actions are the steps taken to accomplish objectives and ultimately goals.

Lake Management Alternatives

Alternative actions that were considered as means to meet goals and objectives were provided by committee members and recommended by consultants and advisors. Alternatives included current actions of the LOA. Committee members refined the description of each alternative and selected those that remain in the plan following review of existing management and recommended actions.

Alternatives/Actions Analysis

In some cases, actions included in the Lake Owen Comprehensive Lake Management Plan (CLMP) lack detail for implementation or are listed for consideration only. Alternatives will be evaluated for inclusion in more detailed implementation plans and updates to this plan with the following in mind:

1) Does the action fit under one of the CLMP goals?
2) Does the action fulfill one of the CLMP objectives? If not, is the result to be obtained from the action important, and does it necessitate a new plan objective?
3) How will the action's progress toward plan objectives be evaluated?
4) What alternatives are available to reaching the objective?
    a. Is this action more likely to produce results compared with other alternatives?
    b. Is this action more cost effective when compared with other alternatives?
    c. Does the risk of no action outweigh the risk of uncertainty of success?

5) Does the LOA and/or its partners have the resources available to implement the action? Volunteers? Advisors? Funding for consultants or construction?
6) Is grant funding available to support the action?
7) Who (what committee, board member, volunteer) is responsible to lead the action?

Process for Plan Amendments

While minor changes to implementation strategies can be accomplished through annual strategic planning updates, plan amendments may be needed in order to allow for substantial changes in plan goals, objectives, and actions. A plan amendment may be required to establish eligibility for certain DNR grant programs, for example. The LOA Board will ensure that appropriate public input and review is followed for plan amendments which result in substantive changes to the plan.

Plan Implementation

This section of the plan lists goals and objectives for lake management for Lake Owen. It also presents a list of actions that will be used to reach plan goals and objectives.

The Lake Owen Association board and committees will track implementation of plan actions and evaluate progress toward reaching plan goals and objectives. An action plan spreadsheet will be used as a planning and tracking tool.

Plan Guiding Principles

Lake Owen management activities are guided by best available science and practice and adaptive management.

Adaptive management is a systematic approach for improving resource management by learning from management outcomes. Adaptive management uses results of monitoring, evaluation of project activities, and updated information to modify and guide future project implementation.

Management Plan Goals (Strategic Plan Goals 2024)

1) Prevent the introduction and establishment of invasive species.
2) Preserve water quality.
3) Protect and restore in-lake, near shore, and shoreland habitat.
4) Monitor lake-related public policy and regulations and inform stakeholders.
5) Inspire active stakeholder involvement.
6) Retain best in class lake management.
7) Establish sustainable financial resources.

Goals, Objectives, and Actions

GOAL 1: Prevent the introduction and establishment of invasive species.

EVALUATION: No new invasive species become established and spread in Lake Owen (current AIS include yellow iris, aquatic forget-me-not, phragmites, narrow-leaved cattail, and Chinese mystery snail).

EVALUATION: Complete 200 AIS decontaminations in 2024 based on inspection results.[23]

Clean Boats, Clean Waters inspectors remind boaters to clean, drain, and dry boats and equipment at two main landings.

Boats are inspected and decontaminated if necessary prior to entering Lake Owen.

- Operate the decontamination stations at the North Outlet Landing and Two Lakes Campground.
- Identify best methods to encourage decontamination at Otter Bay landing (comprehensive plan update).
- Investigate methods to increase use and efficiency of the decontamination stations as part of the comprehensive plan update (inspectors, financial incentives with accountability, automated systems (camera, on-line timecard), improved education). USFS partnership is critical.

Lake residents understand the importance of AIS prevention.

- Include description of AIS threat and prevention methods on the website and social media.

Implement a rapid response plan.

- Conduct aquatic invasive species meandering survey monthly June to September.
- Review and update the rapid response plan annually

Yellow iris is removed from Lake Owen.

- Continue monitoring and manual and chemical control.

[23] 178 boats were decontaminated in 2023 including 20 at the Two Lakes Campground.

GOAL 2: Preserve Lake Owen water quality.

EVALUATION: Monitor water quality (review methods as part of comprehensive plan update).

Encourage Lake Owen owners to take actions to preserve water quality by reducing runoff from their properties.

- Design and install projects to mitigate nutrients and sediment carried in runoff from densely developed properties (Identify best ways to encourage participation).

Encourage Property Owners' Best Practices

- Technical assistance may be more important than financial – offer homeowner visits and acknowledge participation.
- Establish three demonstration sites of shoreland best practices in 2024.
- Inform owners/develop outreach materials re: best practices (*X Ways to Love/Protect Lake Owen*).
- Offer tools for self-evaluation of property (*available in print and on-line through DNR*).
- Consider LOA financial assistance for installation (DNR grant requirements viewed as too restrictive).

GOAL 3: Protect and restore in-lake, near shore, and shoreland habitat.

Share important Lake Owen habitat and ways to protect it with Lake Owen Community.

Work with WDNR and other experts to better understand the Lake Owen fishery.

- Develop a scope of work to understand Lake Owen food web and fishery.

GOAL 4: Monitor lake- related public policy and regulations and inform stakeholders.

Track, evaluate, and encourage member input to local and state land use, zoning, and AIS policies.

Host/attend meetings on special issues

GOAL 5: Inspire active stakeholder involvement.

EVALUATION. Increase membership by 5% per year over the next 2 years.

- Define membership and establish baseline number.
- Add personal notes to member appeal. Send follow up letter to non-responders.
- Direct members to website for electronic payment.
- Maintain on-line directory as a member benefit. Use directory to measure and track membership numbers.

EVALUATION. Increase attendance at annual meetings (from 50 in 2019, to 57 in 2020, 50 in 2021, counts for 2022 and 2023 were not taken but are estimated to be about 50).

Identify, invite, and promote speakers of interest

- Rotate reports from various stakeholders at annual meeting

EVALUATION. Increase web site and social media effectiveness. Record baseline number of website and social media hits, track on a monthly and annual basis

- List LOA website address on all LOA publications and communications.
- Increase quality and amount of content - develop list of topics/issues to cover (include lake manager reports).
- Add stories from the Lake Owen book.

Enhance relationships with key stakeholders.

- Key stakeholders include Towns of Drummond and Cable, WDNR, US Forest Service, Bayfield County, Tribes (list), Bayfield County Lakes Forum.
- Provide annual reports and hold meetings with key stakeholders.
- Attend meetings and volunteer at other stakeholder's events.
- Establish direct one-on-one contacts between board members and stakeholder reps.
- Host LOA forums on technical issues inviting stakeholders to present.

Increase involvement of "Next Generation" in LOA.

- Have a next generation board member (or 2).
- Ask for next gen input – what should LOA do to support connections? Perhaps, start a next gen "group chat" for them to throw out ideas and get connected.
- Use technology to reach younger audience.
- Connect with next gen through older generation family members.
- Bring in younger LOA members.
- Hold events for young families/children.
- Hold events that focus on lake preservation and present technical information, generational transfer of property.
- Sponsor a silent sports week.

Increase attendance at social events

- Spread activities throughout summer season.
- Host events aimed at a younger audience.
- Host kid/family activities.
- Identify most effective events and continue those with good attendance such as the annual picnic.

GOAL 6. Retain best in class lake management.

Complete annual review/self-evaluation for lake managers.

Identify model programs and organizations to learn from their activities.

- Establish relationships with lakes outside of the region.
- Attend state and national conferences (lake managers and board).

Seek outside expertise when needs are identified.

GOAL 7. Establish sustainable financial resources.

Carry out endowment fund campaign to raise $2.5 million (began early 2021).

Increase efficiency and effectiveness of operations.

Prepare for board transitions:

- Update bylaws – incorporate new job descriptions,
- Develop job descriptions and outsource some functions of treasurer (bookkeeping, member database and donation acknowledgement).

Gain support for LOA activities.

- Communicate need for LOA funding.
- Explain rationale for programming.
- Connect with people on an emotional level – share love of the lake, tell stories.
- Communicate accomplishments, lessons learned, and future plans (with timeline).
- Demonstrate success, share results.

Maintain eligibility and apply for grant dollars.

- Update strategic plan tables annually.
- Seek WNDR grant support where eligible.

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Appendix A. Property Owner Survey Results

2022 LAKE OWEN ASSOCIATION SURVEY

Summary of Surveys Sent, Received and Completed:

Total number of survey notifications sent 334
- Number of survey notifications E-mailed 302
- Number of survey notifications USPS mailed 32

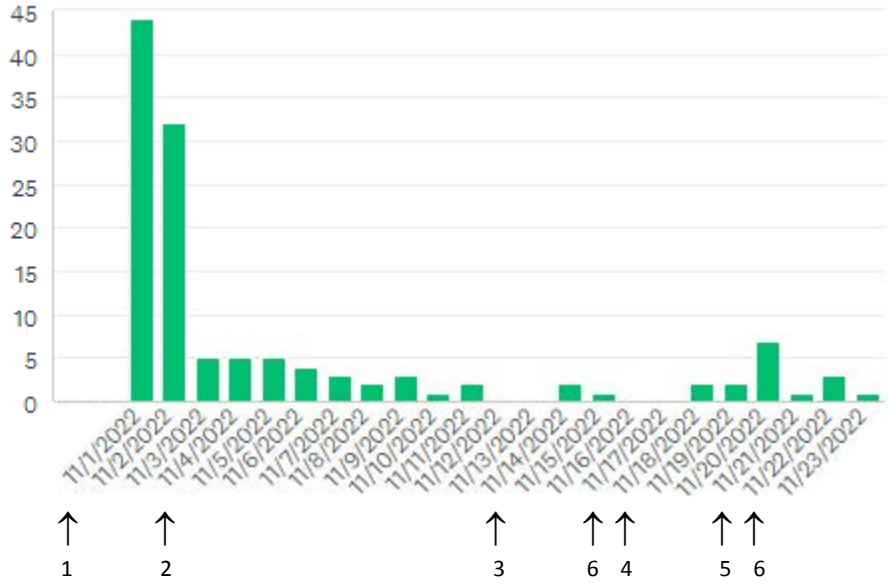
Number of surveys successfully delivered 321
- Number of surveys that did not reach E-mail recipients 12
- Number of surveys that did not reach USPS mail recipients 1

Number of surveys fully completed (97% completion rate) 121
Number of surveys incomplete[1] 4
- Number of surveys accessed through web link 120
- Number of surveys accessed through QR code 5
- Number of paper surveys requested/received 0

Percentage of fully completed surveys compared with those successfully delivered ..... 38 %
Typical time spent ..... 10 min. 15 sec.

Note: In addition to the survey notifications, the annual appeal also included a survey reminder:
250 letters sent by USPS mail and 301 sent by E-mail (289 successfully delivered).

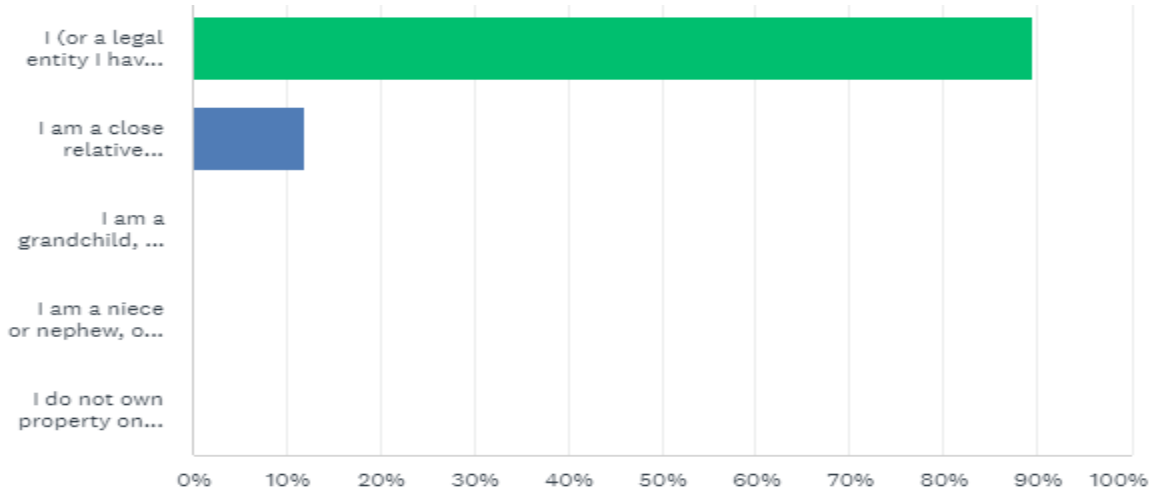
Response Volume by Day:



1. Original E-mails & USPS mail sent: 11/1/22.
2. Reminder E-mails sent to those who did not open original: 11/4/22
3. Reminder USPS mail sent: 11/14/22
4. Reminder included in annual report E-mails: 11/18/22
5. Reminder to unopened annual report E-mails: 11/21/22
6. Reminder included in USPS mailed annual reports: 11/17&22/22[1]

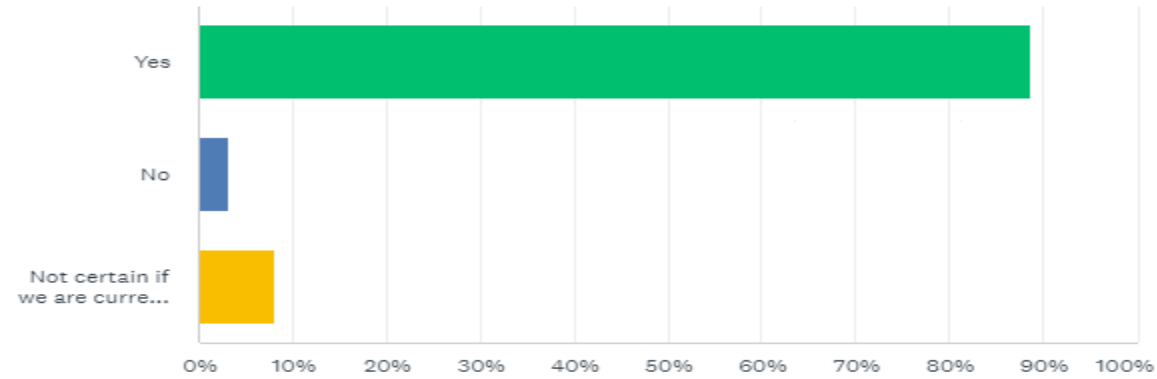
[1] 125 surveys completed through Q8, 124 through Q9, 123 through Q10, and 121 completed the entire survey.

Q1 Which of the following statements applies to you? Check all that apply.
(Answered: 125, Skipped: 0)



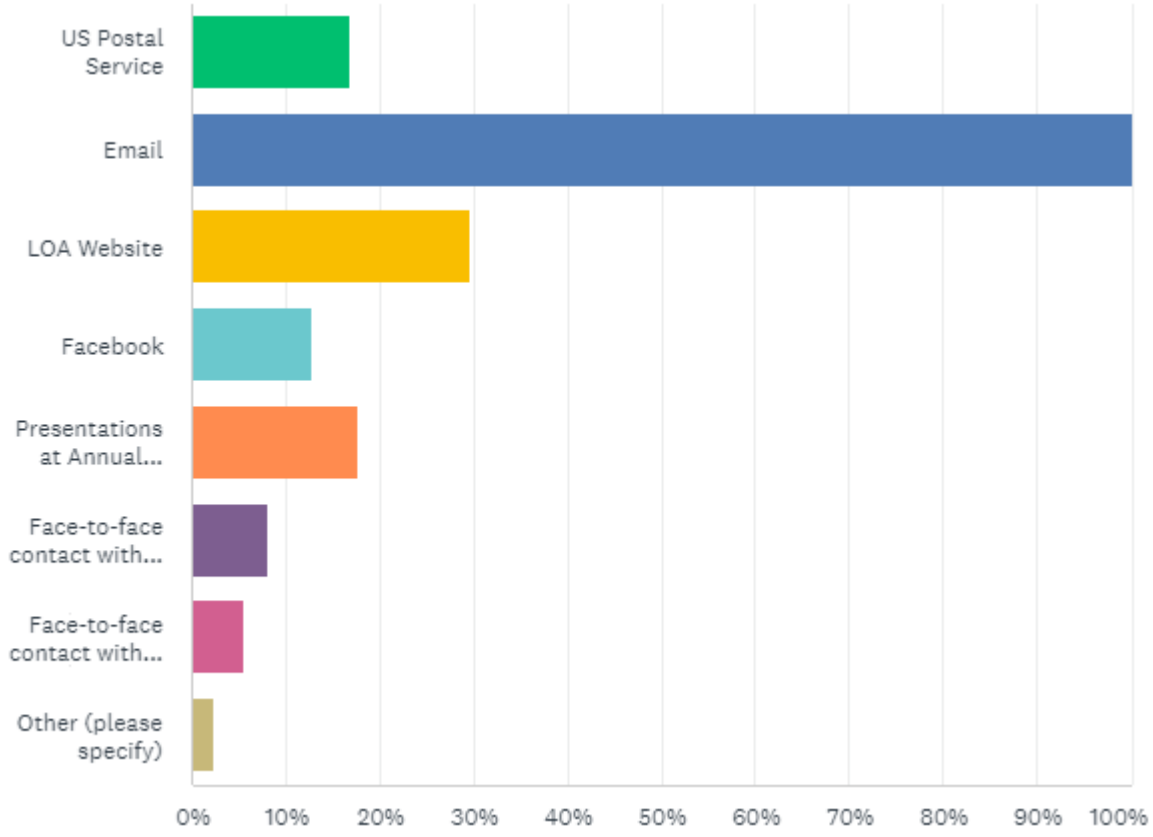
ANSWER CHOICES	RESPONSES	
I (or a legal entity I have set up or manage, like an LLC or a trust) own property on or within one mile of Lake Owen.	89.60%	112
I am a close relative (parent, sibling, spouse, child, or in-law) to a Lake Owen property owner.	12.00%	15
I am a grandchild, or spouse of a grandchild, of a Lake Owen property owner.	0.00%	0
I am a niece or nephew, or spouse of a niece or nephew, of a Lake Owen property owner.	0.00%	0
I do not own property on Lake Owen, and none of the above apply to me.	0.00%	0
Total Respondents: 125		

Q2 All owners/managers of parcels of land on or within one mile of Lake Owen are eligible to be dues-paying members of the Lake Owen Association (LOA). Is the property you own, manage, or are responding for, current on dues for the 2022 season?
(Answered: 125, Skipped: 0)



ANSWER CHOICES	RESPONSES	
Yes	88.80%	111
No	3.20%	4
Not certain if we are current on dues for 2022	8.00%	10
TOTAL		125

Q3 Which methods of communication with the Lake Owen Association do you most prefer? Choose 1 to 3 options.
(Answered: 125, Skipped: 0)

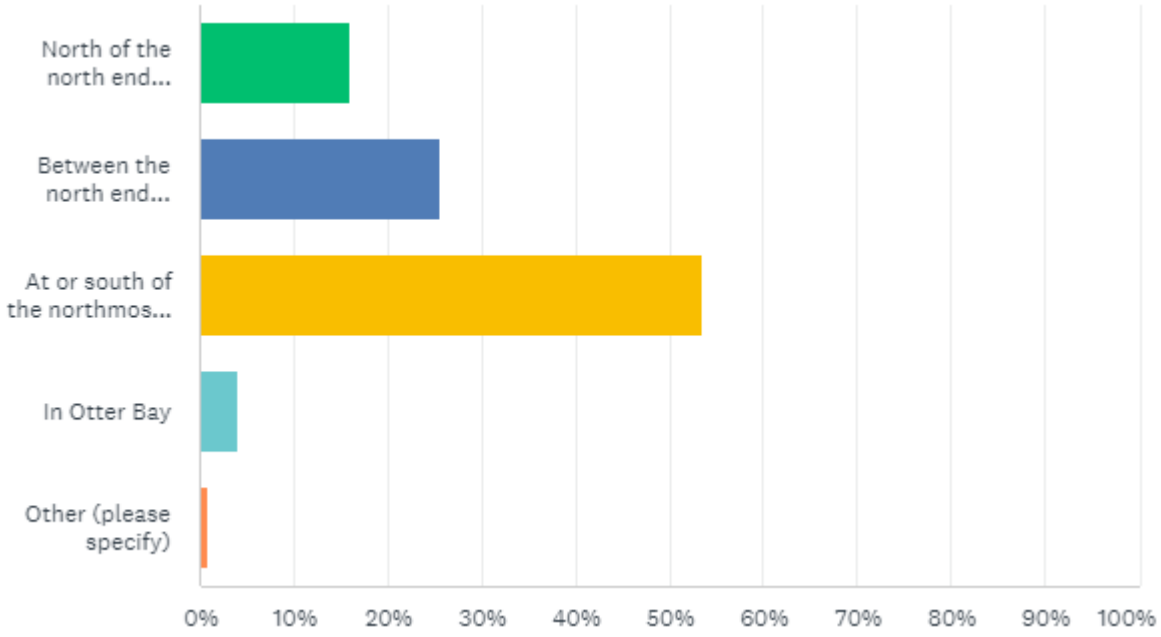


ANSWER CHOICES		RESPONSES	
US Postal Service		16.80%	21
Email		100.00%	125
LOA Website		29.60%	37
Facebook		12.80%	16
Presentations at Annual Meetings		17.60%	22
Face-to-face contact with LOA board members		8.00%	10
Face-to-face contact with other LOA members		5.60%	7
Other (please specify)	Responses	2.40%	3
Total Respondents: 125			

Other:

1. Text.
2. Text.
3. Rounds of golf at TOIX.

Q4 Where is your primary property located on Lake Owen?
(Answered: 125, Skipped: 0)

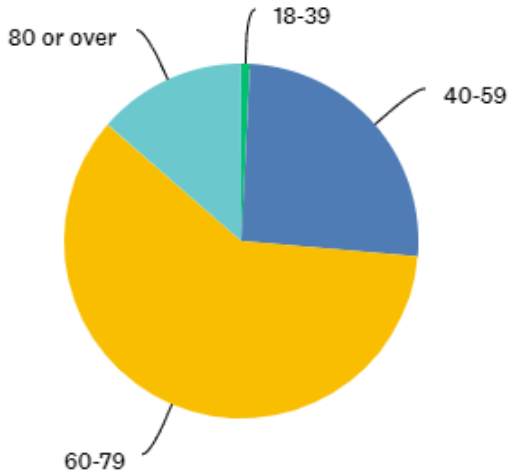


ANSWER CHOICES		RESPONSES	
North of the north end narrows (North End)		16.00%	20
Between the north end narrows and the entrance to Otter Bay (Mid Lake)		25.60%	32
At or south of the northmost end of Kraft's Point Road (South End, except Otter Bay)		53.60%	67
In Otter Bay		4.00%	5
Other (please specify)	Responses	0.80%	1
TOTAL			125

Other:

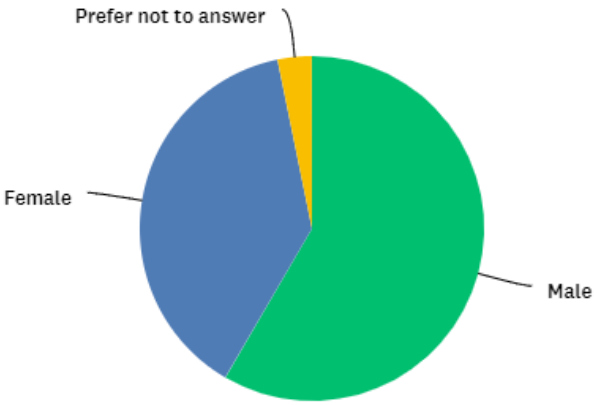
1. Near Agnes Bay.

Q5 What is your age?
(Answered: 125, Skipped: 0)



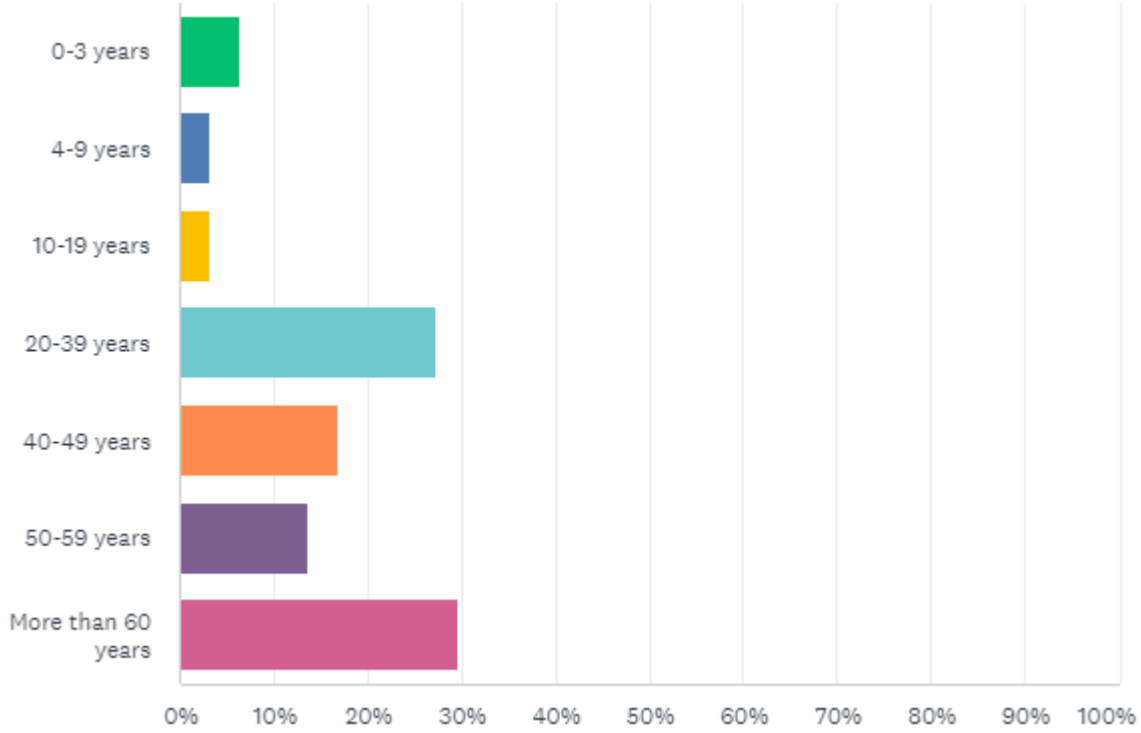
ANSWER CHOICES	RESPONSES	
18-39	0.80%	1
40-59	25.60%	32
60-79	60.00%	75
80 or over	13.60%	17
TOTAL		125

Q6 What is your gender?
(Answered: 125, Skipped: 0)



ANSWER CHOICES	RESPONSES	
Male	58.40%	73
Female	38.40%	48
Prefer not to answer	3.20%	4
TOTAL		125

Q7 How long have you, or your immediate family, owned property on Lake Owen?
(Answered: 125, Skipped: 0)



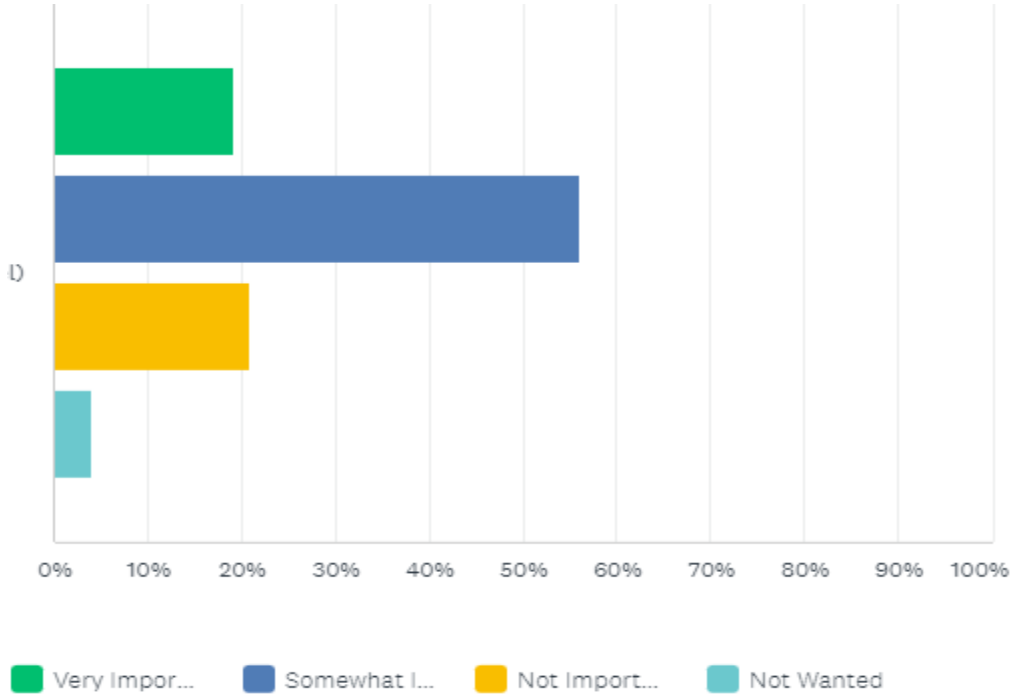
ANSWER CHOICES	RESPONSES	
0-3 years	6.40%	8
4-9 years	3.20%	4
10-19 years	3.20%	4
20-39 years	27.20%	34
40-49 years	16.80%	21
50-59 years	13.60%	17
More than 60 years	29.60%	37
TOTAL		125

Note: In the next few questions, the "Weighted Average" is based on the following:

- *The leftmost choices are assigned the highest number of points (e.g., "Very Important," "Frequently," "Strongly Agree," etc.).*
- *The right-most choices are assigned only 1 point (e.g., "Not Wanted," "Strongly Disagree," etc.).*

Example: In Q8 below, "Very Important" is valued at 4 points, "Somewhat Important" at 3 points, "Not important" at 2 points and "Not Wanted" at 1 point.

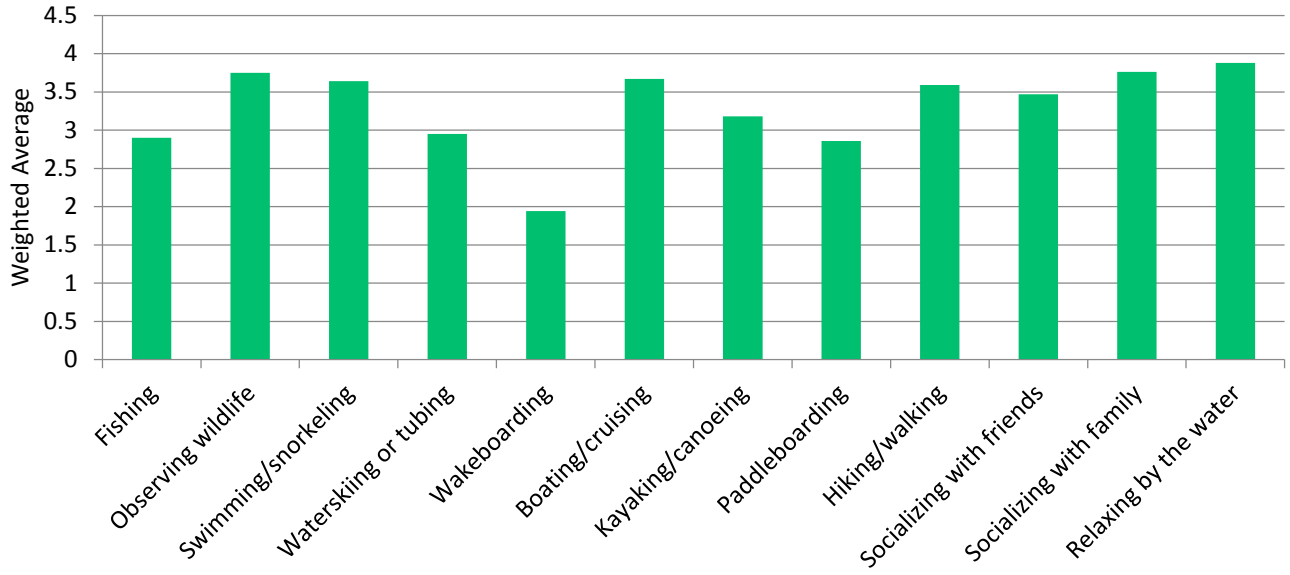
Q8 How important is it to you that a Directory of Lake Owen property owners be created, to facilitate communication?
(Answered: 125, Skipped: 0)



VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT IMPORTANT	NOT WANTED	TOTAL	WEIGHTED AVERAGE
19.20% 24	56.00% 70	20.80% 26	4.00% 5	125	2.90

Q9 How often do you and/or members of your family engage in each of the following activities on or around Lake Owen?

(Answered: 124, Skipped: 1)

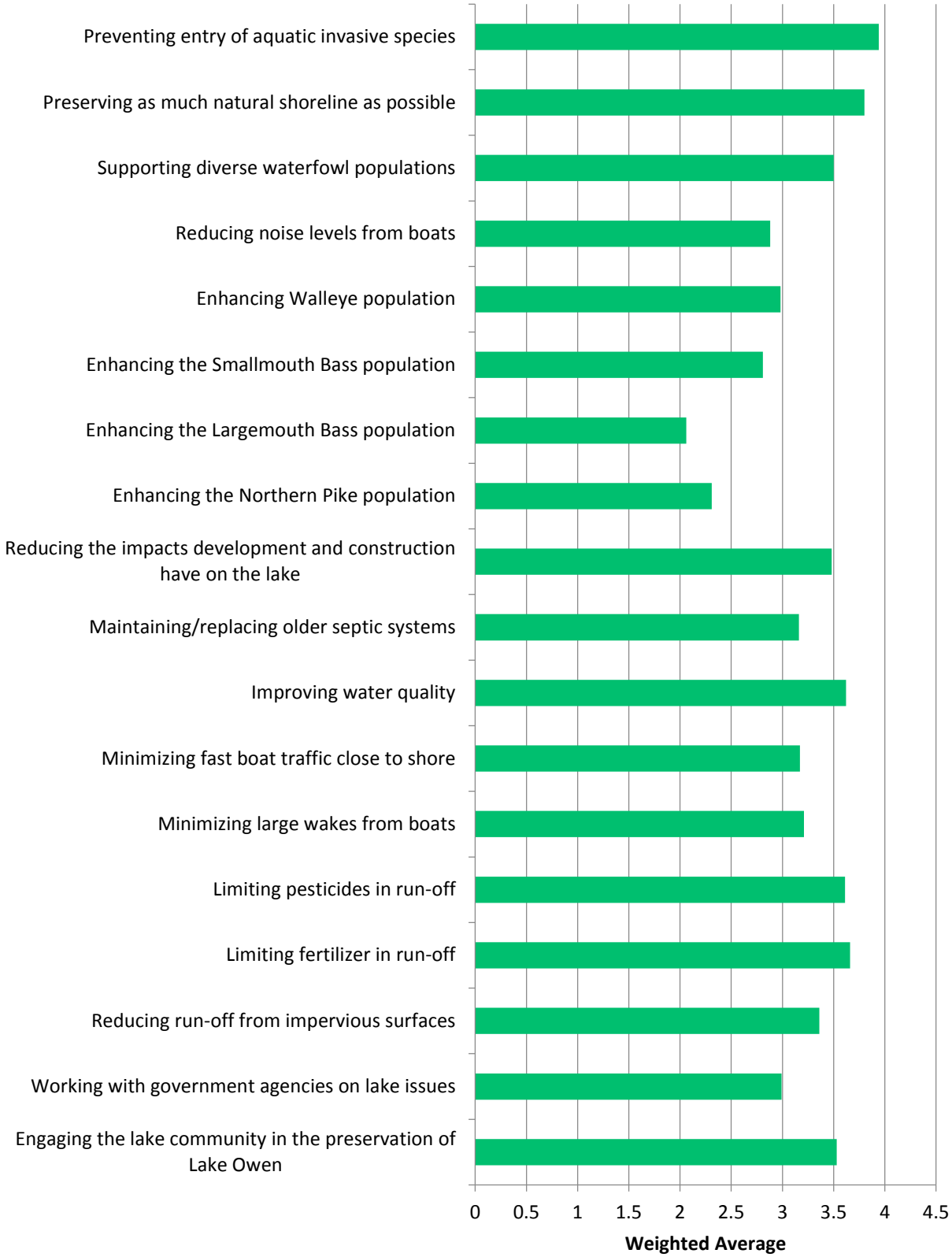


	FREQUENTLY	OCCASIONALLY	RARELY	NEVER	TOTAL	WEIGHTED AVERAGE
Fishing	27.42% 34	43.55% 54	20.97% 26	8.06% 10	124	2.90
Observing wildlife	79.03% 98	17.74% 22	2.42% 3	0.81% 1	124	3.75
Swimming/snorkeling	71.77% 89	22.58% 28	3.23% 4	2.42% 3	124	3.64
Waterskiing or tubing	44.35% 55	24.19% 30	13.71% 17	17.74% 22	124	2.95
Wakeboarding	13.71% 17	18.55% 23	15.32% 19	52.42% 65	124	1.94
Boating/cruising	77.42% 96	15.32% 19	4.03% 5	3.23% 4	124	3.67
Kayaking/canoeing	44.35% 55	37.10% 46	10.48% 13	8.06% 10	124	3.18
Paddleboarding	41.13% 51	25.81% 32	11.29% 14	21.77% 27	124	2.86
Hiking/walking	70.97% 88	19.35% 24	7.26% 9	2.42% 3	124	3.59
Socializing with friends	52.42% 65	42.74% 53	4.03% 5	0.81% 1	124	3.47
Socializing with family	81.45% 101	14.52% 18	2.42% 3	1.61% 2	124	3.76
Relaxing by the water	91.13% 113	6.45% 8	1.61% 2	0.81% 1	124	3.88

Other:

1. Golf, tennis and pickleball.
2. Snowmobiling.
3. Deer hunting.
4. Hunting, camping, star gazing.
5. We have a paddleboat that gets used by family/friends in our end of the lake.
6. Mountain biking, road cycling, cross country skiing, fat biking.
7. Picking berries.
8. Golfing at TOIX.

Q10 As a Lake Owen resident, how important to you are the following issues? For each item, please pick one choice that describes how you feel.
(Answered: 123, Skipped: 2)

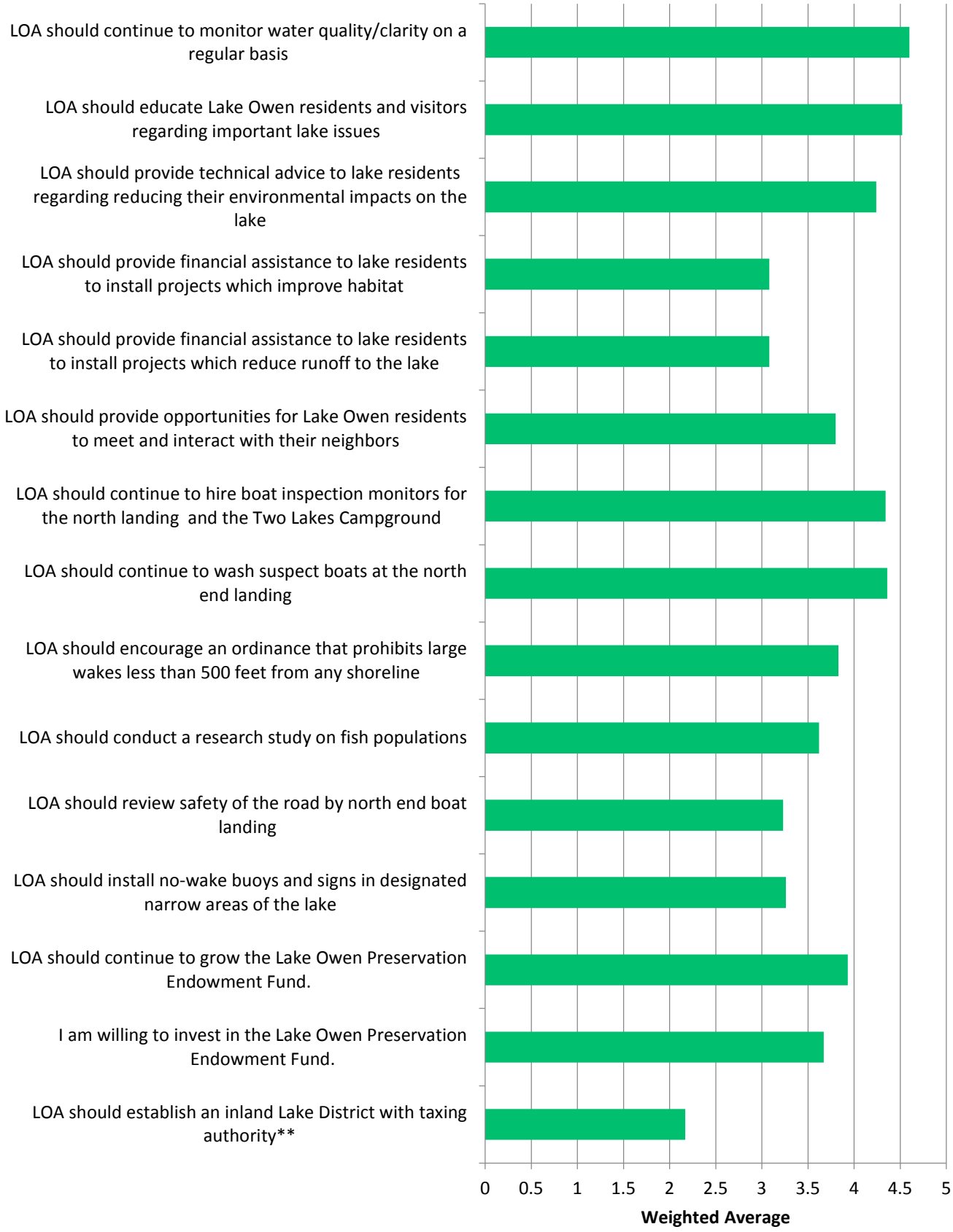


	VERY IMPORTANT	SOMEWHAT IMPORTANT	UNCERTAIN	NOT IMPORTANT	TOTAL	WEIGHTED AVERAGE
Preventing entry of aquatic invasive species	93.55% 116	6.45% 8	0.00% 0	0.00% 0	124	3.94
Preserving as much natural shoreline as possible	83.06% 103	15.32% 19	0.00% 0	1.61% 2	124	3.8
Supporting diverse waterfowl populations	60.48% 75	33.87% 42	0.81% 1	4.84% 6	124	3.5
Reducing noise levels from boats	41.94% 52	30.65% 38	0.81% 1	26.61% 33	124	2.88
Enhancing Walleye population	34.68% 43	43.55% 54	7.26% 9	14.52% 18	124	2.98
Enhancing the Smallmouth Bass population	26.61% 33	47.58% 59	5.65% 7	20.16% 25	124	2.81
Enhancing the Largemouth Bass population	10.48% 13	33.06% 41	8.06% 10	48.39% 60	124	2.06
Enhancing the Northern Pike population	14.52% 18	39.52% 49	8.87% 11	37.10% 46	124	2.31
Reducing the impacts development and construction have on the lake	62.90% 78	28.23% 35	2.42% 3	6.45% 8	124	3.48
Maintaining/replacing older septic systems	48.39% 60	33.87% 42	3.23% 4	14.52% 18	124	3.16
Improving water quality	71.77% 89	23.39% 29	0.00% 0	4.84% 6	124	3.62
Minimizing fast boat traffic close to shore	50.81% 63	31.45% 39	1.61% 2	16.13% 20	124	3.17
Minimizing large wakes from boats	56.45% 70	25.81% 32	0.00% 0	17.74% 22	124	3.21
Limiting pesticides in run-off	70.97% 88	23.39% 29	1.61% 2	4.03% 5	124	3.61
Limiting fertilizer in run-off	74.19% 92	20.97% 26	1.61% 2	3.23% 4	124	3.66
Reducing run-off from impervious surfaces	53.23% 66	35.48% 44	5.65% 7	5.65% 7	124	3.36
Working with government agencies on lake issues	33.06% 41	46.77% 58	6.45% 8	13.71% 17	124	2.99
Engaging the lake community in the preservation of Lake Owen	61.29% 76	34.68% 43	0.00% 0	4.03% 5	124	3.53

Other:

1. Reducing speed, noise and time of use from jet skis = very important.
2. Eliminate wake board boats, and boats that throw large wakes that negatively impact lake shore degradation.
3. Improving the water quality - maintaining its pristine quality is the goal.
4. It is very important that we all acknowledge that we do not own Lake Owen. Large structures, such as many of the so-called docks on Lake Owen, have no right of presence over fishermen and boaters.
5. Bring back signage indicating no wake zones in each of the narrows.
6. Most importantly, banning wake surfing and other activities causing large wakes.
7. Restrict internal-combustion power boats to no more than 15 horsepower (each) -- VERY important.

Q11 For each of the following statements, please indicate how much you agree with each by selecting the appropriate button.
(Answered: 121, Skipped: 4)

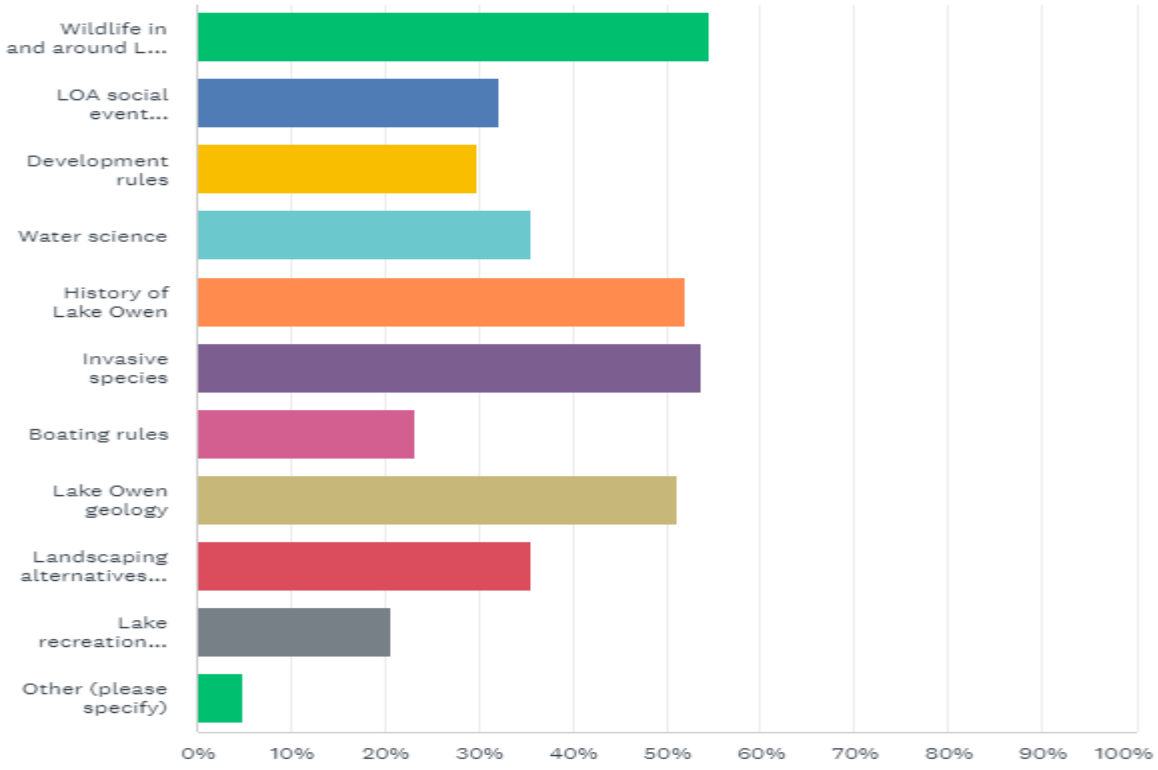


	STRONGLY AGREE	AGREE	UNDECIDED	DISAGREE	STRONGLY DISAGREE	TOTAL	WEIGHTED AVERAGE
LOA should continue to monitor water quality/clarity on a regular basis	68.60% 83	25.62% 31	4.13% 5	0.83% 1	0.83% 1	121	4.60
LOA should educate Lake Owen residents and visitors regarding important lake issues	60.33% 73	33.88% 41	4.13% 5	0.83% 1	0.83% 1	121	4.52
LOA should provide technical advice to lake residents regarding reducing their environmental impacts on the lake	47.11% 57	38.84% 47	6.61% 8	5.79% 7	1.65% 2	121	4.24
LOA should provide financial assistance to lake residents to install projects which improve habitat	14.88% 18	14.88% 18	40.50% 49	23.14% 28	6.61% 8	121	3.08
LOA should provide financial assistance to lake residents to install projects which reduce runoff to the lake	16.53% 20	14.88% 18	35.54% 43	26.45% 32	6.61% 8	121	3.08
LOA should provide opportunities for Lake Owen residents to meet and interact with their neighbors	16.67% 20	50.83% 61	28.33% 34	4.17% 5	0.00% 0	120	3.80
LOA should continue to hire boat inspection monitors for the north landing and the Two Lakes Campground	54.17% 65	33.33% 40	5.83% 7	5.83% 7	0.83% 1	120	4.34
LOA should continue to wash suspect boats at the north end landing	56.67% 68	30.00% 36	6.67% 8	5.83% 7	0.83% 1	120	4.36
LOA should encourage an ordinance that prohibits large wakes less than 500 feet from any shoreline	44.63% 54	20.66% 25	14.05% 17	14.05% 17	6.61% 8	121	3.83
LOA should conduct a research study on fish populations	20.66% 25	36.36% 44	28.10% 34	14.05% 17	0.83% 1	121	3.62
LOA should review safety of the road by north end boat landing	13.33% 16	17.50% 21	51.67% 62	13.33% 16	4.17% 5	120	3.23
LOA should install no-wake buoys and signs in designated narrow areas of the lake	21.49% 26	30.58% 37	14.05% 17	19.83% 24	14.05% 17	121	3.26
LOA should continue to grow the Lake Owen Preservation Endowment Fund.	28.33% 34	40.83% 49	26.67% 32	4.17% 5	0.00% 0	120	3.93
I am willing to invest in the Lake Owen Preservation Endowment Fund.	21.49% 26	33.88% 41	36.36% 44	6.61% 8	1.65% 2	121	3.67
LOA should establish an inland Lake District with taxing authority**	2.48% 3	8.26% 10	31.40% 38	19.01% 23	38.84% 47	121	2.17

Other:

1. Question about providing financial assistance to lake residents and the taxing authority question are too open-ended. Would need more information.
2. Have already donated to Endowment Fund.
3. I do not at all understand the final question.
4. We own only our own cabin, not any real property. We pay more to the federal government in annual permit fees than many landowners pay in property taxes. We would not want to be taxed again by LOA.
5. Assume bulk of financial support to members would come from grants.
6. Need more details regarding taxing authority.

Q12 On which topics would you like more information? You may check as many areas as you feel appropriate.
(Answered: 121, Skipped: 4)



ANSWER CHOICES		RESPONSES	
Wildlife in and around Lake Owen		54.55%	66
LOA social event opportunities		32.23%	39
Development rules		29.75%	36
Water science		35.54%	43
History of Lake Owen		52.07%	63
Invasive species		53.72%	65
Boating rules		23.14%	28
Lake Owen geology		51.24%	62
Landscaping alternatives that prevent runoff		35.54%	43
Lake recreation opportunities (e.g., scuba and sailing)		20.66%	25
Other (please specify)	Responses	4.96%	6
Total Respondents: 121			

Other:

1. Fish population - species and percent of each, etc.
2. Rare plant species in the Lake Owen Hardwoods State Natural Area.
3. None.
4. None.
5. None.
6. I can find all the information I need/want.

Q13 Please add any other comments regarding the preservation and stewardship of Lake Owen.
(Answered: 41, Skipped: 83)

Boats & launches:

1. Radical thought: Lake Owen should consider someday prohibiting gas powered boats. Electric only. This could be a 10 year effort so people can prepare. There are other lakes even now with this requirement. Electric boats will continue to get better and more acceptable. The noise pollution on the lake is bad and we all know gas powered boats are a big polluters. It will be hard for some to change their ways but everyone I know who drives an EV car will never go back to gas. Thanks.
2. Eliminate wake boats and high power boats. Eliminate high speed fishing boats.
3. It does feel like Lake Owen is getting considerably more boat traffic from non-lake residents. I suspect there are few ways in which help curb the number of "foreign" boats put into the Lake. Likewise, it does feel a bit like the LOA is protecting the lake from a lot of non-resident visitors who do not contribute to that effort. Not sure if anything can be done about these linked issues, but they do feel like very real issues.
4. Need more launches at north end when busy too crowded. Need additional parking as well.
5. With regard to item on safety at north end oat landing, we should promote relocating that boat landing to the bathing beach to eliminate the traffic safety problem.
6. I think our biggest problem is damage to lakeshore by boat wakes. Also, I would like to see better fishing promoted.

Communication & attendance:

7. Better and more effective communications with members.
8. I would like to see each LOA member bring a non-LOA member who has a home on Lake Owen to an annual meeting. This might increase membership. Thanks for conducting the survey.
9. Get more stakeholders to attend annual LOA meeting. Allow for more interaction at annual meeting. Breakout sessions on different areas of interest to have deeper conversations.
10. Love to see more concerts on the lake.

Governance & authority:

11. While, I may agree with some concerns, this is still a public lake on public lands. Some of the questions suggest a reach that extends far beyond a homeowner associations authority. I'd refer the LOA to the state of WI boating regulations, DNR, DOT, Town of Drummond regulations and other governing bodies as adequately addressing these issues.
12. The preservation and stewardship of Lake Owen should be voluntary and not overly regulated. No tax authority for LOA.
13. In all, I think you are doing a nice job. I didn't give to the endowment fund specifically because I felt the LOA board was overstepping their bounds in some areas.
14. I believe it is better to establish a separate township to create an independent community and taxing authority.
15. I am in favor of educating Lake Owen residents regarding lake quality and other lake issues. However, I strongly and vigorously oppose any type of additional government regulatory oversight or additional government intrusion. We have sufficient laws already!

Non-resident issues:

16. The importance of being "Lake People." The Vrbo/Airbnb business on the lake I believe is a mistake. We've witnessed drunk boating, unsafe activities & loud parties. It's not what Lake Owen wants or needs. There should be strict rules for such properties & consequences.

Water quality, invasive species & shoreline:

17. LOA needs to continue to monitor landings to prevent invasive species from entering lake. I'd like to see Otter Bay's boat launch monitored to prevent invasive species and eliminate fishing tournaments on Lake Owen. If they prevail, they should pay for our boat monitors to check every boat that comes in for tournaments at Otter Bay.
18. The partnerships and investments the LOA has made is impressive. Water Quality is key; however, not sure if the $ spent on some of the science projects is yielding us the desired outcome.
19. Focus on water quality and invasive species and preservation of the natural shoreline.
20. A measure of Water Quality tracked annually that is advertised how well we are doing against this goal. Get everyone on board what measurable goal we are working towards.
21. Paramount is maintaining a clean, clear lake with a feeling of remoteness. The Two Lakes Campground boat launch is a real threat to our lake.
22. Wondering if there are rules about fertilizer for cabins on the lake. Also concerned about the golf course owned by the Johnson's and where the chemical run off occurs.
23. Feel LOA priority is to maintain water quality through education of impacts of runoff, fertilizers, shoreline clearing and boat activity.
24. Develop a long term plan to connect the south end of Lake Owen residences to a municipal sewage treatment plant.

Thanks and appreciation:

25. Thank you for asking for our opinion and LOA's efforts to maintain the overall quality of LO.
26. Keep up the good work. It makes a difference and with continued the effort the future is bright.
27. Thank you for taking the time to ask the questions.
28. Thank you.
29. Thank you for all you do.
30. I think the Lake Owen Association Board is doing a terrific job!
31. Keep up the good work. Thanks!
32. We appreciate all efforts to preserve and protect the wildness of this lake. We strongly encourage all shareholders to minimize the impact of their presence on the lake.
33. Keep up the good work.
34. We strongly support LOA efforts to preserve and enhance the quality of the Lake Owen ecosystem.
35. Lake Owen is a jewel and appreciate your efforts to keep it that way.
36. Keep up the good work. Please do continue to inform us of how we can, as residents, preserve our beautiful lake and forest.
37. Thank you!
38. Appreciate what the LOA is doing!
39. Great idea, hope you get a good response.
40. Thank you for all you do!
41. Thanks to the LOA!

Appendix B. Local and State Requirements for Watershed Protection

Bayfield County Shoreland Zoning Ordinance (Title 13)

Bayfield County has adopted a zoning code that is implemented by the Planning and Zoning Department for the purpose of:

- Promoting and protecting the public health, safety, convenience, and welfare
- To further the maintenance of safe and healthful conditions
- To prevent and control water pollution
- To protect spawning grounds, fish, and aquatic life
- To control building sites, placement of structures, and land uses
- To prevent overcrowding of any natural resource such as a lake, river, or stream
- To preserve shore cover and natural beauty
- To promote the better uses of scenic resources

Shorelands are lands within 1,000 feet of the ordinary high water mark (OHWM) of lakes, ponds, or flowages and within 300 feet of the OHWM of navigable rivers or streams. Zoning provisions establish minimum lot sizes, setbacks, minimum frontage, requirements for boathouses, provisions for stairways and walkways, and building heights, among other provisions (13-1-20 (b)).

For all Bayfield County lakes, shoreline clearing is limited to preserve a minimum thirty-five foot shoreline buffer zone of natural shoreline vegetation yet allow shoreline property owners access to the waters abutting their property. For every 100 feet of shoreline, a property owner may create an area up to thirty-five feet wide more or less perpendicular to the shore through mowing, pruning and selective removal of trees, stumps, and shrubbery (13-1-23(a)).

Impervious surface limits are established for construction, reconstruction, expansion, and relocation of impervious surfaces within 300 feet of the ordinary high water mark. In this area, impervious surfaces are limited to 15% or to 30% with a mitigation plan that meets specific standards (13-1-32(c)).

Permits are required for filling and grading 1,000 ft^2 or more within 300 feet of the ordinary high water mark. Special permits are required for slopes >20%. These permits may trigger requirements for erosion control and restoration plans.

Dimensional requirements for lot size, minimum lot width and building setbacks vary by zoning district. Land around Lake Owen, zoned according to the map in Figure 36, includes R-1 (Residential 1), R-RB (Recreational-Residential) and F-1 (Forestry). The map was current as of February 6, 2024 and is subject to changes with rezoning petitions.

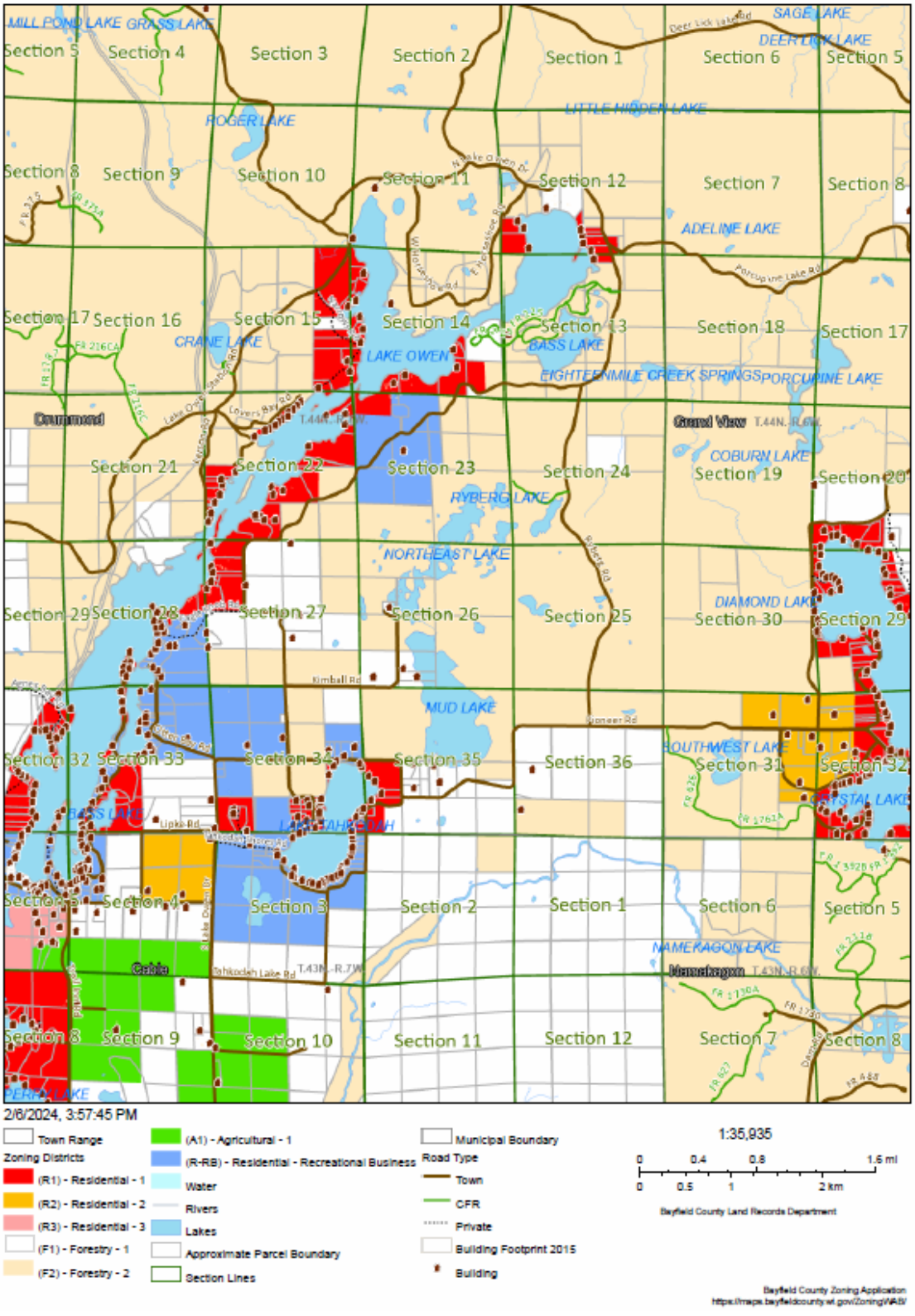


FIGURE 36. ZONING AROUND LAKE OWEN

TABLE 12. BAYFIELD COUNTY ZONING DISTRICT DIMENSIONAL REQUIREMENTS

			Minimum Side & Rear Yards	
Zoning District	**Minimum Area**	**Minimum Average Width**	**Principal Building**	**Accessory Building**
R-RB, R-1	30,000 sq. ft.	150'	10'	10'
F-1, R-2, A-1	4½ acres	300'	75'	30'
R-3	2 acres	200'	20'	20'
F-2, A-2, M-M	35 acres	1,200'	75'	30'
I, C*	20,000 sq. ft.	100'	5'	5'
M	20,000 sq. ft.	100'	10'	10'
R-4				
(a) Sewer/water	10,000 sq. ft.	75'	10'	10'
(b) Sewer only	15,000 sq. ft.	75'	10'	10'
(c) Water only	20,000 sq. ft.	100'	10'	10'

(13-1-60(a))

Bayfield County Land Division Ordinance (Title 14)

This Chapter is intended to regulate and control the division and subdivision of land within the unincorporated areas of Bayfield County in order to promote the public health, safety and general welfare and to encourage the most appropriate use of land. The ordinance establishes procedures and standards for dividing unincorporated lands within Bayfield County.

Private Onsite Wastewater Treatment Systems

The following requirements are included in state regulations (Chapter 145 WI Statutes) and local ordinance. Bayfield Ordinance (Title 15) is adopted to promote and protect public health and safety by assuring the proper siting, design, installation, inspection and management of private sewage systems and nonplumbing sanitation systems. All domestic wastewater shall enter a private sewage system unless otherwise exempted by the State or this ordinance.

Maintenance Requirements

Holding Tanks: every 90 days

Advanced Treatment Systems: every 6 – 12+ months (depending upon system)

Conventional/Mound/At-grade Systems: service every three years

Replacement

POWTS modification or replacement may be required with additions of 250 ft^2 or more or if the system is determined to be failing due to old age or improper use.

Failing POWTS (WI Statute 145.245)

1. The discharge of sewage into surface water or groundwater.
2. The introduction of sewage into zones of saturation which adversely affects the operation of a POWTS.
3. The discharge of sewage to a drain tile or into zones of bedrock.
4. The discharge of sewage to the surface of the ground.
5. The failure to accept sewage discharges and back up of sewage into the structure served by the POWTS.

Grandfathered Systems

The last major Wisconsin septic regulation changes were in the early 2000s (SPS 383 Private Onsite Wastewater Treatment Systems). Changes in this code were generally more protective of surface and groundwater. However, the code does not retroactively apply to an existing POWTS installed prior to July 1, 2000. Many older systems (20 years or older) are "grandfathered" and do not have to meet requirements of the current code, which can be problematic.[24]

[24] Written communication. Letter from Daniel Lefebvre, Burnett County POWTS and Zoning Specialist.

Storm Water and Erosion Control Permit (WDNR)

The landowner of a construction site where one acre or more of land will be disturbed must apply for and obtain coverage under the WPDES General Permit for Storm Water Associated with Land Disturbing Construction Activity (Permit No. WI-S067831-6) from the Wisconsin Department of Natural Resources (WDNR). This general permit regulates the discharges of pollutants to waters of the state as provided in S. 283.33, Wis. Stats., and Subch. III of Ch. NR 216, Wis. Adm. Code.

The general permit requires the permittee to implement best management practices to control storm water runoff in accordance with site-specific erosion control and storm water management plans to reduce sediment and other pollutants from entering waters of the state. Waters of the state include surface waters, groundwater, and wetlands. The general permit requires landowners of regulated construction sites to develop and implement erosion control and post-construction storm water management plans in accordance with Subch. III of Ch. NR 216, Wis. Adm. Code, and the applicable performance standards of Ch. NR 151, Wis. Adm. Code (among other requirements). The erosion control plan details how sediment and other pollutants will be controlled on the site. The storm water management plan includes practices such as wet ponds, infiltration structures, grass swales, vegetation filter strips, and vegetative buffers to control runoff from the site after construction is completed.

NR151 Non-Agricultural Performance Standards

Construction Sites >1 acre – must control 80% of sediment load from sites

Stormwater management plans (>1 acre)

- Total suspended solids
- Peak discharge rate
- Infiltration
- Buffers around water

Developed urban areas (>1,000 persons/square mile)

- Public education
- Yard waste management
- Nutrient management
- Reduction of suspended solids

The general permit will not be used to provide permit coverage to a storm water discharge within Indian Country. Permit coverage is required from the USEPA for construction site storm water discharges within Indian County. Information on such permitting is available at: https://www.epa.gov/npdes/stormwaterdischarges-construction-activities.

(Wisconsin Department of Natural Resources, 2021)

Construction Site Erosion Control

The Wisconsin Department of Safety and Professional Services, Division of Industry Services has authority and responsibility for construction site erosion control for building sites for public buildings and places of employment and one and two-family dwellings. The department may delegate authority under this section to a county, city, village or town.

If a one- or two-family construction site disturbs less than one acre, the specific erosion control requirements in SPS 321.125 (Erosion and sediment control) must be met. Erosion control requirements for construction of public buildings and buildings that are places of employment are found in Wis. Stats. Chapter 101.1206. Standard erosion control plan sheets and a checklist are available from the WDNR and UWEX.

Appendix C. Lake Owen Early Detection and Rapid Response to Aquatic Invasive Species (AIS)

Definition: Aquatic Invasive Species (AIS) are non-native plant and animal species that can out-compete and overtake native species damaging native lake habitat and sometimes creating nuisance conditions. Lake Owen shoreland invasive species present include yellow iris, phragmites (reed grass,) and forget-me-not. Chinese mystery snails are also present in the lake. Additional AIS threaten Lake Owen, and our Lake Scientist will monitor for them throughout the lake.

1. Maintain a contingency fund for rapid response to Eurasian water milfoil, zebra mussels, and other aquatic invasive species (LOA Board). In 2024, this contingency fund is $55,530.
2. Conduct professional monitoring at the public landings and in a monthly meandering survey around the lake. If an AIS is found, inform the LOA Board, Lake Manager, and WDNR (Lake Scientist).
3. Lake residents and visitors should contact the AIS Identification (ID) Board Contact(s) or Lake Scientist if they see a plant or animal in the lake they suspect might be an AIS. Signs at the public boat landings, web pages, handouts at annual meetings, and newsletter articles will provide photos and descriptions of AIS that have a high likelihood of threatening Lake Owen, contact information, and instructions.
4. If a volunteer locates a likely AIS, instructions will request that the volunteer record the location of suspected AIS using GPS, if available, or mark the location with a small float. Note that cell phone applications are available to identify GPS points.

   If a plant:

   a. Take a digital photo of the plant in the setting where it was found (if possible). Then collect five to ten intact specimens. Try to get the root system, and all leaves as well as seed heads and flowers when present. Place in a zip lock bag with no water. Place on ice and transport to refrigerator.

   b. Inform a LOA Board Member or LOA Lake Scientist.

LAKE OWEN AQUATIC INVASIVE SPECIES


Yellow iris


Phragmites (reed grass)


Forget-me-not


Chinese mystery snail


Narrow-leaved Cattail

5. If an animal other than a fish:
    a. Take a digital photo of the animal in the setting where it was found (if possible). Then collect up to five specimens. Place in a jar with water; put on ice and transport to refrigerator. Transfer specimen to a jar filled with rubbing alcohol (except for Jellyfish – leave in water).
6. Inform a LOA AIS ID Board Contact(s) or LOA Lake Scientist. The Lake Scientist will tentatively confirm identification of plant or animal AIS with WDNR then,

If a plant:

    a. Fill out plant incident form http://dnr.wi.gov/lakes/forms/3200-125-plantincident.pdf
    b. Contact WDNR staff, then deliver collected plants to the WDNR (810 W. Maple St., Spooner, WI 54801) as soon as possible (or to the location they specify).

If an animal:

    a. Be sure the suspected invasive species has not been previously found on the waterbody
    b. If a zebra mussel report to WDNR and Bayfield County
    c. Fill out form 3200-126 – Aquatic Invasive Animal Incident Report

7. If identification is positive, the Lake Scientist will:
    a. Inform the person who reported the AIS and the board, who will then inform Bayfield County, the WDNR, and the US Forest Service.
    b. Mark the location of AIS with a more permanent marker and GPS points.
    c. Post a notice at the public landing (WDNR has these signs available) and post a news item on the website and on the LOA Facebook page. Notices will inform residents and visitors of the approximate location of AIS and provide appropriate means to avoid its spread.
8. Determine the extent of the AIS introduction (LOA Lake Scientist in cooperation with Bayfield County and WDNR). Divers may be used. If small amounts of AIS are found during this assessment, divers may be directed to identify locations with GPS points and hand pull plants/remove animals found. All plant fragments will be removed from the lake when hand pulling.
9. Select a control plan in cooperation with the WDNR (LOA Board, Lake Scientist, and Lake Manager) and the US Forest Service (if on or adjacent to Forest Service land). The goal of the rapid response control plan will be eradication of the AIS.

Control methods may include hand pulling, use of divers to manually or mechanically remove the AIS from the lake bottom, application of herbicides, and/or other effective and approved control methods.

10. Implement the selected control plan including applying for the necessary permits. Regardless of the control plan selected, it will be implemented by persons who are qualified and experienced in the technique(s) selected.
11. The LOA will work with the WDNR to apply for an Early Detection and Rapid Response AIS Control Grant.
12. Frequently inspect the area of the AIS to determine the effectiveness of the treatment and whether additional treatment is necessary (Lake Scientist, WNDR and/or other agency representatives).
13. Review the procedures and responsibilities of this rapid response plan on an annual basis. Changes may be made with approval of the LOA Board.

EXHIBIT A

LAKE OWEN ASSOCIATION

Board Contact:	
Overall Management	Amy Louis (630-606-6489) ashacklouis@gmail.com
Lake Scientist (AIS ID and survey)	Steve Schieffer (715-554-1168) ecointegservice@gmail.com
Lake Manager	Cheryl Clemens (715-225-0690) harmonyenv@amerytel.net

BAYFIELD COUNTY LAND AND WATER RESOURCES DEPARTMENT

AIS Coordinator	Andrew Teal: (715- 373-6167) ATeal@bayfieldcounty.org

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Permits and Grants	VACANT
AIS Identification and Notice	Alex Selle (715-413-2376) Alexander.Selle@wisconsin.gov

UNITED STATES FOREST SERVICE, WASHBURN RANGER DISTRICT

District Ecologist	Eric North (715-373-2667 x5240) Eric.north@USDA.gov

ADDITIONAL REFERENCES

http://dnr.wi.gov/lakes/invasives/GoalsNew.aspx?show=emerging

https://dnr.wi.gov/topic/Invasives/report.html