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LAKE EAU GALLE, DUNN COUNTY

2024-2028 APMP
WDNR WBIC: 2056600

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Lake Eau Galle Association Eau Galle, WI 54737

Distribution List

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Table of Contents

Figures

Tables

Appendices

AQUATIC PLANT MANAGEMENT PLAN-LAKE EAU GALLE

PREPARED FOR THE LAKE EAU GALLE ASSOCIATION

INTRODUCTION

Lake Eau Galle is documented as being a 360-acre lake in southwestern Dunn County near the Village of Eau Galle. Lake Eau Galle is the most downstream impound on the Eau Galle River. The river covers 46 miles from north of Spring Valley, WI to the Chippewa River downstream of Lake Eau Galle about 6 miles as a crow flies (Figure 1). Portions of the river upstream of Lake Eau Galle are considered trout waters, but are threatened by turbidity, natural erosion, and streambank grazing. This portion of the river is listed as impaired water in WI.

Lake Eau Galle itself is not listed as impaired water, but due to sedimentation from the river coming in, much of what was once open water in a lake up to 30ft deep (from the Lake Eau Galle Association webpage) has been filled in. The Wisconsin Department of Natural Resources (WDNR) lists the lake as 360 acres with a maximum depth of 18ft; however the upper or northern 29% of the lake, an area of approximately 104 acres was considered too shallow to navigate during a 2022 aquatic plant survey completed by the WDNR, and during the same survey, the maximum depth of the lake was only 14.0ft and this was found at only one point near the dam (Figure 2).

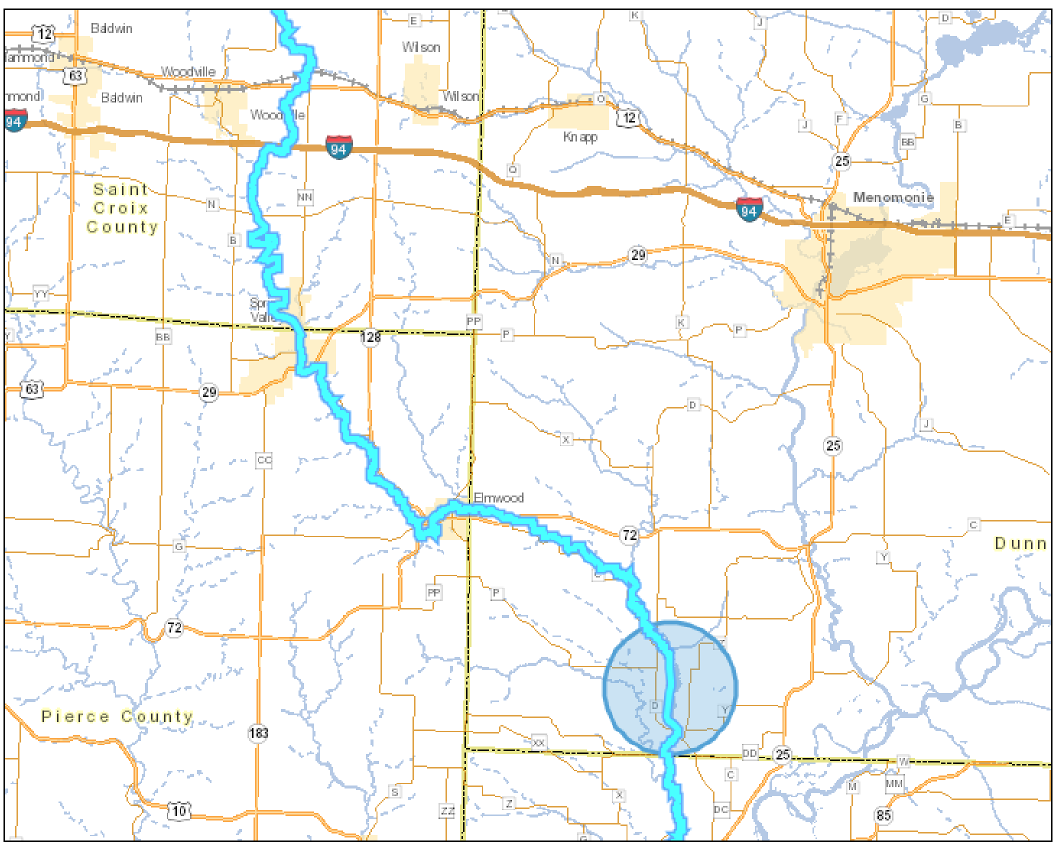

Figure 1: Eau Galle River Map – Lake Eau Galle (blue circle)

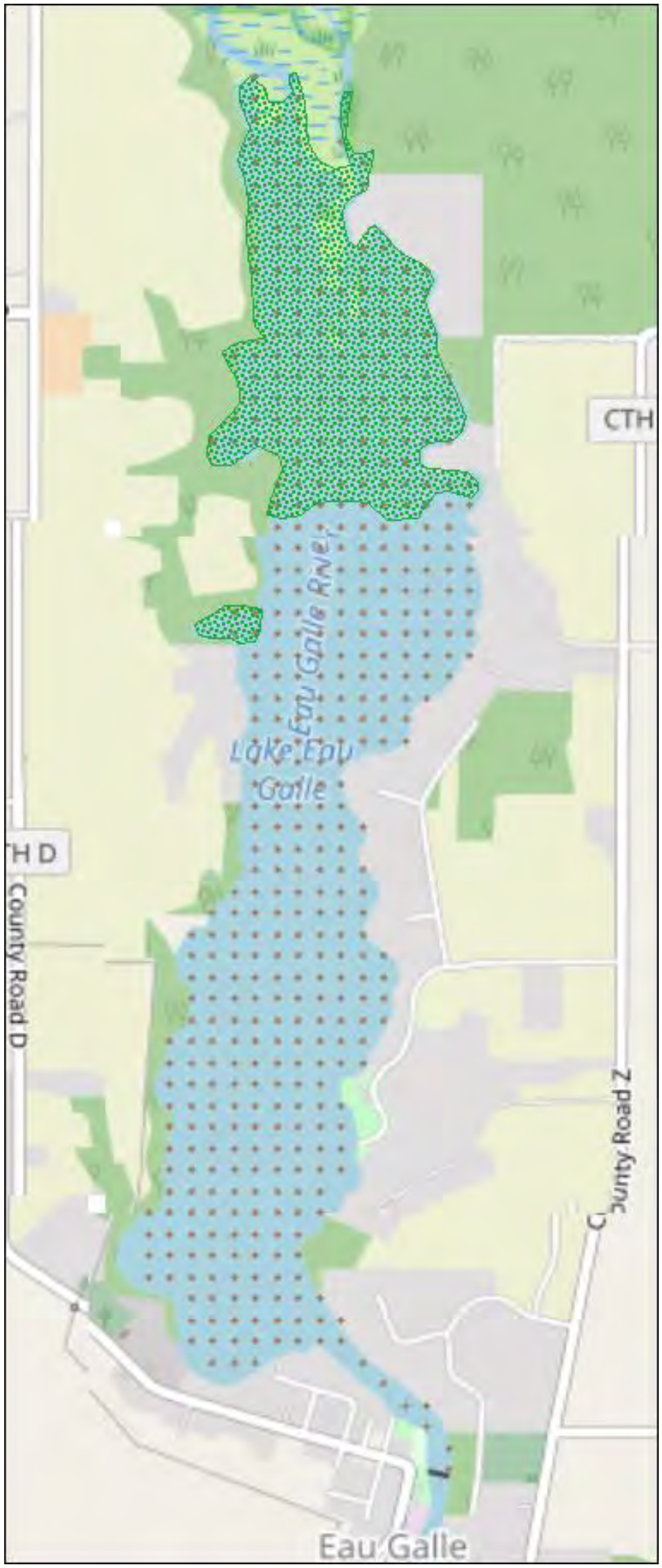

Figure 2: Non-navigable area of Lake Eau Galle based on a 2022 point-intercept survey

Lake Eau Galle is considered a reservoir or impoundment as there is a hydropower generating dam at the outlet of the lake at the extreme south end of the long narrow lake. It is considered a shallow water resource.

PREVIOUS AQUATIC PLANT MANAGEMENT GOALS AND OBJECTIVES

There has never been an Aquatic Plant Management Plan (APMP) developed for Lake Eau Galle. Prior to a whole-lake, point-intercept, aquatic plant survey completed by the WDNR in 2022, the last plant survey was completed in 2002 also by the WDNR, using the transact method of survey. During the 2002 survey, both Eurasian watermilfoil (EWM) and curly-leaf pondweed (CLP) were verified and vouchered in the lake. No aquatic plant management has been completed in the lake.

LAKE EAU GALLE ASSOCIATION

Lake Eau Galle was once a 360-acre lake and it previously had depths as much as 30 feet (within the channel near the dam). It is in the southwestern corner of Dunn County, Wisconsin. Visitors have access to the lake from two public boat landings and one public beach. Fish include Panfish, Northern and Largemouth Bass.

In 2021, a handful of lake owners began to investigate the process of establishing a local lake association to be recognized to work with the DNR, the Army Corps of Engineers, and Extension Lakes (College of Natural Resources). Lake Eau Galle Association (LEGA) was officially incorporated in February of 2022, was recognized as a 501(c)3 organization in April of 2022 (required by the State of Wisconsin to apply for grants) and has over 80 members.

The mission of LEGA is "To improve and maintain Lake Eau Galle by enhancing its water quality, its fisheries and other wildlife habitats, and its recreational activities for today and future generations." LEGA has five committees to help meet this mission: Education, Technology, Grant Writing, Fundraising, and Membership.

LEGA supports a webpage at https://lakeeaugalle.org/ and a Facebook page.

The first major undertaking of LEGA was to apply for WDNR Surface Water grant funds to complete the very first APMP for the lake. That Plan is expected to guide management of aquatic plants for five years beginning in 2024.

PUBLIC PARTICIPATION AND STAKEHOLDER INPUT

Part of the process of developing an APMP for Lake Eau Galle included a "public use and input" mailed to all of the property owners on the lake. The survey was sent out in mid-May 2023 to approximately 90 property owners and interested stakeholders. The survey received a 70% return rate!

The survey sought to gather additional information about how Lake Eau Galle is perceived by those that live on and use it. It also sought to determine the extent of property owner knowledge related to issues that affect the lakes. Many of these issues were discussed in the survey, along with the management actions that could lessen their impact on the lake. Survey results were presented to LEGA and its constituency during a public meeting held July 19, 2023. Portions of the survey are summarized here; other portions will be summarized in other sections of the APMP.

One of the first questions on the survey was to identify what part of the lake the respondent was on, either the upper half of the lake or the lower half of the lake. Results were nearly split 50/50 which made it possible to compare responses from two different perspectives. Those living on the north half or upstream end of the lake suffer the most from sedimentation and the presence of aquatic vegetation. The lower half or downstream end of the lake is deeper with less aquatic vegetation.

Roughly 43% of the respondents were permanent residents on the lake; nearly 47% were seasonal residents. The average time on the lake for all respondents ranged from 1 to 95 years with the overall average being 20 years.

The top uses of the lake were rest/relaxation, pontoon rides, wildlife viewing, and canoe/kayaking. The worst issues on the lake were too much weed growth, green water, and shallow water. When viewing these responses from the two portions of the lake, too much weed growth was twice the concern for the north as it was for the south. Shallow water was 4x the concern for the north as it was for the south. Green water (water quality), floating vegetation, and watersports were much more of a concern for the south then it was for the north.

Nearly 80% of all respondents felt that the water quality in the lake was worse than it was when they first started using it. More than 55% felt the current water quality was poor or very poor, with another 38% saying it was fair. Only 3% felt it was good.

Respondents were asked to indicate whether lake conditions interfered with their use of the lake. To be considered a true interference, at least 25% of the respondents had to say it was. Wildlife viewing, non-motorized boating, motorized boating, swimming, waterskiing/tubing, and fishing were all impacted by water quality. Swimming was most often impacted negatively by lake water quality with 74.6% of the respondents saying it did.

More than 85% of all respondents felt that the lake was shallower now than it was when they first started using it. Lake depth negatively impacted non-motorized boating, motorized boating, swimming, and water skiing/tubing. The most impacted was motorized boating at 47.6% of the respondents saying lake depth interfered with it. Lake depth did not impact wildlife viewing or fishing.

More than 85% of respondents felt that aquatic plant growth had increased since they first started using the lake. Aquatic plant growth in the lake negatively impacted wildlife viewing, non-motorized boating, motorized boating, swimming, waterskiing/tubing, and fishing. The most impacted was swimming at 65.1% of respondents saying it did.

The last section of the public use and input survey asked respondents about their views related to the new lake association. Despite recently being formed in 2022, more than 95% of the survey respondents knew that LEGA existed. Almost 60% of the respondents had been to a LEGA meeting, and more than 80% of the respondents were currently members of LEGA.

Regarding LEGA communications with the constituency, meeting frequency, atmosphere during the meetings, getting things done, community cooperation, financial management, and addressing the concerns of the constituency, a majority of respondents were satisfied with how LEGA operates. The Public Use Survey is included in Appendix A.

APM PLAN

A completed draft of the APM Plan was sent to members of the LEGA Board in early September 2023. It was reviewed by the Board and then made available on the LEGA webpage and Facebook page for public review and comment in October 2023.

OVERALL MANAGEMENT GOAL

The overall aquatic plant management goal for Lake Eau Galle is to minimize property owner and lake user access and navigation issues caused by dense growth of aquatic plants, while at the same time protecting the positive aspects of the aquatic plant community. Although curly-leaf pondweed and Eurasian watermilfoil, both non-native aquatic plant species, are present in Lake Eau Galle, they are not the sole source of the issues caused. As such, there are no management actions recommended in this plan specifically targeted to these species except physical removal. Physical removal is also recommended for control of native aquatic vegetation.

Property owners along the NE shore of Lake Eau Galle are impacted the most by dense growth of aquatic plants. As such, this Plan does recommend that an open water access channel be established in that area of the lake. The recommended action to establish this channel is through mechanical harvesting. Limited dredging could also be used. Both require permits and approval from the WDNR.

Secondary goals include reducing the threat of new aquatic invasive species (AIS) being introduced to the lake through watercraft inspection, monitoring, and constituent education; evaluation and subsequent implementation of shoreland habitat improvement projects; water quality monitoring; and management planning, implementation, and evaluation including further investigation into the potential for dredging in Lake Eau Galle.

- **Goal 1** – Minimize access to open water and lake use issues caused by dense aquatic plant growth.
- **Goal 2** – Reduce the threat that existing AIS will leave the lake; that new aquatic invasive species will be introduced into the lake; and that new AIS introduced to the lake will go undetected in the lake.
- **Goal 3** – Promote and support nearshore and riparian best management practices that will improve fish and wildlife habitat, reduce runoff, and minimize nutrient loading into Lake Eau Galle.
- **Goal 4** – Complete appropriate and on-going monitoring and management assessment to determine changes in the health of the lake ecosystem.
- **Goal 5** – Implement the 2024-28 Lake Eau Galle Aquatic Plant Management Plan effectively and efficiently with a focus on community and constituent education, information, and involvement.

All of these goals and the objectives and actions that accompany them are presented in Appendix B.

CURLY-LEAF PONDWEED

CLP was found during the 2002 plant survey, though it frequency was very low (Konkel, 2002). Data referenced from the 2022 survey only includes those points that were sampled by the surveyor. During the 2022 survey, CLP was found at 22 of 107 points with vegetation for a frequency of occurrence of 20.6%. These points were spread out through the entire littoral zone of the lake. The frequency of occurrence within the littoral or plant growing zone of the lake was 5.8%. Of the 22 points with CLP, 12 were visuals (not found on the rake), 2 were given a rake fullness rating of 2, and 8 were given a rake fullness rating of 1 for an average rake fullness of 1.2 out of 3, meaning only about 7.4 acres (2.1%) of the whole lake had a minor infestation of CLP (Figure 3).

The only caveat to these survey results is that CLP is generally a cool-water aquatic plant at its most dense from about the middle of May to the end of June. Normally, it would not be expected to be an abundant plant species in the middle of August when the 2022 survey was completed. The fact that it was found at 22 sites suggests that the river coming into the lake is carrying cool water; cool enough to continue to support the growth of CLP, even in August. This also suggests that if the whole-lake PI survey was completed in the spring of the year, there may be more CLP.

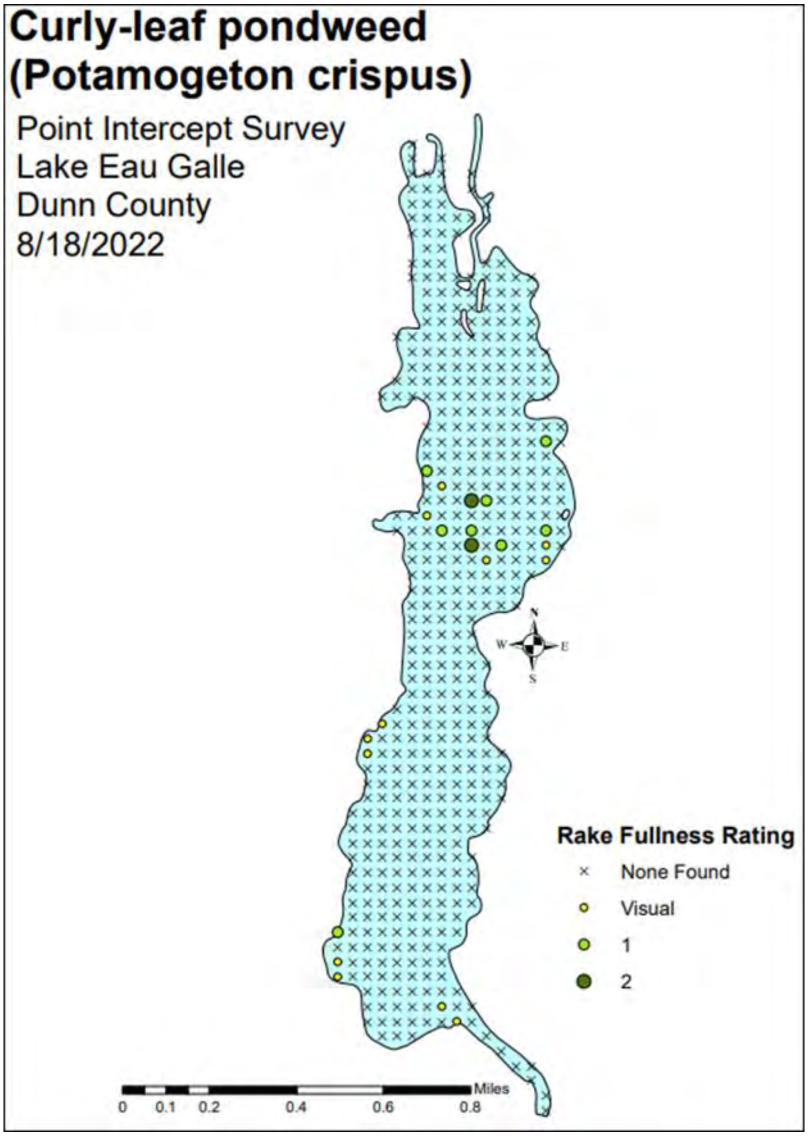

Figure 3: CLP and rake fullness rating (Smith, 2022)

EURASIAN WATERMILFOIL

EWM was found during the 2002 plant survey, with a frequency of about 17%. It was the most abundant aquatic plant species in the 2002 survey (Konkel, 2002). Data referenced from the 2022 survey only includes those points that were sampled by the surveyor. During the 2022 survey, EWM was found at 9 of 107 points with vegetation for a frequency of occurrence of 8.4%. All the points were found in the 3-6ft depth range in the north central portion of the lake. The frequency of occurrence within the littoral or plant growing zone of the lake was 5.3%. Of the 9 points with EWM, 1 was a visual (not found on the rake), and 8 were given a rake fullness rating of 1. The average rake fullness was only 1 out of 3, meaning that only about 5.9 acres (1.6%) of the whole lake had a minor infestation of EWM (Figure 4).

During the 2002 survey, the surveyor reported that EWM "occurred only in the far north end of the reservoir. The other species occurred in scattered locations around the lake." It is unknown exactly what the surveyor meant by "far north end", but it is clear from the 2022 survey that EWM has moved from the far north end into the more central basin of the lake (Figure 4). While it is possible that EWM is still located in the far north end, this area was not surveyed in 2022 due to access issues.

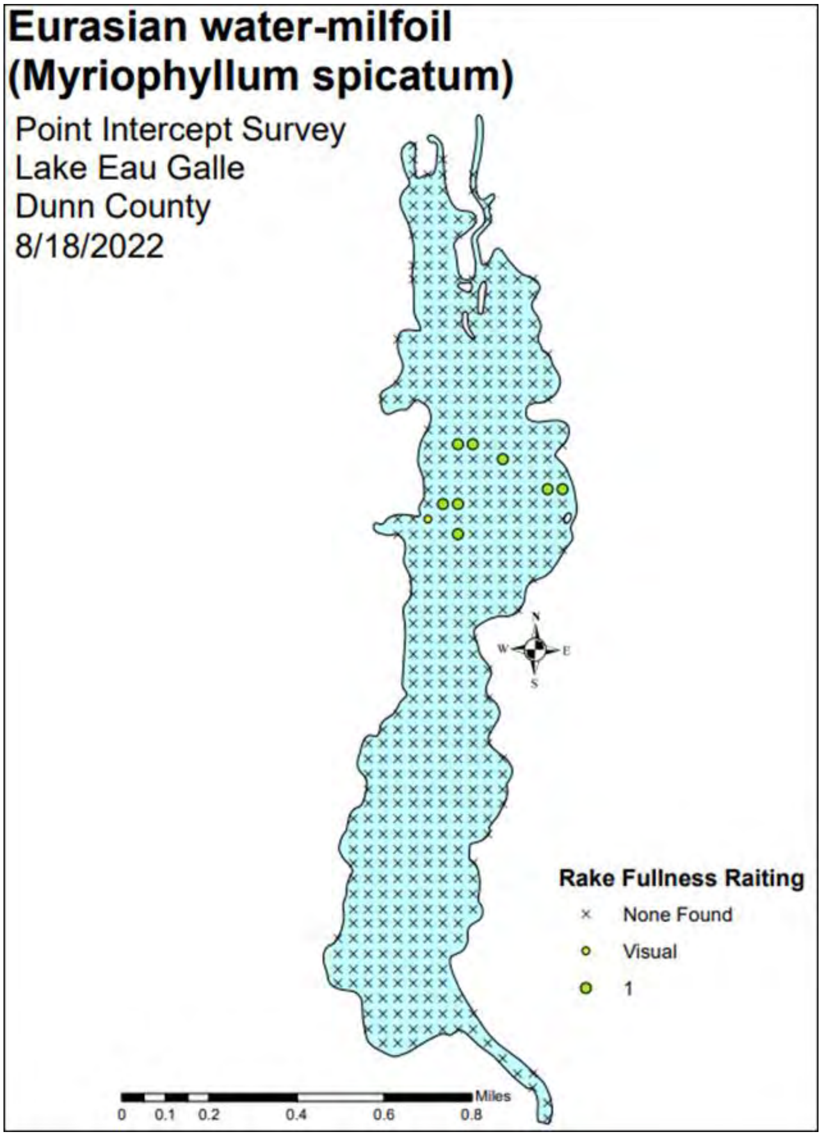

Figure 4: EWM and rake fullness (Smith, 2022)

LAKE INVENTORY

In order to make recommendations for aquatic plant and lake management, basic information about the water body of concern is necessary. A basic understanding of its watershed (the area that drains water into it); and the physical characteristics of the waterbody itself, including size and depth, critical habitat, water quality, water level, fisheries and wildlife, wetlands and soils is needed to make appropriate recommendations for improvement.

WATERSHED

Lake Eau Galle is part of the Eau Galle River watershed that drains approximately 250sqmi of rolling agricultural and wooded areas (Figure 5). The river is 46 miles long and empties into the Chippewa River. The Eau Galle River has four major tributaries that originate from steep coulees (valleys). Lake Eau Galle is one of two major lakes in the watershed. Upstream, near Spring Valley is the Eau Galle Reservoir (also known as Lake George). The entire watershed is ranked High for runoff impacts on streams, Not Ranked for runoff impacts on lakes, and High for runoff impacts on groundwater and therefore has an overall rank of High.[1]

The Wisconsin Healthy Watersheds Assessment (HWA), accessible using the new Wisconsin Water Explorer web page (WEx) evaluates watersheds by aggregating multiple metrics of health and vulnerability into composite indexes. The HWA organizes health and vulnerability hierarchically into indexes sub-indexes. “Health” and “Vulnerability” are the two highest levels in the hierarchy. Under “Health,” the main sub-indexes are “Hydrologic Condition,” “Water Quality” and so on. The size of the font indicates the level in that hierarchy. The numeric values to the right of each index indicate the score in that category, from 0 to 100, where higher values are healthier and more vulnerable. For the lowest level scores on the hierarchy, the raw value is shown outside of the parentheses, and the rank scores are shown within the parentheses. As scores increase in health, the colors go from red to blue. For vulnerability however, the colors go from blue to red as scores increase.[2]

The overall health of a watershed generally dictates the health of the lake contained within it, particularly those that are part of the river system, like Lake Eau Galle is. Overall, the watershed for Lake Eau Galle is ranked near the middle for aquatic ecosystem health (Figure 5). Its weakest parameter is water quality with total phosphorus having the lowest health index value (11). Although not shown in Figure 5, the watershed for Lake Eau Galle is ranked very low for vulnerability.

[1] https://apps.dnr.wi.gov/water/waterDetail.aspx?key=15606
[2] https://dnr-wisconsin.shinyapps.io/WaterExplorer/

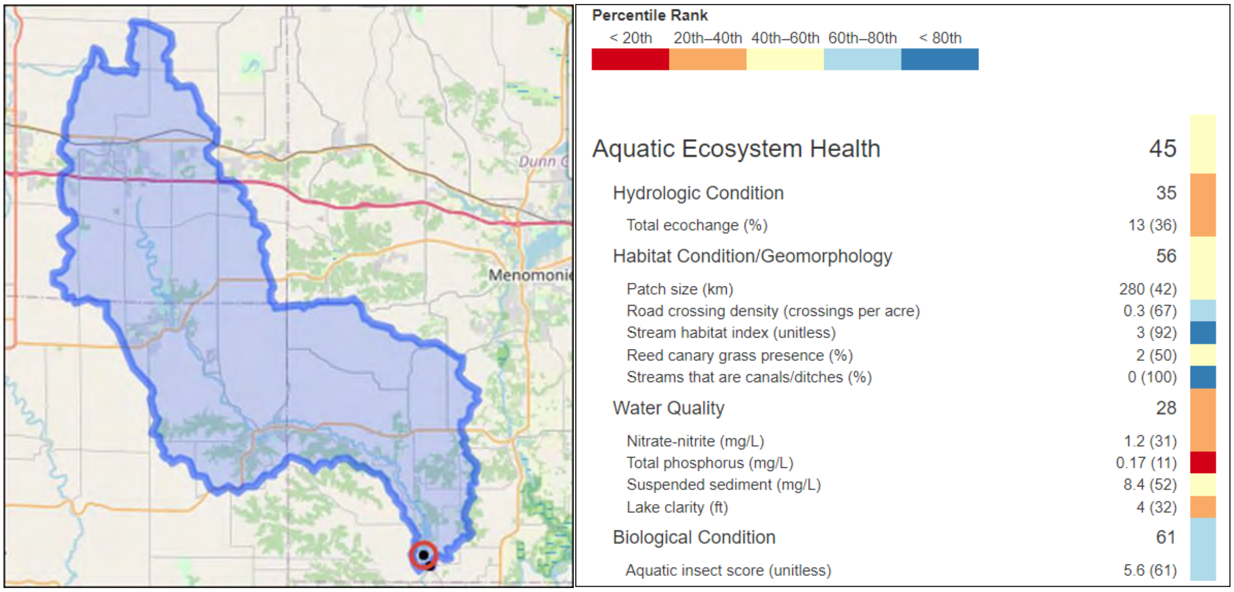

Figure 5: Watershed of Lake Eau Galle (left), and the aquatic ecosystem health determination for the lake (right) (WEx WDNR, 2023)

The watershed of Lake Eau Galle covers 115,681 acres. Land use within the watershed is shown in Table 1. Land cover and land use management practices have a strong influence on water quality. Increases in impervious surfaces, such as roads, rooftops, and compacted soils, associated with residential and agricultural land uses can reduce or prevent the infiltration of runoff. This can lead to an increase in the amount of rainfall runoff that flows directly into area lakes as well as into the rivers and streams that drain to them. The removal of riparian, i.e., near shore, vegetation causes an increase in the amount of nutrient-rich soil particles transported directly to the lake during rain events.

Table 1: Land use in the watershed of Lake Eau Galle (WEx WDNR, 2023)

Land Use Class	Area (acres)	% of Watershed
Wetlands	1,747	1.51
Rural Res (> 1 Ac)	6,639	5.74
Row Crop Ag	46,291	40.02
Pasture/Grass	26,269	22.71
MD Urban (1/4 Ac)	139	0.12
Lake Surface	497	0.43
HD Urban (1/8 Ac)	46	0.04
Forest	34,053	29.44
TOTAL	115,681	100.01

LAKE CHARACTERISTICS

Lake Eau Galle (WBIC 2056600), considered a reservoir by the Wisconsin Department of Natural Resources (WDNR), is in the southern part of the watershed near the Town of Eau Galle. There is a hydropower generating dam at the outlet of Lake Eau Galle that is owned by Dunn County but operated by a private company – Renewable World Energies. Lake Eau Galle covers about 360 acres, and according to the information on the WDNR Lake page, it has a maximum depth of 18ft, and a mean depth of 5.75ft (Table 2, Figure 6). These data are based on sonar mapping last completed by the WDNR in 1967. However, according to data collected by the WDNR during a 2022 whole-lake, point-intercept, aquatic plant survey, of the 345 out of 486 points that could be sampled, the maximum depth was only 14.0ft. The mean depth was 7.0ft (WDNR, 2022). The 141 points that were not sampled are still a part of the lake's surface area but because they were not sampled during the 2022 survey, data related to them is not quantifiable. Lake depth and substrate are calculated using only the "sampled" points.

Table 2: Lake Eau Galle characteristics (WDNR Lakes Page)

Lake Characteristics	
Lake Area (acres)	360
Watershed Area (acres)	115,681
Max. Depth (feet)	18
Mean Depth (feet)	5.75
Miles of Shoreline (miles)	7.1
Lake Type	Reservoir

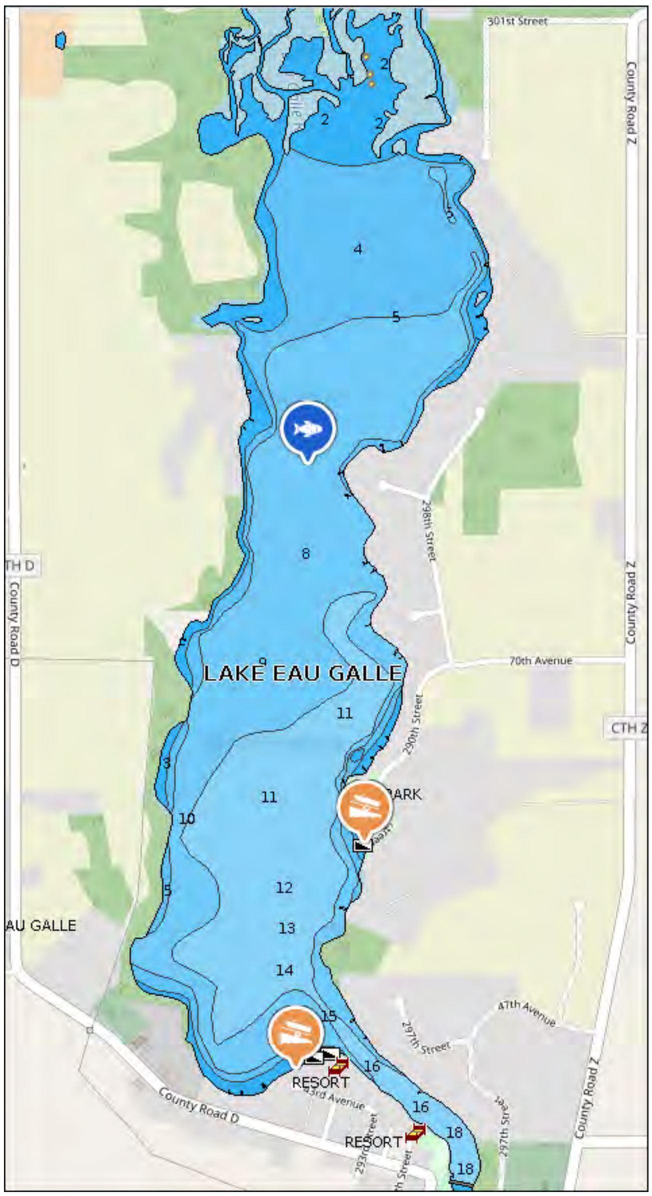

Figure 6: Lake characteristics as listed with the WDNR based on 1967 sonar mapping (https://www.lake-link.com/wisconsin-lakes/dunn-county/lake-eau-galle/1336/)

The lake gradually gets deeper from the north where the river comes in to the south and the channel to the dam (Figures 7 and 8). During the 2022 survey, all the brown points in Figure 7 were not sampled.

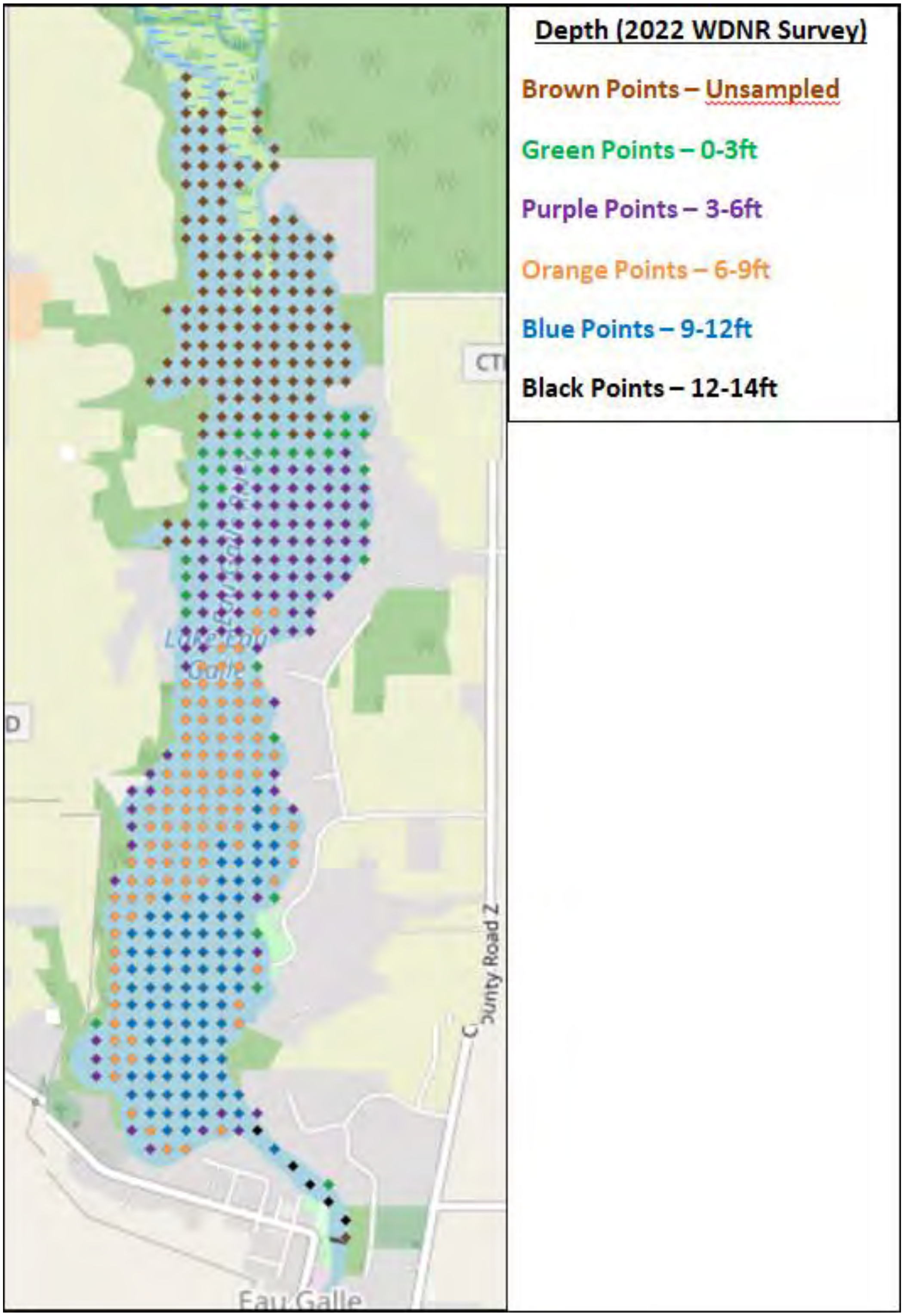

Figure 7: Lake depth (2022 WDNR Survey)

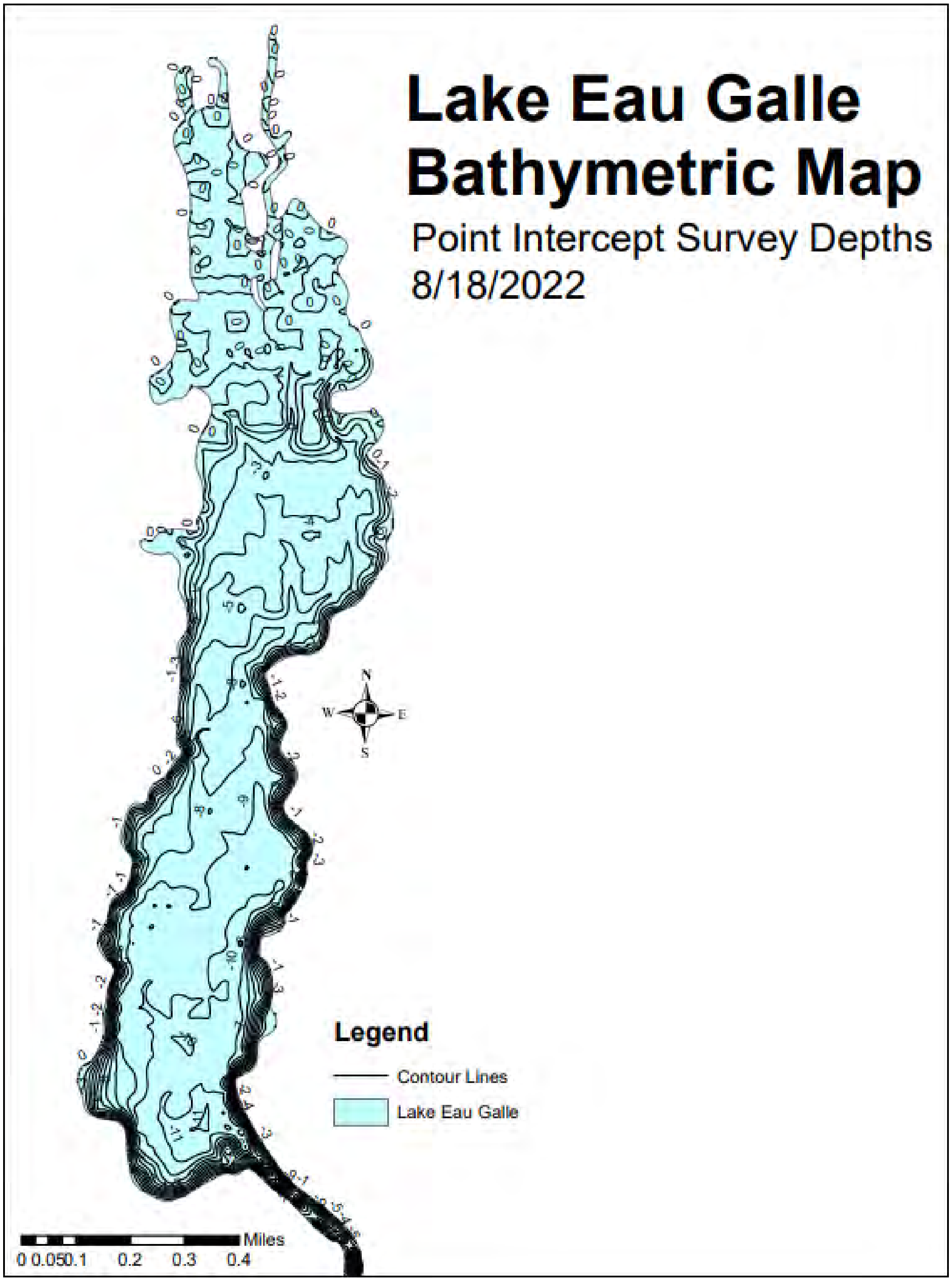

Figure 8: Bathymetric map based in the 2022 point-intercept survey (Smith, 2022)

Lake substrate is mostly muck with some sand along the shores and in a flat off the east shoreline (Figure 9).

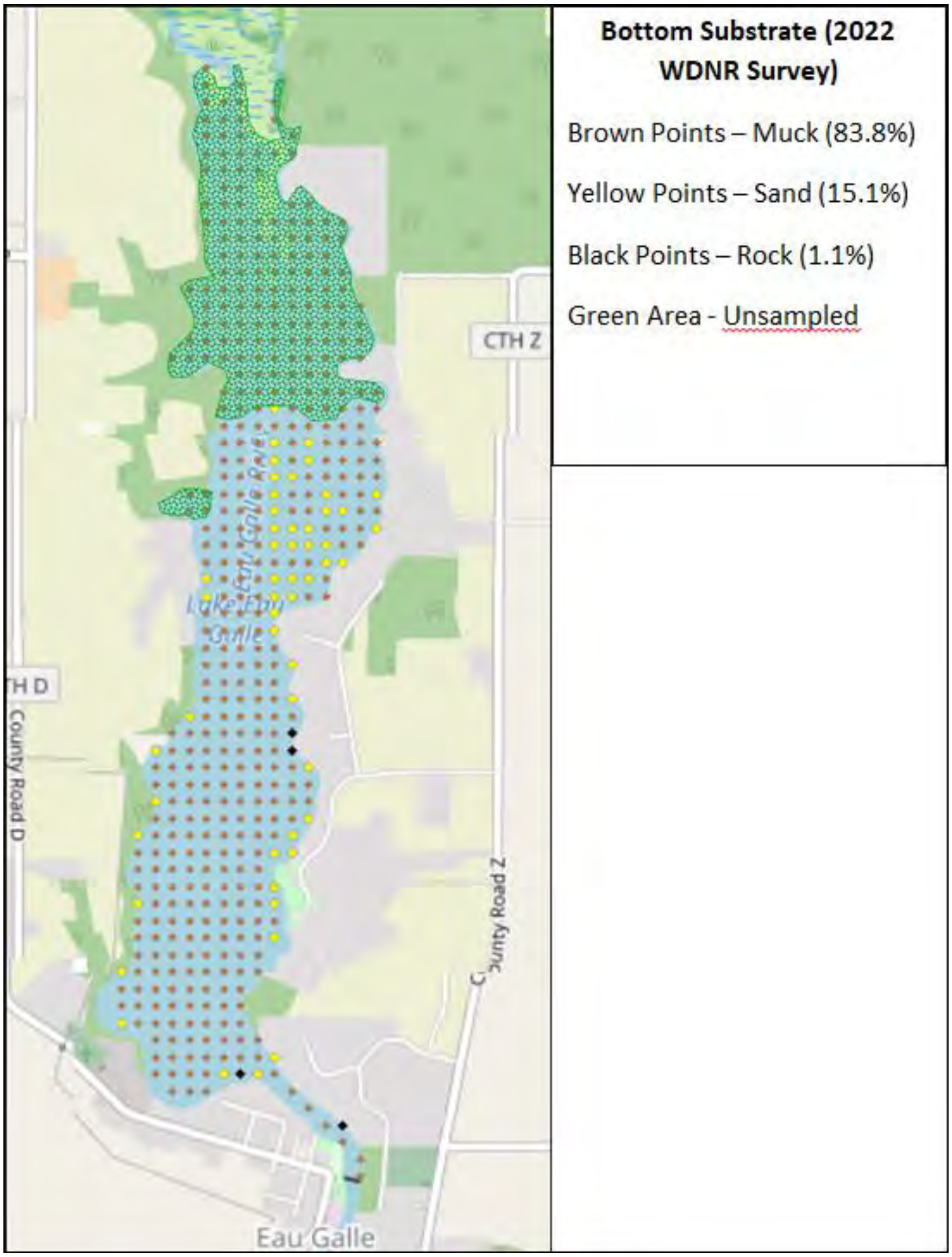

Figure 9: Lake substrate (2022 WDNR Survey)

WATER QUALITY

WATER CLARITY

The Citizen Lake Monitoring Network[3] (CLMN) is a water quality monitoring partnership between the WDNR, the Wisconsin Lakes Partnership, and over a 1,000 citizen volunteers statewide. The goals of the CLMN are to collect high-quality data, to educate and empower volunteers, and to share this data and knowledge. Volunteers measure water clarity using the Secchi disk, as an indicator of water quality (based on clarity). They also comment on other parameters including lake level, color of the water, murkiness, and how

[3] For more information about the CLMN go to: https://dnr.wisconsin.gov/topic/lakes/clmn

they perceive the lake on any given monitoring date using a 1 to 5 scale with 1 being "great, fantastic" and 5 being "really bad". Volunteers may also collect chemistry data; collect temperature and dissolved oxygen data; and monitor for the first appearance of aquatic invasive species near boat landings, other access points, or along the shoreline.

Unfortunately, there is not a lot of water quality data for Lake Eau Galle. Sporadic Secchi disk readings of water clarity exist in 1995, 2002, 2006, and 2022 (Figure 10). The year 1995 is the only year with a complete season's worth of results. During the 1995 season Secchi disk readings of water clarity look to have averaged about 3.0ft (WEx WDNR, 2023). There is not enough data to establish any trends in water clarity for the lake (WEx WDNR, 2023).

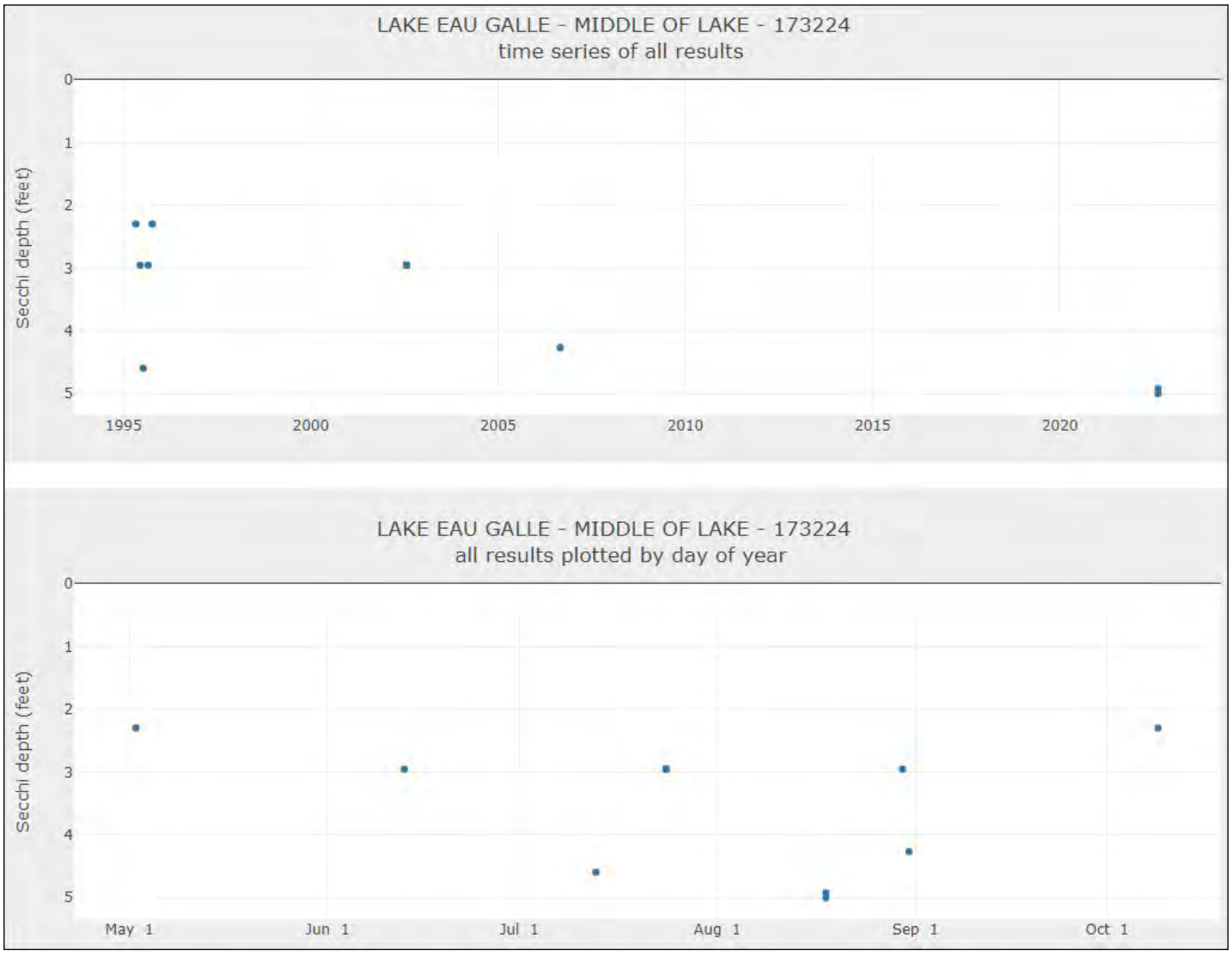

Figure 10: All CLMN water clarity data (WEx WDNR, 2023)

WATER CHEMISTRY – TP AND CHLA

The "expanded" water quality monitoring level of the CLMN includes volunteers collecting Total Phosphorus (TP) and Chlorophyll-a (ChlA) data along with Secchi disk readings of water clarity. CLMN protocol for TP monitoring involves collecting water samples four times during the open water season to determine the amount of phosphorus in the water. Phosphorus is the main nutrient needed for both aquatic plants and algae growth in a lake. Figure 11 reflects all the TP data that exists for Lake Eau Galle. Like Secchi disk data of water clarity, it is limited. There is not enough data to determine any trends within the lake.

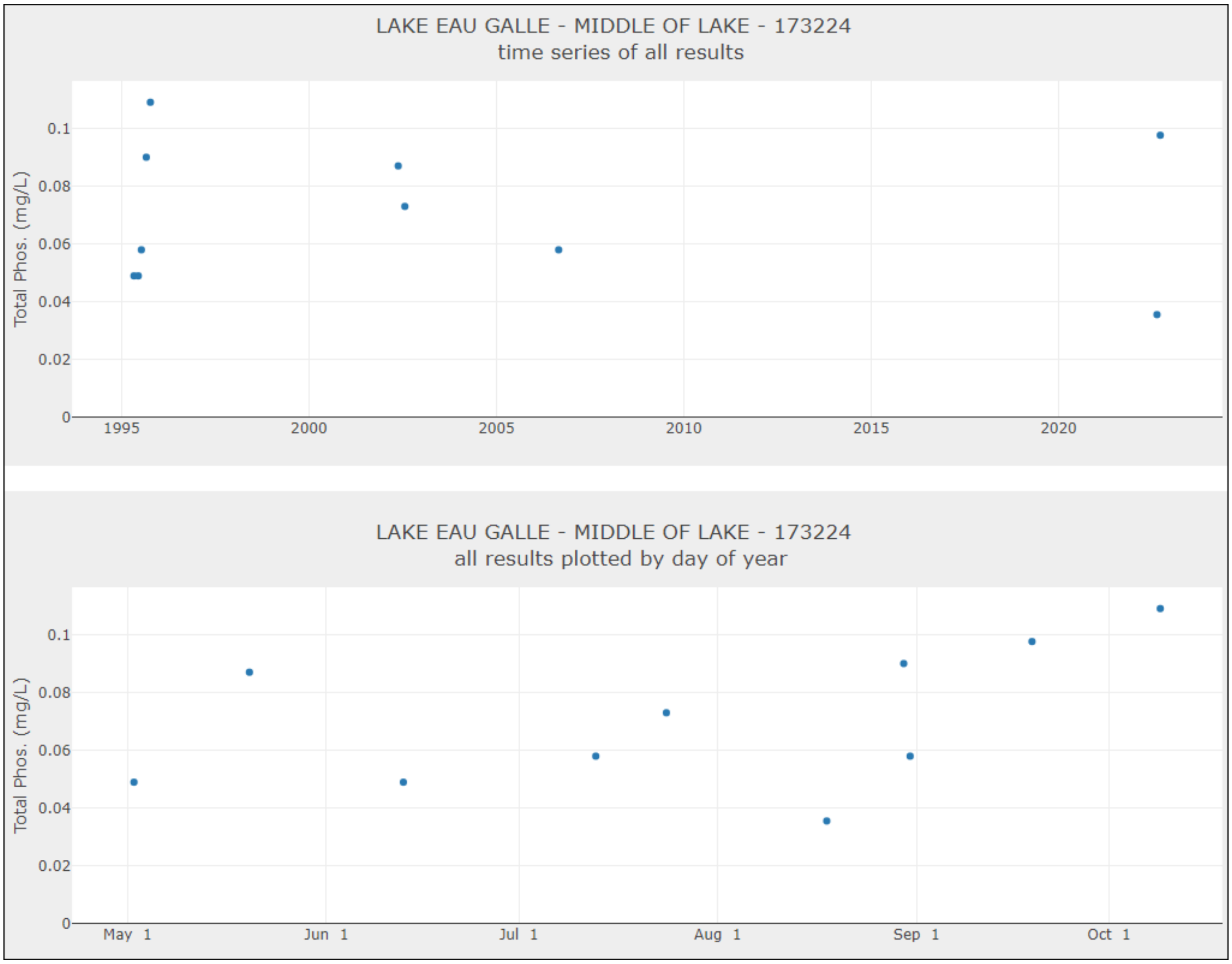

Figure 11: Total phosphorus concentration - all CLMN data (WEx WDNR, 2023)

CLMN monitoring of Chlorophyll-a involves collecting water samples three times during the open water season. ChlA is the pigment that makes all plants green. In a lake, ChlA is used as a measurement of the amount of algae that is in the water. Like Secchi disk readings of water clarity and TP data, ChlA data is limited. Figure 12 shows all the existing ChlA data for Lake Eau Galle. There is not enough data to determine any trends within the lake.

It is highly recommended that volunteers from LEGA participate in the CLMN lake monitoring program. Initial involvement will likely only include collecting Secchi disk readings of water clarity, but expanded monitoring that includes total phosphorous, and chlorophyll-a should begin as soon as the CLMN allows it to. In lieu of being involved in CLMN expanded water quality testing, if grants are applied for and received, they should include water sampling like what is offered through CLMN.

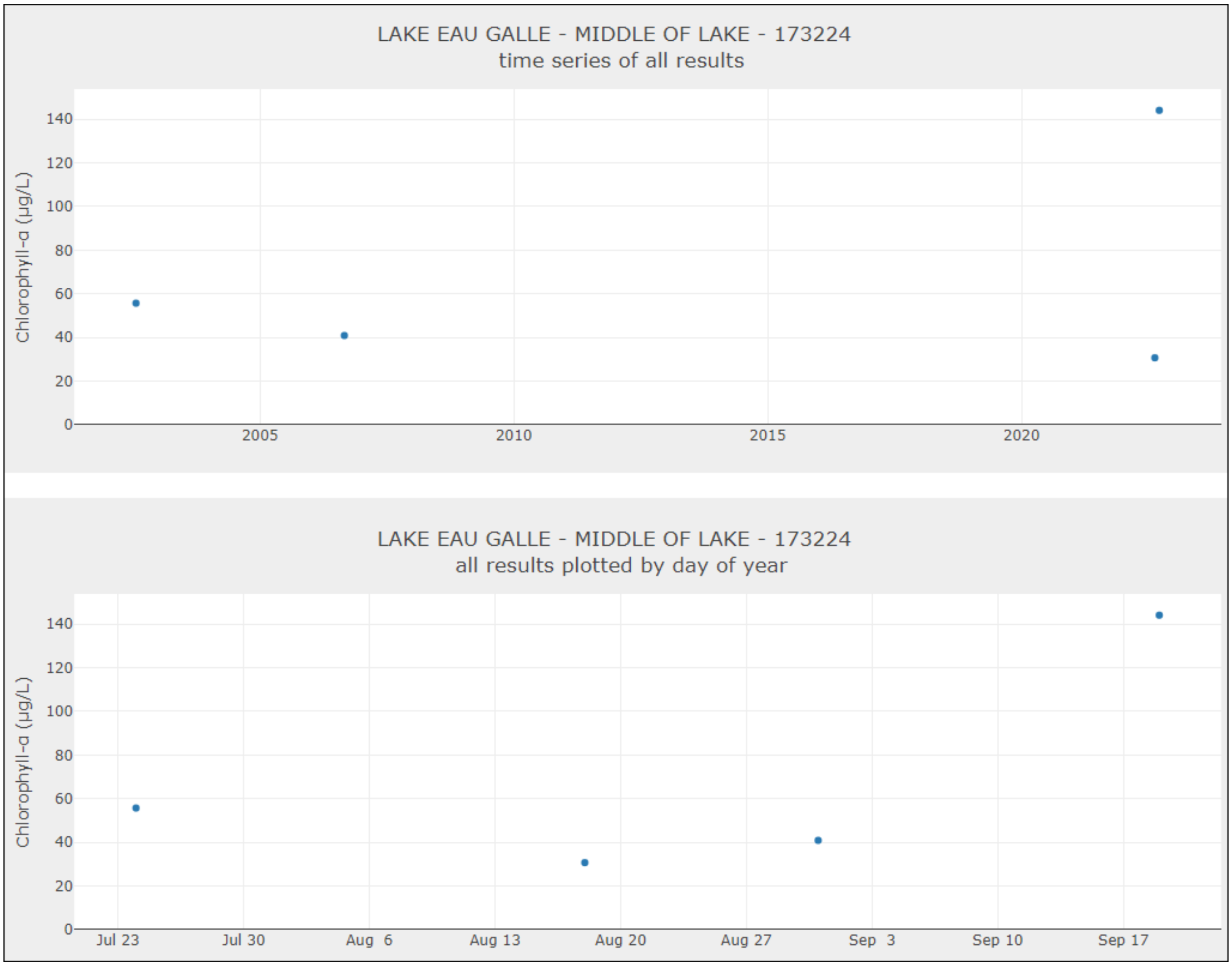

Figure 12: Chlorophyll-a concentration - all CLMN data (WEx WDNR, 2023)

TROPHIC STATE INDEX – LAKE PRODUCTIVITY

Water clarity (based on Secchi disk readings), total phosphorus, and chlorophyll-a are parameters that can be used to determine the productivity or trophic status of a lake. The Carlson trophic state index (TSI) is a frequently used biomass-related index. The trophic state of a lake is defined as the total weight of living biological material (or biomass) in a lake at a specific location and time. Eutrophication is the movement of a lake's trophic state in the direction of more plant biomass. Eutrophic lakes tend to have abundant aquatic plant growth, high nutrient concentrations, and low water clarity due to algae blooms (Figure 13). Oligotrophic lakes, on the other end of the spectrum, are nutrient poor and have little plant and algae growth (Figure 13). Mesotrophic lakes have intermediate nutrient levels and only occasional algae blooms (Figure 13).

Using the averages for all the data that does exist for Lake Eau Galle (Secchi – 4.3ft, TP – 71ug/L, and ChlA – 67.8ug/L) and comparing it to Figure 13, Lake Eau Galle is borderline eutrophic (Secchi and TP)/hyper-eutrophic (ChlA).

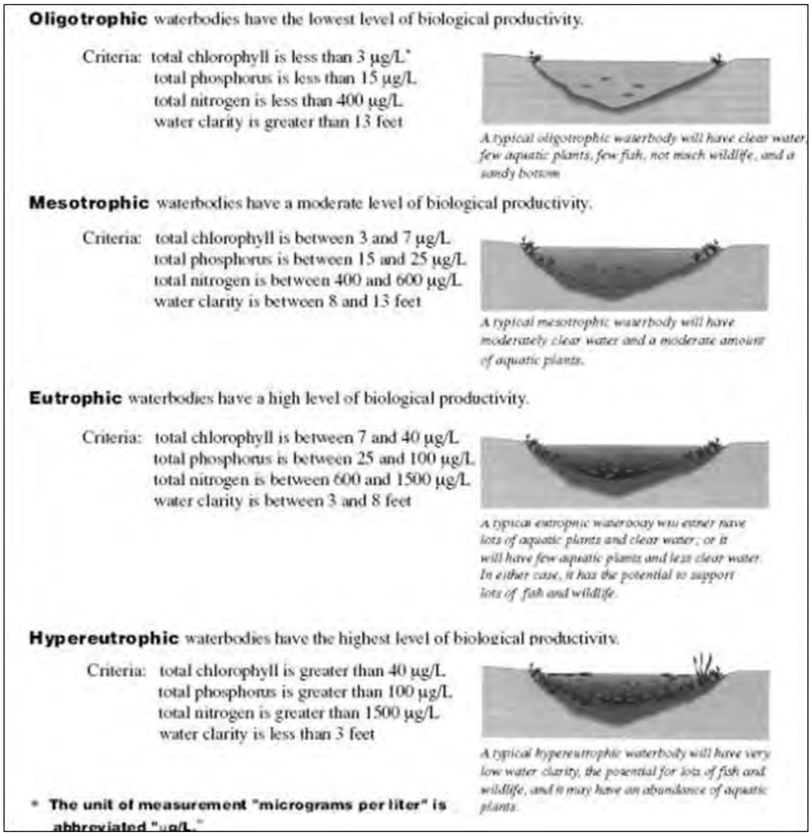

Figure 13: Trophic states in lakes

All the existing data can be converted to fit the TSI scale. The TSI scale runs from "0" to "100". Generally, TSI values from 0-40 are considered oligotrophic, 40-50 are mesotrophic, 50-70 are eutrophic, and anything above 70 is considered hypereutrophic (Table 3).

Table 3: TSI Scale (Cedar Corporation, 2006)

Table 3-4: Trophic State Index (TSI)

TSI Value	Water Quality Attributes	Fisheries, Recreation or Example Lakes
<30	**Oligotrophic:** Clear water, oxygen through the year in the hypolimnion. Water supply may be suitable unfiltered.	Salmonid fisheries dominate.
30-40	Hypolimnia of shallower lakes may become anoxic during the summer.	Salmonid fisheries in deep lakes only. Example: Lake Superior (WDNR)
40-50	**Mesotrophic:** Water moderately clear but increasing probability of anoxia in hypolimnion during summer. Possible iron, manganese, taste and odor problems may worsen in water supply. Water turbidity requires filtration.	Walleye may predominate and hypolimnetic anoxia results in loss of salimonoids.
50-60	**Eutrophic:** Lower boundary of classic eutrophy. Decreased transparency, anoxic hypolimnion during the summer, macrophyte problems evident, warm water fisheries dominant.	Bass may dominate.
60-70	Dominance of blue-green algae, algal scums probable, extensive macrophyte problems. Possible episodes of severe taste and odor from water supply. Anoxic hypolimnion, water-water fisheries.	Nuisance macrophytes, algal scums and low transparency may discourage swimming and boating.
70-80	**Hypereutrophic:** Light limited productivity, dense algal blooms and macrophyte beds.	Lake Menomin & Tainter Lake, Dunn County, WI (WDNR).
>80	Algal scums, few macrophytes, summer fishery kills.	Dominant rough fish.

All TSI values for Lake Eau Galle range from approx. 60 to 65 making the lake eutrophic. In Figure 14, the TSI values for all the existing water quality data fall in the eutrophic portion (light green) of the figure.

TSI data can be used for more than just visualizing trends. Over time, several familiar patterns emerge from the data. Carlson and Havens (2005) discussed the patterns that frequently emerge when looking at long-term trend data and TSI values. For the existing data, Chla and TP TSI values are both higher than the TSI value for water clarity. This suggests that large chlorophyll-containing particulates such as Aphanizomenon flakes (Figure 15) dominate the surface water (Carlson & Havens, 2005).

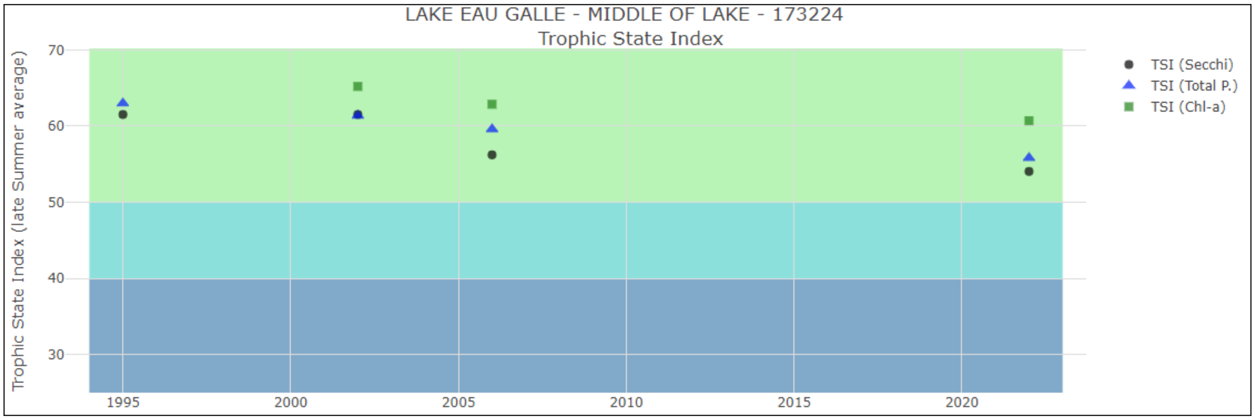

Figure 14: Yearly TSI values for Chla, Secchi (water clarity), and TP (CLMN)

Figure 15: Measuring water transparency with a Secchi disk on a lake during a bloom of Aphanizomenon (http://websites.umich.edu/~hrstudy/photoset.htm)

TEMPERATURE AND DISSOLVED OXYGEN

Temperature and dissolved oxygen are important factors that influence aquatic organisms and nutrient availability in lakes. As temperature increases during the summer in deeper lakes, the colder water sinks to the bottom and the lake develops three distinct layers as shown in Figure 16. This process, called stratification, prevents mixing between the layers due to density differences which limits the transport of nutrients and dissolved oxygen between the upper and lower layers. In most lakes in Wisconsin that undergo stratification, the whole lake mixes in the spring and fall when the water temperature is between 53 and 66°F, a process called overturn. Overturn begins when the surface water temperatures become colder and therefore denser causing that water to sink or fall through the water column. Below about 39°F, water becomes less dense and begins to rise through the water column. Water at the freezing point is the least dense which is why ice floats and warmer water is near the bottom (called inverse stratification) throughout the winter.

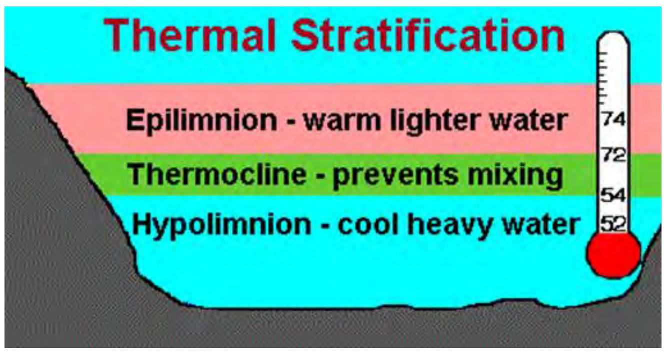

Figure 16: Summer thermal stratification

Because of its shallow nature and because there is water continuously moving through Lake Eau Galle, it does not stratify. Oxygen and temperature remain consistent from the surface of the lake to the bottom of the lake during the summer season. Dissolved oxygen may be used up at the very bottom of the lake by decay of aquatic plants and other detritus.

FISHERIES AND WILDLIFE

Lake Eau Galle is managed as a northern pike, largemouth bass, and panfish fishery. A WDNR fisheries survey was completed in the spring of 2023, however the final report for that survey has not been published yet (Kasey Yallaly, WDNR Fisheries Management, personal communication 9/5/2023). The following is from an email from Kasey.

"All species are totally supported by natural reproduction. The northern pike size structure was excellent with several fish over 40 inches within our sample. The pike population is in high abundance. Largemouth bass abundance was also high and size structure was also excellent. Black crappies were very abundant, but size structure was relatively poor with few fish larger than 10 inches. Bluegill and yellow perch were in moderate abundance and average size structure. Common carp are abundant as well."

WDNR stocking records (Table 4) show that Lake Eau Galle has most recently (up until 2018) been stocked with Northern Pike. There is no record of any additional stocking completed between 2019 and 2023. Earlier fish stocking included walleye and largemouth bass. Personal communication from Kasey Yallaly explains why.

According to the WDNR, marshes with grasses, sedges, rushes or aquatic plants and flooded wetlands are prime spawning habitat for northern pike. Mature females move into flooded areas where the water is 12 or less inches deep, followed by a "spawning group" of one to three males. The best habitat for Largemouth bass is warm, shallow, weedy lakes and ponds, and calm river backwaters. They are seldom found in water more than 20 feet deep and prefer temperatures of 80-85ºF. Both Largemouth bass and bluegill build beds, or 'nests,' to deposit their eggs in various areas and substrates but are particularly fond of gravel or sandy bottoms. They like to build their nests in areas with a firm bottom and sand or gravel, so they can dig out the center, leaving their eggs exposed so the parent can fan the bed to provide fresh, oxygenated water as the eggs develop. Both species utilize the same substrate and prefer protected areas and water depths of about 18 inches. Their difference comes in the time of the year they spawn, and that bass are more solitary spawners, and bluegill will spawn in a colony. Bluegill will utilize the same areas that Bass have spawned in once it is their time of year to spawn.

Table 4: WDNR fish stocking records for Lake Eau Galle in Dunn County

Stocking Year	Stocked Waterbody Name	Species	Age Class	Number Fish Stocked	Avg Fish Length(IN)
2018	LAKE EAU GALLE	NORTHERN PIKE	LARGE FINGERLING	700	9.5
2016	LAKE EAU GALLE	NORTHERN PIKE	LARGE FINGERLING	700	8
2014	LAKE EAU GALLE	NORTHERN PIKE	SMALL FINGERLING	700	4.8
2014	LAKE EAU GALLE	NORTHERN PIKE	LARGE FINGERLING	1400	9.2
2012	LAKE EAU GALLE	NORTHERN PIKE	LARGE FINGERLING	750	7.5
2008	LAKE EAU GALLE	NORTHERN PIKE	LARGE FINGERLING	692	9.6
2006	LAKE EAU GALLE	WALLEYE	SMALL FINGERLING	12270	1.5
2006	LAKE EAU GALLE	NORTHERN PIKE	LARGE FINGERLING	700	9.2
2000	LAKE EAU GALLE	NORTHERN PIKE	SMALL FINGERLING	700	7
2000	LAKE EAU GALLE	WALLEYE	SMALL FINGERLING	17550	2.3
1999	LAKE EAU GALLE	LARGEMOUTH BASS	SMALL FINGERLING	52650	1.2
1999	LAKE EAU GALLE	WALLEYE	SMALL FINGERLING	15550	1.5
1999	LAKE EAU GALLE	NORTHERN PIKE	LARGE FINGERLING	700	8
1998	LAKE EAU GALLE	NORTHERN PIKE	SMALL FINGERLING	700	7.3
1998	LAKE EAU GALLE	WALLEYE	SMALL FINGERLING	17550	1.5
1998	LAKE EAU GALLE	LARGEMOUTH BASS	SMALL FINGERLING	17550	2
1996	LAKE EAU GALLE	WALLEYE	FINGERLING	8960	2.4
1994	LAKE EAU GALLE	WALLEYE	FINGERLING	17550	2.6
1992	LAKE EAU GALLE	WALLEYE	FINGERLING	8765	4

According to the Natural Heritage Inventory (NHI), there are five birds, six fish, seven mussel, and two plant species that are of "special concern", "threatened", or "endangered" in the Township and Range where Lake Eau Galle is located (Table 5). In addition, there are four "communities" (Table 5).

Table 5: NHI records for T26N, R13W (Lake Eau Galle in Dunn County, WI

Common Name	WI Status	Group
Acadian Flycatcher	THR	Bird
Grasshopper Sparrow	SC/M	Bird
Hooded Warbler	THR	Bird
Red-shouldered Hawk	THR	Bird
Bald Eagle		Bird
Moist Cliff	NA	Community
Oak Barrens	NA	Community
Southern Dry-mesic Forest	NA	Community
Floodplain Forest	NA	Community
American Eel	SC/N	Fish
Blue Sucker	THR	Fish
Crystal Darter	END	Fish
Lake Sturgeon	SC/H	Fish
Paddlefish	THR	Fish
River Redhorse	THR	Fish
Buckhorn	THR	Mussel
Elktoe	SC/P	Mussel
Fawnsfoot	THR	Mussel
Monkeyface	THR	Mussel
Salamander Mussel	THR	Mussel
Sheepnose	END	Mussel
Wartyback	THR	Mussel
Ovate Beak Grass	END	Plant
Prairie Fame-flower	SC	Plant

CRITICAL HABITAT

Every body of water has areas of aquatic vegetation that offer critical or unique fish and wildlife habitat. Such areas can be identified by the WDNR and identified as Sensitive Areas per Ch. NR 107. Although Lake Eau Galle has not been surveyed by the WDNR for sensitive areas, there are areas of the lake that should be left in an undisturbed state to provide aquatic habitat and ecosystem services necessary for a healthy lake. Aquatic habitat areas provide the basic needs (e.g., habitat, food, nesting areas) for waterfowl, fish, and wildlife and care should be taken so that management actions do not negatively impact them.

COARSE WOODY HABITAT (WOLTER, 2012)

Coarse woody habitat (CWH) in lakes is classified as trees, limbs, branches, roots, and wood fragments at least 4 inches in diameter that enter a lake by natural (beaver activity, toppling from ice, wind, or wave scouring) or human means (logging, intentional habitat improvement, flooding following dam construction). CWH in the littoral or near-shore zone serves many functions within a lake ecosystem including erosion control, as a carbon source, and as a surface for algal growth which is an important food base for aquatic macro invertebrates. The presence of CWH has also been shown to prevent suspension of sediments, thereby improving water clarity. CWH serves as an important refuge, foraging, and spawning habitat for fish, aquatic invertebrates, turtles, birds, and other animals. The amount of littoral CWH occurring naturally in lakes is related to characteristics of riparian forests and likelihood of toppling. However, humans have also had a large impact on amounts of littoral CWH present in lakes through time. During the 1800's the amount of CWH in northern lakes increased beyond natural levels as a result of logging practices. But time changes in the logging industry and forest composition along with increasing shoreline development have led to reductions in CWH present in many northern Wisconsin lakes.

CWH is often removed by shoreline residents to improve aesthetics or select recreational opportunities (swimming and boating). Jennings et al. (2003) found a negative relationship between lakeshore development and the amount of CWH in northern Wisconsin lakes. Similarly, Christensen et al. (1996) found a negative correlation between density of cabins and CWH present in Wisconsin and Michigan lakes. While it is difficult to make precise determinations of natural densities of CWH in lakes it is believed that the value is likely on the scale of hundreds of logs per mile. The positive impact of CWH on fish communities has been well documented by researchers, making the loss of these habitats a critical concern. One study determined that black crappie selected nesting sites that were usually associated with woody debris, silty substrate, warmer water, and protected from wind and waves (Pope & Willis, 1997).

Fortunately, remediation of this habitat type is attainable on many waterbodies, particularly where private landowners and lake associations are willing to partner with county, state, and federal agencies. Large-scale CWH projects are currently being conducted by lake associations and local governments with assistance from the WDNR where hundreds of whole trees are added to the near-shore areas of lakes. For more information on this process visit: http://dnr.wi.gov/topic/fishing/outreach/fishsticks.html (last accessed on 12-29-2016).

Small-scale CWH projects, more commonly referred to as "fishsticks," can also be done by individual property owners, and are eligible for grant assistance through the WNDR Healthy Lakes program. This program is intended to help individual property owners make a positive impact on their lake's ecosystem through small-scale projects such as fishsticks (Figure 17).

Figure 17 - Coarse woody habitat-Fishsticks projects

SHORELANDS

How the shoreline of a lake is managed can have big impacts on the water quality and health of that lake. Natural shorelines prevent polluted runoff from entering lakes, help control flooding and erosion, provide fish and wildlife habitat, may make it harder for AIS to establish themselves, muffle noise from watercraft, and preserve privacy and natural scenic beauty. Many of the values lake front property owners appreciate and enjoy about their properties - natural scenic beauty, tranquility, privacy, relaxation - are enhanced and preserved with good shoreland management. And healthy lakes with good water quality translate into healthy lake front property values.

Shorelands may look peaceful, but they are the hotbed of activity on a lake. 90% of all living things found in lakes - from fish, to frogs, turtles, insects, birds, and other wildlife - are found along the shallow margins and shores. Many species rely on shorelands for all or part of their life cycles as a source for food, a place to sleep, protection from predators, and to raise their young. Shorelands and shallows are the spawning grounds for fish, nesting sites for birds, and where turtles lay their eggs. There can be as much as 500% more species diversity at the water's edge compared to adjoining uplands.

Lakes are buffered by shorelands that extend into and away from the lake. These shoreland buffers include shallow waters with submerged plants (like coontail and pondweeds), the water's edge where fallen trees and emergent plants like rushes might be found, and upward onto the land where different layers of plants (low ground cover, shrubs, trees) may lead to the lake. A lake's littoral zone is a term used to describe the shallow water area where aquatic plants can grow because sunlight can penetrate to the lake bottom. Shallow lakes might be composed entirely of a littoral zone. In deeper lakes, plants are limited to where they can grow by how deeply light can penetrate the water.

Shorelands are critical to a lake’s health. Activities such replacing natural vegetation with lawns, clearing brush and trees, importing sand to make artificial beaches, and installing structures such as piers, can cause water quality to decline and change what species can survive in the lake. In addition to being potentially damaging, some of these undertakings require permits and approval. Most changes to lakebed exposed by fluctuating water levels (removal of sediments, additions of beach sand, etc.), often require permits and approval. The only exceptions to this are manual removal of a 30-foot corridor of native plants or the removal of non-native invasive plants. These regulations have been put in place to encourage property owners to responsibly manage their shorelands to improve and maintain the quality of the lake.

Protecting Water Quality

Shoreland buffers slow down rain and snow melt (runoff). Runoff can add nutrients, sediments, and other pollutants into lakes, causing water quality to decline. Slowing down runoff will help water soak (infiltrate) into the ground. Water that soaks into the ground is less likely to damage lake quality and recharges groundwater that supplies water to many of Wisconsin's lakes. Slowing down runoff water also reduces flooding and stabilizes stream flows and lake levels.

Shoreland wetlands act like natural sponges trapping nutrients where nutrient-rich wetland sediments and soils support insects, frogs, and other small animals eaten by fish and wildlife.

Shoreland forests act as filters, retainers, and suppliers of nutrients and organic material to lakes. The tree canopy, young trees, shrubs, and forest understory all intercept precipitation, slowing runoff, and contributing to water infiltration by keeping the soil's organic surface layer well-aerated and moist. Forests also slow down water flowing overland, often capturing its sediment load before it can enter a lake or stream. In watersheds with a significant proportion of forest cover, the erosive force of spring snow melts is reduced as snow in forests melts later than snow on open land and melt water flowing into streams is more evenly distributed. Shoreland trees grow, mature, and eventually fall into lakes where they protect shorelines from erosion, and are an important source of nutrients, minerals, and wildlife habitat.

Natural Shorelands Role in Preventing AIS

In addition to removing essential habitat for fish and wildlife, clearing native plants from shorelines and shallow waters can open opportunities for invasive species to take over. Like tilling a home garden to prepare it for seeding, clearing shoreland plants exposes bare earth and removes the existing competition (the cleared shoreland plants) from the area. Nature fills a vacuum. While the same native shoreland plants may recover and reclaim their old space, many invasive species possess "weedy" traits that enable them to quickly take advantage of new territory and out-compete natives.

The act of weeding creates continual disturbance, which in turn benefits plants that behave like weeds. The modern-day practice of mowing lawns is an example of keeping an ecosystem in a constant state of disturbance to the benefit of invasive species like turf grass, dandelions, and clover, all native to Europe. Keeping shoreline intact is a good way to minimize disturbance and minimize opportunities for invasive species to gain a foothold.

Threats to Shorelands

When a landowner develops a waterfront lot, many changes may take place including the addition of driveways, houses, decks, garages, sheds, piers, rafts and other structures, wells, septic systems, lawns, sandy beaches and more. Many of these changes result in the compaction of soil and the removal of trees and native plants, as well as the addition of impervious (hard) surfaces, all of which alter the path that precipitation takes to the water.

Building too close to the water, removing shoreland plants, and covering too much of a lake shore lot with hard surfaces (such as roofs and driveways) can harm important habitat for fish and wildlife, send more nutrient and sediment runoff into the lake, and cause water quality decline.

Changing one waterfront lot in this fashion may not result in a measurable change in the quality of the lake or stream. But cumulative effects when several or many lots are developed in a similar way can be enormous. A lake's response to stress depends on what condition the system is in to begin with, but bit by bit, the cumulative effects of tens of thousands of waterfront property owners "cleaning up" their shorelines, are destroying the shorelands that protect their lakes. Increasing shoreline development and development throughout the lake's watershed can have undesired cumulative effects.

Shoreland Preservation and Restoration

If a native buffer of shoreland plants exists on a given property, it can be preserved, and care taken to minimize impacts when future lake property projects are contemplated. If a shoreline has been altered, it can be restored. Shoreline restoration involves recreating buffer zones of natural plants and trees. Not only do quality wild shorelines create higher property values, but they bring many other values too. Some of these are aesthetic in nature, while others are essential to a healthy ecosystem. Healthy shorelines mean healthy fish populations, varied plant life, and the existence of the insects, invertebrates and amphibians which feed fish, birds, and other creatures. Figure 18 shows the difference between a natural and unnatural shoreline adjacent to a lake home. More information about healthy shorelines can be found at the following website: http://wisconsinlakes.org/index.php/shorelands-a-shallows (last accessed 12-27-2016).

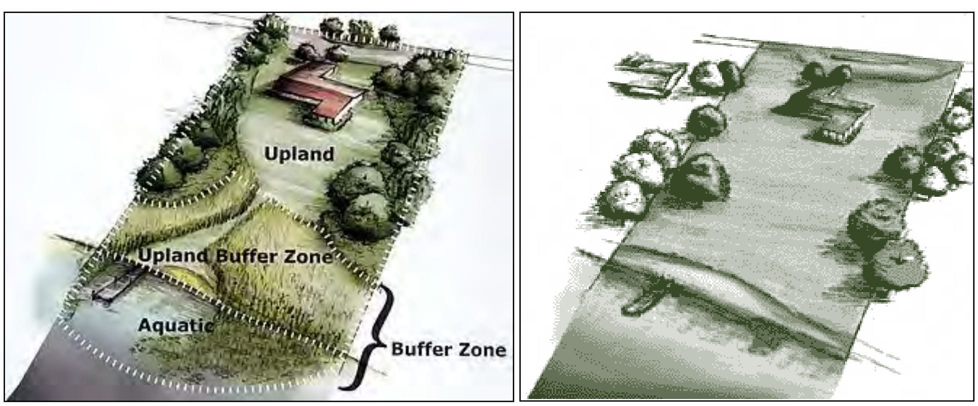

Figure 18 - Healthy, AIS Resistant Shoreland (left) vs. Shoreland in Poor Condition

SHORELAND EVALUATION

During the 2002 aquatic plant survey the shoreland of Lake Eau Galle was evaluated (Konkel, 2002). According to the 2002 survey results, Lake Eau Galle is protected by a buffer of natural shoreline (wooded, shrub and native herbaceous growth) along approximately 84% of the shore. Wooded cover occurred at the highest frequency and coverage. Disturbed shoreline (mowed lawn, riprap, hard structures) occurred at 44%

of the sites and covered 16% of the shoreline. Mowed lawn occurred at 22% of the sites and covered 12% of the shoreline. Mowed grass results in increased runoff to the lake, carrying pesticides, fertilizers and other lawn chemicals and pet wastes.

The shoreland of Lake Eau Galle has not been assessed since 2002. Following guidelines provided in the WDNR Shoreland Habitat Assessment, a new shoreland assessment could be completed, with results helping to determine where shoreland improvements could be made. WDNR Healthy Lakes and Rivers grant funding could be used to implement several different shoreland and habitat improvement projects including rain gardens, native planting, diversions, catch basins, and "fishsticks" projects.

To develop an APMP, it is necessary to document the aquatic vegetation that exists in a lake and compared current data with any past data that might exist.

WARM-WATER FULL POINT-INTERCEPT AQUATIC PLANT SURVEY

In anticipation of developing an Aquatic Plant Management Plan for Lake Eau Galle, the WDNR completed a whole-lake, point-intercept, aquatic plant survey on the lake in mid-August 2022 as a part of the WDNR Directed Studies project (Smith, 2022). The survey was completed by the WDNR to assist the newly formed lake association for Lake Eau Galle in getting a first time APMP.

The first whole-lake, aquatic plant survey on Lake Eau Galle was also completed by the WDNR back in 2002 (Konkel, 2002). That survey, however, did not use the point-intercept method, it used the transect method instead. Comparisons of the two surveys are made where possible, but only to get an idea of the changes that have occurred on the lake since 2002.

Using a standard formula that considers the shoreline shape and distance, water clarity, depth and total acreage, Jennifer Hauxwell (WDNR) generated the original 486-point sampling grid used for the 2022 survey. Where possible, each survey point in the grid is located using a handheld mapping GPS unit (Garmin 76CSx). At the point, a rake is used to sample an approximate 2.5ft section of the bottom. Plants that are found on the rake are assigned a rake fullness value of 1-3 as an estimation of abundance (Figure 19). All visual sightings of aquatic plants within six feet of a sample point are also noted. If a point is inaccessible, a note is made on the spreadsheet.

The data presented in the following sections are taken from the 2022 aquatic plant PI survey spreadsheet completed by the WDNR (Smith, 2022). During this survey, only 345 out of 486 points were sampled. The northern 29% of the lake was considered non-navigable with the boat that was used. This does not mean that this area of the lake was dry land, only that the water was too shallow to navigate. As such, there are likely more aquatic plant species in this area that were not quantified by this survey. It is in this area that floating leaf plants like American lotus and lily pads, and probably some emergent species like sedges, rushes, and bur-reed may be present. However, until a visual survey of this area is completed the presence of these, and other aquatic plant species is merely speculation.

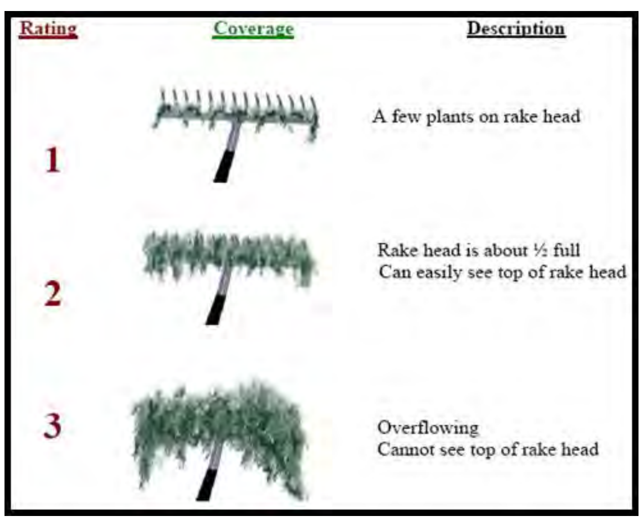

Figure 19: Rake fullness ratings (UWEX, 2010)

Depth and substrate readings have already been reported in an earlier section of this APMP.

During the August 2022 survey, plants were found growing in up to 7.0ft of water (Figure 20, Table 6). The 107 points with vegetation covered approximately 22.0% of the entire lake bottom and 62.6% of the littoral zone. During the 2002 transect survey aquatic plants were estimated to have covered about a third of the littoral zone.

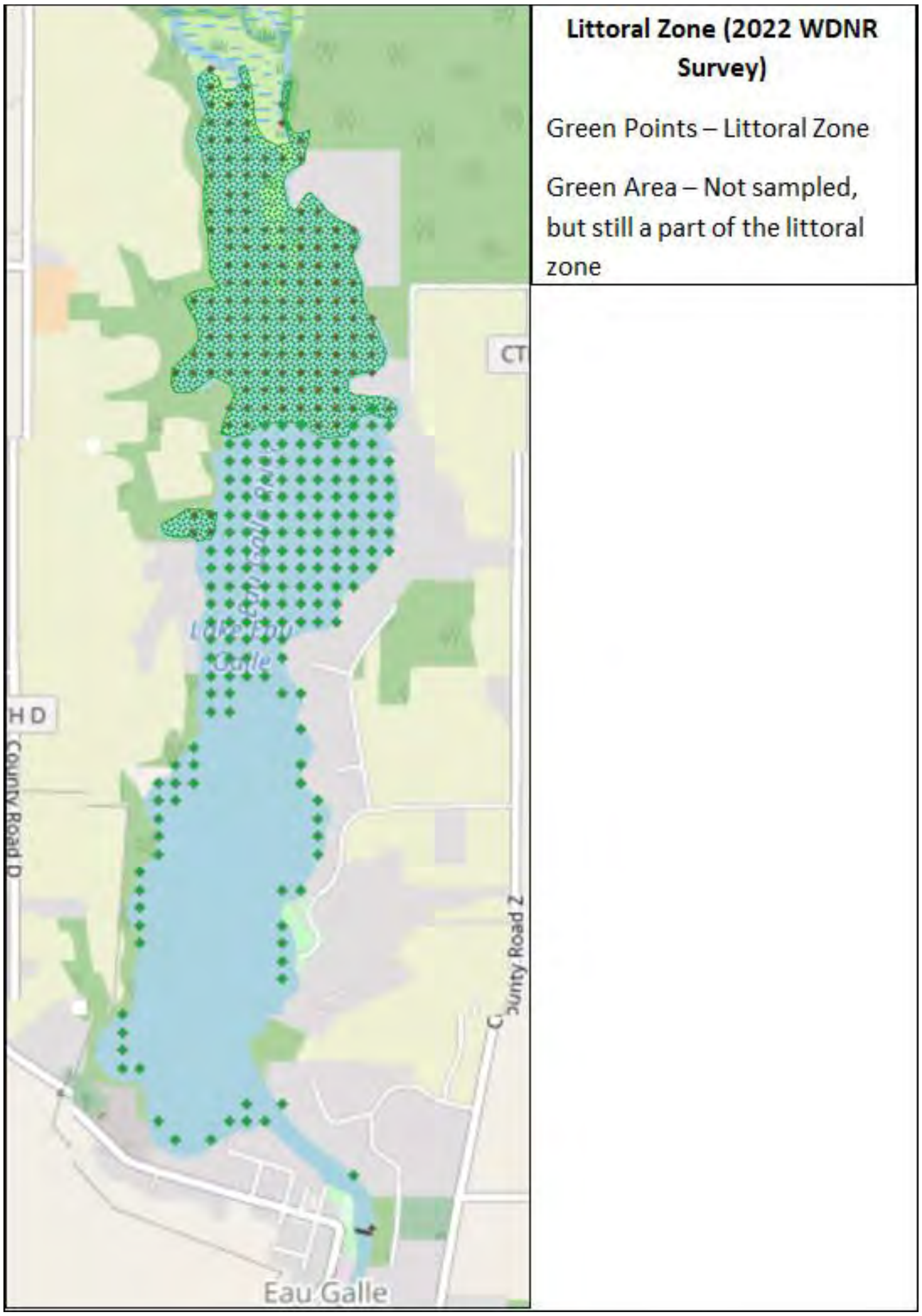

Figure 20: Littoral zone (2022 WDNR Survey)

Table 6 – 2002 and 2022 aquatic plant survey statistics

SUMMARY STATS: Lake Eau Galle, Dunn County	2002	2022
Total number of sites visited	NA	345
Total number of sites with vegetation	NA	107
Total number of sites shallower than maximum depth of plants	NA	171
Frequency of occurrence at sites shallower than maximum depth of plants	26.0	62.57
Simpson Diversity Index	0.85	0.71
Maximum depth of plants (ft)**	5.5	7.00
Number of sites sampled using rake on Rope (R)	NA	0
Number of sites sampled using rake on Pole (P)	NA	345
Average number of all species per site (shallower than max depth)	NA	1.18
Average number of all species per site (veg. sites only)	0.7	1.88
Average number of native species per site (shallower than max depth)	NC	1.07
Average number of native species per site (veg. sites only)	NC	1.71
Species Richness	11	10
Species Richness (including visuals)	11	11

From 2002 to 2022, a change in mean aquatic plant species at sites with vegetation from 0.7/site to 1.88/site was documented (Table 6).

Total rake fullness was not recorded in 2002. In 2022 the total rake fullness for the 107 points sampled with vegetation was a moderate 2.11. Most of the aquatic plants recorded were in the north central area of the lake at an average depth of 3.8ft (Figure 21). During the 2002 transect plant survey the highest lake-wide density was 0.31 on a scale of 0-5 for EWM. All other plants were less than 0.31 in terms of lake-wide density. When looking at the density of a particular aquatic plant in the lake where it was found, the maximum density was 4 out of 5 for American lotus, followed by Sago pondweed with a 3 out of 5 density rating. All other species found were less than 2.5 out of 5 in terms of density at the sites they were found.

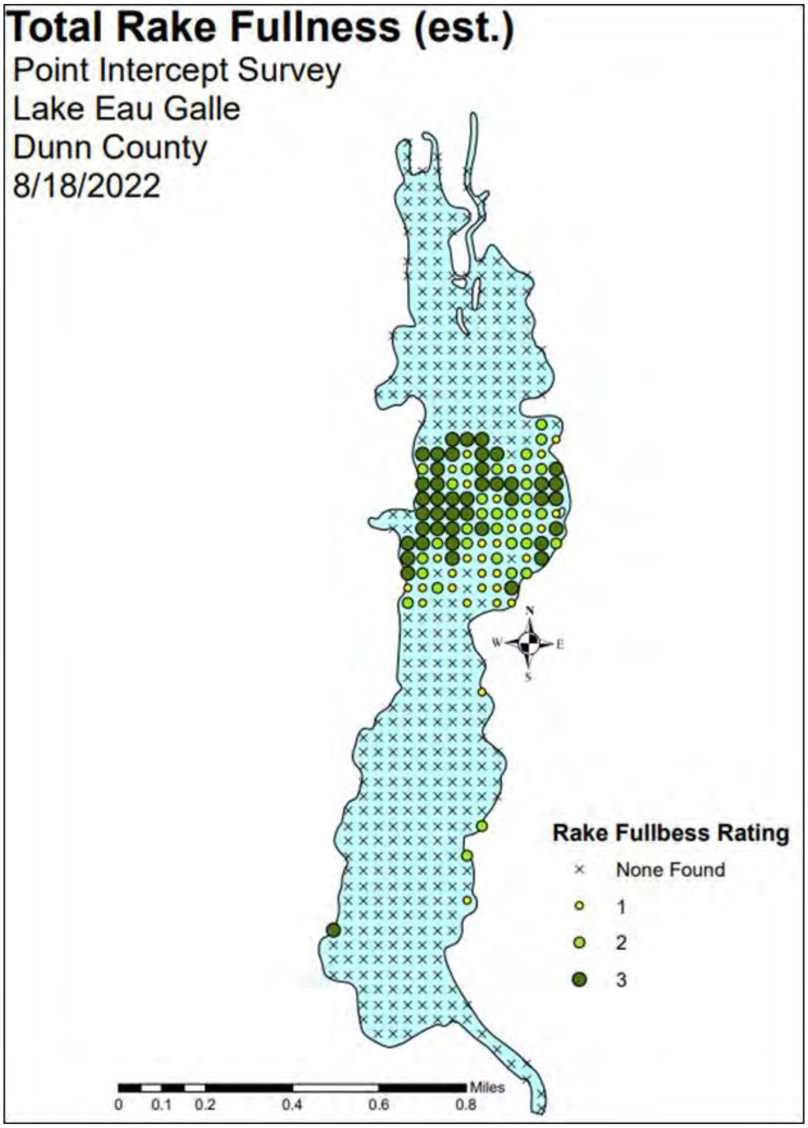

Figure 21: 2022 rake fullness (Smith, 2022)

CHANGES IN THE AQUATIC PLANT COMMUNITY

Lake Eau Galle has a limited native plant community that is dominated by lower conservatism value species which can tolerate the lake's poor water clarity. Although generally few, these plants are supremely important to the lake as they are the basis of the aquatic ecosystem. They capture the sun's energy and turn it into usable food, "clean" the water of excess nutrients, and provide habitat for other organisms like aquatic invertebrates and the lake's fish populations. Because of this, preserving them is critical to maintaining the lake's overall health.

The plant survey results from 2002 and 2022 corroborate the above statement with Coontail (86.0%), Slender waterweed (53.3%), and Common watermeal (46.7%) being the most abundant native plant species in 2022 (Table 7, Figure 22). Coontail and Common watermeal were also present during the 2002 survey. Three species identified in the 2002 survey were not identified during the 2022 survey: Large duckweed, American lotus, and Bur-reed (Figure 23). Three new species were identified in the 2022 survey: Slender waterweed, Flat-stem pondweed, and Horned pondweed (Figure 24). Additional native aquatic plant species found in both the 2002 and 2022 surveys include Long-leaf pondweed, Sago pondweed, small duckweed, and water stargrass (Figure 25). All these species are frequently found in lakes that suffer from a lack of water clarity that reduces sunlight penetration into deeper water. From 2002 to 2022, the number of different species in the lake did not decrease with 11 different species identified in each survey. Unfortunately, two of the species identified in both 2002 and 2022 are considered non-native, invasive species (CLP and EWM).

Table 7: Aquatic plant comparisons from 2002 to 2022

2002 and 2022 Aquatic Plant Comparisons		
Species	**2002* (Present-X)**	**2022** # of (Points)**
Eurasian watermilfoil	X	9
Curly-leaf pondweed	X	22
Coontail	X	92
Slender waterweed		57
Small duckweed	X	8
Long-leaf pondweed	X	11
Flat-stem pondweed		17
Sago pondweed	X	9
Common watermeal	X	50
Horned pondweed		4
Water stargrass	X	1
Large duckweed	X	0
American lotus	X	0
Bur-reed	X	0
***Transect methodology**		
****Point-intercept methodolgy**		

Figure 22: Coontail (left), Slender waterweed (center), and Common watermeal (right)

Figure 23: Large duckweed (left), American lotus (center), Bur-reed sp. (right)

Figure 24: Slender waterweed (left), Flat-stem pondweed (center), Horned pondweed (right)

Figure 25: Long-leaf pondweed (top left), Sago pondweed (top right), Small duckweed (bottom left), Water stargrass (bottom right)

Three measurements of the health of the aquatic plant community outside of these survey statistics are the Simpson's Diversity Index (SDI), Floristic Quality Index (FQI), and Coefficient of Conservatism.

SIMPSON'S DIVERSITY INDEX

A diversity index allows the entire plant community at one location to be compared to the entire plant community at another location. It also allows the plant community at a single location to be compared over time thus allowing a measure of community degradation or restoration at that site. With Simpson's Diversity Index, the index value represents the probability that two individual plants (randomly selected) will be different species. The index values range from 0 -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 each 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.

The SDI in 2002 was 0.85 (Konkel, 2002). In 2022 the value decreased to 0.71, suggesting that it was less likely to find a different aquatic plant species at a different point in the lake than it was in 2002.

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 1-10. 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 FQI is calculated by averaging the conservatism value for each native index species found in the lake during the point-intercept survey and multiplying it by the square root of the total number of plant species (N) in the lake. Statistically speaking, the higher the index value, the healthier the lake's aquatic 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 Eau Galle is in the North Central Hardwood Forests Ecoregion.

In 2002, 9 native index species were identified in the rake during the transect survey. They produced a mean C of 4.1 and a FQI of 13.6 (Konkel, 2002). In 2022, 8 native index plants were identified in the rake during the point-intercept survey. They produced a mean C of 5.4 and a FQI of 15.2, slightly better than in 2002, but still way below the average reported by Nichols (1999) for North Central Hardwood Forests Region of 14 species, 5.6 Mean C, and 20.9 FQI (Nichols, 1999).

WILD RICE

According to the WDNR Surface Water Data Viewer, Lake Eau Galle is not wild rice water.

AQUATIC INVASIVE SPECIES (AIS)

There are currently only two non-native aquatic plant species that have been officially documented in Lake Eau Galle – EWM and CLP. Both were present during the 2002 aquatic plant survey, and though they were likely in the lake before then, 2002 is the official year they were confirmed. There are many other AIS that could be introduced to the lake including shoreland plants like Purple loosestrife and Yellow flag iris; and invasive animal species like Chinese mystery snails and Zebra mussels.

Information on these and other AIS is included in Appendix C.

AIS PREVENTION STRATEGY

The best AIS prevention strategy is public awareness and education. LEGA should begin a watercraft inspection program following WDNR/UW-Extension Clean Boats, Clean Waters protocol. A CBCW grant could be applied for to support this program. Lake residents and users should also be aware of the invasive species already in the lake and, if possible, complete some physical removal of them. AIS monitoring is also an important action to take. Even though CLP and EWM are already in the lake, monitoring could identify any new AIS before it becomes a problem. The most likely AIS to be around the lake is purple loosestrife. The mostly likely AIS to get into the lake would be Chinese mystery snails and/or Zebra mussels.

Additionally, having educated and informed lake residents is the best way to keep non-native AIS at bay in Lake Eau Galle. To foster this, LEGA will host and/or sponsor lake community events including AIS identification and management workshops; distribute education and information materials to lake property owners and lake users through the newsletter, webpage, general mailings, and at the boat landings.

There have been no watercraft inspection hours logged into the WDNR SWIMS database on lakes in Dunn County since 2015. Lake Eau Galle should be one of the first lakes in the County to get this program back up and running.

WISCONSIN'S AQUATIC PLANT MANAGEMENT STRATEGY

There are many techniques for managing aquatic plants in Wisconsin. Often management may mean protecting desirable aquatic plants by selectively hand pulling the undesirable ones. Sometimes more intensive management may be needed such as using harvesting equipment, herbicides, or biological control agents. Because aquatic plants are recognized as a natural resource to be protected, managed, and used wisely, the development of long-term, integrated aquatic plant management strategies to identify important plant communities and manage nuisance aquatic plants in lakes, ponds or rivers is often required by the State of Wisconsin.

The Public Trust Doctrine is the driving force behind all management, plant or other, in Wisconsin lakes. Protecting and maintaining Wisconsin's lakes for all of Wisconsin's people are at the top of the list in determining what is done and where. Two other factors that reflect Wisconsin's changing attitude toward aquatic plants. One is a growing realization of the importance of a strong, diverse community of aquatic plants in a healthy lake ecosystem; and the other is the concern over the spread of AIS.

INTEGRATED PEST MANAGEMENT

Integrated Pest Management (IPM) is an ecosystem-based management strategy that focuses on long-term prevention and/or control of a species of concern. Adapted for aquatic plant management, IPM considers all the available control practices such as: prevention, biological control, biomanipulation, nutrient management, habitat manipulation, substantial modification of cultural practices, pesticide application, water level manipulation, mechanical removal, and population monitoring (Figure 26). In addition to monitoring and considering information about the target species' life cycle and environmental factors, groups can decide whether the species' impacts can be tolerated or whether those impacts warrant control. Then, an IPM-based plan informed by current, comprehensive information on pest life cycles and the interactions among pests and the environment can be formed. If control is needed, data collected on the species and the waterbody will help groups select the most effective management methods and the best time to use them.

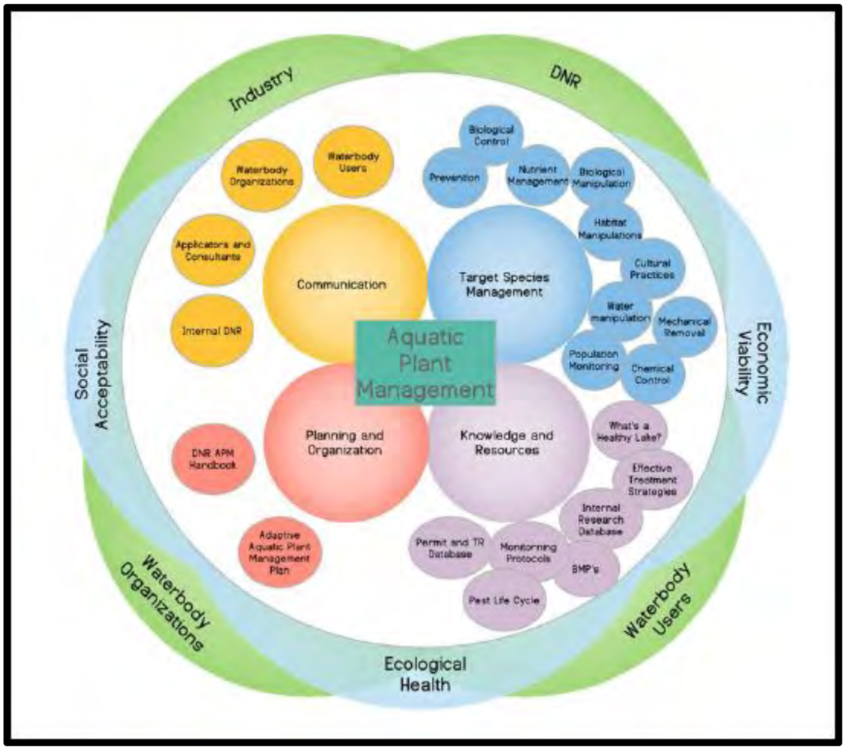

Figure 26: Wisconsin Department of Natural Resources: Wisconsin Waterbodies – Integrated Pest Management March 2020

The most effective, long-term approach to managing a species of concern is to use a combination of methods. Approaches for managing pests are often grouped in the following categories:

- **Assessment** – is the use of learning tools and protocols to determine a waterbodies' biological, chemical, physical, and social properties and potential impacts. Examples include point-intercept (PI) surveys, water chemistry tests and boater usage surveys. This is the most important management strategy for every single waterbody.
- **Biological Control** – is the use of natural predators, parasites, pathogens, and competitors to control target species and their impacts. An example would be beetles for purple loosestrife control.
- **Cultural controls** – are practices that reduce target species establishment, reproduction, dispersal, and survival. For example, a Clean Boats, Clean Waters program at boat launches can reduce the likelihood of the spread of species of concern.
- **Mechanical and physical controls** – can kill a target species directly, block them out, or make the environment unsuitable for it. Mechanical harvesting, hand pulling, and diver assisted suction harvesting are all examples.
- **Chemical control** – is the use of pesticides. In IPM, pesticides are used only when needed and in combination with other approaches for more effective, long-term control. Groups should use the most selective pesticide that will do the job and be the safest for other organisms and for air, soil, and water quality.

IPM is a process that combines informed methods and practices to provide long-term, economic pest control. A quality IPM program should adapt when new information pertaining to the target species is provided or monitoring shows changes in control effectiveness, habitat composition and/or water quality. While each situation is different, eight major components should be established in an IPM program:

1. Identify and understand the species of concern.
2. Prevent the spread and introduction of the species of concern.
3. Continually monitor and assess the species' impacts on the waterbody.
4. Prevent impacts on species of concern.
5. Set guidelines for when management action is needed.
6. Use a combination of biological, cultural, physical/mechanical, and chemical management tools.
7. Assess the effects of target species' management!
8. Change the management strategy when the outcomes of a control strategy create long-term impacts that outweigh the value of target species control.

MANAGEMENT ALTERNATIVES

Nuisance aquatic plants can be managed a variety of ways in Wisconsin. The best management strategy will be different for each lake and depends on which nuisance species needs to be controlled, how widespread the problem is, and the other plants and wildlife in the lake. In many cases, an integrated pest management (IPM) approach to aquatic plant management that utilizes several control methods is necessary. The eradication of non-native aquatic invasive plant species such as CLP and EWM is generally not feasible but preventing them from becoming a more significant problem is an attainable goal. It is important to remember however, that regardless of the plant species targeted for control, sometimes no manipulation of the aquatic plant community is the best management option. Plant management activities can be disruptive to a lake ecosystem and should not be done unless it can be shown they will be beneficial and occur with minimal negative ecological impacts.

Management alternatives for nuisance aquatic plants can be grouped into four broad categories:

- Manual and mechanical removal
- Chemical application
- Biological control
- Physical habitat alteration.

Manual and mechanical removal methods include pulling, cutting, raking, harvesting, suction harvesting, and other means of removing the physical plant from the water. Chemical application is typified using herbicides that kill or impede the growth of the aquatic plant. It is illegal to put any chemical into the waters of Wisconsin without a chemical application permit from the WDNR. Some forms of physical removal, specifically suction harvest and mechanical harvesting, also require a WDNR permit. Biological control methods include organisms that use the plant for a food source or parasitic organisms that use the plant as a host, killing or weakening it. Biological control may also include the use of species that compete successfully with the nuisance species for available resources. This activity may require a WDNR permit. Physical habitat alteration includes dredging, installing lake-bottom covers, manipulating light penetration, flooding, and drawdown. These activities may require WDNR permits. They may also include making changes to or in the watershed of a body of water to reduce nutrients going in.

Informed decision-making related to aquatic plant management implementation requires an understanding of plant management alternatives and how appropriate and acceptable each alternative is for a given lake. The following sections list scientifically recognized and approved alternatives for controlling aquatic vegetation.

NO MANAGEMENT

When evaluating the various management techniques, the assumption is erroneously made that doing nothing is environmentally neutral. In dealing with nonnative species like CLP and EWM, the environmental consequences of doing nothing may be high, possibly even higher than any of the effects of management techniques. Unmanaged, these species can have severe negative effects on water quality, native plant distribution, abundance and diversity, and the abundance and diversity of aquatic insects and fish (Madsen J. , 1997). Nonindigenous aquatic plants are the problem, and the management techniques are the collective solution. Nonnative plants are a biological pollutant that increases geometrically, a pollutant with a very long residence time and the potential to "biomagnify" in lakes, rivers, and wetlands (Madsen J. , 2000).

Because issues with aquatic vegetation are not specific to CLP and EWM, and because these species provide some additional habitat and needed vegetation in the lake, no management of these species is a consideration for LEGA. If management of these species does occur, it will likely be in cooperation with management for other reasons.

HAND-PULLING/MANUAL REMOVAL

Manual or physical removal of aquatic plants by means of a hand-held rake or cutting implement; or by pulling the plants from the lake bottom by hand is allowed by the WDNR without a permit per NR 109.06. Generally though, these activities can only occur in a zone that is no more than 30-ft wide and adjacent to a pier or lake use area (Figure 27). There is no limit as to how far out into the lake the 30-ft zone can extend, however clearing large swaths of aquatic plants not only disrupts lake habits, it also creates open areas for non-native species to establish.

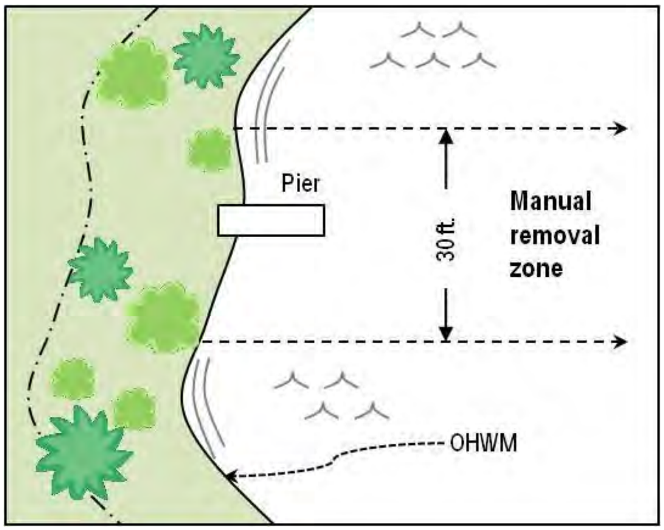

Figure 27: Aquatic vegetation manual removal zone

Physical removal of aquatic plants does require a permit if the removal area is in a "sensitive" or critical habitat area previously designated by the WDNR. Manual or physical removal can be effective at controlling individual plants or small areas of plant growth. It limits disturbance to the lake bottom, is inexpensive, and can be practiced by many lake residents. In shallow, hard bottom areas of a lake, or where impacts to fish spawning habitat need to be minimized, this is the best form of control. If water clarity in a body of water is such that aquatic plants can be seen in deeper water, pulling AIS while snorkeling or scuba diving is also allowable without a permit according to the conditions in NR 106.06(2) and can be effective at slowing the spread of a new AIS infestation within a lake when done properly.

In some areas of Lake Eau Galle, if CLP and EWM management is needed, hand-pulling/manual removal may be the best alternative. However, it is not suitable to manage all of the AIS in the lake this way. Efforts should continue to teach property owners to identify, and then physically remove CLP and EWM growing in the lake near their property. LEGA should regularly provide education and training for residents on the lake to teach them how to identify nonnative invasive species and how to properly remove them from around their docks, in their swimming areas, and along their shores.

DIVER ASSISTED SUCTION HARVEST

Diver assisted suction harvesting or DASH, as it is often called, is a recent aquatic plant removal technique. DASH involves scuba divers who swim along the bottom of the lake with a hydraulic suction tube and when a target plant is found, it is dislodged by the diver and fed into the suction tube. Hydraulic suction brings the removed plant to the surface of the lake and deposits into a bag or bin on the boat (Figures 28 and 29). It is called "harvesting" rather than "dredging" because, although a specialized small-scale dredge is used, bottom sediment is not removed from the system. DASH increases the ability of a diver to remove the offending vegetation from a larger area, faster, but also requires a Mechanical Harvesting permit from the WDNR. The cost to implement DASH is also more expensive than employing a diver alone. A DASH boat consists of a pontoon boat equipped with the necessary water pump, catch basin, suction hose, and other apparatus (Figure 29).

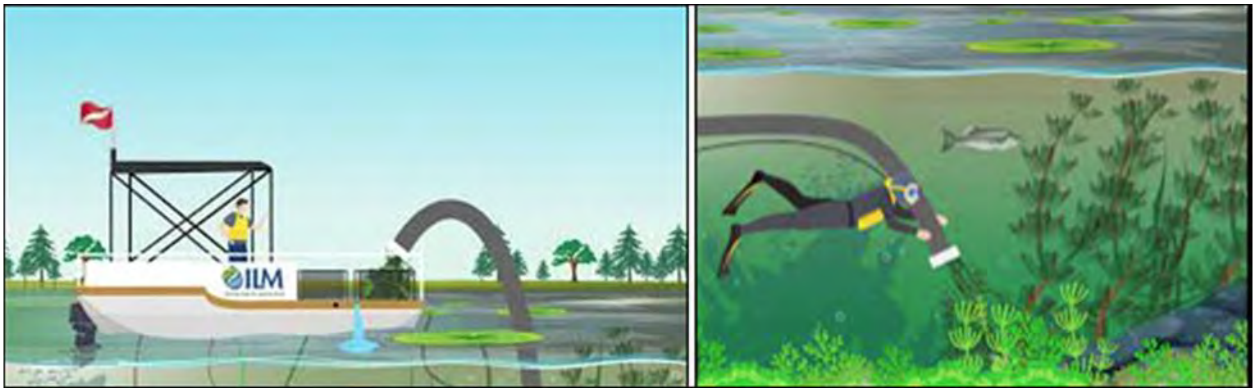

Figure 28: DASH boat and underwater operation (ILM Environments)
https://www.youtube.com/watch?v=YQmLMKzc1UM

Figure 29: DASH – Feeding EWM into the underwater Suction Hose (Marinette Co.); and a sample DASH Pontoon Boat (Beaver Dam Lake Management District)

Access to DASH services is also limited, with only one private company offering services in all northern WI. Contracted DASH services usually run in the $2,000.00 to $3,000.00 per day range with no guarantees on how much CLP or EWM can be removed in a day. The estimated costs to build a custom DASH boat range from $15,000.00 to $20,000.00.

DASH operations could be used to improve access to open water from those properties along the shores with the densest aquatic vegetation. Under this management scenario, all vegetation within a designated access lane would likely be targeted, not just CLP or EWM.

MECHANICAL REMOVAL

Mechanical management involves the use of devices not solely powered by human means to aid removal. This includes gas and electric motors, ATV's, boats, tractors, etc. Using these instruments to pull, cut, grind, or rotovate aquatic plants is illegal in Wisconsin without a permit. Diver Aided Suction Harvest (DASH) is considered mechanical removal. To implement mechanical removal of aquatic plants a Mechanical/Manual Aquatic Plant Control permit is required annually, although the WDNR is now offering multi-year harvesting permits in some instances. The permit application is reviewed by the WDNR and other entities and awarded if required criteria are met. Once an annual permit for mechanical harvesting has been approved, harvesting can occur in the approved areas as often as necessary to manage the vegetation.

Using repeated small-scale mechanical disturbance such as bottom rollers or sweepers can be effective at control in small areas, but in Wisconsin these devices are not wholly supported by the WDNR, may be illegal, and are generally not permitted.

LARGE-SCALE MECHANICAL HARVESTING

Aquatic plant harvesters are floating machines that cut and remove vegetation from the water (Figure 30). The size and harvesting capabilities of these machines vary greatly. As they move, harvesters cut a swath of aquatic plants that is between 4 and 20 feet wide, and depending on the machine, up to 10 feet deep. The on-board storage capacity of a harvester ranges from 100 to 1,000 cubic feet (by volume) or 1 to 8 tons (by weight). An average harvester can cut between 2 and 8 acres of aquatic vegetation per day. The average lifetime of a mechanical harvester is 10 years.

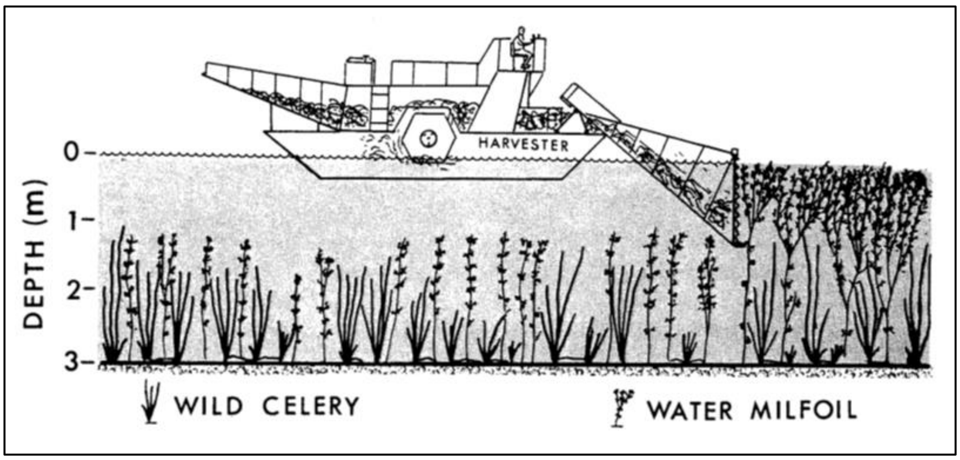

Figure 30: How a mechanical harvester works (Engle, 1987)

Harvesters can remove thousands of pounds of vegetation in a relatively short time. They are not, however, species specific. Everything in the path of the harvester will be removed, including the target species, other plants, macro-invertebrates, semi-aquatic vertebrates, forage fishes, young-of-the-year fishes, and even adult game fish found in the littoral zone (Booms, 1999). Plants are cut at a designated depth, but the root of the plants is often not disturbed. Cut plants will usually grow back after time, and re-cutting several times a season is often required to provide adequate annual control (Madsen J. , 2000).

Harvesting activities in shallow water can re-suspend bottom sediments into the water column releasing nutrients and other accumulated compounds (Madsen J. , 2000). Even the best aquatic plant harvesters leave some cutting debris in the water to wash up on the shoreline or create loose mats of floating vegetation on the surface of the lake. This "missed" cut vegetation can potentially spread offending vegetation as it floats around the lake and establishes in new sites. Floating mats of "missed" cut vegetation can pile up on shorelines creating another level of nuisance that property owners may have to deal with.

A major benefit of aquatic plant harvesting however, is the removal of large amounts of plant biomass from a water body. This large-scale removal can help reduce organic material build up in the bottom of the lake over time and even help to improve water clarity and reduce phosphorus loading.

The results of mechanical harvesting - open water and accessible boat lanes - are immediate and can be enjoyed without the restrictions on lake use which follow some herbicide treatments. In addition to the human use benefits, the clearing of thick aquatic plant beds may also increase the growth and survival of some fish. By eliminating the upper canopy, harvesting reduces the shading caused by aquatic plants. The nutrients stored in the plants are also removed from the lake, and the build-up of organic material that normally occurs because of the decaying of this plant matter is reduced. Additionally, repeated harvesting may result in thinner, more scattered growth.

Disposal sites are a key component when considering the mechanical harvesting of aquatic plants. The sites must be on shore and upland to make sure the plants and their reproductive structures don't make their way back into the lake or to other lakes. The number of available disposal sites and their distance from the targeted harvesting areas will determine the efficiency of the operation, in terms of time and cost.

Timing is also important. The ideal time to harvest, to maximize the efficiency of the harvester, is just before the aquatic plants break the surface of the lake. For CLP, it should also be before the plants form turions (reproductive structures) to avoid spreading the turions within the lake. If the harvesting work is contracted, the equipment should be inspected before and after it enters the lake. Since these machines travel from lake to lake, they may carry plant fragments or other plant parts with them and facilitate the spread of aquatic invasive species from one body of water to another.

Large-scale mechanical harvesting is commonly used for control of CLP, and in the absence of other management alternatives or conditions that prevent the use of other management alternatives, can also be an effective way to reduce EWM biomass in a water body. Harvesting is also used to open access lanes in lakes with dense-growth aquatic vegetation.

Harvesting Totals and Estimated Costs (Owning versus Contracting Services)

Costs per acre vary with numbers of acres harvested, accessibility of disposal sites to the harvested areas, density, and species of the harvested plants, and whether a private contractor or public entity does the work. Costs as low as $250 per acre have been reported. Private contractors generally charge $500 to $800 per acre or $2000 to $3000 per day. The purchase price of new harvesters' ranges from $75,000 to $300,000. There are several harvester manufacturers in the United States (including at least two in Wisconsin) and some lake groups may choose to operate and purchase their own machinery rather than contracting for these services.

In the last several years, more companies have started offering contracted mechanical harvesting, DASH, and physical removal services. Several companies are in the northern half of Wisconsin including TSB Lakefront Restoration and Diving (New Auburn, WI) and Aquatic Plant Management (Minocqua, WI). Several other companies exist in southeastern WI, the Twin Cities area, and even in northern Illinois. Most of the services they offer run about $2,500-$3,500.00 per day.

There are benefits and drawbacks for both contracted harvesting and purchasing a harvester outright. With contracted harvesting, the cost per acre can vary depending on vegetation density, distance between the area being harvesting and the off-loading site, and the distance to the designated disposal site. Another issue is timing. When contracted harvesting takes place, is likely going to be dependent on the availability of the contractor, not necessarily on when the best time to complete harvesting is. There are many benefits to contracted harvesting, the biggest one being the reduced costs associated with contracting. There is no large outlay of funds for purchasing a harvester, no maintenance and storage costs, no insurance costs, and there are reduced costs or no costs if, in any given year, there is less, or no harvesting completed.

Purchasing is the more expensive option due to not only the initial cost of purchase, but also insurance, storage, maintenance, and an operator's salary (unless volunteer operated). However, there are many benefits to purchasing. Purchasing a harvester eliminates the potential for new AIS to be introduced to the lake from the harvester, the cost per acre tends to go down the longer a harvester is operational, and these costs will not increase dramatically if the amount of vegetation being harvested increases. This also allows harvesting to be done during the best times as well as providing a way to maintain navigation channels throughout the summer. The biggest drawbacks to purchasing a harvester are the increased up-front cost and the annual costs associated with maintaining the harvester. Even during years with less harvesting, the maintenance, storage, and other miscellaneous costs will remain around the same as those costs would be during years that require large amounts of harvesting.

SMALL-SCALE MECHANICAL HARVESTING

There are a wide range of small-scale mechanical harvesting techniques, most of which involve the use of boat mounted rakes, scythes, and electric cutters. As with all mechanical harvesting, removing the cut plants is required. Commercial rakes and cutters range in prices from $200 for rakes to around $3000 for electric cutters with a wide range of sizes and capacities. Using a weed rake or cutter that is run by human power is allowed without a permit, but the use of any device that includes a motor, gas or electric, would require a permit. Dragging a bed spring or bar behind a boat, tractor, or any other motorized vehicle to remove vegetation is also illegal without a permit. Although not truly considered mechanical management, incidental plant disruption by normal boat traffic is a legal method of management. Active use of an area is often one of the best ways for riparian owners to gain navigation relief near their docks. Most aquatic plants won't grow well in an area actively used for boating and swimming. It should be noted that purposefully navigating a boat to clear large areas is not only potentially illegal it can also re-suspend sediments, encourage AIS growth, and cause ecological disruptions.

A more recent option for small-scale mechanical harvesting of aquatic plants is using a "mini" harvester that is remote-controlled. Weeders Digest currently offers two versions of a remote controlled mini mechanical harvester, the WaterBug and the WaterGator.

The WaterBug (Figure 31) is 5.4' wide by 11' 9" long but weighs only 370 lbs. and boasts a storage bunk capacity of 600 lbs. This makes it easy for one person to use as it fits on a compact trailer that can be pulled behind a 4-wheeler or garden tractor. It floats in as little as 4" of water and can cut and skim 34" wide, is adjustable to 15-16" water depth by remote control (can be set manually to a depth of 24") and features long-lasting batteries that can operate 5 hours on a single charge.

Figure 31: WaterBug remote-controlled aquatic plant harvester (https://lakeweedharvester.com/waterbug/)

The WaterGator (Figure 32) features the same technology as the WaterBug including a harvesting camera that shows the operator what the WaterGator sees on the remote viewing screen. The WaterGator cuts, skims, and collects aquatic vegetation. It is easy for any user to operate, and it is extremely versatile, with a cutting range reaching 3-1/2 feet deep, and a generous cutting and skimming width of 42 inches. It has a storage bunk capacity of 1,200 lbs. double that of the WaterBug. The WaterGator is battery powered and provides the operator with 8-plus hours of run time on a single charge. The WaterGator is designed for larger ponds, lake shores, channels, and other medium size bodies of water.

The cost of a WaterBug is estimated at around $17,000.00. The cost of a WaterGator is about double that at $35,000.00.

Figure 32: WaterGator remote-controlled aquatic plant harvester (https://lakeweedharvester.com/watergator/)

One Lake District in Barron County, WI purchased a WaterGator in 2022 to help them implement an aquatic plant harvesting program, in their case, navigation and access lanes through dense growth watershield and other native vegetation. Prior to the purchase of a WaterGator, this group used a pontoon-mounted, cutting bar to cut vegetation, and then used rakes to collect the cut material. After a full season of use, the main operator had this to say about the WaterGator.

"The harvester worked well, given how it's made but it could easily use some improvements. The paddle wheels seem undersized in that they don't seem to really bite the water as efficiently as they might, so it takes too long to get from one location on the lake to another and it flounders around when there's a breeze. But maybe a better operator could help. One time I took the pontoon boat and pushed the harvester across the lake, and I've rigged a harness for towing. I'd like to see us putting on an operator's platform. With the glare from the sky, it's hard to see where to cut, with the view through the TV camera in many instances. And I must wonder if the relatively smooth belt is as efficient as a different type might be. No problem picking up lilies but watershield seems to pile up in front of the take-up belt so at times I stop and tilt the belt up to get the watershield to load onto it and consequently get dumped into the storage bunk/belt. So, it's not everything I hoped for but a definite step in the right direction."

Joel Meyer, Kirby Lake Management District

The company that builds and markets both the WaterBug and WaterGator is in the Twin Cities area of MN. They promote the two mini harvesters as able to "cut, skim, and collect" aquatic vegetation.

Small-scale harvesting of aquatic plants on this level could benefit property owners and users of Lake Eau Galle, while at the same time minimizing disturbance and reducing the negative impacts (stirring up sediment, removing too much vegetation, etc.) that might be caused by large-scale harvesting. A small harvester like the WaterGator could remove small amounts of submerged aquatic vegetation, surface mats of filamentous algae, and help improve the aesthetic appeal of the near shore area of the lake adjacent to homes and the public beach.

HABITAT ALTERATION

DREDGING

Dredging is the removal of bottom sediment from a lake. Its success is based on altering the target plant's environment. It is not usually performed solely for aquatic plant management but rather to restore lakes that have been filled in with sediment, have excess nutrients, inadequate pelagic and hypolimnetic zones, need deepening, or require removal of toxic substances (Peterson, 1982). In shallow lakes with excess plant growth, dredging can make areas of the lake too deep for plant growth. It can also remove significant plant root structures, seeds/turions, rhizomes, tubers, etc.

Dredging projects to remove material from lakebeds or streambeds can pose a risk to the aquatic environment. As such, permit authorization typically requires input from multiple WDNR programs. Dredging projects can be logistically challenging and expensive to implement. Projects may require contaminated sediment sampling, in-water sediment control practices, and dredge spoil disposal techniques. The WDNR recommends that enough planning is done to determine the estimated cost, volume of material, methods to be used, and disposal methods and location, if applicable, before starting the permit process. The pre-application information form, available from the WDNR dredging webpage [4] is a good starting place for project planning. The WDNR also recommends seeking out one or more private consultants or contractors who are familiar with dredging projects.

<u>Riparian Navigational Dredging on Man-Made Impoundments General Permit</u>

As of October 2018, DNR has a new general permit for riparian owners located on man-made impoundments who want to dredge up to 50 cubic yards for up to 5 years. This permit can be applied for by individual riparian owners separate from LEGA, but it is recommended that any of these permits include LEGA in the planning and implementation phases.

In addition to specific design standards detailed in General Permit 20 (Appendix D), individual projects need to meet two eligibility standards. First, the project needs to be located on a man-made impoundment with a watershed comprised of more than 30% combined agricultural and urban land use development based upon the department's latest WiscLand dataset. Lake Eau Galle meets this standard and is on the "Eligible Impoundments List". Applicants will also be required to submit a self-certification that the dredging is exempt from consultation from the Waste Materials Management or get separate approval from Waste Materials Management. Applicants can consult the Self-certification Exemption Criteria Flowchart for Dredge Material Disposal Facility (Appendix E).

If a property owner is planning on removing a total of less than 2 cubic yards of be material (about one small dump truck full) in any given year, a permit is not needed. Pier, boat lift, or beach maintenance can be completed without a permit if you stay under the annual limit of 2 cubic yards. If not, a dredging permit will be needed.

In discussions with LEGA and its constituency, dredging is really what they want to see happen on the lake. The lake has filled in with sediment carried in by the Eau Galle River. A larger dredging project could be considered that might "catch" incoming sediment in a sediment basin that can be cleaned out or emptied at regular intervals or as needed. Smaller dredging projects could provide more immediate and property-specific relief from both shallow water and nuisance aquatic plant growth.

More guidelines are provided on the WDNR Waterways/dredging webpage and should be consulted before any dredging project begins.

DRAWDOWN

Drawdown, like dredging, alters the plant environment by removing all water in a water body to a certain depth, exposing bottom sediments to seasonal changes including temperature and precipitation. A winter drawdown is a low cost and effective management tool for the long-term control of certain susceptible

[4] https://dnr.wisconsin.gov/topic/Waterways/dredging

species of nuisance aquatic plants. Winter drawdown has been shown to be an effective control measure for EWM, but typically only provides 2-3 years of relief before EWM levels return to pre-drawdown levels. A winter drawdown controls susceptible aquatic plants by dewatering a portion of the lake bottom over the winter, and subsequently exposing vascular plants to the combined effect of freezing and desiccation (drying). The effectiveness of drawdown to control plants hinges on the combined effect of the freezing and drying. If freezing and dry conditions are not sustained for 4-6 weeks, the effectiveness of the drawdown may be reduced.

Desirable Effects of A Drawdown

Aside from being a cost-effective means to control certain species of unwanted aquatic vegetation, a drawdown may offer several other benefits including increasing shoreline emergent vegetation, consolidation of some lake sediments, making shoreline improvement and dredging projects easier (subject to WDNR permits), identifying possible septic system issues, and when used as a part of an integrated management, may reduce the amount of herbicides needed to control an unwanted species (Cooke, Welch, Peterson, & and Nichols, 2005). Another possible benefit would be the concentration of forage fish and game fish in the same area. This could lead to reduced forage fish through predation and larger game fish (Cooke et al. 2005).

Undesirable Effects of Drawdown

Possible undesirable side effects include negative impacts to benthic fauna, loss or reduction of desirable plant species, invasion by drawdown resistant undesirable plants, reduced attractiveness to waterfowl, possible fishkills if oxygen demand exceeds aeration efforts, loss of aesthetic appeal during drawdown, possible algal blooms after refill, reduction in water supply to wells, and impairment of recreational activities during the drawdown (Cooke, Welch, Peterson, & and Nichols, 2005). Amphibians and reptiles could also be impacted depending on their ability to move around and how fast lake level changes are made. An inability to rapidly refill a drawn down lake is a basic concern in evaluating the potential for a drawdown. By completing a winter drawdown, many of these side effects can be avoided. On Lake Eau Galle, a winter drawdown also means less loss related to the generation of hydro-electric power and the lost power company revenue associated with it.

The dam that creates Lake Eau Galle generates hydroelectricity and is managed by Renewable World Energies (RWE). LEGA would need to work closely with RWE and Dunn County who owns the dam to develop a drawdown plan for the lake that could be used to control aquatic vegetation, and perhaps more importantly, provide an opportunity to implement a larger dredging project or even smaller riparian dredging projects.

It is very likely that RWE will seek reimbursement for reduced power generation during any drawdown. This was the case in 2021 with the Minong Flowage in Washburn County when they completed a winter drawdown to control EWM in the lake. More than $30,000.00 was needed to offset the loss of power generation. Fortunately, this cost could be covered in part by a WDNR surface water grant.

Target vs non-target Species

In the Minong Flowage, the plant species targeted by winter drawdown was EWM (Figure 33). A winter drawdown can be effective in reducing the amount of EWM in a body of water provided freezing and drying occurs for at least a 4–6-week time period. However, EWM has been shown to be able to withstand low temperatures if the plant remains moist or if the exposed hydrosoil is not frozen for several weeks. EWM is also well adapted to rapid vegetative spread and may recolonize areas dominated by native plants prior to drawdown (Cooke, Welch, Peterson, & and Nichols, 2005).

Figure 33: EWM fragment with adventitious roots (left), and a dense bed of EWM

CLP is generally not impacted as substantially by a winter drawdown. CLP spreads through burr-like winter buds (turions), which are moved among waterways (Figure 34). It grows new plants every year from turions already in the sediment and has a different life cycle than EWM and most native aquatic plants. New plants form under the ice in winter, making curly-leaf pondweed one of the first nuisance aquatic plants to emerge in the spring (Figure 35). It becomes invasive in some areas because of its tolerance for low light and low water temperatures. These tolerances allow it to get a head start on and out-compete native plants in the spring. By early July, the plant completes its life cycle, dies, and drops to the lake bottom (Figure 34). However, colder water brought in by the Eau Galle River appears to keep growing conditions such that CLP still thrives, even in the summer. CLP is commonly found in alkaline and high nutrient waters, preferring soft substrate and shallow water depths.

Figure 34: Curly-leaf pondweed and its turions

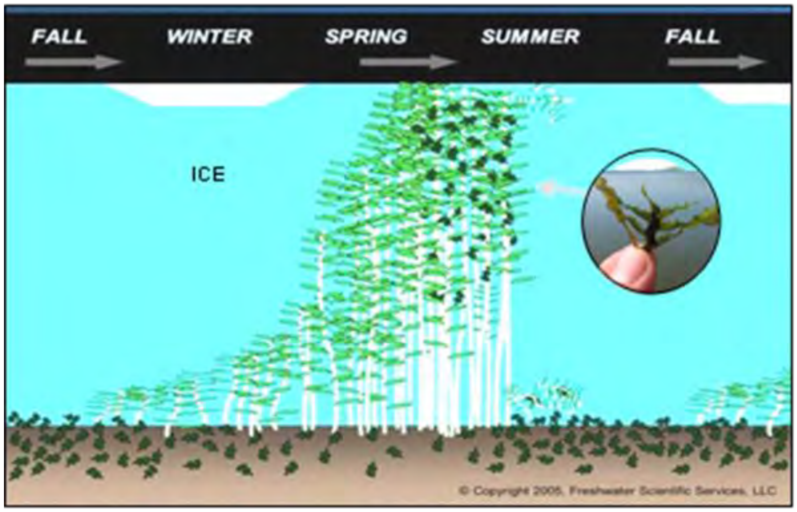

Figure 35: Diagram showing annual CLP life cycle in northern lakes (Freshwater Scientific Services, 2008)

In Lake Eau Galle, a winter drawdown would likely reduce EWM, but it may also negatively impact Coontail, Slender waterweed, Water stargrass, and Duckweeds. Long-leaf pondweed, Flat-stem pondweed, and Sago pondweed may expand. Impacts on CLP are mixed. Tables 8 and 9 reflect some of the aquatic plant species that decrease, increase, or generally stay the same because of a winter drawdown (Cooke, Welch, Peterson, & and Nichols, 2005).

Table 8: Aquatic plant changes due to a winter drawdown-Part 1 (Cooke, Welch, Peterson, & and Nichols, 2005)

Scientific Names	Common Names	Decrease	"No Change"	Increase
Alternanthera philoxeroides	alligator weed			●
Brasenia schreberi	watershield	●	●	
Cabomba caroliniana	fanwort	●		
Callitriche spp.	water starwort	●	●	●
Ceratophyllum demersum	coontail	●	●	●
Chara spp.	muskgrass/chara		●	●
Egeria densa	egeria/Brazilian waterweed/Brazilian elodea	●		
Eichhornia crassipes	water hyacinth	●	●	●
Elatine spp.	waterworts	●	●	
Eleocharis acicularis	needle spikerush	●		
Eleocharis spp.	spikerushes	●	●	●
Elodea Canadensis	elodea/Canadian waterweed	●	●	●
Elodea spp.	waterweeds	●		
Glyceria borealis	small floating mannagrass			●
Gratiola neglecta	clammy-hedge hyssop		●	●
Hydrilla verticillata	hydrilla		●	●
Isoetes lacustris	lake quillwort	●		
Juncus spp.	rushes		●	●
Leersia oryzoides	rice cutgrass			●
Lemna minor	duckweed/common duckweed		●	●
Lobelia dortmanna	water lobelia/Dortmann's cardinal flower	●		
Lythrum salicaria	purple loosestrife		●	●
Megalodonta beckii	water marigold/Beck's water marigold			●
Myriophyllum alterniflorum	alternate-leaved watermilfoil	●		
Myriophyllum aquaticum	parrotfeather/parrotfeather watermilfoil	●	●	
Myriophyllum heterophyllum	variable-leaf water-milfoil/two-leaf watermilfoil	●		
Myriophyllum sibiricum	short-spike water-milfoil/northern watermilfoil	●		
Myriophyllum verticillatum	whorled watermilfoil	●		
Najas flexilis	slender naiad/nodding waternymph		●	●
Najas guadalupensis	southern naiad/southern waternymph	●	●	
Najas minor	brittle naiad/brittle waternymph			●
Nelumbo lutea	American lotus		●	
Nelumbo nucifera	sacred lotus		●	
Nitella spp.	stonewort/nitella		●	●
Nuphar advena	spatterdock/cow lily/yellow pond lily	●	●	
Nuphar variegata	varigated yellow pond lily	●	●	
Nymphaea odorata	American white water lily/fragrant water lily	●	●	
Nymphoides cordata	little floating heart		●	●
Nymphoides peltata	yellow floating heart		●	●

Table 9: Aquatic plant changes due to a winter drawdown-Part 2

Persicaria amphibium	water smartweed/water knotweed		•	•
Phragmites australis	common reed			•
Potamogeton amplifolius	big-leaf pondweed/large-leaf pondweed	•	•	•
Potamogeton crispus	curly-leaf pondweed/curly pondweed	•	•	
Potamogeton diversifolius	water-thread pondweed/diverse-leaf pondweed			•
Potamogeton epihydrus	ribbon-leaf pondweed		•	•
Potamogeton foliosus	leafy pondweed		•	•
Potamogeton gramineus	variable-leaf pondweed/grass-leaf pondweed		•	•
Potamogeton natans	floating pondweed/broad-leaf pondweed	•	•	•
Potamogeton nodosus	long-leaf pondweed		•	
Potamogeton pusillus	small pondweed		•	•
Potamogeton Richardsonii	Richardson's pondweed		•	•
Potamogeton Robbinsii	Robbins' pondweed	•	•	
Potamogeton zosteriformis	flat-stem pondweed		•	•
Ranunculus trichophyllus	thread-leaf crowfoot	•	•	•
Sagittaria graminea	grass-leaf arrowhead/grassy arrowhead	•	•	
Sagittaria latifolia	broad-leaf arrowhead/common arrowhead/duck potato		•	•
Salix interior	sandbar willow			•
Schoenoplectus americanus	chairmaker's bulrush/three square bulrush			•
Schoenoplectus californicus	California bulrush/southern bulrush	•		
Schoenoplectus lacustris	lakeshore bulrush/common clubrush			•
Schoenoplectus tabernaemontani	softstem bulrush			•
Scirpus cyperinus	woolgrass			•
Sium suave	hemloch waterparsnip			•
Sparganium angustifolium	narrow-leaf bur-reed		•	•
Sparganium emersum	European bur-reed/unbranched bur-reed	•	•	
Sparganium hyperboreum	northern bur-reed		•	•
Sparganium natans	small bur-reed	•	•	
Spirodela polyrhiza	giant duckweed/greater duckweed	•		
Stuckenia pectinata	sago pondweed		•	•
Trapa natans	water chestnut		•	
Typha latifolia	broadleaf cattail/common cattail		•	•
Utricularia spp.	bladderworts	•	•	
Utricularia vulgaris	common bladderwort/greater bladderwort	•		
Vallisneria Americana	water celery/American eelgrass	•	•	•
Wolffia columbiana	watermeal/Columbian watermeal		•	

Implementation Timing

If implemented on an annual basis, the effectiveness of a drawdown may diminish over time. The diminished effectiveness is associated with the replacement of drawdown-susceptible species by drawdown-tolerant species after repetitive drawdown. A start up program that employs drawdown for two to three consecutive years, followed by a staggered program of drawdown every other year or two may minimize the risk of developing a dominant plant community that is dominated by species resistant to drawdown.

Dropping the lake level to allow for the desiccation, aeration, and freezing of lake sediments has been shown to be an effective aquatic plant management technique. Repeated drawdowns lasting 4 to 6 months that include a freezing period are the most effective. A winter drawdown could be used to control undesirable aquatic vegetation but would not likely be done specifically for plant control.

Completing a winter drawdown in tandem with a dredging project would likely be the best management scenario for Lake Eau Galle.

Suggested Monitoring Associated with a Winter Drawdown

If a winter drawdown is considered, the following program of inspections and monitoring could be conducted in conjunction with the implementation of a winter drawdown.

Well Monitoring
During the period of drawdown residents should periodically monitor water levels in their wells or check water flows to ensure that sufficient water is available. If adverse impacts are noted the MFA should be notified immediately.

Vegetation Surveys
Annual vegetation surveys should be completed to document the areal coverage and distribution of aquatic plants. Plant surveys should be conducted in mid to late summer to assess conditions under maximum plant coverage.

Water Quality Testing
Dissolved oxygen testing should be completed at least monthly during the winter drawdown. Expanded water quality testing including water clarity, total phosphorus, and chlorophyll a should be monitored at least once monthly throughout the open water season following the drawdown.

Volunteer Amphibian Monitoring
Amphibian monitoring by volunteers should be completed annually following guidelines provided by the Citizen-based Monitoring Network (http://wiatri.net/CBM/WhosWho/subject.cfm, last accessed 3-4-2015).

WDNR Boom Shocking
A boom shocking survey should be completed in the year following the drawdown to determine if there were any noticeable negative impacts to the fishery.

BOTTOM BARRIERS AND SHADING

Physical barriers, fabric or other, placed on the bottom of the lake to reduce the growth of AIS would likely eliminate all plants, inhibit fish spawning, affect benthic invertebrates, and could cause anaerobic conditions which may release excess nutrients from the sediment. Gas build-up beneath these barriers can cause them to dislodge from the bottom and sediment can build up on them allowing AIS to re-establish. Bottom barriers are typically used for very small areas and provide only limited relief. Currently the WDNR does not permit this type of control.

Creating conditions in a lake that may serve to shade out plant growth has also been tried with mixed success. The general intention is to reduce light penetration in the water which in turn limits the depth at which plants can grow. Typically, dyes have been added to a small water body to darken the water. Bottom barriers and attempts to further reduce light penetration in Lake Eau Galle are not recommended.

BIOLOGICAL CONTROL

Biological control involves using one plant, animal, or pathogen to control a target species in the same environment. The goal of biological control is to weaken, reduce the spread, or eliminate the unwanted population so that native or more desirable populations can make a comeback. Care must be taken however, to ensure that the species used for control does not become as big a problem as the one that is being controlled. A special permit is required in Wisconsin before any biological control measure can be introduced into a new area.

GALERUCELLA BEETLES

Two species of Galerucella beetles are currently approved for the control of purple loosestrife in Wisconsin (Figure 36). The entire lifecycle of Galerucella beetles is dependent on purple loosestrife. In the spring, adults emerge from the leaf litter below old loosestrife plants. The adults then begin to feed on the plant for several days until they begin to reproduce. Females lay their eggs on loosestrife leaves and stems. When the larvae emerge from these eggs they begin feeding on the leaves and developing shoots. When water levels are high these larvae will burrow into the loosestrife stems to pupate into adult beetles. These new adults emerge and begin feeding on the loosestrife again (Sebolt, 1998). Galerucella beetles do not forage on any plants other than purple loosestrife. Because of this the populations, once established, are self-regulating. When the purple loosestrife population drops off, the beetle population also declines. When the loosestrife returns, the beetle numbers will usually increase.

Figure 36: Galerucella Beetle

These beetles will not eradicate purple loosestrife entirely. This is true of almost all forms of biological control. Galerucella beetles will help regulate loosestrife which will allow native plants to also become re-established. Raising Galerucella beetles does not require a lot of skill or material. Materials consist of 3–5-gallon pails, kids wading pool, fine mesh nets, and a net supporting structure. The cooperator must also have access to purple loosestrife plants and a source of "starter beetles". Because rearing these beetles requires the cultivation of a restricted species, a permit is necessary. Purple loosestrife rootstock and starter beetles can be obtained from the WDNR, private vendors, or many of the public wetlands around Wisconsin.

EWM WEEVILS

While many biological controls have been studied for EWM, only one has proven to be effective at controlling EWM under the right circumstances. *Euhrychiopsis lecontei* is an aquatic weevil native to Wisconsin that feeds on aquatic milfoils (Figure 37). Their host plant is typically northern watermilfoil; however, they seem to prefer EWM when it is available. Milfoil weevils are typically present in low numbers wherever northern or Eurasian water milfoil is found. They often produce several generations each year and over winter in undisturbed shorelines around the lake. All aspects of the weevil's life cycle can affect the plant. Adults feed on the plant and lay their eggs. The eggs hatch and the larva feed on the plant. As the larva mature, they eventually burrow into the stem of the plant. When they emerge as adults later, the hole left in the stem reduces buoyancy often causing the stem to collapse. The resulting interruption in the flow of carbohydrates to the root crowns reduces the plant's ability to store carbohydrates for over wintering reducing the health and vigor Newman et al. (1996).

Figure 37: EWM weevil

The weevil is not a silver bullet. They do not work in all situations. The extent to which weevils exist naturally in a lake, adequate shore land over wintering habitat, the population of bluegills and sunfish in a system, and water quality characteristics are all factors that have been shown to affect the success rate of the weevil.

Biological control of EWM with weevils and rearing Galerucella beetles for control of purple loosestrife are not recommended for Lake Eau Galle.

NATIVE PLANT RESTORATION

A healthy population of native plants might slow invasion or reinvasion of non-native aquatic plants. It should be the goal of every management plan to protect existing native plants and restore native plants after the invasive species has been controlled. In many cases, a propagule bank probably exists that will help restore native plant communities after the invasive species is controlled (Getsinger et al (1997). If a native aquatic plant propagule bank does not exist, consideration could be had to try and introduce new native aquatic plant species to Lake Eau Galle. Likely candidates might include submersed species like Northern watermilfoil and Wild Celery (Figure 38), and emergent species like Hardstem bulrush, Pickerel weed, Short-stem bur-reed, and Arrowhead sp. (Figure 39).

Figure 38: Northern water milfoil (left) and Wild celery (right)

Figure 39: Hardstem bulrush (top left), Pickerel weed (top right), Short-stem bur-reed (bottom left), and Arrowhead sp. (bottom right)

CHEMICAL CONTROL

Aquatic herbicides are granular or liquid chemicals specifically formulated for use in water to kill plants or retard plant growth. Herbicides approved for aquatic use by the U.S. Environmental Protection Agency (EPA) are considered compatible with the aquatic environment when used according to label directions.

The WDNR evaluates the benefits of using a particular chemical at a specific site vs. the risk to non-target organisms, including threatened or endangered species, and may stop or limit treatments to protect them. The Department frequently places conditions on a permit to require that a minimal amount of herbicide is needed and to reduce potential non-target effects, in accordance with best management practices for the species being controlled. For example, certain herbicide treatments are required by permit conditions to be in spring because they are more effective, require less herbicide and reduce harm to native plant species. Spring treatments also mean that, in most cases, the herbicide will be degraded and gone by the time peak recreation on the water starts.

The advantages of using chemical herbicides for control of aquatic plant growth are the speed, ease and convenience of application, relatively low cost, and the ability to control plant types somewhat selectively with certain herbicides. Disadvantages of using chemical herbicides include possible toxicity to aquatic animals or humans, oxygen depletion after plants die and decompose which can cause fishkills, a risk of increased algal blooms as nutrients are released into the water by the decaying plants, adverse effects on desirable aquatic plants, loss of fish habitat and food sources, water use restrictions, and a need to repeat treatments due to existing seed/turion banks and plant fragments. Chemical herbicide use can also create conditions favorable for non-native AIS to outcompete native plants (for example, areas of stressed native plants or devoid of plants).

EFFICACY OF AQUATIC HERBICIDES

The efficacy of aquatic herbicides is dependent on both application concentration and exposure time, and these factors are influenced by two separate but interconnected processes - dissipation and degradation. Dissipation is the physical movement of the active herbicide within the water column both vertically and horizontally. Dissipation rates are affected by wind, water flow, treatment area relative to untreated area, and water depths. Degradation is the physical breakdown of the herbicide into inert components. Depending on the herbicide utilized, degradation occurs over time either through microbial or photolytic (chemical reactions caused by sunlight exposure) processes.

SMALL-SCALE HERBICIDE APPLICATION

Small-scale herbicide application involves treating areas less than 10 acres in size. Small-scale chemical applications are usually completed in the early season (April through May). Research related to small-scale herbicide application generally shows that these types of treatment are less effective than larger scale treatments due to rapid dilution and dispersion (dissipation) of the herbicide applied. As such, chemically treating areas less than 5.0 acres in size of either CLP or EWM is generally not recommended.

LARGE-SCALE HERBICIDE APPLICATION

Large-scale herbicide application involves treating areas more than 10 acres in size or more than 10% of the littoral zone. Like small-scale applications, this is usually completed in the early season (April through May) for control of non-native invasive species like CLP or EWM while minimizing impacts on native species. It is generally accepted that with large-scale applications the likelihood of the herbicide staying in contact with the target plant for a longer time is greater. If the volume of water treated is more than 10% of the volume of the lake, or the treatment area is ≥160 acres, or 50% of the lake's littoral zone, effects can be expected at a whole-lake scale. Large-scale herbicide application can be extended in some lakes to include whole bay or even whole lake treatments. The size of the treatment area, the more contained the treatment area, and the depth of the water in the treatment area, are factors that impact how whole bay or whole lake treatments are implemented.

COMMON AQUATIC HERBICIDES

ProcellaCOR® is a relatively new systemic, selective herbicide that can be used to target EWM with limited impact to most native species. It is also very fast acting, making it an effective control measure on smaller beds that may be too large for DASH, especially ones in high boat traffic areas and/or deeper water. In addition, applications rates are measured in ounces, not gallons as is common with almost all other liquid herbicides. And while it is more expensive to use than 2,4-D equivalents, it has been shown to provide two or more years of control without re-application.

Sonar®, whose active ingredient is fluridone, is a broad-spectrum herbicide that interferes with the necessary processes in a plant that creates the chlorophyll needed to turn sunlight into plant food through a process called photosynthesis. Sonar is generally applied during a whole-lake application and is expected to be in the lake at very low concentrations for weeks or months once applied.

2,4-D and triclopyr are active ingredients in several selective herbicides including 2,4-D Amine 4®, Navigate®, DMA 4®, Renovate®, and Renovate Max G®. These herbicides stimulate plant cell growth causing them to rupture, but primarily in narrow-leaf plants like milfoil. These herbicides are considered selective as they have little to no effect on monocots in treated areas. ProcellaCOR, fluridone, 2,4-D, and triclopyr are all considered systemic. When applied to the treatment area, plants in the treatment area draw the herbicide in through the leaves, stems, and roots killing all the plant, not just the part that encounters the herbicide.

Aquathol® whose active ingredient is endothall and Reward® whose active ingredient is diquat are considered broad spectrum contact herbicides. They destroy the outer cell membrane of the material they encounter and therefore kill a plant very quickly. Neither of these is considered selective and has the potential to kill all the plant material that they encounter regardless of the species. As such, great care should be taken when using these products. Certain plant species like CLP begin growing very early in the spring, even under the ice, and are often the only growing plant present at that time. This is a good time to use a contact herbicide like Aquathol, as few other plants would be impacted. Using these products later in the season, will kill all vegetation in contact with the herbicide and can provide substantial nuisance relief from a variety of aquatic plants. Endothall based herbicides are the most used herbicides for CLP control, but diquat can be used under the appropriate circumstances.

It is possible to apply more than one herbicide at a time when trying to establish control of unwanted aquatic vegetation. An example would be controlling EWM and CLP at the same time with an early season application and controlling aquatic plants and algae at the same time during a mid-season nuisance relief application. Applying systemic and contact herbicides together has a synergistic effect leading to increased selectivity and control. Single applications of the two could result in reduced environmental loading of herbicides and monetary savings via a reduction in the overall amount of herbicide used and of the manpower and number of application periods required to complete the treatment.

PRE AND POST TREATMENT AQUATIC PLANT SURVEYING

When introducing new chemical treatments to lakes where the treatment size is greater than ten acres or greater than 10% of the lake littoral area and more than 150-ft from shore, the WDNR may require pre and post chemical application aquatic plant surveying. Results from pre and post treatment surveying are used to improve consistency in analysis and reporting, and in making the next season's management recommendations.

The number of pre and post treatment sampling points required is based on the size of the treatment area. Ten to twenty acres generally requires at least 100 sample points. Thirty to forty acres requires at least 120 to 160 sampling points. Areas larger than 40 acres may require as many as 200 to 400 sampling points. Regardless of the number of points, each designated point is sampled by rake recording depth, substrate type, and the identity and density of each plant pulled out, native or invasive.

In the year prior to an actual treatment, the area to be treated must have a mid-season/summer/warm water point intercept survey completed that identifies the target plant and other plant species that are present. A pre-treatment aquatic plant survey is done in the year the herbicide is to be applied, prior to application to confirm the presence and level of growth of the target species. A post-treatment survey is done in the same year as the chemical treatment was completed or in the year after a chemical treatment was completed, sometimes both. A post-treatment survey should be scheduled when native plants are well established, generally mid-July through mid-August. For the post-treatment survey, the same points sampled in the pre-treatment survey will again be sampled. For whole-lake scale treatments, a full lake-wide PI survey should be conducted.

Continued implementation of pre- and post-chemical treatment aquatic plant surveying is an important tool in determining the impacts of management actions on both the target and non-target species. Results from pre and post treatment surveying are used to improve consistency in analysis and reporting, and in making the next season's management recommendations.

CHEMICAL CONCENTRATION TESTING

Chemical concentration testing is often done in conjunction with treatment to track the fate of the chemical herbicide used. Concentration testing can help to determine if target concentrations are met, to see if the chemical moved outside its expected zone, and to determine if the chemical breaks down in the system as expected. Monitoring sites are located both within and outside of the treatment area, particularly in areas that may be sensitive to the herbicide used, where chemical drift may have adverse impacts, where movement of water or some other characteristic may impact the effect of the chemical, and where there may be impacts to drinking and irrigation water. Water samples are collected prior to treatment and for a period of hours, days, weeks, or even months following chemical application.

OVERUSE OF AQUATIC HERBICIDES

Concerns exist when herbicide treatments using the same herbicide are done over multiple and subsequent years. Target plant species may build up a tolerance to a given herbicide making it less effective, susceptible plant species may be damaged and/or disappear from the lake (ex. water lilies), concerns over fish and other wildlife might occur, and concern over recreational use in chemically treated water may be voiced. By using several different aquatic herbicides interspersed with physical removal efforts between treatments, many of these concerns are minimized.

ProcellaCOR is classified as an auxin herbicide (WSSA Group 4; HRAC Group O), like other systemic herbicides including 2,4D and triclopyr. Weed populations may develop biotypes that are resistant to different herbicides with the same mode of action. If herbicides with the same mode of action are used repeatedly in the same field, resistant biotypes may eventually dominate the weed population and may not be controlled by these products. To delay development of herbicide resistance, the following practices are recommended:

- Alternate use of products containing ProcellaCOR EC with other products with different mechanisms of action.
- ProcellaCOR EC can be tank mixed or used sequentially with other approved products to broaden the spectrum of weed control, provide multiple modes of action and control weeds that ProcellaCOR EC does not control.
- Herbicides should be used based on an IPM program.
- Monitor treated areas and control escaped weeds.

CONCERNS RELATED TO WHOLE-LAKE/LARGE-SCALE CHEMICAL TREATMENTS

In 2020, the WDNR published a paper (Mikulyuk, et al., 2020) comparing the ecological effects of the invasive aquatic plant EWM with the effects of lake-wide herbicide treatments used for EWM control using aquatic plant data collected from 173 lakes in Wisconsin, USA. First, a pre–post analysis of aquatic plant communities found significant declines in native plant species in response to lake-wide herbicide treatment. Second, multi-level modeling using a large data set revealed a negative association between lake-wide herbicide treatments and native aquatic plants, but no significant negative effect of invasive EWM alone. Taken together, their results indicate that lake-wide herbicide treatments aimed at controlling EWM had larger effects on native aquatic plants than did the target of control-EWM.

This study reveals an important management tradeoff and encourages careful consideration of how the real and perceived impacts of invasive species like EWM in a lake and the methods used for their control are balanced.

The use of aquatic herbicides is not recommended in Lake Eau Galle.

PREVIOUS AIS MANAGEMENT

It is not known if any previous aquatic plant management using aquatic herbicides or harvesting have been completed on Lake Eau Galle.

MANAGEMENT DISCUSSION

Aquatic plants are probably the most important part of a lake ecosystem. A lake's rooted plants are the basis of the aquatic ecosystem. They capture the sun's energy and turn it into usable food, "clean" the water of excess nutrients, stabilize shorelines and lake beds, and provide habitat for other organisms like the lake's fish populations. Because of this, preserving them is critical to maintaining a lake's overall health.

WHEN IS AQUATIC PLANT MANAGEMENT NECESSARY?

In Wisconsin, there are generally two main reasons why aquatic plant management is considered: 1) Are there demonstrated ecological changes because of one or more specific aquatic plants (target plants)? 2) Is lake use restricted or obstructed by one or more specific aquatic plants?

To determine if the first reason applies questions like Has the target plant spread, and/or gotten denser; and has that spread and increase in density negatively impacted other, more desirable aquatic plants (non-target plants)? If the answer to these questions is generally "no", then aquatic plant management is likely not necessary.

To determine if the second reason applies, exactly where, when, and what species is causing restricted or obstructed lake use must be determined.

IS AQUATIC PLANT MANAGEMENT NECESSARY IN LAKE EAU GALLE?

REASON 1 – DEMONSTRATED ECOLOGICAL CHANGES

Non-native, aquatic invasive species like curly-leaf pondweed and Eurasian watermilfoil can be problematic, but only when they take over habitat previously filled with other, likely more desirable native aquatic plants, creating a more monotypic plant community. Diversity is key. Generally, the more diverse, i.e. a greater number of different aquatic plants in a lake, the healthier the lake is. Lake Eau Galle has a limited plant community with only a handful of different native species making the addition of any new aquatic plant, even non-natives like CLP and EWM, beneficial to the lake provided the non-natives do not take over the aquatic plant community.

This is the case in Lake Eau Galle. With CLP and EWM included, there are around 11 different aquatic plant species in the lake, well below average for lakes in the region. Where they grow is dictated by water clarity, sediment type, and available nutrients. In Lake Eau Galle, this means the bulk of the aquatic plant growth is in the 1-7ft with 4ft of water being the depth with the most abundant vegetation (Figure 40). The area of the lake that presents the best conditions for aquatic plant growth is where the delta created by the Eau Galle River begins to taper off and before the lake water gets too deep to provide the necessary sunlight (Figure 40). The map of total rake fullness for all points sampled during the 2022 survey confirms this (Figure 41). The rest of the lake has few if any aquatic plant issues.

Aquatic plant management in Lake Eau Galle should not be done for this reason.

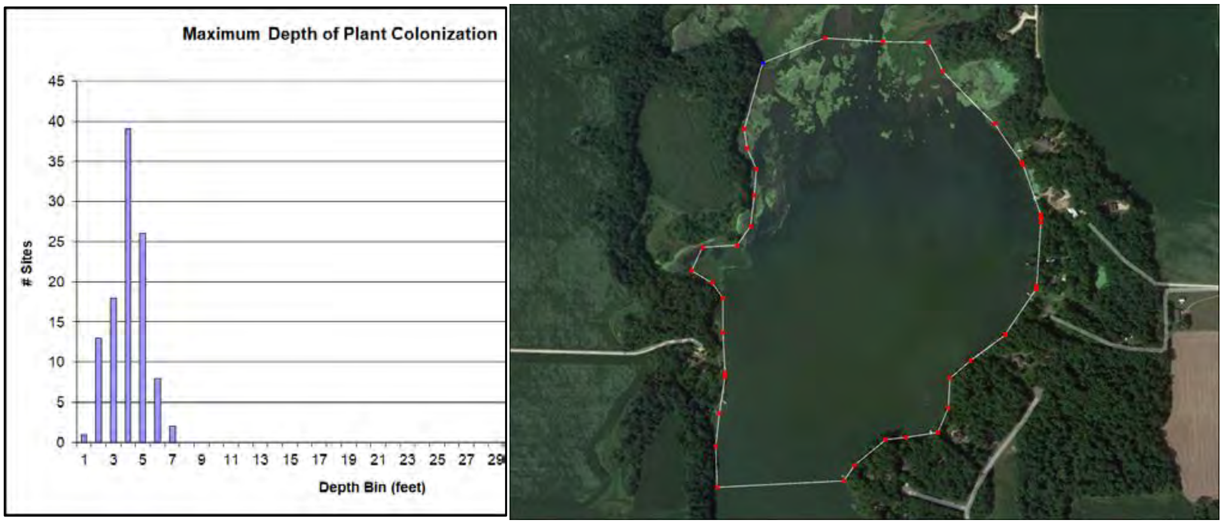

Figure 40: Depth of aquatic plant growth (Smith, 2022), and area of Lake Eau Galle in that depth range

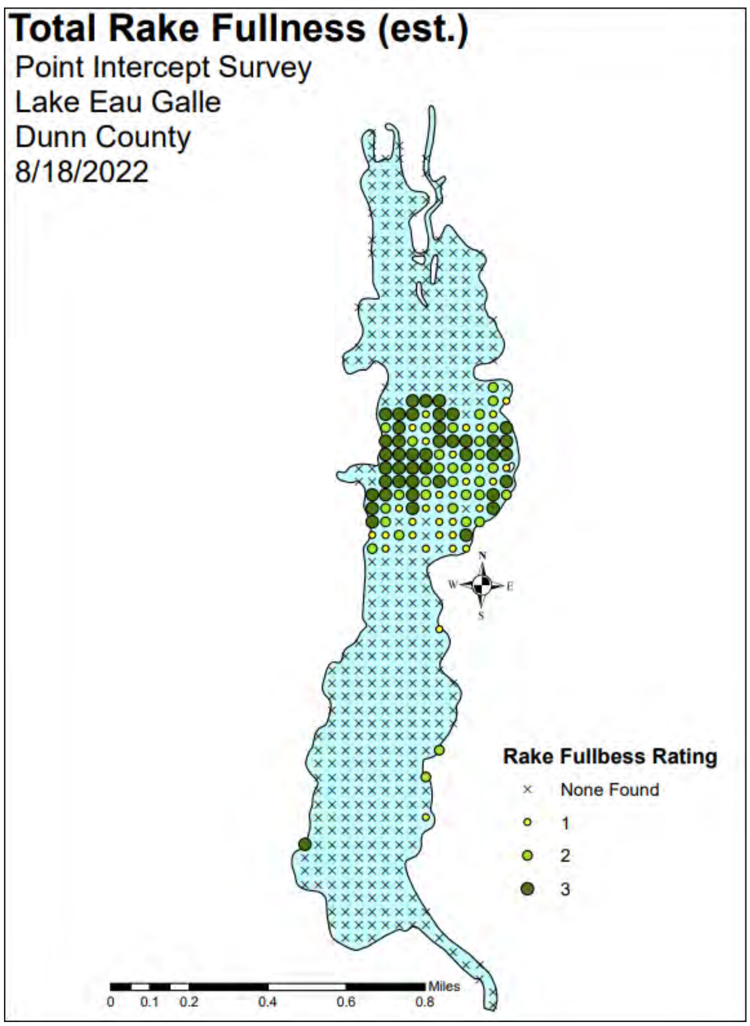

Figure 41: 2022 survey rake fullness results (Smith, 2022)

REASON 2 – RESTRICTED OR OBSTRUCTED LAKE USE

Unfortunately, the area discussed in the last section does cause restricted or obstructed access to the lake for at least a few property owners, particularly those along the northeast shore. This is confirmed based on lake use and public input survey results from early 2023 where property owners on the north half of the lake indicated that dense aquatic plant growth prevented them from doing several lake activities, more than twice as often as property owners living on the southern half of the lake.

In this area, aquatic plant management would benefit the property owners, and if limited in nature, have little negative impact on the aquatic plant community that is so vital for the health of the lake.

AQUATIC PLANT MANAGEMENT

In the public use and input survey, respondents were asked what aquatic plant management alternatives they would support. The most supported management alternative (over 84% of respondents) was the one that would help address both aquatic plant issues and sediment issues – dredging. Unfortunately, this is likely the most complicated management alternative to implement. Other management alternatives were physical removal (79%), mechanical harvesting (65% support), drawdown (48%), and application of herbicides (32%). Implementing no management was opposed by 78% of respondents.

The aquatic plant management actions recommended in this APMP takes a two-step approach. The first step is providing needed relief for those property owners who are struggling with gaining access to open water due to dense aquatic plant growth along the northeast shore of the lake. To that end, establishing a navigation/access channel along that shore to open water is recommended. The channel, as presented in Figure 42 is approximately 2,100ft long and would be made to be at least 20-ft wide. In total, just shy of an acre of surface water is included in the channel. There are multiple ways the channel could be constructed.

A private company offering mechanical harvesting could be contracted to clear the channel. Mechanical harvesting is usually limited to 3ft of water or more to reduce disturbances of the bottom and to protect the harvesting equipment. The channel in Figure 42 has been placed where mapping has indicated lake depth is 3 or more feet. One-time, contracted harvesting may not provide season-long benefit, simply because plants cut by the harvester will likely grow back over time. For this reason, it may be beneficial for LEGA to consider the purchase of their own mechanical harvester, something along the lines of the WaterGator presented in a previous section. Owning their equipment would allow harvest of the channel multiple times during the season without substantial additional cost. There are grant dollars available to help purchase a mechanical harvester through the WDNR Recreational Boating Facilities program, perhaps covering as much as 50% of the cost. Mechanical harvesting requires a WDNR permit and a designated disposal site.

The channel could also be cleared using an aquatic herbicide. In this case, a contact herbicide like endothall or diquat, expected to kill all the plant material it encounters would be the most appropriate. Use of an aquatic herbicide would not create a clearly distinct navigation lane like mechanical harvesting would because the herbicide would likely drift off the designated channel, possibly negatively impacting nearby vegetation. In addition, it would take longer for the channel to be clear of vegetation because it takes time for the herbicide to kill the plant and to have it drop out of the water column. The benefit is likely cost and longevity. Applying an aquatic herbicide to approximately 3-acft of water would be quick and relatively inexpensive. If an aquatic herbicide is used, one application a year would likely suffice. Herbicide application requires a WDNR permit.

Finally, limited dredging could be used to "excavate" an access channel. Dredging would both remove the aquatic plants and make the channel deeper for extended use. There are companies that could provide dredging services, though this is likely to be the most expensive way to establish the channel. It would also require consultation with the WDNR and other stakeholders. A WDNR permit is necessary to complete a dredging project in most cases (see previous section), and a place to dispose of the sediment removed is necessary.

Figure 42: Navigation/access channel along the northeast shore of Lake Eau Galle

The second step is to consider a broader approach that includes not just aquatic plant control, but also addresses the issues that cause the aquatic plant issues in the first place, namely sedimentation in the lake. This step is an important one, because aquatic plants, even the two non-native, invasive species CLP and EWM are not the problem in Lake Eau Galle. They are a symptom of a larger problem caused by sediment carried into the lake from the Eau Galle River. And, unless the larger problem of sedimentation is addressed, the aquatic plant management actions in the first step will have to be continued indefinitely.

Determining an appropriate plan to address issues with sedimentation is beyond the scope of this APMP. It is recommended that LEGA work with lake residents, area landowners, Township and County elected officials, Dunn County Land and Water Resources staff, RWE power company representatives, sportsmen's groups, and others to generate interest and secure commitments to help address the sediment problem in the lake. It can't be denied that in-filling is occurring and will continue to occur.

Sediment issues may best be addressed on a watershed level. In fact, in previous years sediment loading to the lake has been studied and lake-specific modeling to determine likely outcomes of implementing Best

Management Practices (BMPs) has been completed (The Eau Galle Aquatic Ecology Laboratory, 2003) (St. Paul District-Hydraulics/Hydrology, 2006).

CLP AND EWM

No management action other than physical removal is specifically recommended for control of CLP and EWM.

OTHER AIS MONITORING AND MANAGEMENT

Lake Eau Galle volunteers should be trained to monitor the lake and shoreline for other AIS like purple loosestrife, yellow iris, and zebra mussels. Training can be provided by State and County resource personnel through the CLMN AIS Monitoring Program. If individual purple loosestrife plants or yellow iris are found, they should be removed if possible. Any new AIS should be reported to the WDNR with samples collected to serve as vouchers.

COARSE WOODY HABITAT

Coarse woody habitat has never been quantified in Lake Eau Galle. At some point during the implementation of this 5-year plan, the amount of CWH should be quantified and willing property owners should be sought for the installation of one or more CWH/Fishsticks projects. Increasing the level of CWH in the lake would likely improve the overall fishery in the lake.

SHORELAND IMPROVEMENT

Making improvements to the nearshore area around the lake and upstream of the lake could benefit the lake. Information on small-scale, grant eligible projects for interested property owners can be found at https://healthylakeswi.com/

WATER QUALITY

Water quality data is very limited for Lake Eau Galle. It is recommended that Lake Eau Galle volunteers collect basic water quality data through the Citizen Lake Monitoring Network (CLMN). This program begins with the collection of water clarity data, but can be expanded to include temperature and oxygen profiling, and collection of water samples to be analyzed for total phosphorus and chlorophyll a.

2024-2028 AQUATIC PLANT MANAGEMENT GOALS, OBJECTIVES, AND ACTIONS

Based on the information shared in this document the following aquatic plant management goals, objectives, and actions are recommended. The Goals, Objectives, and Actions are also available in Appendix B.

Goal 1 – Minimize access to open water and lake use issues caused by dense aquatic plant growth.

1) Objective 1 – Open and maintain an access channel from properties along the NE shoreline to open water.
   a) Action – Removal of aquatic plants via mechanical harvesting of a channel approximately 2,100 ft long and 20-ft
      i) Requires a WDNR Mechanical Harvesting Permit
      ii) The same channel could be opened and maintained via dredging with DNR consultation and appropriate permitting.
2) Objective 2 – Physical removal (hand-pulling and/or raking) of CLP and EWM in areas adjacent to docks, beaches, or public boat launches.
   a) Action – Unlimited hand-pulling and raking by property owners and/or maintenance crews to remove CLP and EWM in shallow areas considered important for public use and adjacent to developed properties.
      i) No permits are necessary.
3) Objective 3 – Physical removal (hand-pulling and/or raking) of native aquatic plants in areas adjacent to docks, beaches, or public boat launches.
   a) Action – Hand-pulling, raking, and/or manual cutting with removal of native aquatic plants in shallow areas considered important for public use and adjacent to developed properties.
      i) No permit is necessary.
      ii) Subject to restrictions/conditions in NR 106.06(2)

Goal 2 – Reduce the threat that existing AIS will leave the lake; that new aquatic invasive species will be introduced into the lake; and that new AIS introduced to the lake will go undetected in the lake.

1) Objective 1 – Implement a Clean Boats, Clean Waters (watercraft inspection) program.
   a) Action – Complete 200 hours annually if grant funding is used.
   b) Action – Complete an unspecified number of hours if grant funding is not used.
      i) The number of hours would be determined by expected lake use.
2) Objective 2 – Monitor the presence of AIS in the lake.
   a) Action – Participate in CLMN AIS monitoring.
3) Objective 3 – Increase AIS awareness and knowledge level of the LEGA constituency and lake users.
   a) Action – Distribute AIS education and identification materials.
   b) Action – Plan and implement AIS identification and physical removal workshops.

Goal 3 – Promote and support nearshore and riparian best management practices that will improve fish and wildlife habitat, reduce runoff, and minimize nutrient loading into Lake Eau Galle.

1) Objective 1 – Evaluate the state of the shoreland and nearshore around Lake Eau Galle.
   a) Action – Complete a Shoreland Habitat Assessment on Lake Eau Galle.

b) Action - Promote Healthy Lakes projects based on the results of the Shoreland Habitat Assessment.
c) Action – Apply for Healthy Lake grant funding to support projects that improve shoreland habitat and reduce runoff into the lake.

Goal 4 – Complete appropriate and on-going monitoring and management assessment to determine changes in the health of the lake ecosystem.

1) Objective 1 – Monitor long-term trends in water quality.
   a) Action - Become a part of the CLMN Level 1 Water Quality Monitoring Program (water clarity).
   b) Action – Become a part of the CLMN Expanded Level Water Quality Monitoring Program (adding total phosphorus and chlorophyll-a monitoring).
   c) Action – In future grants, add water quality sampling for total phosphorus and chlorophyll-a (if not already being done as a part of CLMN) and total suspended sediment.
2) Objective 2 – Complete Annual Project Activity and Assessment Reports.
   a) Action – LEGA and their Consultant will prepare end-of-year reports summarizing the management actions taken and how they impacted the lake.
   b) Action – Review end of year summary reports with the LEGA constituency, other stakeholders, and WDNR to determine following year management actions.

Goal 5 – Implement the 2024-28 Lake Eau Galle Aquatic Plant Management Plan effectively and efficiently with a focus on community and constituent education, information, and involvement.

1) Objective 1 - Build and support partnerships.
   a) Action – Work with WDNR, Dunn County, local Towns, Renewable World Energies, local businesses, contractors, and other resources to support management actions.
2) Objective 2 – Keep lake residents informed about planned activities.
   a) Action – Continue reaching out to the lake constituency to inform and seek input for management actions.
3) Objective 3 - Select cost effective implementation actions.
   a) Action – Work within the budget constraints to establish the best management actions to implement annually.
   b) Action – Continue to investigate the use of dredging to make improvements to the lake and aquatic plant community.
   c) Action – Apply for State of Wisconsin grant funding to support education, planning, and management implementation.

IMPLEMENTATION AND EVALUATION

This plan is intended to be a tool for use by the LEGA to move forward with aquatic plant management actions that will maintain the health and diversity of Lake Eau Galle and its aquatic plant community. This plan is not intended to be a static document, but rather a living document that will be evaluated on an annual basis and updated as necessary to ensure goals and community expectations are being met. This plan is also not intended to be put up on a shelf and ignored. Implementation of the actions in this plan through funding obtained from the WDNR and/or LEGA funds is highly recommended. An Implementation and Funding Matrix is provided in Appendix F.

Since many actions occur annually, a calendar of actions to be implemented was created in Appendix G.

WISCONSIN DEPARTMENT OF NATURAL RESOURCES GRANT PROGRAMS

There are several WDNR grant programs that may be able to assist LEGA in implementing its new APM Plan. AIS grants are specific to actions that involve education, prevention, planning, and in some cases, implementation of AIS management actions. Lake Management Planning grants can be used to support a broad range of management planning and education actions. Lake Protection grants can be used to help implement approved management actions that would help to improve water quality. Grant funding is not a guarantee but will not be awarded if it is not applied for.

More information about WDNR grant programs can be found at:
https://dnr.wisconsin.gov/aid/SurfaceWater.html

OUTSIDE RESOURCES TO HELP WITH FUTURE MANAGEMENT PLANNING

Many of the actions recommended in this plan cannot be completed solely by LEGA. They will continue to need the help of an outside consultant or other outside resource. Multiple outside resources and expertise exist to help guide implementation. Appendix H lists several outside resources that LEGA could partner with to implement the actions in this plan.

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May 13, 2023

Dear Lake Eau Galle Property Owners and Users:

The Lake Eau Galle Lake Association (LEGA) received an education and planning grant from the Wisconsin Department of Natural Resources (WDNR) in February 2023 to address concerns that have been expressed related to the condition of Lake Eau Galle. LEAPS was hired to help administer the activities in this grant.

Many things can negatively impact the quality of a lake. Native and non-native aquatic plant growth, loss of depth due to sedimentation, excess nutrients that turn the water green, and how the lake is used by property owners and visitors are just a few examples. Planning and implementation of actions to control aquatic plants, address sedimentation, and other aspects of a lake is dependent on what the populace is willing to support, what the WDNR will allow, the capacity of LEGA to lead the efforts.

The survey attached to this letter seeks to gather additional information about how Lake Eau Galle is perceived by those that live on and use it. It also seeks to determine the extent of property owner knowledge related to issues that affect the lakes. Many of these issues are discussed in this survey, along with the management actions that could lessen their impact on the lakes.

Every property owner on the lake has been mailed this survey. There are more than (insert a number here) property owners included. In addition, the survey is being made available for other interested people to respond to. Individuals are encouraged to complete their own survey. Please take the time to read through and respond to this survey.

Your responses to the questions in this survey are completely anonymous, unless you choose to add your contact information at the end of the survey. All surveys will be sent to back to LEAPS for tabulation. Only the results, not the actual surveys will be shared with LEGA, so you can be completely honest in your responses. Survey results will be incorporated into an Aquatic Plant Management Plans for Lake Eau Galle in 2023. A final report will be completed and a public presentation made at a later date to discuss survey results.

Please take the time to complete this survey and send it back to LEAPS in the return envelope provided. Responses received back by **June 11, 2023** are guaranteed to be a part of the Final Report and Presentation. Your participation is important to the overall success of any management on Lake Eau Galle. Thank You.

Sincerely,

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Lake Eau Galle, Dunn County Lake Use and Concerns Survey

<u>SECTION 1 – Residency</u>
These first few questions will help to determine who is responding to this survey.

1. Do you own or rent property on Lake Eau Galle?

   ___ I own and rent property
   ___ I own property
   ___ I rent property
   ___ no (skip to Section 2)

2. What type of property do you have on Lake Eau Galle? If you have more than one type of property, please report on only the property you have owned or rented the longest. (please select one)

   ___ permanent residence
   ___ seasonal residence (a month or more at a time)
   ___ vacation, weekend, and/or holiday residence
   ___ undeveloped land
   ___ business
   ___ other (please specify) ____

3. How long have you owned or rented the property indicated in Question 2? (If less than 1 year, please write '1' in the space provided)

   I have had the property for _______ year(s).

4. The map included with this survey shows two different basins of Lake Eau Galle. Please indicate in which basin you own or rent the property indicated in Question 2.

   ___ Upper ___ Lower

5. During a 12-month period (Jan. 1 – Dec. 31) how many days are you, members of your family, or guests at the property indicated in Question 2? ***(please provide your best estimate in the space below)***

   There are people at the property approximately ________ days a year.

6. On average, about how many people are at the property each time it is being used? _________

<u>SECTION 2 – Lake Use & Lake Issues</u>

1. From the list below, check all activities on Lake Eau Galle that you, your family, or guests participate in.

___ A. fishing from the shore	___ E. ice fishing	___ I. wildlife viewing
___ B. fishing from a boat	___ F. speed boating	___ J. rest/relaxation
___ C. pontoon boating	___ G. jet skiing	___ K. water skiing/tubing
___ D. canoe/kayak/paddle boat	___ H. sailing	___ L. swimming/wading

   ___ M. other (please list) ____
   ___ N. I don't participate in activities on the lake *(skip to Question 3)*

2. Which 3 activities from the above list do you or members of your family participate in most often? *(Write the letters of the corresponding activities in the spaces below)*

   I (We) participate in _____ most often, _____ 2nd most often, and _____ 3rd most often.

3. Below are numerous issues that may negatively affect your use of Lake Eau Galle. From the list below, please mark all of the issues that are of concern to you.

___ A. poor quality fishing	___ H. lake depth (too shallow)
___ B. too much public use	___ I. lake depth (too deep)
___ C. too much weed growth	___ J. overdevelopment of the shoreline
___ D. not enough weed growth	___ K. foul or offensive odor
___ E. poorly maintained boat access	___ L. "icky" or "green" water
___ F. low water level in the lake	___ M. floating vegetation
___ G. high water level in the lake	___ N. too many rough fish (carp)

   ___ O. nuisance wildlife (please specify) ___________________________________
   ___ P. excessive or uncontrolled water skiing or use of personal watercraft
   ___ Q. introduction of undesirable aquatic plants and animals (invasive species)
   ___ There are no issues affecting my use of the lake *(skip to Question 5)*

4. Which three issues from the above list are of the most concern to you? *(Write the letters of the corresponding issues in the spaces below)*

   I am most concerned about issues _____, _____, and _____.

5. During the open-water (no ice) season, how frequently do you, your family, or guests use a boat or other watercraft on the lake?

___ never	___ 1 or 2 times/month	___ several times/week
___ 1 or 2 times/season	___ 3 or 4 times/month	___ daily

6. During the open-water (no ice) season, how frequently are you, your family, or guests swimming or wading in the lake?

___ never ___ 1 or 2 times/month ___ several times/week
___ 1 or 2 times/season ___ 3 or 4 times/month ___ daily

7. In the time since you started visiting/using Lake Eau Galle, would you say lake water quality is:

___ better ___ worse ___ stayed the same ___ I don't know

8. In your opinion, the current water quality in Lake Eau Galle is:

___ excellent ___ good ___ fair ___ poor ___ very poor

9. How often, if at all, has water quality in Lake Eau Galle kept you, your family, or your guests from using the lakes for any of the following activities? If you, your family, or guests have no interest in the activity, please mark 'N/A'.

Activity	**Never**	**Rarely**	**Sometimes**	**Often**	**NA**
Fishing					
Water skiing or tubing					
Swimming or wading					
Motorized boating (including personal watercraft)					
Non-motorized boating (including paddle boards)					
Enjoying the "view"					

10. In the time since you started visiting/using Lake Eau Galle, would you say the depth of the lake has gotten:

___ deeper ___ shallower ___ stayed the same ___ I don't know

11. How often, if at all, has the lake depth in Lake Eau Galle kept you, your family, or your guests from using the lakes for any of the following activities? If you, your family, or guests have no interest in the activity, please mark 'N/A'.

Activity	**Never**	**Rarely**	**Sometimes**	**Often**	**NA**
Fishing					
Water skiing or tubing					
Swimming or wading					
Motorized boating (including personal watercraft)					
Non-motorized boating (including paddle boards)					
Enjoying the "view"					

SECTION 3 – Aquatic Invasive Species

Aquatic invasive species (AIS) are non-native plants and animals that are introduced into our lakes and streams and can potentially upset the natural balance of a lake ecosystem while decreasing recreational opportunities. This section asks a few questions about your awareness of aquatic invasive species.

1. Which of the following, if any, aquatic invasive species have you generally heard of?

___ Zebra mussels
___ Rusty crayfish
___ Spiny water fleas
___ Chinese mystery snail
___ Curly-leaf pondweed
___ None of these
___ Eurasian watermilfoil
___ Purple loosestrife
___ Yellow flag iris
___ Japanese knotweed
___ Common carp

2. Would you be interested in a training session to help you identify aquatic invasive species in the lake? This is not a commitment but rather a measure of possible interest.

___ definitely yes
___ probably yes
___ unsure
___ probably not
___ definitely not

SECTION 4 – Aquatic Plant Growth

Aquatic plants (rooted and floating) are an important part of any healthy lake system. However, excessive aquatic plant growth can sometimes interfere with or prevent certain lake activities and even impact water quality. This section of the survey evaluates how lake users feel about the aquatic plant growth in Lake Eau Galle.

1. In the time since you have started visiting/using Lake Eau Galle, would you say the amount of aquatic plant growth in the lake has:

___ increased ___ decreased ___ stayed the same ___ unsure

2. Thinking about current aquatic plant growth in Lake Eau Galle, would you say there is too little, too much, or about the right amount of aquatic plant growth?

___ definitely too little
___ probably too little
___ just the right amount
___ probably too much
___ definitely too much

3. How often, if at all, has aquatic plant growth in Lake Eau Galle kept you, your family, or your guests from using the lakes for any of the following activities? If you, your family, or guests have no interest in the activity, please mark 'N/A'.

Activity	Never	Rarely	Sometimes	Often	NA
Fishing					
Water skiing or tubing					
Swimming or wading					
Motorized boating (including personal watercraft)					
Non-motorized boating (including paddle boards)					
Enjoying the "view"					

4. At what time period during the year do you consider the aquatic plant growth in Lake Eau Galle to be excessive? **(check one)**

___ April – June ___ throughout the open water season (April – December)I don't know
___ July - September ___ aquatic plant growth is never excessive
___ October – December ___ I don't know

5. Have you made any attempts to remove or control aquatic plants in the lake by your lake shore property? **(check one)**
___ yes, I did some myself and I hired someone
___ yes, I did some myself
___ yes, I hired someone
___ no
___ I do not own or rent lake shore property

6. Who do you feel should be responsible for managing aquatic plant growth in Lake Eau Galle? **(check all that apply)**

___ local township government ___ individual land owners
___ county government ___ "Mother Nature" (i.e. no management)
___ Wisconsin DNR ___ I don't know
___ Lake Eau Galle Association ___ other (please specify) __________________

7. In the time since you started visiting/using Lake Eau Galle, would you say the amount of algae growth (both the small green particles suspended in the water and the longer, green slimy stuff attached to rocks, docks, and other plants) has:

___ increased ___ stayed the same ___ decreased ___ I don't know

SECTION 5 – Aquatic Plant Management
Aquatic plants in a lake can be managed in many different ways. Sometimes no management may be the best option. At the present time, no aquatic plant management has been completed in Lake Eau Galle. This section provides some limited information about different aquatic plant management alternatives that may be applicable in Lake Eau Galle, and then asks for your opinion about each alternative.

No Management
Contrary to popular belief, no active aquatic plant management is an alternative. This involves doing nothing and letting nature do what it does.

Physical Removal (hand and rake)
Physical removal involves only the use of hand and/or rake removal or cutting completed by property owners and/or contracted or volunteer divers (snorkel or scuba). Physical removal provides effective aquatic plant control in small areas, around docks, and for isolated plants.

Diver-Assisted Suction Harvesting (DASH)
DASH is physical removal aided by a mechanical suction apparatus. Divers pull target plant species from the bottom of the lake by hand and then feed them into a hydraulic suction tube that carries it to the surface where it is collected for disposal.

Mechanical Harvesting
Mechanical harvesting involves the use of specialized equipment that cuts or pulls aquatic plants from a lake. Mechanical harvesting is effective for both small-scale and large-scale aquatic plant management, but can increase the amount of floating plant fragments found in a lake or washed to shore. It is not a selective management action as it does not target a specific species.

Application of Aquatic Herbicides
Aquatic herbicides are granules or liquid chemicals specifically formulated for use in water to kill plants or cease plant growth. Herbicides are approved for aquatic use by the U.S. Environmental Protection Agency (EPA) and are considered compatible with the aquatic environment when used according to label directions.

Biological Control
Biological control involves using one plant, animal, or pathogen as a means to control a target species in the same environment. The goal of biological control is to weaken, reduce the spread, or eliminate the unwanted population so that native or more desirable populations can make a comeback.

Bottom Barriers and Shading
Physical barriers, fabric or other, placed on the bottom of the lake can be used to reduce aquatic plant growth.

Dredging
Dredging is the removal of bottom sediment from a lake. It is not usually performed solely for aquatic plant management but rather to restore lakes that have been filled in with sediment, have excess nutrients, need deepening, or require removal of toxic substances.

Water-level Drawdown
Drawdowns alter the plant environment by lowering the water level to a certain depth in order to expose bottom sediments to seasonal changes including temperature and precipitation.

1. Please indicate if you support or oppose each of the following aquatic plant control methods for Lake. If you are unsure about these management methods, or would not accept any of them, please check the last column.

Management Alternative	Support	Oppose	Need more Information
No Management			
Physical Removal - hand-pulling and raking			
Physical Removal – snorkel or scuba diver			
Diver-Assisted Suction Harvesting (DASH)			
Mechanical Harvesting			
Application of Aquatic Herbicides			
Biological Control			
Bottom Barriers and Shading			
Dredging			
Water-level Drawdown			

2. Please place a 1, 2, and a 3 in order of preference by the three methods that you would most support to manage aquatic plants Lake Eau Galle. If you are unsure about these management methods, or would not accept any of them, please check the appropriate blank.

   ___ No management
   ___ Physical removal - hand-pulling and raking in shallow waters
   ___ Physical removal – snorkel or scuba diver removal
   ___ Diver Assisted Suction Harvest (DASH)
   ___ Mechanical harvesting
   ___ Application of aquatic herbicides
   ___ Biological control (using one live species to control another)
   ___ Bottom barriers and shading
   ___ Dredging
   ___ Water level drawdown
   ___ None - I am unsure and need additional information to make a decision
   ___ None - I would not accept any of these management alternatives

3. If you have other suggestions for managing aquatic plants in Lake Eau Galle, or have another outcome in mind, we would like to know about them. Please use the space below to describe.

____
____
____

<u>SECTION 6 – Public Participation and Community Support</u>

Local, county, state, and federal resources will be sought in addition to Lake Eau Galle Association (LEGA) funds to implement management recommendations for Lake Eau Galle. Donations of volunteer time, services, materials, and equipment can be used as match funding for many grant programs reducing the overall financial burden to LEGA.

1. Which of the following activities, if any, would you be willing to volunteer your time for if additional assistance is needed? **(Please note this is not regarded as a commitment but rather to gauge potential interest.)**

   ___ watercraft inspection at the boat landings
   ___ lake monitoring for AIS
   ___ organizing LEGA fund raising events
   ___ water quality monitoring
   ___ shore land monitoring for AIS
   ___ raising beetles that eat purple loosestrife
   ___ photography to document lake conditions and improvements
   ___ native aquatic plant monitoring and identification
   ___ wildlife monitoring (ex. frogs, turtles, loons, other waterfowl, mussels & clams)
   ___ reestablishing rooted aquatic vegetation adjacent to your shoreline
   ___ helping property owners with the installation of shoreland buffers, native plantings, and rain gardens
   ___ improving fish and wildlife habitat by adding woody debris in the water adjacent to your shore line
   ___ I am not interested in volunteering any time **(skip to question 3)**

2. How much time would you be willing to contribute to support any of the activities in Question 1 above?

   ___ a few hours a year ___ a few days a year ___ longer periods of time

3. Professional services or special skills are sometimes needed to accomplish goals set by the LEGA. Do you have any special skills or services that you might be willing to provide if appropriate? Please check all services that you might be willing to donate to help the LEGA manage Lake Eau Galle. This is not a commitment but rather a measure of possible assistance if needed.

___ GPS use
___ grant writing
___ printing services
___ physical labor
___ sewing
___ graphic design
___ legal services
___ construction services
___ gardening/landscaping design
___ gardening/landscaping implementation
___ web development
___ scuba diving
___ outdoor sign design
___ other (please specify) ____

___ I am not interested or not able to provide any services

4. Prior to receiving this survey, did you know that there was a LEGA?

___ yes ___ no **(skip to Section 7)**

5. Have you ever attended a LEGA meeting?

___ yes **(skip to question 7)** ___ no

6. If you answered "no" in Question 5, what has prevented you from attending a LEGA meeting?

___not interested ___I don't have time ___I never know when they are occurring
___other **(please explain)** ____

7. What is your affiliation with the LEGA?

___ current member **(skip to Question 10)** ___ former member ___ I've never been a member

8. Please help us understand your reasons for not being a current member of the LEGA. **(Check all that apply)**

___ not interested
___ membership dues are too high
___ I do not have enough time
___ I disagree with what they are doing
___ I haven't been asked to be a member
___ I feel there is no benefit for being a member
___ other **(please specify)** ____

9. If you are not a current member of the LEGA, do you wish to be contacted to become a new member?

___ yes **(please fill out contact information in Section 7)** ___ no

10. How satisfied are you with the following aspects of LEGA activity? **(Please place a check mark under one column only for each activity)**

LEGA Activity	Very Satisfied	Somewhat Satisfied	Unsure	Somewhat Dissatisfied	Very Dissatisfied
LEGA communication within the community					
LEGA meeting frequency					
LEGA meeting atmosphere (parliamentary procedure)					
Getting things done					
Promoting community cooperation to achieve goals and objectives					
Management of LEGA finances					
Listening to/addressing property owners concerns					

SECTION 7 - Final Comments

1. If there are any additional issues you would like the LEGA to address, or comments you would like to make, please use the space below.

   ____
   ____
   ____
   ____
   ____

2. Thank you for your time and your answers! Providing your contact information is optional, but if you wish to, please do! Contact information will be used for follow up if needed.

Name: ____
Address____
City: ________________________________ State: _____________________ Zip: ______________________
Phone number: ___________________ Email address: ____

Appendix B – Lake Eau Galle 2024-28 Aquatic Plant Management Plan Discussion and Goals

Aquatic plants are probably the most important part of a lake ecosystem. A lake's rooted plants are the basis of the aquatic ecosystem. They capture the sun's energy and turn it into usable food, "clean" the water of excess nutrients, stabilize shorelines and lake beds, and provide habitat for other organisms like the lake's fish populations. Because of this, preserving them is critical to maintaining a lake's overall health.

WHEN IS AQUATIC PLANT MANAGEMENT NECESSARY?

In Wisconsin, there are generally two main reasons why aquatic plant management is considered: 1) Are there demonstrated ecological changes as a result of one or more specific aquatic plants (target plants)? 2) Is lake use restricted or obstructed by one or more specific aquatic plants?

To determine if the first reason applies questions like Has the target plant spread, and/or gotten denser; and has that spread and increase in density negatively impacted other, more desirable aquatic plants (non-target plants)? If the answer to these questions is generally "no", then aquatic plant management is likely not necessary.

To determine if the second reason applies, exactly where, when, and what species is causing restricted or obstructed lake use has to be determined.

IS AQUATIC PLANT MANAGEMENT NECESSARY IN LAKE EAU GALLE?

REASON 1 – DEMONSTRATED ECOLOGICAL CHANGES

Non-native, aquatic invasive species like curly-leaf pondweed and Eurasian watermilfoil can be problematic, but only when they take over habitat previously filled with other, likely more desirable native aquatic plants, creating a more monotypic plant community. Diversity is key. Generally the more diverse, i.e. a greater number of different aquatic plants in a lake, the healthier the lake is. Lake Eau Galle has a limited plant community with only a handful of different native species making the addition of any new aquatic plant, even non-natives like CLP and EWM, beneficial to the lake provided the non-natives do not take over the aquatic plant community.

This is the case in Lake Eau Galle. With CLP and EWM included, there are around 11 different aquatic plant species in the lake, well below average for lakes in the region. Where they grow is dictated by water clarity, sediment type, and available nutrients. In Lake Eau Galle, this means the bulk of the aquatic plant growth is in the 1-7ft with 4ft of water being the depth with the most abundant vegetation (Figure 1). The area of the lake that presents the best conditions for aquatic plant growth is where the delta created by the Eau Galle River begins to taper off and before the lake water gets too deep to provide the necessary sunlight (Figure 2). The map of total rake fullness for all points sampled during the 2022 survey confirms this (Figure 2). The rest of the lake has few if any aquatic plant issues.

Aquatic plant management in Lake Eau Galle should not be done for this reason.

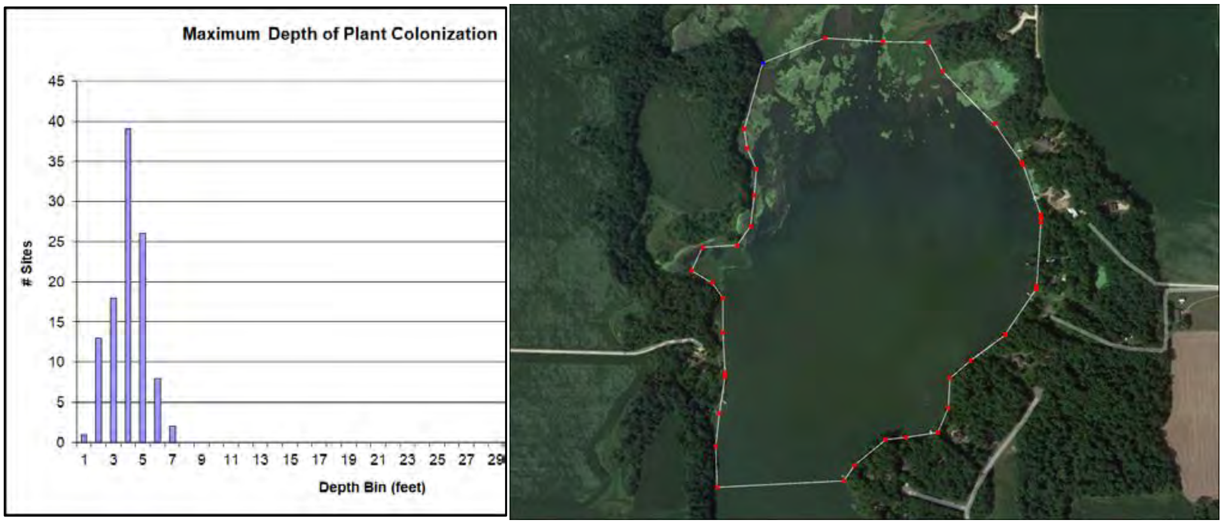
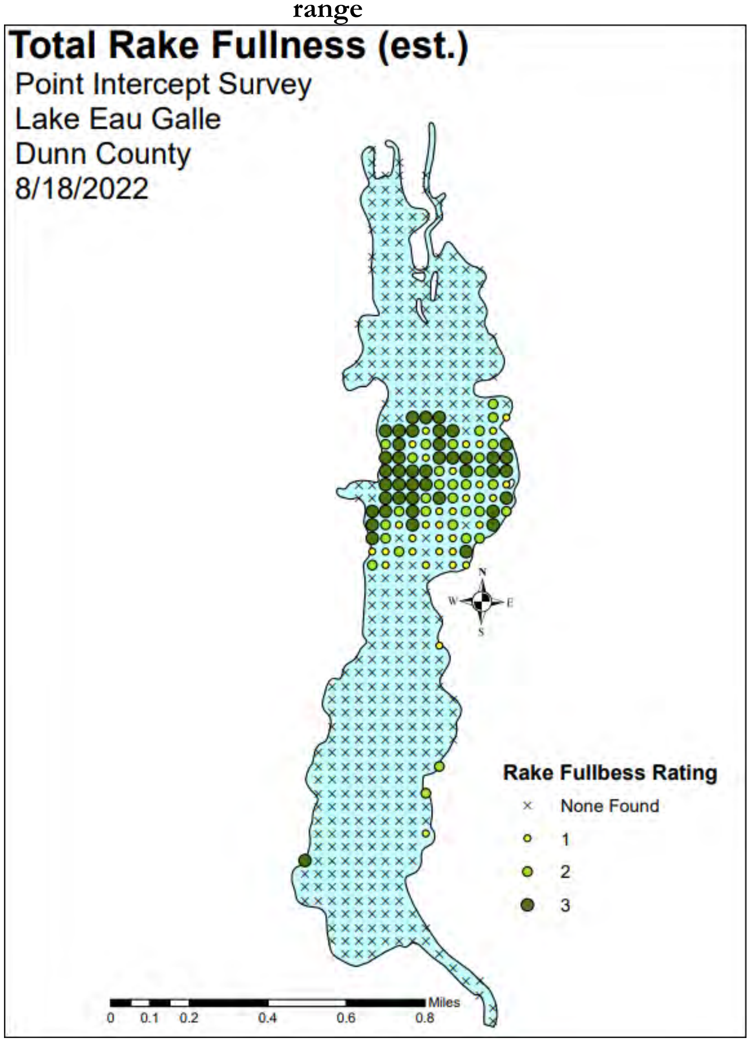


Figure 1: Depth of aquatic plant growth (Smith, 2022), and area of Lake Eau Galle in that depth range



1)

Figure 2: 2022 survey rake fullness results (Smith, 2022)

REASON 2 – RESTRICTED OR OBSTRUCTED LAKE USE

Unfortunately, the area discussed in the last section does cause restricted or obstructed access to the lake for at least a few property owners, particularly those along the northeast shore. This is confirmed based on lake use and public input survey results from early 2023 where property owners on the north half of the lake indicated that dense aquatic plant growth prevented them from doing several lake activities, more than twice as often as property owners living on the southern half of the lake.

In this area, aquatic plant management would benefit the property owners, and if limited in nature, have little negative impact on the aquatic plant community that is so vital for the health of the lake.

AQUATIC PLANT MANAGEMENT

In the public use and input survey, respondents were asked what aquatic plant management alternatives they would support. The most supported management alternative (over 84% of respondents) was the one that would help address both aquatic plant issues and sediment issues – dredging. Unfortunately, this is likely the most complicated management alternative to implement. Other management alternatives were physical removal (79%), mechanical harvesting (65% support), drawdown (48%), and application of herbicides (32%). Implementing no management was opposed by 78% of respondents.

The aquatic plant management actions recommended in this APMP takes a two-step approach. The first step is providing needed relief for those property owners who are struggling with gaining access to open water due to dense aquatic plant growth along the northeast shore of the lake. To that end, establishing a navigation/access channel along that shore to open water is recommended. The channel, as presented in Figure 3 is approximately 2,100ft long and would be made to be at least 20-ft wide. In total, just shy of an acre of surface water is included in the channel. There are multiple ways the channel could be constructed.

A private company offering mechanical harvesting could be contracted to clear the channel. Mechanical harvesting is usually limited to 3ft of water or more to reduce disturbances of the bottom and to protect the harvesting equipment. The channel in Figure 3 has been placed where mapping has indicated lake depth is 3 or more feet. One-time, contracted harvesting may not provide season-long benefit, simply because plants cut by the harvester will likely grow back over time. For this reason, it may be beneficial for LEGA to consider the purchase of their own mechanical harvester, something along the lines of the WaterGator presented in a previous section. Owning their equipment would allow harvest of the channel multiple times during the season without substantial additional cost. There are grant dollars available to help purchase a mechanical harvester through the WDNR Recreational Boating Facilities program, perhaps covering as much as 50% of the cost. Mechanical harvesting requires a WDNR permit and a designated disposal site.

The channel could also be cleared using an aquatic herbicide. In this case, a contact herbicide like endothall or diquat, expected to kill all of the plant material it comes in contact with would be the most appropriate. Use of an aquatic herbicide would not create a clearly distinct navigation lane like mechanical harvesting would due to the fact that the herbicide would likely drift off the designated channel, possibly negatively impacting nearby vegetation. In addition, it would take longer for the channel to be clear of vegetation due to the fact that it takes time for the herbicide to kill the plant and to have it drop out of the water column. The benefit is likely cost and longevity. Applying an aquatic herbicide to approximately 3-acft of water would be quick and relatively inexpensive. If an aquatic herbicide is used, one application a year would likely suffice. Herbicide application requires a WDNR permit.

Finally, limited dredging could be used to "excavate" an access channel. Dredging would both remove the aquatic plants and make the channel deeper for extended use. There are companies that could provide dredging services, though this is likely to be the most expensive way to establish the channel. It would also require consultation with the WDNR and other stakeholders. A WDNR permit is necessary to complete a dredging project in most cases (see previous section), and a place to dispose of the sediment removed is necessary.

Figure 3: Navigation/access channel along the northeast shore of Lake Eau Galle

The second step is to consider a broader approach that includes not just aquatic plant control, but also addresses the issues that cause the aquatic plant issues in the first place, namely sedimentation in the lake. This step is an important one, because aquatic plants, even the two non-native, invasive species CLP and EWM are not the problem in Lake Eau Galle. They are a symptom of a larger problem caused by sediment carried into the lake from the Eau Galle River. And, unless the larger problem of sedimentation is addressed, the aquatic plant management actions in the first step will have to be continued indefinitely.

Determining an appropriate plan to address issues with sedimentation is beyond the scope of this APMP. It is recommended that LEGA work with lake residents, area landowners, Township and County elected officials, Dunn County Land and Water Resources staff, RWE power company representatives, sportsmen's groups, and others to generate interest and secure commitments to help address the sediment problem in the lake. It can't be denied that in-filling is occurring and will continue to occur.

Sediment issues may best be addressed on a watershed level. In fact, in previous years sediment loading to the lake has been studied and lake-specific modeling to determine likely outcomes of implementing Best

Management Practices (BMPs) has been completed (The Eau Galle Aquatic Ecology Laboratory, 2003) (St. Paul District-Hydraulics/Hydrology, 2006).

CLP AND EWM

No management action other than physical removal is specifically recommended for control of CLP and EWM.

OTHER AIS MONITORING AND MANAGEMENT

Lake Eau Galle volunteers should be trained to monitor the lake and shoreline for other AIS like purple loosestrife, yellow iris, and zebra mussels. Training can be provided by State and County resource personnel through the CLMN AIS Monitoring Program. If individual purple loosestrife plants or yellow iris are found, they should be removed if possible. Any new AIS should be reported to the WDNR with samples collected to serve as vouchers.

COARSE WOODY HABITAT

Coarse woody habitat has never been quantified in Lake Eau Galle. At some point during the implementation of this 5-year plan, the amount of CWH should be quantified and willing property owners sought for the installation of one or more CWH/Fishsticks projects. Increasing the level of CWH in the lake would likely improve the overall fishery in the lake.

SHORELAND IMPROVEMENT

Making improvements to the nearshore area around the lake and upstream of the lake could benefit the lake. Information on small-scale, grant eligible projects for interested property owners can be found at https://healthylakeswi.com/

WATER QUALITY

Water quality data is very limited for Lake Eau Galle. It is recommended that Lake Eau Galle volunteers collect basic water quality data through the Citizen Lake Monitoring Network (CLMN). This program begins with the collection of water clarity data, but can be expanded to include temperature and oxygen profiling, and collection of water samples to be analyzed for total phosphorus and chlorophyll-a.

2024-2028 AQUATIC PLANT MANAGEMENT GOALS, OBJECTIVES, AND ACTIONS

Based on the information shared in this document the following aquatic plant management goals, objectives, and actions are recommended. The Goals, Objectives, and Actions are also available in Appendix A.

Goal 1 – Minimize access to open water and lake use issues caused by dense aquatic plant growth.

1) Objective 1 – Open and maintain an access channel for properties along the NE shoreline to open water.
    a) Action – Removal of aquatic plants via mechanical harvesting of a channel approximately 2,100 ft long and 20-ft
        i) Requires a WDNR Mechanical Harvesting Permit
        ii) The same channel could be opened and maintained via dredging with DNR consultation and appropriate permitting.
2) Objective 2 – Physical removal (hand-pulling and/or raking) of CLP and EWM in areas adjacent to docks, beaches, or public boat launches

a) Action – Unlimited hand-pulling and raking by property owners and/or maintenance crews to remove CLP and EWM in shallow areas considered important for public use and adjacent to developed properties.
   i) No permits are necessary

3) Objective 3 – Physical removal (hand-pulling and/or raking) of native aquatic plants in areas adjacent to docks, beaches, or public boat launches
   a) Action – Hand-pulling, raking, and/or manual cutting with removal of native aquatic plants in shallow areas considered important for public use and adjacent to developed properties.
      i) No permit is necessary
      ii) Subject to restrictions/conditions in NR 106.06(2)

Goal 2 – Reduce the threat that existing AIS will leave the lake; that new aquatic invasive species will be introduced into the lake; and that new AIS introduced to the lake will go undetected in the lake.

1) Objective 1 – Implement a Clean Boats, Clean Waters (watercraft inspection) program.
   a) Action – Complete 200 hours annually if grant funding is used.
   b) Action – Complete an unspecified number of hours if grant funding is not used.
      i) Number of hours would be determined by expected lake use.
2) Objective 2 – Monitor for the presence of AIS in the lake.
   a) Action – Participate in CLMN AIS monitoring
3) Objective 3 – Increase AIS awareness and knowledge level of the LEGA constituency and lake users.
   a) Action – Distribute AIS education and identification materials
   b) Action – Plan and implement AIS identification and physical removal workshops

Goal 3 – Promote and support nearshore and riparian best management practices that will improve fish and wildlife habitat, reduce runoff, and minimize nutrient loading into Lake Eau Galle.

1) Objective 1 – Evaluate the state of the shoreland and nearshore around Lake Eau Galle.
   a) Action – Complete a Shoreland Habitat Assessment on Lake Eau Galle.
   b) Action - Promote Healthy Lakes projects based on the results of the Shoreland Habitat Assessment.
   c) Action – Apply for Healthy Lake grant funding to support projects that improve shoreland habitat and reduce runoff into the lake.

Goal 4 – Complete appropriate and on-going monitoring and management assessment to determine changes in the health of the lake ecosystem.

1) Objective 1 – Monitor long-term trends in water quality.
   a) Action - Become a part of the CLMN Level 1 Water Quality Monitoring Program (water clarity).
   b) Action – Become a part of the CLMN Expanded Level Water Quality Monitoring Program (adding total phosphorus and chlorophyll-a monitoring).
   c) Action – In future grants, add water quality sampling for total phosphorus and chlorophyll-a (if not already being done as a part of CLMN) and total suspended sediment.
2) Objective 2 – Complete Annual Project Activity and Assessment Reports.
   a) Action – LEGA and their Consultant will prepare end-of-year reports summarizes the management actions taken and how they impacted the lake.
   b) Action – Review end of year summary reports with the LEGA constituency, other stakeholders, and WDNR to determine following year management actions.

Goal 5 – Implement the 2024-28 Lake Eau Galle Aquatic Plant Management Plan effectively and efficiently with a focus on community and constituent education, information, and involvement.

1) Objective 1 - Build and support partnerships.
   a) Action – Work with WDNR, Dunn County, local Towns, Renewable World Energies, local businesses, contractors, and other resources to support management actions.
2) Objective 2 – Keep lake residents are informed about planned activities
   a) Action – Continue reaching out to the lake constituency to inform and seek input for management actions.
3) Objective 3 - Select cost effective implementation actions
   a) Action – Work within the budget constraints to establish the best management actions to implement annually.
   b) Action – Continue to investigate the use of dredging to make improvements to the lake and aquatic plant community.
   c) Action – Apply for State of Wisconsin grant funding to support education, planning, and management implementation.

Recommended Implementation, Funding, and Priority Plan for the 2024-28 Lake Eau Galle Aquatic Plant Management Plan

	Goals/Objectives/Actions	Priority Level	Healthy Lakes Grant	CBCW Grant	AIS Education Grant	AIS Population Control Grant	LPL Grant	Implementers	2024	2025	2026	2027	2028
1. Minimize access to open water and lake use issues caused by dense aquatic plant growth.													
1.1 Open and maintain an access channel from properties along the NE shoreline to open water.													
1	Removal of aquatic plants via mechanical harvesting of a channel approximately 2,100 ft long and 20-ft.						×	LEGA, RP	×	×	×	×	×
1.2 Physical removal (hand-pulling and/or raking) of CLP and EWM in areas adjacent to docks, beaches, or public boat launches.													
1	Unlimited hand-pulling and raking by property owners and/or maintenance crews to remove CLP and EWM.							LEGA, RP	×	×	×	×	×
1.3 Physical removal (hand-pulling and/or raking) of native aquatic plants in areas adjacent to docks, beaches, or public boat launches.													
1	Hand-pulling, raking, and/or manual cutting with removal of native aquatic plants.							LEGA, RP	×	×	×	×	×
2. Reduce the threat that a new AIS will be introduced and go undetected in Gilmore Lake or that an existing AIS will be carried to other lakes													
3.1 Implement a Clean Boats, Clean Waters (CBCW) watercraft inspection program annually													
1	Complete 200 hours annually if grant funding is used.			x				LEGA	?	?	?	?	?
2	Complete an unspecified number of hours if grant funding is not used.								×	×	×	×	×
3.2 Monitor for the presence of AIS in the lake.													
1	Participate in CLMN AIS monitoring.				×		×	LEGA	×	×	×	×	×
3.3 Increase AIS awareness and knowledge level of the LEGA constituency and lake users.													
1	Distribute AIS education and identification materials.				×		×	LEGA	×	×	×	×	×
2	Plan and implement AIS identification and physical removal workshops.				×		×	LEGA	×	×	×	×	×
3. Promote and support implementation of nearshore and riparian best management practices													
4.1 Evaluate the state of the shoreland and nearshore around Lake Eau Galle.													
1	Complete a Shoreland Habitat Assessment .						×	LEGA		×			
2	Promote Healthy Lakes projects based on the results of the Shoreland Habitat Assessment.							LEGA		×	×	×	
3	Apply for Healthy Lake grant funding to support projects that improve shoreland habitat and reduce runoff into the lake.		x					LEGA			×		
4. Complete appropriate and on-going monitoring and management assessment to determine changes in the health of the lake ecosystem.													
4.1 Monitor long-term trends in water quality.													
1	Become a part of the CLMN Level 1 Water Quality Monitoring Program (water clarity).							LEGA, WDNR	×	×	×	×	×
2	Become a part of the CLMN Expanded Level Water Quality Monitoring Program (adding total phosphorus and chlorophyll-a monitoring).							LEGA, WDNR	?	?	?	?	?
3	In future grants, add water quality sampling for total phosphorus and chlorophyll-a (if not already being done as a part of CLMN) and total suspended sediment.				×		×	LEGA, RP	?	?	?	?	?
4.2 Complete Annual Project Activity and Assessment Reports.													
1	LEGA and their Consultant will prepare end-of-year reports summarizes the management actions taken and how they impacted the lake.				×		×	LEGA, RP	×	×	×	×	×
2	Review end of year summary reports with the LEGA constituency, other stakeholders, and WDNR to determine following year management actions.				×		×	LEGA, RP, WDNR	×	×	×	×	×
5. Implement the 2024-28 Lake Eau Galle Aquatic Plant Management Plan effectively and efficiently with a focus on community and constituent education, information, and involvement.													
5.1 Build and support partnerships.													
1	Work with WDNR, Dunn County, local Towns, Renewable World Energies, local businesses, contractors, and other resources to support management actions.				×		×	LEGA, RP	×	×	×	×	×
5.2 Keep lake residents are informed about plan activities.													
1	Continue reaching out to the lake constituency to inform and seek input for management actions.				×		×	LEGA	×	×	×	×	×
5.3 Select cost effective implementation actions.													
1	Work within the budget constraints to establish the best management actions to implement annually.				×		×	LEGA	×	×	×	×	×
2	Continue to investigate the use of dredging to make improvements to the lake and aquatic plant community.						×	LEGA, RP	×	×	×	×	×
3	Apply for State of Wisconsin grant funding to support education, planning, and management implementation.				×		×	LEGA, RP	×	×	×	×	×

Implementers: LEGA, Lake Eau Galle Association; RP, resource professionals/consultant; WDNR, Wisconsin Department of Natural Resources; CLMN, Citizen Lake Monitoring Network; AIS, aquatic invasive species; CBCW, Clean Boats, Clean Waters; CLP, Curly-leaf pondweed; EWM, Eurasian watermilfoil; LPL, Lake Planning.