Aquatic Plant Management Plan

Bear Trap Lake and Lake Wapogasset

Polk County, Wisconsin

June 2022

Sponsored by:

LWBT SANITARY DISTRICT

Support from:

WAPOGASSET LAKE ASSOCIATION BEARTRAP

Consulting Partners:

Harmony Environmental
Finding a balance
People Land Water

Ecosystem Society Economy
Ecological Integrity Service, LLC

Grant Support from:

WISCONSIN DEPT. OF NATURAL RESOURCES

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June 30, 2022

Mark Jacobson, Commissioner
Lake Wapogasset and Bear Trap Lake Sanitary District
777 South Shore Drive
Amery, WI 54001

Subject: Wapogasset and Bear Trap Lakes APM Plan Review and Approval

Dear Commissioner Jacobson,

Thank you for your efforts to understand, protect, and improve Wapogasset and Bear Trap Lakes! This letter is to notify you that the June 2022 Aquatic Plant Management Plan (Plan) meets the criteria under Administrative Codes NR109 and NR 193 and thus, the DNR has approved the Plan.

Approved management activities in the Plan and outlined below are eligible for funding under the Surface Water Grants program subject to the application requirements of the program.

Approved management recommendations include the following:
1. Educational activities involving AIS, lake stewardship, habitat, aquatic plants, shoreline health, etc.
2. Water quality, AIS, and aquatic plant monitoring activities
3. Shoreline activities to reduce external phosphorus loading and improve habitat

Please note: Permits may be required for activities included within the Plan. This approval letter does not substitute or negate the need for permit approval prior to beginning projects. Also, aquatic plant management for the purposes of nuisance relief or navigation are not eligible for Surface Water Grant funding. The Department reserves the right to inspect nuisance or navigation conditions prior to permitting aquatic plant management activities.

Thanks to you and the lake community for continuing your efforts to protect and improve Wapogasset and Bear Trap Lakes.

Sincerely,

Alex Smith
Lake Biologist

CC: Mark Hazuga, Tyler Mesalk, Ali Mikulyuk – WDNR
Cheryl Clemens – Harmony Environmental

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Introduction

This aquatic plant management (APM) plan update is sponsored by the Lake Wapogasset and Bear Trap Lake Sanitary District (Sanitary District). The Lake Wapogasset/Bear Trap Lake Improvement Association (Lake Association) is a partner in plan development and implementation. The aquatic plant management plan for Lake Wapogasset and Bear Trap Lake was first developed in 2010 and was updated in 2015. The 2022 APM plan update was funded by a Wisconsin Department of Natural Resources Surface Water Grant, the Sanitary District, and the Lake Association.

The plan presents a strategy for managing aquatic plants by protecting native plant populations, reducing impacts of curly-leaf pondweed, and preventing the establishment of additional invasive species. It includes data about the plant community, fisheries, watershed, and water quality. Based on this data and public input, goals and strategies for the sound management of aquatic plants in the lakes are presented. This plan will guide the Sanitary District, the Lake Association, and the Wisconsin Department of Natural Resources in aquatic plant management for project lakes over the next five years (from 2023 through 2028).

Public Input

The Aquatic Plant Management (APM) Advisory Committee provided input for the development of this plan. The APM Advisory Committee included representatives from the Sanitary District and Sanitary District Conservancy, the Lake Association and the Balsam Branch Partnership. It also included lake residents representing various interests. The APM Advisory Committee met three times. All meetings of the committee were noticed in the Amery Free Press.

At the first meeting on January 20, 2022 the committee reviewed plan goals, identified plant management concerns, and reviewed progress toward 2015 APM goals and objectives including for the curly-leaf pondweed harvesting program. At a second meeting on February 22, 2022 the committee finalized the curly-leaf pondweed harvesting program, discussed aquatic invasive species prevention and monitoring, and reviewed navigation management. The third meeting on March 22, 2022 considered plan implementation with a focus on the educational strategy. The APM Advisory Committee concerns are reflected in the goals and objectives for aquatic plant management in this plan.

The Sanitary District Board announced the availability of the draft Aquatic Plant Management Plan for review with an email to lake residents and in a public notice of the Sanitary District meeting in the Amery Free Press the week of May 1, 2022. The plan was available for public review on the Sanitary District web site: wapobear.com for four weeks. Comments were accepted through June 1, 2022. Two comments which provided input, but didn't result in plan changes were received.

Resident Concerns

The APM Advisory Committee expressed a variety of concerns that are reflected in the goals and objectives for aquatic plant management in this plan. Management concerns included preserving native plants, preventing introduction of invasive species, quantifying project results, funding projects, and mitigating runoff to the lakes. Water quality concerns are outside the scope of this plan and, aside from

curly-leaf pondweed harvesting to remove nutrients and promotion of shoreline runoff mitigation, will be deferred until the comprehensive lake management plan is updated.

Lake Organizations

The Lake Wapogasset and Bear Trap Lake Sanitary District (Sanitary District) and the Lake Wapogasset and Bear Trap Lake Improvement Association (Lake Association) cooperatively manage the lakes. The Sanitary District operates and maintains a sanitary sewer system and wastewater treatment plant. The District also manages a curly-leaf pondweed harvesting program and is leading this plan update.

The Conservancy Committee of the Sanitary District completed a water quality project to reduce nutrient loading from a farm field to Friday Creek and Lake Wapogasset in cooperation with Polk County Land and Water Resources Department in 2015 and is working on a new property acquisition in 2022.

The Lake Association sponsors the Clean Boats, Clean Waters program with the Sanitary District as the fiscal agent. It also supports Healthy Lakes grants and projects. Lake Association volunteers collect Citizen Lake Monitoring data measuring Secchi depth and collecting water samples to measure total phosphorus and chlorophyll a. They also take temperature and oxygen profiles in the deep holes of each lake.

There is also an active Lake Association AIS monitoring program on the lakes. This includes installation and monitoring of Zebra Mussel plate samplers and three volunteer groups who periodically check the lakes for Eurasian water-milfoil and other AIS. The Lake Association also plans and hosts social activities such as a spring social, flotilla, picnics, and Fourth of July "light up the lake." It also hosts an outstanding volunteer recognition dinner.

Lake Information

The Lakes

The project area is in southwestern Polk County, Wisconsin in the towns of Lincoln (T33N R17W and R16W) and Garfield (T33N R17W). Project lakes include Bear Trap Lake (WBIC: 2618100) and Lake Wapogasset (WBIC: 2618000). Bear Trap Lake is a 241-acre lake with a maximum depth of 25 feet. Lake Wapogasset is a 1,186-acre lake with a maximum depth of 32 feet. Development around the lakes is moderate to heavy with much of the lakeshore and some back lots developed for residential use.

The maximum depth to which plants grow (the littoral zone) varies based on water clarity and light penetration. The littoral zone reached a depth of more than 18 feet in Bear Trap Lake and 21.8 feet in Lake Wapogasset in 2020. Table 1 summarizes information about project lakes.

Bear Trap Lake and Lake Wapogasset are drainage lakes that are connected by a channel locally referred to as the "narrows." Lake Wapogasset has two inlets, Balsam Branch and Friday Creek. Balsam Branch contributes a large portion of the water to the lake, and Friday Creek has substantially less flow. A single outlet, Mud Creek/Sucker Branch, exits Lake Wapogasset along the west shoreline. A dam on the outlet establishes a fixed water level on the lakes. The five-foot high concrete dam holds back three feet of water. It is owned by the Lake Association. Bear Trap Lake does not have tributaries that flow continuously.

Table 1. Lake Characteristics

	Bear Trap Lake	**Lake Wapogasset**
WBIC	2618100	2618000
Location	T33N R17W S25	T33N R17N S26
Area	241 acres	1,186 acres
Lake Classification	Shallow Lowland Drainage	Shallow Lowland Drainage
Maximum Depth	25 feet	32 feet
Mean Depth	10.9 feet	9.8 feet
Littoral Zone Depth	18 feet	21.8 feet
Trophic State	Eutrophic	Eutrophic

Primary Human Use Areas

Lake Wapogasset has public boat landings at Sunrise Beach Drive and County Highway F. The Highway F/Garfield landing includes a public fishing pier and picnic shelter. A YMCA Camp and Lutheran Bible Camp are located on the lake. Waterside, a restaurant, is located on the north end of Lake Wapogasset. There is a dock and boat launch there along with five boat and trailer parking places. Bear Trap Lake has a gravel public boat access on South Shore Court.

Development around the lakes is extensive with few undeveloped areas adjacent to the lakes. Waterfront property owners and the general public use the lakes for a wide variety of activities including fishing, boating, swimming, and viewing wildlife.

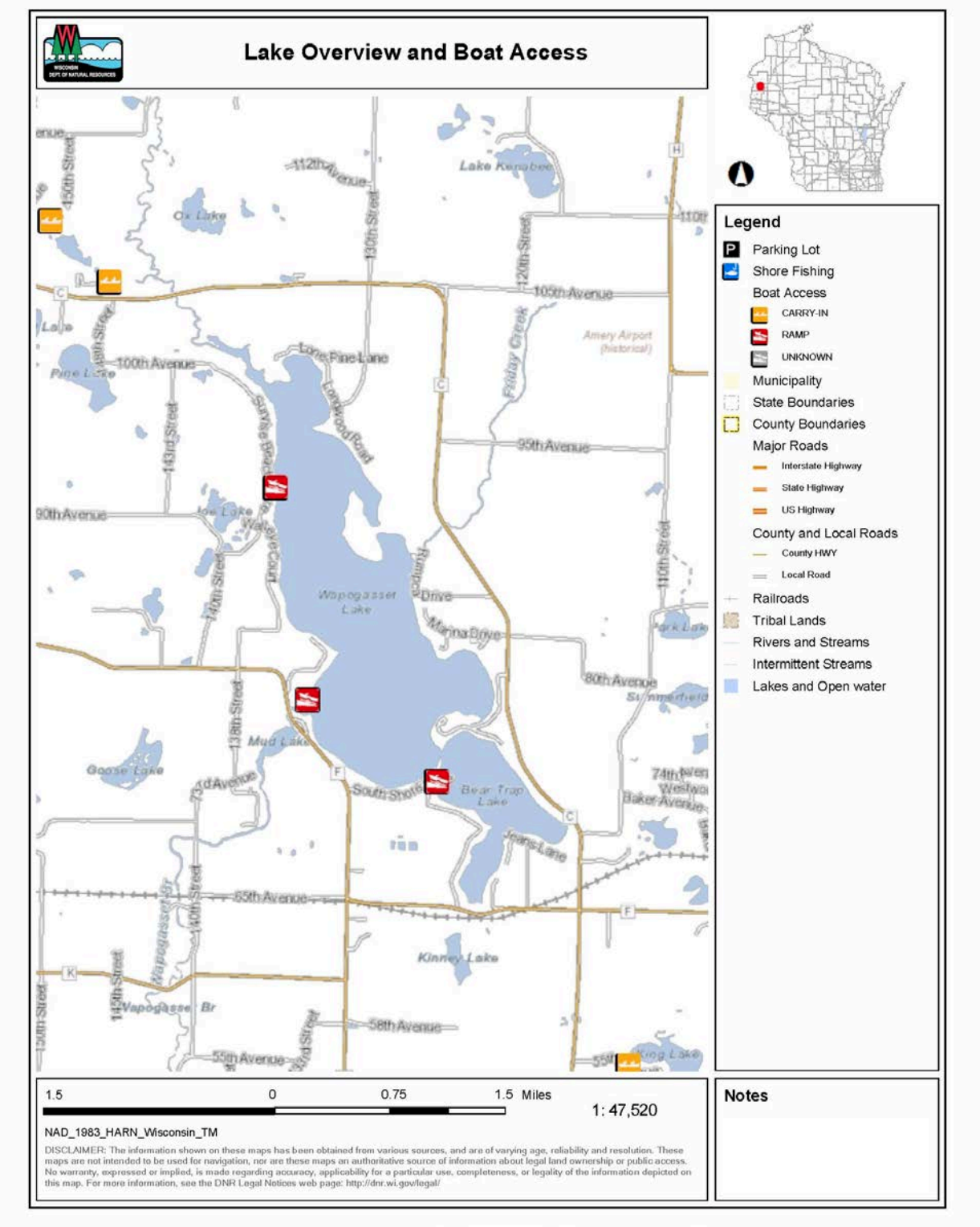

Figure 1. Lake Wapogasset and Bear Trap Lake Tributaries and Boat Landings

Water Quality

The Wisconsin Department of Natural Resources uses data collected by citizen volunteers and during water quality studies to characterize lakes.

Citizen Lake Monitoring Network Results[1]

Lake resident volunteers have collected Secchi disc self-help monitoring data since 1991 (although not every year). Secchi depths are the most commonly collected self-help lake monitoring data reported. Secchi depths measure water clarity. The Secchi depth reported is the depth at which the black and white Secchi disk is no longer visible when it is lowered into the water. Greater Secchi depths occur with greater water clarity. Results of average July and August Secchi depth readings for each lake are shown in Figures 2 and 3. Water clarity is generally higher on Bear Trap Lake.

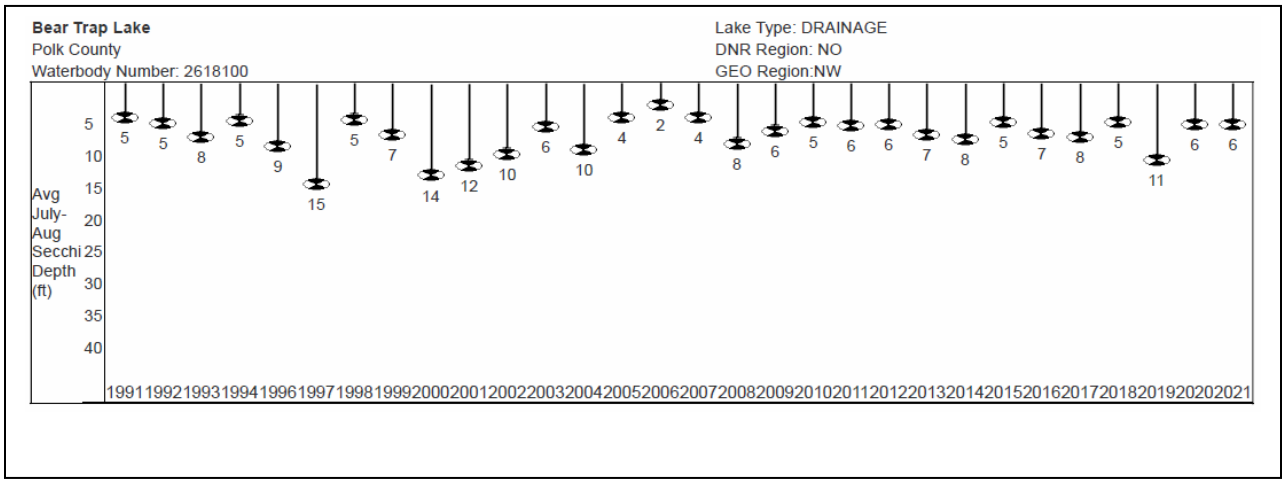

Figure 2. Bear Trap Lake Secchi Depth 1991-2021

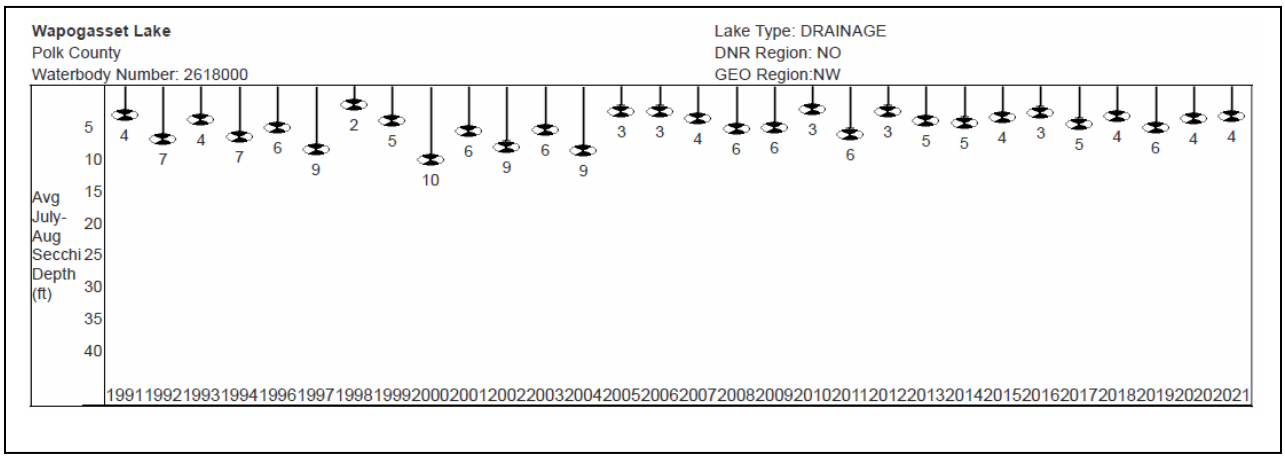

Figure 3. Lake Wapogasset Secchi Depth 1991-2021

[1] https://dnr.wisconsin.gov/topic/lakes/clmn

Trophic State

Trophic state describes the productivity of a lake. Lakes with more nutrients have higher productivity and support more algae and plant growth. The least productive lakes are oligotrophic lakes. The most productive lakes are classified as eutrophic. Those in the middle are mesotrophic. Lake Wapogasset and Bear Trap Lake are classified as eutrophic or nutrient rich lakes with trophic state indices generally >50. Eutrophic lakes have high nutrient levels and frequent algae blooms.

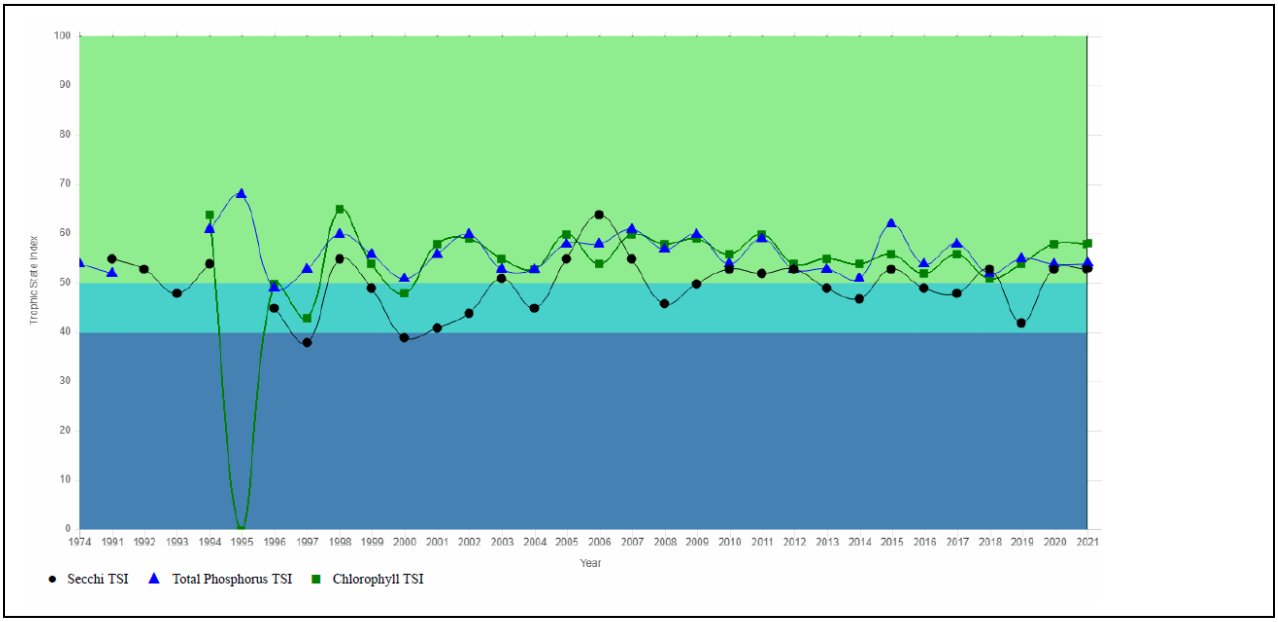

Figure 4. Bear Trap Lake Trophic State 1991to 2021

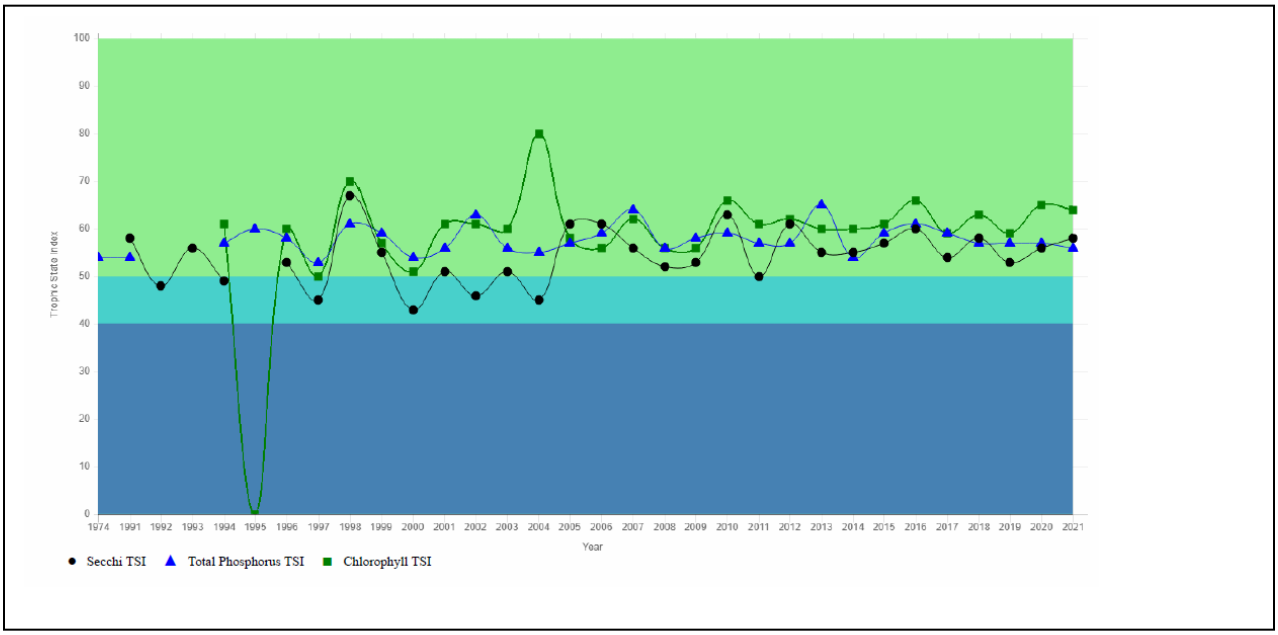

Figure 5. Lake Wapogasset Trophic State 1991 to 2021

Wisconsin Water Quality Standards

The Wisconsin Department of Natural Resources publishes a list of waters considered impaired, as required by the federal Clean Water Act, every two years. Impaired waters are those that do not meet water quality standards and may not support fishing, swimming, recreating, or public health and welfare. A water body is considered healthy when it supports:

- healthy aquatic animal and plant communities,
- safe human recreation like swimming, and
- safe fish consumption.

If any of these are not supported, then the water is considered impaired (Wisconsin Department of Natural Resources, 2021). Both Bear Trap Lake and Lake Wapogasset are listed as impaired waters.[2]

Bear Trap Lake (WBIC 2618100) was placed on the impaired waters list for excess algal growth in 2014. The 2018 assessments showed continued excess algal growth: chlorophyll-a sample data exceeded the 2018 WisCALM listing thresholds for the Recreation use. In 2020 chlorophyll-a sample data was described as follows: "may meet" 2020 WisCALM listing thresholds for the Recreation use and were "clearly below" the Fish and Aquatic Life standards. Total phosphorus data were "clearly below" the Recreation use and Fish and Aquatic Life use listing thresholds in both 2018 and 2020.[3]

Wapogasset Lake (WBIC 2618000) was placed on the impaired waters list for total phosphorus/excess algal growth in 2012. Based on updated information in 2018, the impairment of Eutrophication was added to this listing. The 2020 assessments showed continued excess algal growth: new chlorophyll-a sample data exceeded the 2020 WisCALM listing thresholds for Recreation use and Fish and Aquatic Life use.[4]

Phosphorus is the nutrient that leads to algae growth in project lakes. Sources of phosphorus external to the lake (tributaries, watershed, and atmosphere) were examined in a study from 2006 and 2007. Results are reported in the 2015 aquatic plant management plan (Schieffer, Lake Wapogasset and Bear Trap Lake Aquatic Plant Management Plan, 2015). Internal loading from lake sediments is also a significant source of phosphorus which was a targeted by an alum treatment in 1999. Results of the alum treatment are reported in previous plans, and not repeated here.

Aquatic Plant Management for Water Quality

Plant management can reduce phosphorus by preserving native plant growth. In addition, harvesting of curly-leaf pondweed (CLP) is used, in part, to remove phosphorus from the lakes. The 2015 aquatic plant management plan proposed to track the amount of CLP harvested and resulting phosphorus removed

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[2] https://dnr.wi.gov/water/waterDetail.aspx?key=16455

[3] Water Detail - Bear Trap Lake, Balsam Branch Watershed (SC05) (wi.gov) 12/06/2021

[4] Water Detail - Wapogasset Lake, Balsam Branch Watershed (SC05) (wi.gov)

from the lake. Further, the plan was to look for any correlation between phosphorus removal from CLP harvesting and declines in in-lake phosphorus concentrations and increases in Secchi depth in late July and August.

Lake Scientist, Steve Schieffer, compared the late July[5] Secchi reading year-over-year trends for each lake 1) before CLP harvesting began in 2017 and 2) including the years before and after harvesting CLP began. The goal stated in the 2015 APM plan was to increase August Secchi depth by one foot. For Lake Wapogasset, there was a weak improvement in the Secchi depth trend line when comparing before harvesting (Figure 6) and all years measured (Figure 7). That trend was not evident in Bear Trap Lake (Figure 8 and Figure 9). The Sanitary District did not increase total phosphorus monitoring as recommended in the 2015 aquatic plant management plan because of budget concerns, so potential changes in phosphorus concentration cannot be examined.

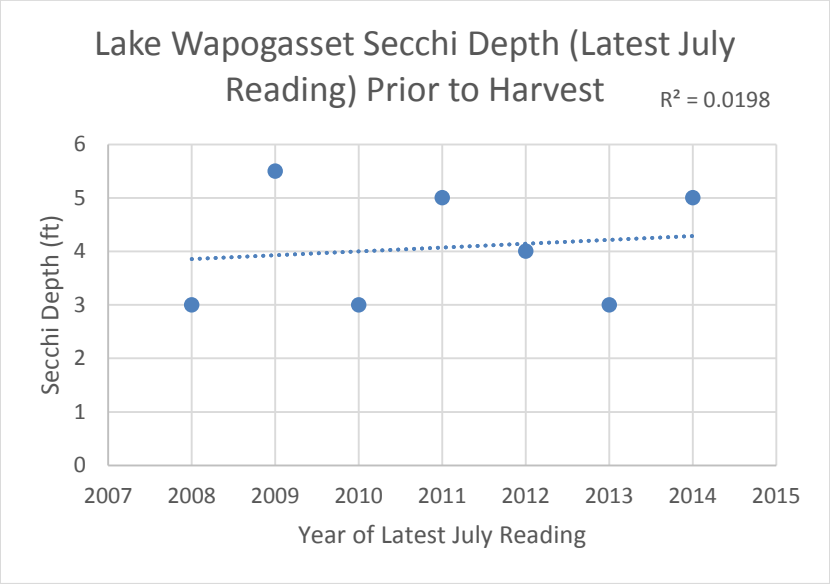

Figure 6. Lake Wapogasset Secchi Late July Depth Prior to CLP Harvest

[5] Actual Secchi readings were taken between July 17 and August 3.

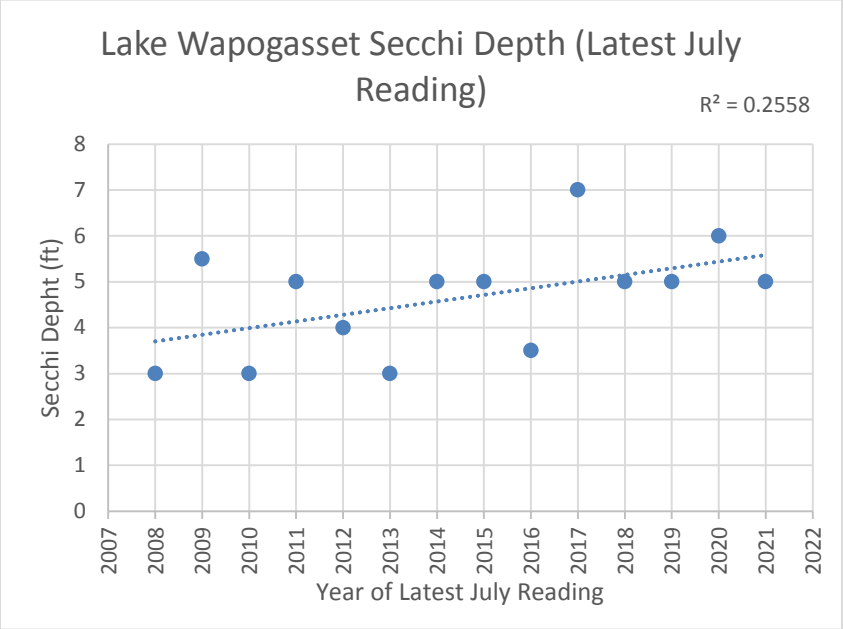

Figure 7. Lake Wapogasset Late July Secchi Depth 2007 – 2021

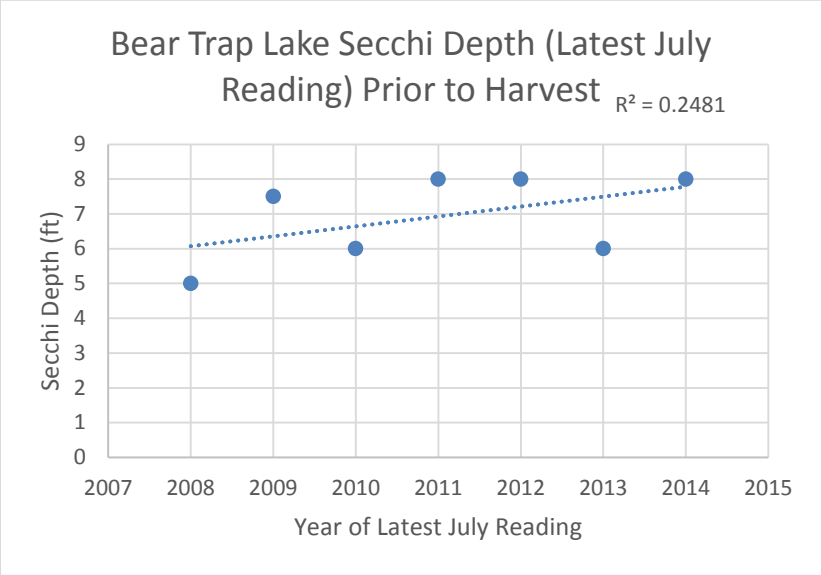

Figure 8. Bear Trap Lake Late July Secchi Depth Prior to CLP Harvest

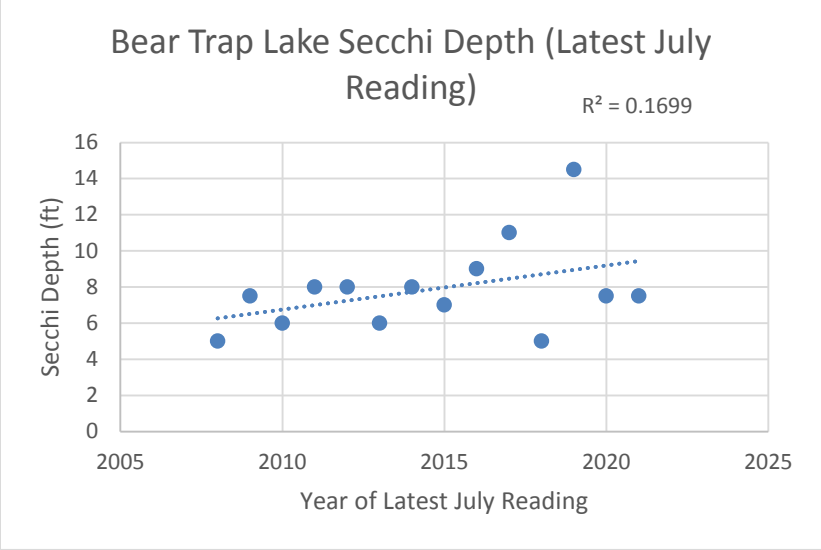

Figure 9. Bear Trap Lake Late July Secchi Depth 2006 - 2021

Fisheries

Both Lake Wapogasset and Bear Trap Lake have diverse and well-rounded fisheries. Fish species include: walleye, northern pike, muskellunge, largemouth bass, smallmouth bass, white bass, bluegill, black crappie, pumpkinseed, yellow perch, green sunfish, warmouth, white sucker, common carp, redhorse, and bullheads (Cole, 2014).

Walleye management in these two lakes has included a long history of stocking walleye fry and small fingerlings. Beginning in 2014, Wapogasset and Bear Trap Lakes began receiving large fingerling (6-8 in) walleye at stocking rate of 15 fish per acre on an alternate year basis. These stockings have greatly improved the walleye populations in both lakes. The densities of adult walleye were estimated to be 4.3 adults per acre in Wapogasset Lake and 4.0 adults per acre in Bear Trap Lake during the 2019 DNR fisheries survey. Both estimates were the highest densities documented for either lake.

The lakes also support a popular musky fishery. Musky populations in these lakes are managed for lower density and high size structure populations.

Largemouth bass had a higher abundance and lower size structure in recent years. However, the bass regulation in both lakes was changed to a 14-18 inch protected slot limit to increase harvest of the abundant population under 14 inches. This regulation could decrease the abundance and increase the size structure of the largemouth bass population.

Wapogasset and Bear Trap Lakes also support desirable panfish populations. Populations of bluegill, black crappie, and yellow perch typically have moderate abundance and higher size structure on these lakes. In addition to the typical panfish species, these lakes also contain populations of white bass and warmouth.

When considering fish in the management of plants in Lake Wapogasset and Bear Trap Lake, the following should be considered:

1. Although natural walleye reproduction is minimal, it does occur. Walleye spawn on clean gravel beds. Sedimentation can render them useless as spawning beds. It is therefore important to keep sedimentation to a minimum by maintaining native shorelines and restoring developed shorelines to native vegetation.

2. Muskellunge reproduce in the spring at water temperatures in the mid-50s F. They also spawn amongst aquatic vegetation and/or woody debris. CLP harvesting likely occurs following musky spawning. When CLP is at the surface and appropriate for harvesting, water temperature is likely above 60 degrees F.

   Early season herbicide treatment could affect muskellunge reproduction because it removes vegetation earlier. CLP may be used by muskellunge for cover and forage areas early in the spring. However, muskellunge reproduction is limited in project lakes.

3. Black crappies also spawn when the water temperature is the same as recommended for early-season CLP herbicide treatment. If herbicide treatment is used, it would need to be timed either prior to or after crappie spawning.

4. Northern pike rely on aquatic plants for spawning. However, they spawn when water temperatures are in the 40s F, so treatment of herbicides in the mid-50s F, and harvesting above 60 degrees F, should not coincide with the northern pike spawning activity.

Table 2. Game Fish Spawning Temperature and Substrate Needs

Fish species[6]	Spawning Temp in °F	Spawning substrates
Black crappie	Upper-50s to lower-60s	Build nests in 1-6 feet on hard bottom
Bluegill, Largemouth bass and Pumpkin seed	Mid-60s to lower-70s	Build nests in less than 3 feet on hard bottom
Muskellunge[7]	Mid-50s to near 60	Broadcast eggs over organic sediment, woody debris, and submerged vegetation.
Northern Pike	Upper-30s to mid-40s soon after ice-out	Broadcast eggs onto vegetation (eggs attach)
Smallmouth Bass	Usually between 62 and 64 but recorded as low as 53	Nests in circular, clean gravel
Walleye	Low-40s to 50	Gravel/rocky shoals with moving or windswept water 1-6 feet deep
Yellow perch	Mid-40s to lower-50s	Broadcast eggs in submergent vegetation or large woody debris

[6] Heath Benike. Wisconsin DNR Fisheries Biologist. 2006

[7] Rust, Ashely J., James Diana, Terry L. Margenau, and Clayton J. Edwards. Lake Characteristics Influencing Spawning Success of Muskellunge in Northern Wisconsin Lakes. *North American Journal of Fisheries Management*. 2002. p834.

Sensitive Habitats and Species

The Wisconsin Department of Natural Resources (WDNR) conducted a sensitive area survey on Lake Wapogasset in 1989. Seven locations around the lake were recorded as "sensitive areas" based upon their importance as habitat in the lake ecosystem. Table 3 describes locations, lists importance, and suggests protection measures for each sensitive area. A sensitive area survey was also completed for Bear Trap Lake in 1989, and two sensitive areas were identified as described in Table 4.

Table 3. Lake Wapogasset Sensitive Area Descriptions

Area	Location/description	Importance	Protection
A	3000 feet of shoreline extending from Friday Creek to YMCA camp	Habitat for centrachid and esocid species of fish; important wildlife habitat	Chemical and mechanical treatments should not be allowed.
B	2000 feet of shoreline out 200 feet on East shore of Wapogasset	Rock and gravel bottom with no silt that provides walleye spawning	No dredging, structures or deposits should occur.
C	1500 feet of shoreline out 200 feet near bible camp.	Rock and gravel bottom with no silt that provides walleye spawning.	No dredging, structures or deposits should occur
D	2000 feet of shoreline out 200 feet on western shore of Wapogasset	Rock and gravel bottom with no silt that provides walleye spawning	No dredging, structures or deposits should occur
E	Entrance of Balsam Branch into Wapogasset and surrounding wetlands/approx. 3500 feet of shoreline	Habitat for centrachid and esocid species of fish for spawning and nursing; important wildlife habitat; wild rice in the area Wild Rice observed	Chemical and mechanical treatments should not be allowed
F	A small bay on north end of Wapogasset/approx. 800 feet of shoreline	Habitat for centrachid and esocid species of fish for spawning and nursing; important wildlife habitat	Chemical and mechanical treatments should not be allowed
G	Located along YMCA camp out 200 feet covering approx. 900 feet of shoreline	Rock and gravel bottom with no silt that provides walleye spawning	No dredging, structures or deposits should occur

Table 4. Bear Trap Lake Sensitive Area Descriptions

Area	Location/description	Importance	Protection
A	Southern bay of Bear Trap Lake near County F	Habitat for centrachid and esocid species of fish for spawning and nursing; important wildlife habitat	Chemical and mechanical treatments should be limited to navigation channels
B	Along northwest shoreline of Bear Trap Lake including narrows leading to Lake Wapogasset.	Habitat for centrachid and esocid species of fish for spawning and nursing; important habitat forage species; important wildlife habitat	Chemical and mechanical treatments should be limited to 80 feet from shoreline

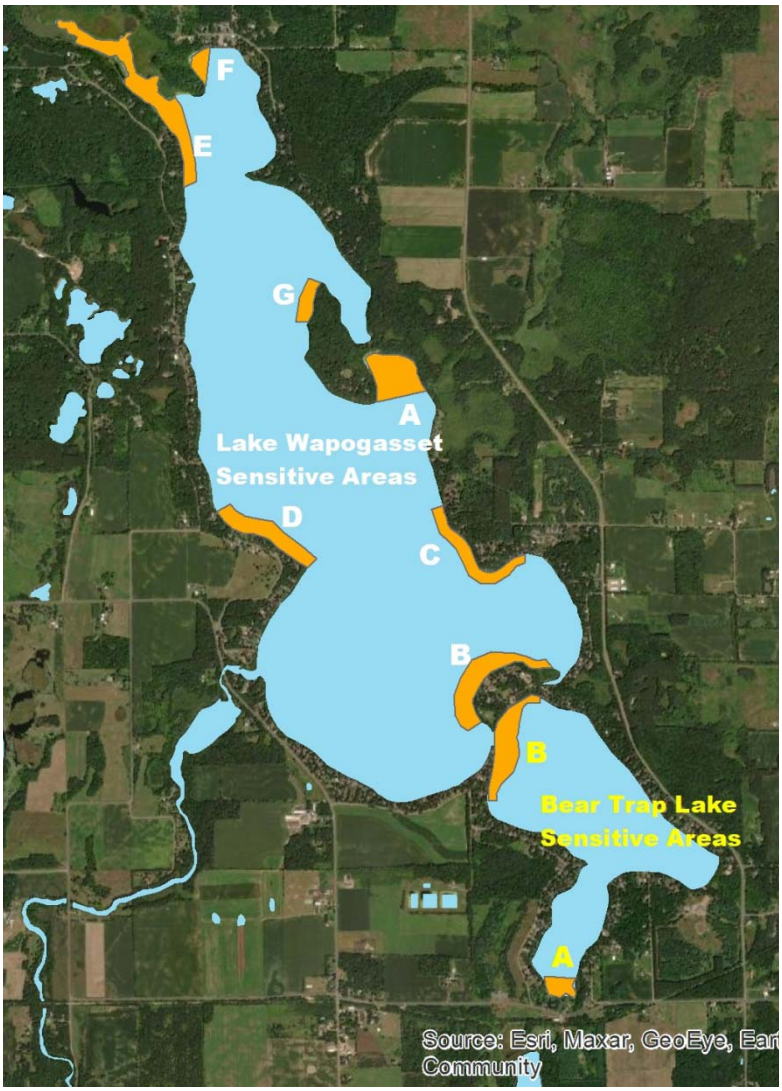

Figure 10. Sensitive Areas on Lake Wapogasset and Bear Trap Lake

Special Concern Species

According to the Wisconsin Natural Heritage Inventory, the Blandings Turtle *(Emydoidea blandingii)* is the only aquatic flora or fauna reported as endangered, threatened, rare, or of special concern in geographic areas (Town and Range) where Lake Wapogasset and Bear Trap Lake are located.[8] The Blandings Turtle is considered "a protected wild animal." Bald eagles are not represented, and sensitive species vulnerable to collection and disturbance have been removed from lists available to the public, where applicable.

[8] Natural Heritage Inventory data access - Wisconsin DNR Updated October 13, 2021.

Plant Community

Importance of Aquatic Plants

The lake ecosystem relies extensively on the littoral zone, which is the area of the lake where the light penetrates and allows growth of aquatic plants. The aquatic plant community plays an important role in maintaining a healthy lake ecosystem.

Emergent plants (which stick above the water surface) can help filter runoff that enters the lake from the watershed area. Their extensive root networks can stabilize sediments on the lake bottom. Wave energy is reduced by emergent plants, thus decreasing shoreline erosion. Emergent plant beds provide important fish habitat and spawning areas as well as key wildlife habitat. Many birds, waterfowl, and some mammals rely on emergent plants for food and nesting materials.

Floating-leaf plants such as water lily also reduce wave energy and erosion. In addition, they provide shade and cover for invertebrates and fish. Although they appear thick on the surface, the underwater area beneath them is more open. This allows fish and other animals to move about hidden by the leaves above.

Submergent plants provide many benefits to the lake ecosystem. These plants are nature's aerators, producing the essential oxygen byproduct from photosynthesis. Submersed plants absorb nutrients through their roots and in some cases through their leaves, decreasing the nutrients that would otherwise be available for nuisance algae growth. Roots stabilize bottom sediments thus reducing re-suspended sediments. As a result, these plants help maintain water clarity.

Aquatic plants take on many shapes and sizes and provide excellent habitat. Many aquatic plants, such as the milfoils and water marigold, have fine leaves that provide key invertebrate habitat. Invertebrates comprise an important level in the food chain and result in excellent forage opportunities for fish. Other plants are adapted to grow in low nutrient substrates such as sand and gravel. These plants maintain important fish and wildlife cover for areas that would otherwise be devoid of plants.

Many fish rely on aquatic plants for reproduction. Northern pike often spawn amongst submergent plants with eggs that are adapted for attachment to the plants. Once fish emerge from their eggs, the plants provide important cover and foraging areas.

Protection against Invasive Species

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

Removal of native vegetation not only diminishes the natural qualities of a lake, but it increases the risk of non-native species invasion and establishment. The presence of invasive species can change many of the natural features of a lake and often leads to expensive annual control measures. Allowing native

plants to grow may not guarantee protection against invasive plants, but it can discourage their establishment. Native plants may cause localized concerns to some users, but as a natural feature of lakes, they generally do not cause harm.[9]

Aquatic Plant Survey Results

Ecological Integrity Service conducted aquatic macrophyte (plant) surveys on Bear Trap Lake and Lake Wapogasset in late summer 2020 (Schieffer, 2020). Both surveys used the point intercept method with a sample grid generated by the Wisconsin DNR. An early season point intercept survey was completed in June 2020 to evaluate the distribution of curly-leaf pondweed (*Potamogeton crispus*). The data and analysis are summarized in this section. More detailed results and maps are available in the report.

The rake fullness value is shown on several figures that follow. Rake fullness value is based on the criteria contained in Figure 11 and Table 5 below.

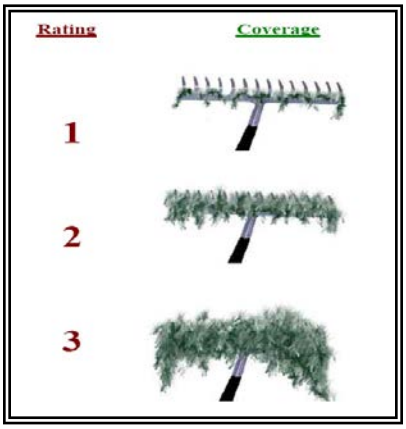

Figure 11. Rake Fullness Diagram

Table 5. Rake Fullness Criteria Descriptions

Rake fullness rating	Criteria for rake fullness rating
1	Plant present occupies less than ½ of tine space
2	Plant present occupies more than ½ tine space
3	Plant present occupies all or more than tine space
v	Plant not sampled but observed within 6 feet of boat

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

Bear Trap Lake

Bear Trap Lake has a moderate coverage and diversity of aquatic plants. There were 22 native plant species and one non-native species (curly-leaf pondweed - *Potamogeton crispus*) sampled on the rake during the 2020 plant survey. Simpson's diversity index was 0.89 indicating a relatively diverse plant community. The floristic quality index (FQI) for Bear Trap Lake was 27.7, higher than the median (FQI=20.3) for lakes studied in the eco-region. The FQI measures the plant community in response to development and human influence on a lake.

The coverage of plants was limited with plants present at 57 percent of the sample points within the littoral zone, the depth at which plants grow. The littoral zone is very narrow, with the exception of the lake's two large bays and the narrows near Lake Wapogasset. A large percentage of Bear Trap Lake is too deep to support plant growth.

The maximum depth with plants was 18 feet, which demonstrates good water clarity. No endangered species, threatened species, or species of special concern were sampled or viewed in Bear Trap Lake.

Figure 12 reports species richness, the number of different species at each sample point. Figure 13 reports total aquatic plant rake density (on a scale from 0 to 3) at each sample point.

The point intercept survey reports statistically significant changes in aquatic plant frequencies between survey years (2007, 2014, and 2020). Changes in plant species occur for a variety of reasons, and the analysis can help to assess if management practices such as herbicide use or harvesting are correlated with species frequency changes. Harvesting of curly-leaf pondweed began in 2017. Chemical use was limited during and between survey years (2007, 2014, and 2020).

In Bear Trap Lake, between 2007 and 2020, there was a significant decrease in seven native species, and a significant decrease in the invasive species curly-leaf pondweed. Between 2014 and the 2020, there was a significant decrease in two native species. From 2007 to 2014, there was a significant increase in one species. From 2014 to 2020, significant increases occurred in four native species in Bear Trap Lake. Because of the timing of these changes, they are not attributed to lake management activities.

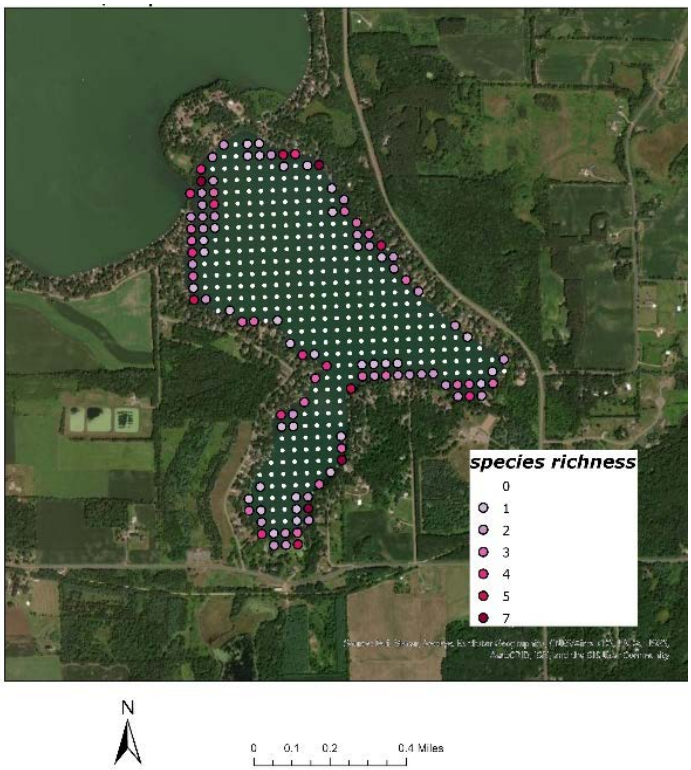

Figure 12. Bear Trap Lake Species Richness June and July 2020

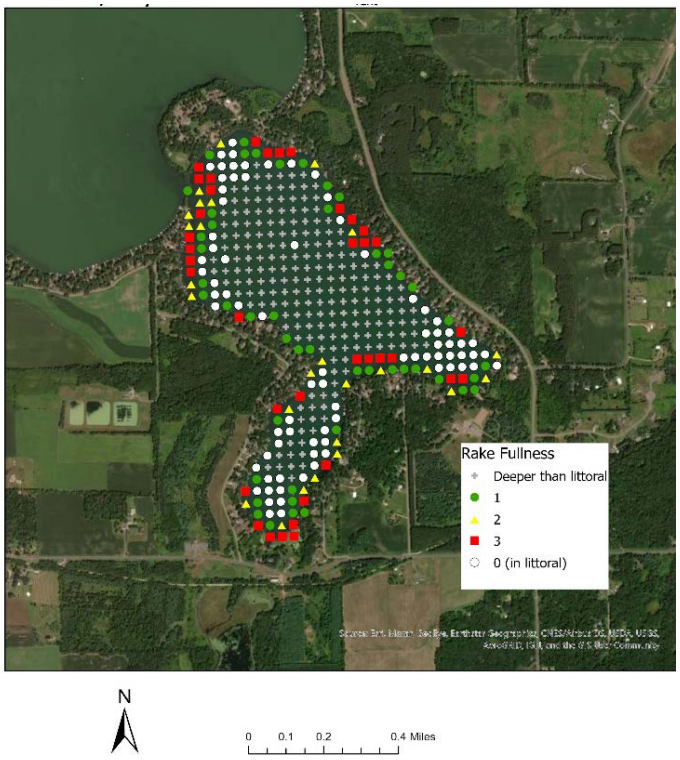

Figure 13. Bear Trap Lake Rake Fullness July 2020

Lake Wapogasset

Lake Wapogasset had a moderately high diversity of aquatic plants. There were 26 native plant species and one non-native species (curly-leaf pondweed - *Potamogeton crispus*) sampled on the rake during the 2020 plant survey. Simpson's diversity index was 0.91 indicating a relatively diverse plant community. The floristic quality index (FQI) for Lake Wapogasset was 30.2, higher than the median (FQI=20.3) for lakes studied in the eco-region. The FQI measures the plant community in response to development and human influence on a lake.

The coverage of plants was moderate with plants present at 52.8 percent of the sample points within the littoral zone, the depth at which plants grow. The maximum depth with plants was 21.8 feet. Plants grow at a greater depth than expected with Lake Wapogasset's poor water clarity. No endangered species, threatened species, or species of special concern were sampled or viewed in Lake Wapogasset.

Figure 14 reports species richness, the number of different species at each sample point. Figure 15 reports total aquatic plant rake density (on a scale from 0 to 3) at each sample point.

The point intercept survey reports statistically significant changes in aquatic plant frequencies between survey years (2007, 2014, and 2020). As previously mentioned, changes in plant species occur for a variety of reasons, and the analysis can help to assess if management practices such as herbicide use or harvesting are correlated with species frequency changes. Harvesting of curly-leaf pondweed began in 2017. Chemical use was limited during and between survey years.

In Lake Wapogasset, between 2007 and 2020, there was a significant decrease in seven native species, and a significant decrease in the invasive species curly-leaf pondweed. Between 2014 and the 2020, there was a significant decrease in seven native species. From 2007 to 2014, there was a significant increase in three species. Because of the timing of these changes, they are not attributed to lake management activities.

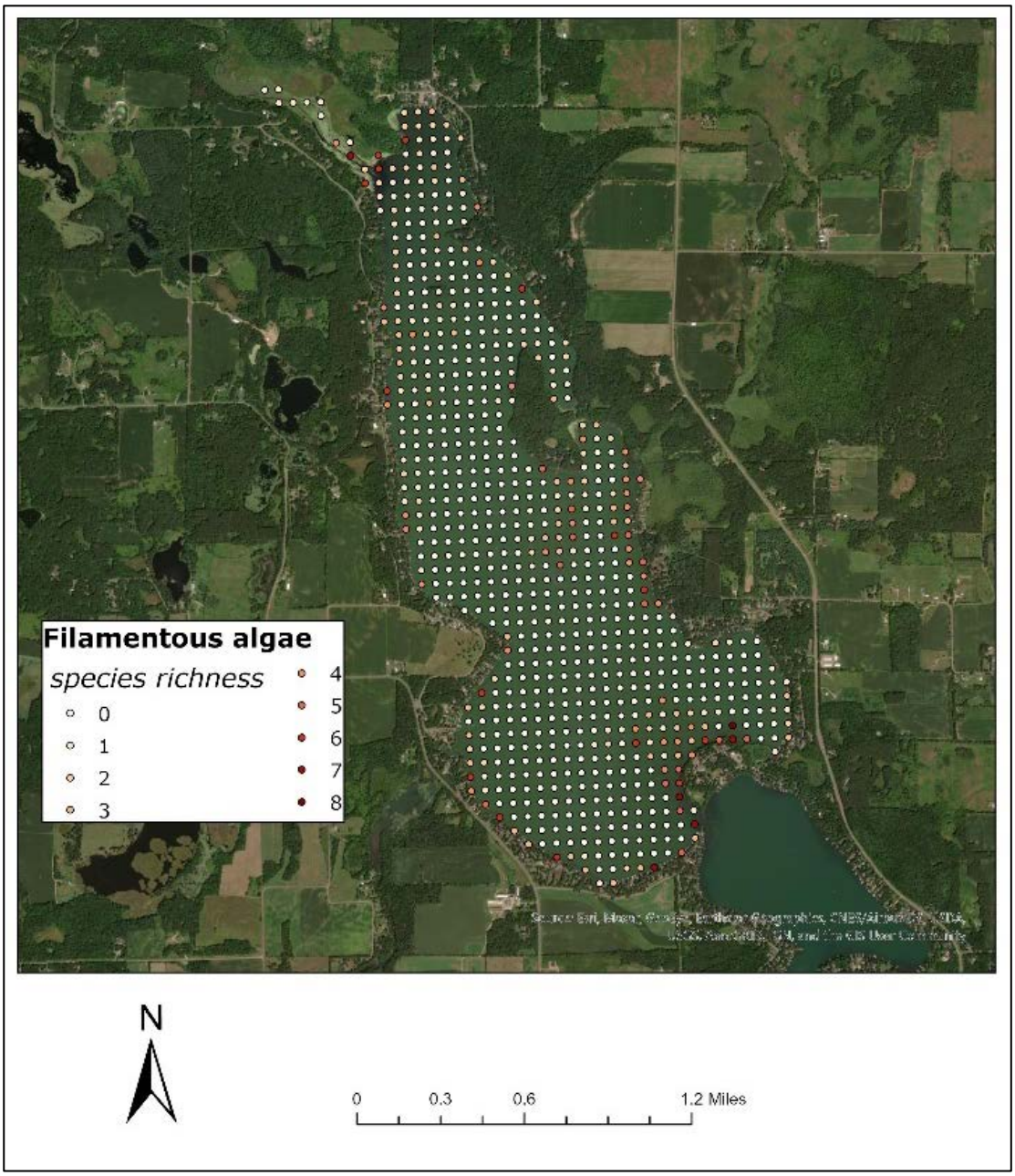

Figure 14. Lake Wapogasset Species Richness July 2020

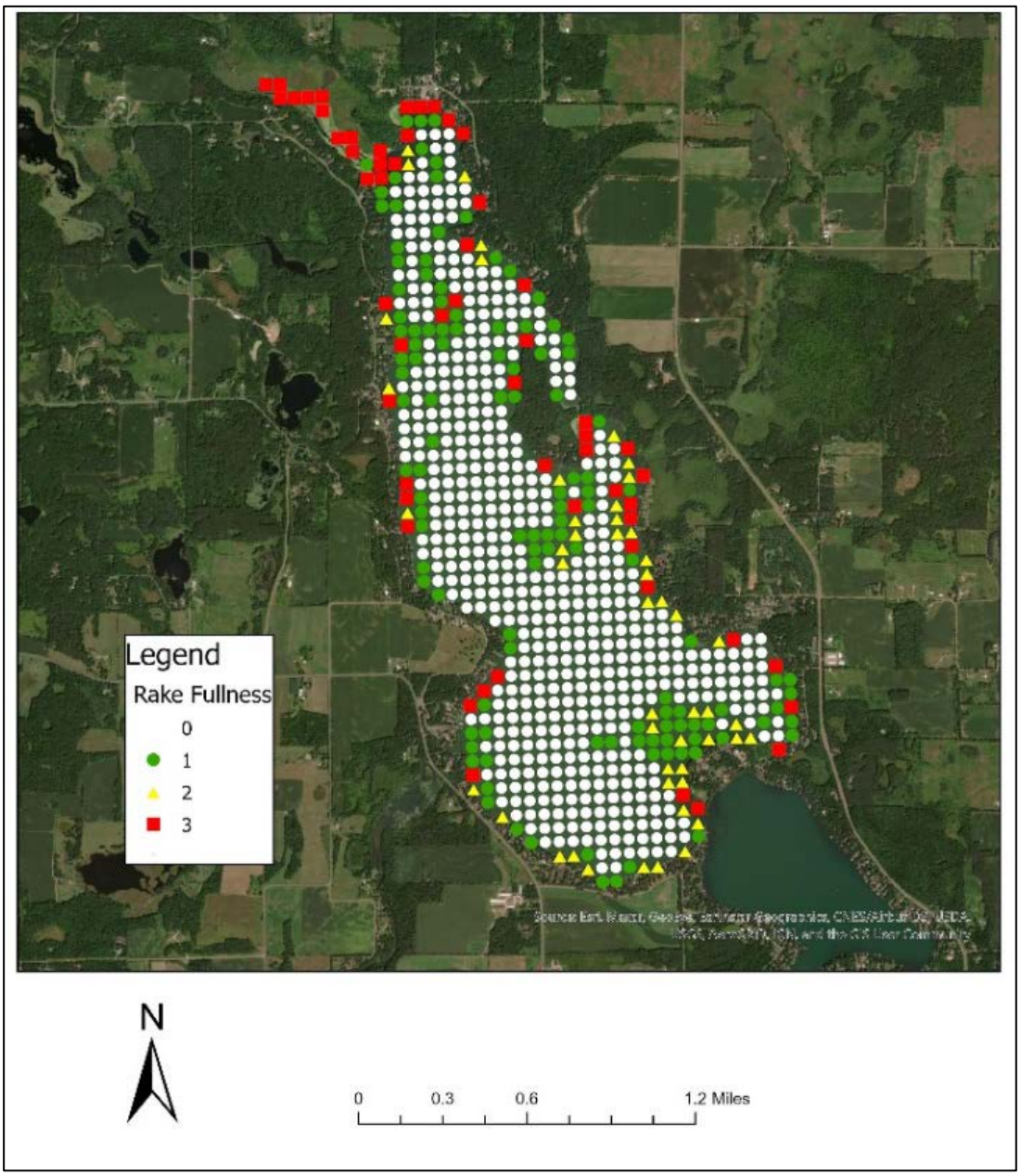

Figure 15. Lake Wapogasset Total Rake Fullness July 2020

Northern Wild Rice (*Zizania palustris*)

Wild rice is an aquatic plant with special significance to Native American Tribes. Wild rice is both ecologically and culturally important on the landscape. Rice beds provide diverse habitat for wildlife and fish, acting as brood rearing and nursery areas. Waterfowl also use rice beds as a food source for both the abundant seeds and the diverse invertebrate community found attached to stalks. Rice can exhibit a fair amount of variation in abundance from year to year in the same bed. Wild rice grows in shallow water. Beds will not expand out further than 4 feet deep, and most rice grows in water depths from 6 inches to 3 feet. Culturally rice has played a prized role in the lives of the Ojibwe and others who have realized the nutritional value of this important resource (GLIFWC).

Ecological Integrity Service conducted a survey of wild rice beds in Lake Wapogasset on September 1, 2021. The survey evaluated wild rice presence, aerial coverage, and relative density (Schieffer, 2021). The DNR aquatic plant harvesting permit prohibits harvesting near wild rice beds, and the 2015 APM plan established a schedule of monitoring wild rice every three years.

Nearly all rice was located at the mouth and further upstream on the Balsam Branch in the northwest corner of Lake Wapogasset. A few plants were also observed at the mouth of Friday Creek on the eastern shore of Lake Wapogasset. Wild rice coverage in 2021 was similar to levels observed in 2018 although survey methods differed. The photograph below shows areas on the Balsam Branch inlet with medium density to high density growth as mapped in Figures 17 and 18. Area C is in the bottom of the Figure 16 photo leading into Area D moving upstream in the Balsam Branch.

Figure 16. Lake Wapogasset Balsam Branch Inlet Wild Rice Growth

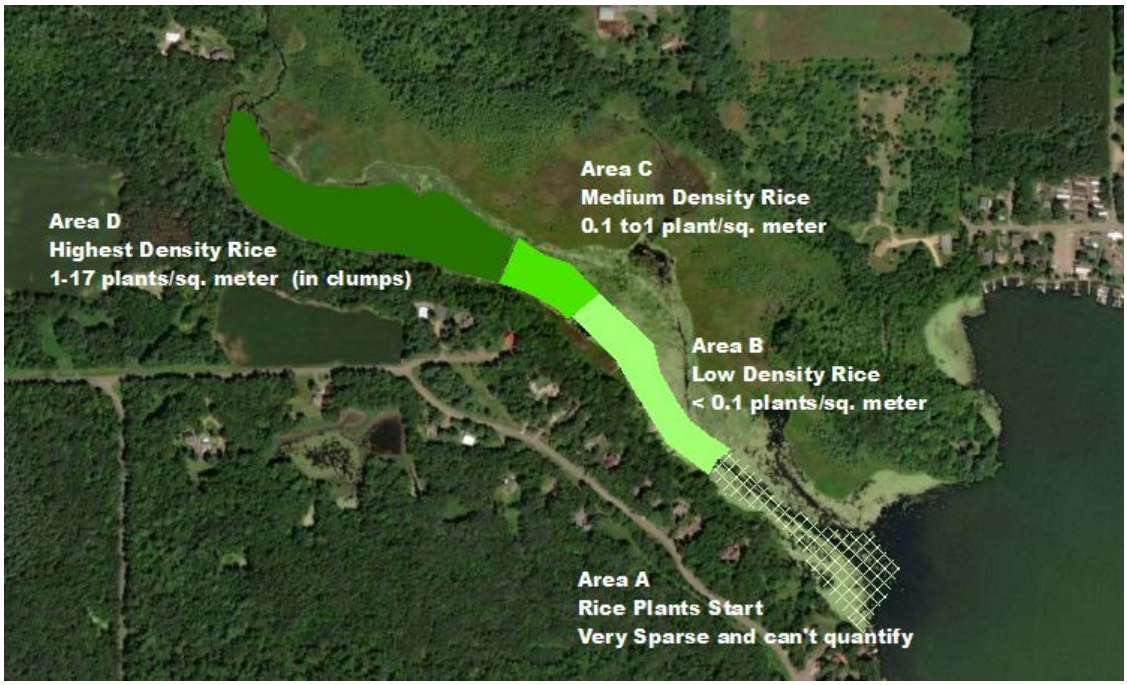

Figure 17. Wild Rice Density Lake Wapogasset 2021

Figure 18. Wild Rice Locations in Lake Wapogasset

Aquatic Invasive Species

Aquatic invasive species present in project lakes include curly-leaf pondweed *(CLP, Potamogeton crispus)*, yellow iris *(Iris pseudacorus)*, narrow-leaved cattail *(Typha angustifolia)*, reed canary grass *(Phalaris arundinacea),* and aquatic forget-me-not (*Myosotis scorpioides*). Only curly-leaf pondweed (CLP) was sampled during the rake survey. The remaining species were observed during a boat survey and have not been mapped. CLP is the focus of aquatic plant management efforts.

Table 6. Invasive Species in Project Lakes

Species	Bear Trap Lake	Lake Wapogasset
Curly-Leaf Pondweed	Sampled in Rake Survey	Sampled in Rake Survey
Yellow Iris	Observed in Boat Survey	Observed in Polk County AIS Survey
Narrow Leaved Cattail	Observed in Boat Survey	Observed in Boat Survey
Reed Canary Grass	Observed in Boat Survey	Observed in Boat Survey
Aquatic Forget-Me-Not	Not Observed	Observed in Boat Survey

Yellow Iris

Yellow flag iris is an escaped showy perennial garden plant that is invasive in natural environments. Yellow flag iris can produce many seeds that can float from the parent plant, or plants can spread vegetatively via rhizome fragments. Once yellow flag iris is established, it forms dense clumps or floating mats that can alter wildlife habitat and species diversity. All parts of this plant are poisonous, which results in lowered wildlife food sources in areas where it dominates.[10]

One option for control is for owners to remove flowers before they form seed ponds. Manual removal of plants and herbicide are also options for yellow iris control.

Figure 19. Yellow Iris (Photo from dnr.wi.gov/invasives)

[10] https://dnr.wisconsin.gov/topic/Invasives/fact/YellowFlagIris.html

Narrow-Leaved Cattail

Narrow-leaved cattail has become common in lakes and serves a similar role as the native broad-leaved cattail. Narrow-leaf cattail can spread and take over in some lakes. However, some literature suggests that narrow-leaf cattail does not act invasively when competing with broad-leaf cattail. It can tend to be more common than broad-leaf cattail because narrow-leaf cattail is more tolerant of deeper water. One study suggests that in more shallow water, which broad-leaf cattail prefers, the narrow-leaf cattail remained the same or declined slightly.[11] Narrow-leaf cattail can also hybridize with broad-leaf cattail, and this hybrid tends to spread more quickly than narrow-leaf cattail. Narrow-leaf cattail could be monitored if it is a concern. Because areas of narrow-leaved cattail growth have not been delineated, it is not known if the plant is spreading.

Figure 20. Narrow-leaf Cattail (Photo from dnr.wi.gov/invasives)

Reed Canary Grass

Reed canary grass is widespread around North America. Populations are a mixture of cultivars that are non-native (from Europe) and plants that are indigenous to North America. Reed canary grass can become invasive, especially in disturbed areas. Due to the extensive distribution, it is often not mitigated unless removed in preparation for a restoration project.

Figure 21. Reed Canary Grass (Photo from dnr.wi.gov/invasives)

[11] James B. Gracea, Robert G. Wetzel. *Long-term Dynamics of Typha Populations. Aquatic Botany*, Volume 61, Issue 2, 1 June 1998, Pages 137–146.

Aquatic Forget-Me-Not

Aquatic forget-me-not readily spreads and can out-compete native plants, especially in wetlands. This plant is typically easy to remove because it has a shallow root structure.

Figure 22. Aquatic forget-me-not (Photo from dnr.wi.gov/invasives)

Curly-Leaf Pondweed

The aquatic invasive species curly-leaf pondweed was surveyed in a June 2020 point intercept survey. CLP is also mapped each year to guide a harvesting program. The 2020 point intercept maps and bed maps for each lake are shown in Figure 24, Figure 25, and Figure 26.

Figure 23. Curly Leaf Pondweed

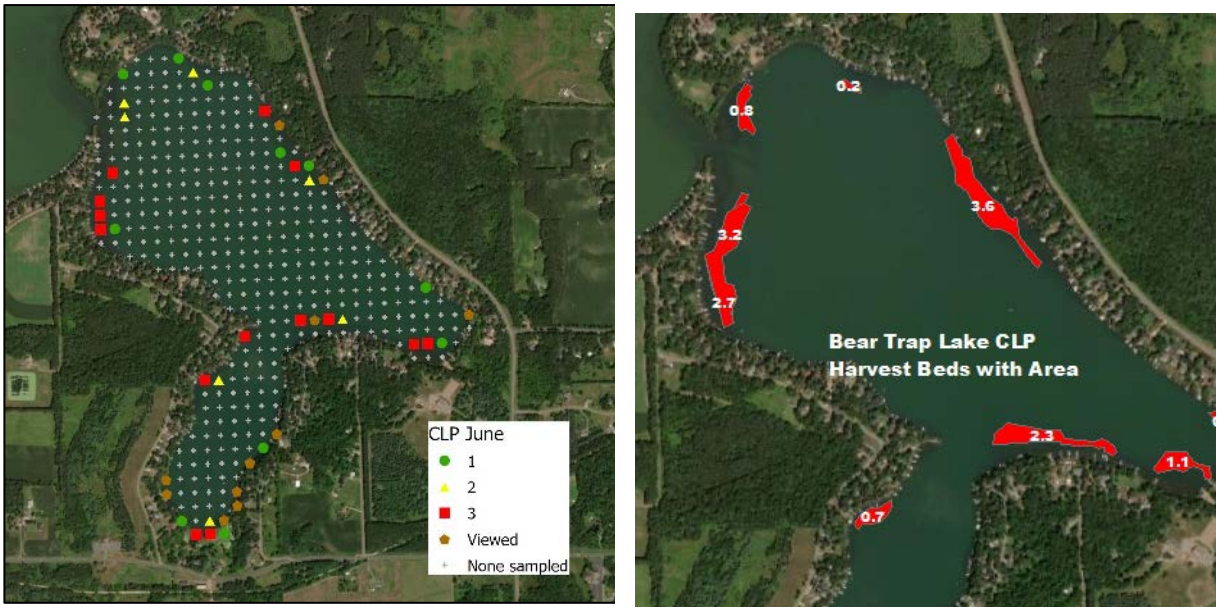

Figure 24.Bear Trap Lake Curly-leaf Pondweed Points and Bed Map June 2020

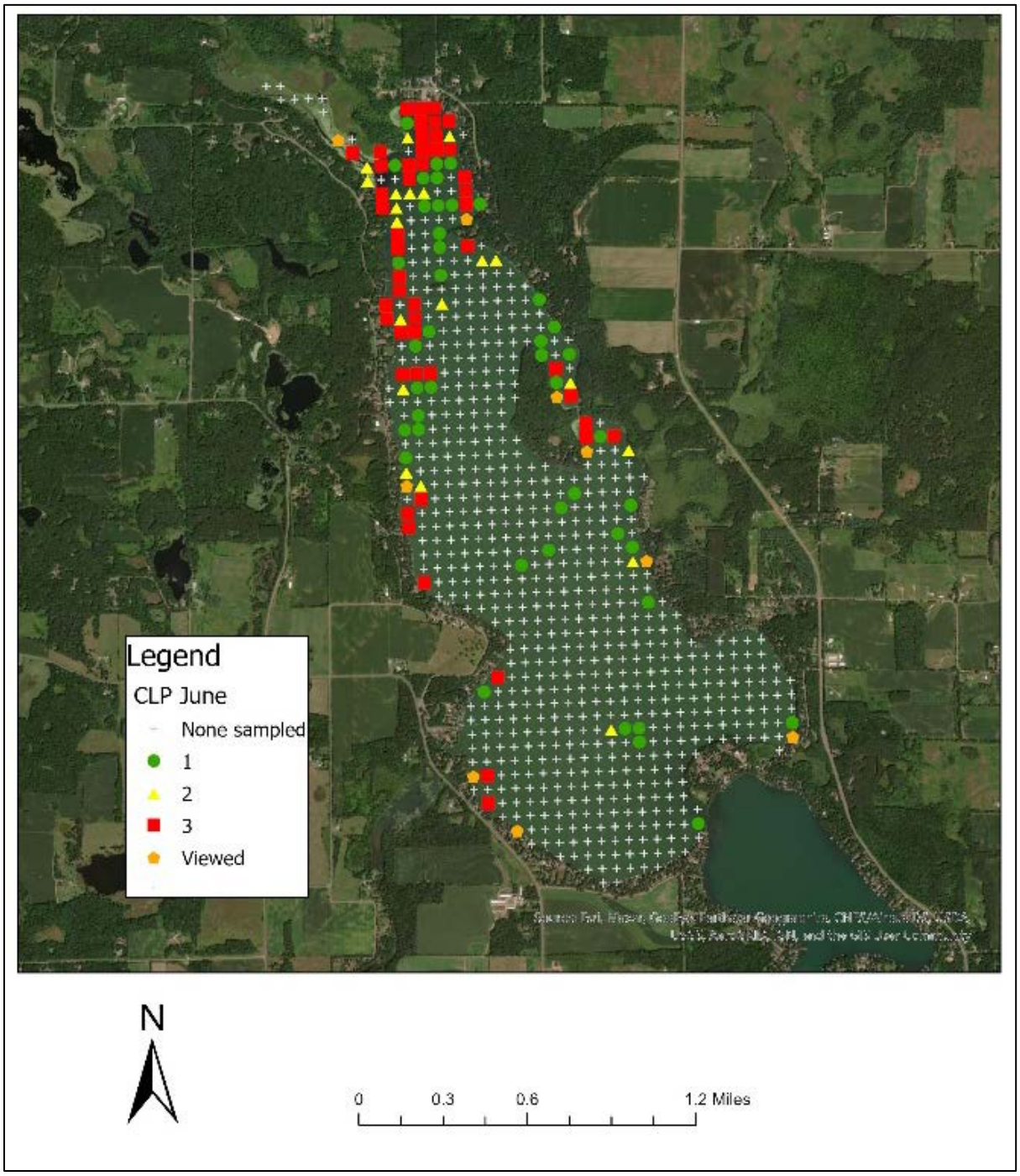

Figure 25. Lake Wapogasset Curly-Leaf Pondweed Point Intercept Survey June 2020

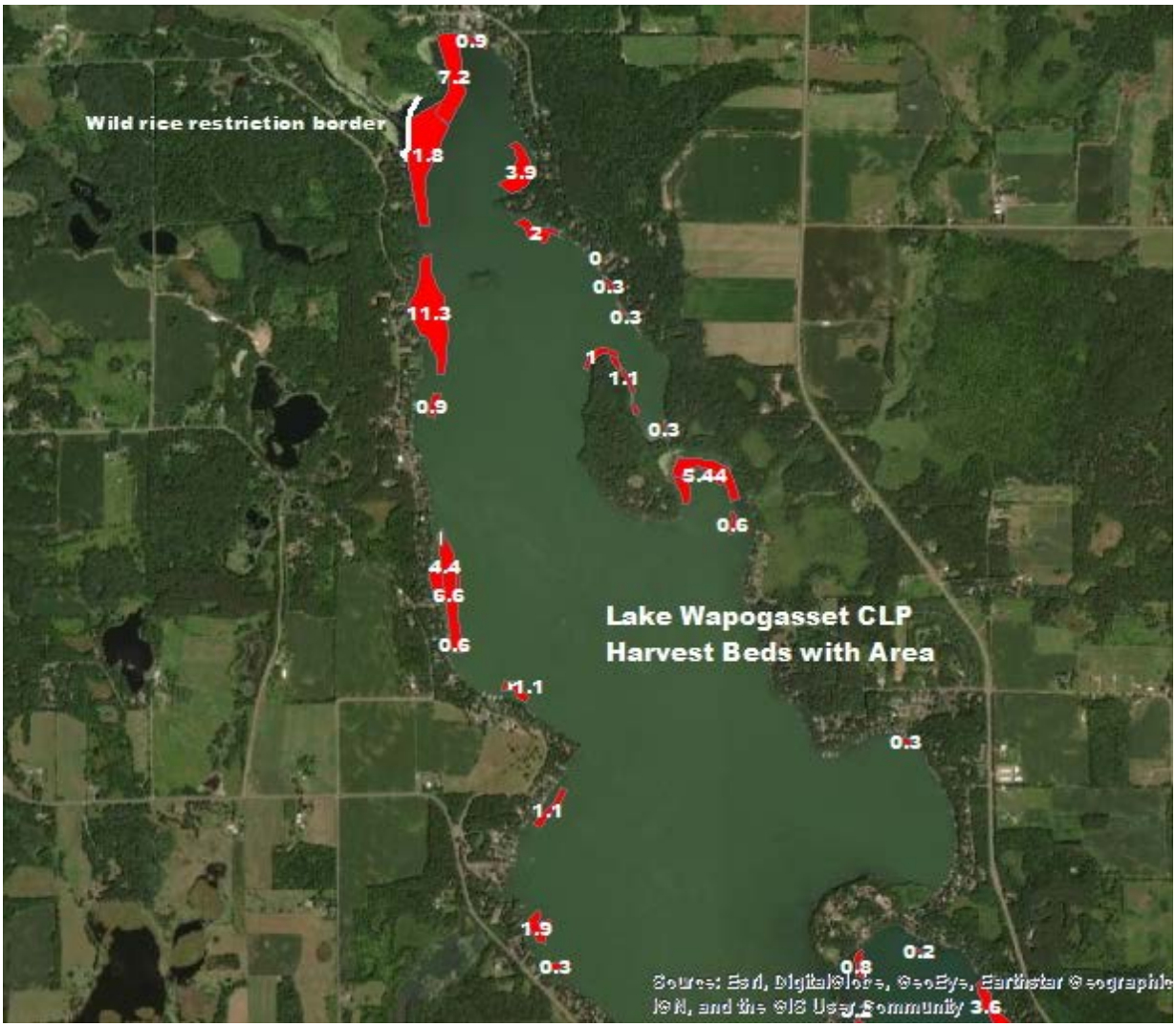

Figure 26. Lake Wapogasset Curly-Leaf Pondweed Bed Maps June 2020

Curly-leaf pondweed beds are areas of dense growth where the plant reaches or nearly reaches the surface. CLP growth varies from year to year. In 2020 there were 15.2 acres mapped on Bear Trap Lake and 66.9 acres mapped on Lake Wapogasset. This represents 6.3 percent of the Bear Trap Lake area and 5.6 percent of the Lake Wapogasset area.

According to the Wisconsin DNR,[12] CLP poses an ecological threat by:

- Invading freshwater lakes, ponds, rivers, and streams. It can become dominant and invasive due to its tolerance for low light and low water temperatures.
- Potentially outcompeting other underwater plants and becoming dominant, causing problems due to the formation of dense mats that interfere with recreational activities.
- Causing an increase in phosphorus concentrations, which can lead to an increase in algae blooms.

[12] https://dnr.wisconsin.gov/topic/Invasives/fact/CurlyLeafPondweed.html

Curly-leaf pondweed reproduces primarily vegetatively. Numerous turions (small pinecone-like structures) are produced in the spring. Stimulated by cooler water temperatures, turions germinate in the fall, over-wintering as a small plant. The next summer plants mature producing reproductive tips of their own.

Aquatic Plant Management

This section reports recent aquatic plant management activities on the lakes. Potential management methods are included in a companion document to this plan.

Aquatic Invasive Species Prevention Efforts

Clean Boats Clean Waters

Clean Boats, Clean Waters is a WDNR-sponsored program. CBCW boat inspectors help perform boat and trailer checks, hand out informational brochures, and educate boaters on how to prevent the spread of aquatic invasive species. WDNR grants support local programs with 75 percent state funding, providing up to $4,000 per landing annually.

The Lake Association Clean Boats, Clean Waters chair manages the program for project lakes. The CBCW chair recruits staff, provides training, and enters data into the state database. The program is currently operated only at the Garfield Landing on Lake Wapogasset where the most visitors enter the lakes. In past years, boats were inspected at other landings, but volunteers and staff were difficult to find. The Sanitary District sponsors the Clean Boats Clean Waters grant and handles payroll for the program.[13]

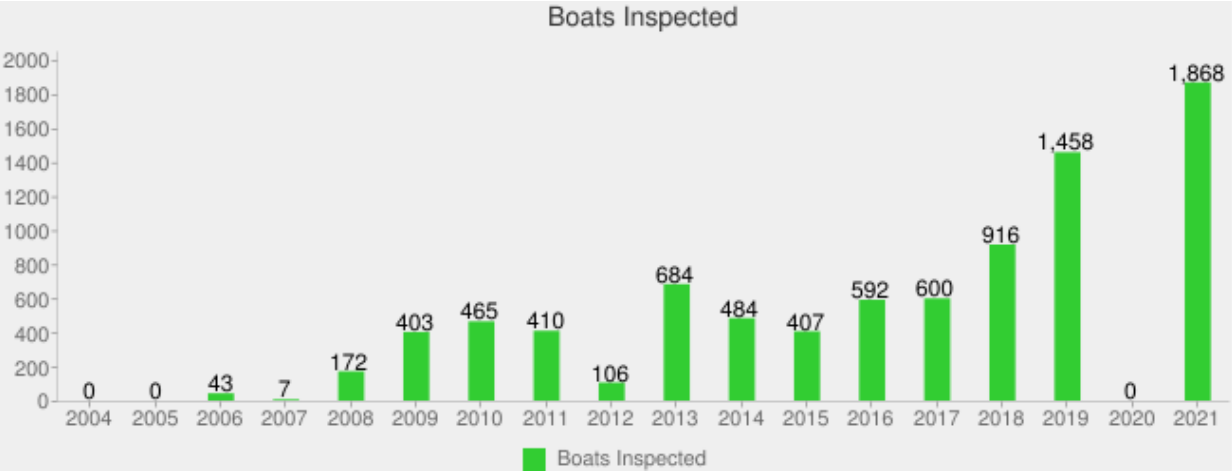

Figure 27. Lake Wapogasset Clean Boats, Clean Waters Boats Inspected 2006 - 2021

[13] Rick Bazille, Lake Association CBCW Chair. Personal Communication. 12/21/2021.

AIS Monitoring

Volunteers from the Lake Association Aquatic Invasive Species Committee monitor the lake for potential aquatic invasive species. They are organized in three groups of two to three people each by geographic area. These areas include 1) north half of Lake Wapogasset, 2) south half of Lake Wapogasset, and 3) Bear Trap Lake. Volunteers set their own schedule for monitoring. Zebra mussel samplers are installed on the lakes each year (12 on Lake Wapogasset and 3 on Bear Trap Lake), and volunteers check the samplers as part of regular monitoring efforts.[14]

Polk County Land and Water Resources staff provided aquatic invasive species monitoring training for Lake Association volunteers in 2017 and 2019. Free DNR AIS monitoring kits were provided in exchange for entering monitoring data into the state database. County staff are available to verify suspected invasive plants or animals.[15]

Healthy Lakes Program

The Lake Association is implementing the WDNR Healthy Lakes Program which provides funding and technical assistance for lake owners to install best management practices to restore native shoreland vegetation and to reduce runoff of nutrients and sediment to water bodies. Through 2021, a single owner installed a diversion and rock infiltration practices through a Healthy Lakes grant (Seidl M. , 2020). Five additional projects to be installed by two owners are planned for 2022 (Seidl M. , 2021).

Plant Management History

Records of aquatic plant management prior to 2009 are not compiled in this plan. Wisconsin Department of Natural Resources aquatic plant management permit records indicate there was extensive chemical treatment contracted by private landowners prior to 2007 when the WDNR created a policy limiting native aquatic plant removal to preserve the benefits native plants provide (WDNR, 2007).

Curly-Leaf Pondweed Herbicide Trial

The Lake Wapogasset/Bear Trap Lake Sanitary District sponsored a trial of early season herbicide treatment of curly-leaf pondweed from 2009 to 2012. The herbicide treatment was somewhat effective two of the four years and not effective the other two years (Schieffer, 2009, 2010, 2011, 2012). Since results were not consistent, the program was discontinued.

[14] Mark Jacobson, Sanitary District, Personal Communication. 12/20/21. Rick Bazille, Lake Association, Personal Communication. 12/21/2021.

[15] Katelin Anderson, Polk County Land and Water Resources. Personal Communication. 12/20/2021.

Phosphorus Loading from CLP

In 2010, the Sanitary District commissioned Ecological Integrity Service to explore the potential impact of CLP on the phosphorus load to the lakes. To estimate CLP phosphorus load, the following steps were taken:

1. Estimated the biomass of CLP by sampling numerous CLP beds and determining the mean dry mass per acre.
2. Measured phosphorus content (in mg of P per gram) of CLP biomass.
3. Delineated and calculated acres of CLP growing in dense beds.
4. Calculated the amount of phosphorus that could be released by all CLP growing in beds annually.

Table 7 summarizes the results which demonstrated significant phosphorus loading from CLP.

Table 7. Estimating Phosphorus Loading from CLP (Schieffer, 2010)

Analysis	Lake Wapogasset	Bear Trap Lake
Mean percent dry mass	9.07%	8.89%
Mean tissue phosphorus	3.3 mg P/g of CLP tissue	3.3 mg P/g of CLP tissue
Mean wet biomass of CLP	194.02 g CLP tissue/sample	174.65 g CLP tissue/sample
Mean dry biomass of CLP	17.6 g dry CLP tissue/sample	15.53 g dry CLP tissue/sample

Since the nutrient content of CLP was high, the Sanitary District pursued CLP control to mitigate phosphorus loading. CLP beds were evaluated again in 2013 to assess how much phosphorus could be removed with mechanical harvesting. During peak CLP growth in June 2013, all beds that were monotypic CLP and had growth at the surface were delineated. The mean depth of the bed was measured, and the amount of CLP growth that could be removed was determined. It was assumed that a harvester could remove plants five feet below the surface. Minimum depth of harvesting allowed by WDNR permits (three feet) was also taken into account. Table 8 summarizes those findings.

Table 8. Potential Phosphorus Removal through CLP Harvesting in 2013 (Schieffer, 2015)

P removal Estimates	**Lake Wapogasset**	**Bear Trap Lake**
Acres of CLP (harvest)	58.66	9.12
Weighted mean depth	6.87	6.27
Percent of harvest (5.5 feet)	80.06	87.72
g P/m2 (from 2010)	0.57	0.51
kg P harvestable	135.31	18.82
Estimated Kg P removed (via harvest)	**108.33**	**16.51**
Percent of total P budget	3.88	3.85

The lake water quality model Bathtub, predicted that the Secchi disk reading could increase up to 0.3 meters with the removal of the amount of phosphorus estimated from the 2013 harvest analysis.

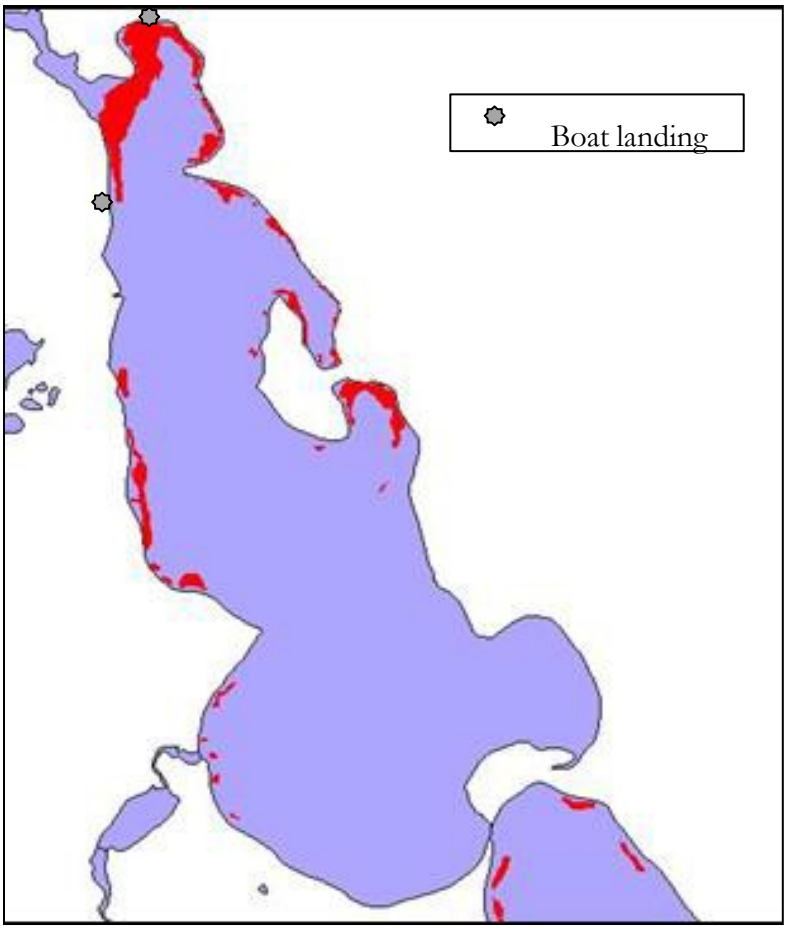

Figure 28. Harvestable CLP on Lake Wapogasset in 2013 (58.7 acres)

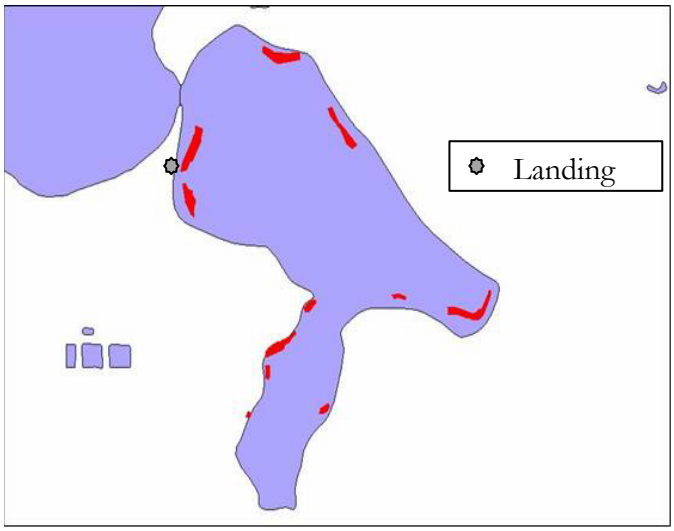

Figure 29. Harvestable CLP Bear Trap Lake in 2013 (9.12 acres)

Curly-Leaf Pondweed Harvesting

The Sanitary District began a full-scale CLP harvesting program in 2017 following a trial in late spring 2016. A Wisconsin DNR Aquatic Plant Management Permit is obtained for harvesting on each lake each year.

The aquatic plant harvester was manufactured by Aquarius Systems. The harvester has a six foot cutting head. The harvester, conveyor, and harvester trailer were purchased with a WDNR Recreational Boating Facilities grant (RBF-1532) and a loan in 2016. The $62,458 grant paid 34 percent of the total project cost of $184,090. The loan is paid by the Sanitary District customers on a yearly basis.

Figure 30. Lake Wapogasset and Bear Trap Lake Harvester

Four to six operators are hired by the Sanitary District each year. The harvester conveyor is positioned at boat landings throughout the lake, depending upon where harvesting is occurring, to allow efficient collection of harvested plant materials. A full harvester travels only about 1.5 miles/hour. The Garfield Landing on Lake Wapogasset is not used because of concern of interfering with a fire pump inlet. Collected plant material is deposited and allowed to decompose in nearby fields with owner permission.[16]

[16] Dennis Badman, Harvesting Coordinator, Sanitary District. Personal Communication. 12/21/2021.

The Sanitary District harvested CLP in May and June from 2017 through 2021. The time period for harvest and amount of CLP varied depending upon CLP growth which is influenced by several factors including depth of winter snow, timing of ice out, and early season water temperatures.

Only plant beds that are predominantly CLP are harvested. CLP beds are identified by the Lead Harvester and verified and mapped by Lake Scientist, Ecological Integrity Service. GPS points with CLP bed locations are uploaded to a device on the harvester. The Lead Harvester prioritizes harvest locations on a daily/weekly basis.

CLP and Phosphorus Removal 2021

Ecological Integrity Service evaluated phosphorus removal from CLP harvesting from 2017 through 2021 (Schieffer, 2021). The 2015 APM plan objective was to remove 80 kg of phosphorus from Lake Wapogasset and 13 kg from Bear Trap Lake annually through CLP harvest.

Mechanical harvest targeting CLP occurred from May 25 to June 22, 2021. The method to calculate phosphorus removed was as follows:

1. Operators recorded truck load volumes which were used to estimate wet mass of each load. Random truck weigh-ins with recorded volumes provided volume to mass ratio.
2. Dry mass to wet mass ratio of plant materials was estimated in 2010 study (Schieffer, 2010) .
3. The percent of CLP in harvested plant materials was determined from random samples of harvested plant material.
4. Results of a CLP nutrient analysis conducted in 2010 on Lake Wapogasset and Bear Trap Lake determined amount of phosphorus removed based upon the mean mass of phosphorus in CLP tissue.
5. The total phosphorus load to project lakes was estimated in a 2007 – 2008 study (Schieffer, 2009).

Results for 2021 are shown in Table 9.

Table 9. Estimated CLP and Phosphorus Removal 2021

	Wet Mass Plant Removed (kg)	Dry Mass Plants Removed (kg)	Dry mass CLP removed (kg)	Phosphorus Removed with CLP (kg)	Percent of total P load (total P load last estimated in 2007/08 study)
Bear Trap Lake	47,454.9	4,318.4	3,670.6	12.1	2.76%
Lake Wapogasset	152,908.8	13,914.7	11,827.5	39.0	1.41%

The mass of phosphorus removed from both lakes in 2021 is just below the average for the years 2017-2021. CLP growth varies each year, and the timing of CLP growth near surface affects the amount of CLP removed. If large beds mature at the same time, the harvester is unable to reach all of them as needed. In an average year, approximately 14 kg of phosphorus was removed from Bear Trap Lake and

approximately 46 kg of phosphorus was removed from Lake Wapogasset through CLP harvest. CLP harvested represents between 1 percent and 3 percent of the total phosphorus loads in each of the two lakes.

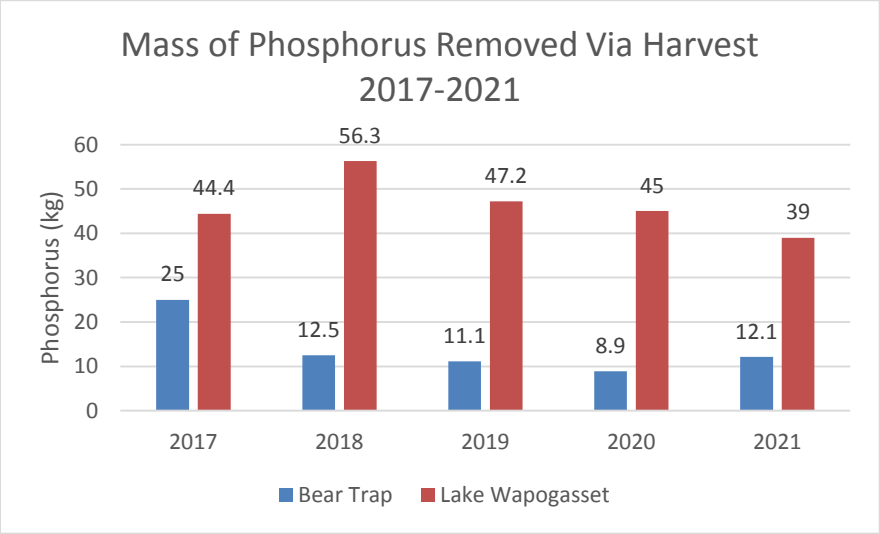

Figure 31. Estimated Phosphorus Removal via CLP Harvest (2017 – 2021)

Turion Analysis

Turions are CLP reproductive structures. Turion sediment density analysis assesses the potential for CLP growth in future years. CLP sediment turions were first analyzed in 2021. The data gathered will provide a baseline to evaluate long-term changes in CLP in both lakes and therefore the effectiveness of CLP removal efforts.

Turions are produced on mature CLP plants. When the plant dies off (senesces), the turions settle into the sediment and germinate into new plants in the fall/winter. If CLP plants are harvested, some of the turions attached to the plants will be removed as well. Repeated years of harvesting could reduce turion production and potentially future CLP plant growth. With an ongoing harvesting program, it is not feasible to measure CLP plant density. Turion density is a better measure of long-term results. Continued turion density monitoring is recommended.

In October 2021, twenty sample locations were sampled for turions using a Ponar dredge. At each sample point, two samples of sediment were collected. The turions were counted and the density was reported as turions/square meter.

Figure 32. Ponar sediment sample (left), sieve separation of sediment (middle), and turions collected (right).

All sample locations had turions present, with a minimum density of 86 turions/m^2. The turion density ranged from **86 turions/m^2 to 617 turions/m^2**, with a standard deviation of 192.5. The mean turion density was **217 turions/m^2**. Interestingly, the two sample points with the highest turion density were within beds that have not been harvested consistently. All other areas with lower density have been harvested annually. This may indicate that harvesting reduces turion density. However, there is no previous turion data available for a valid comparison.

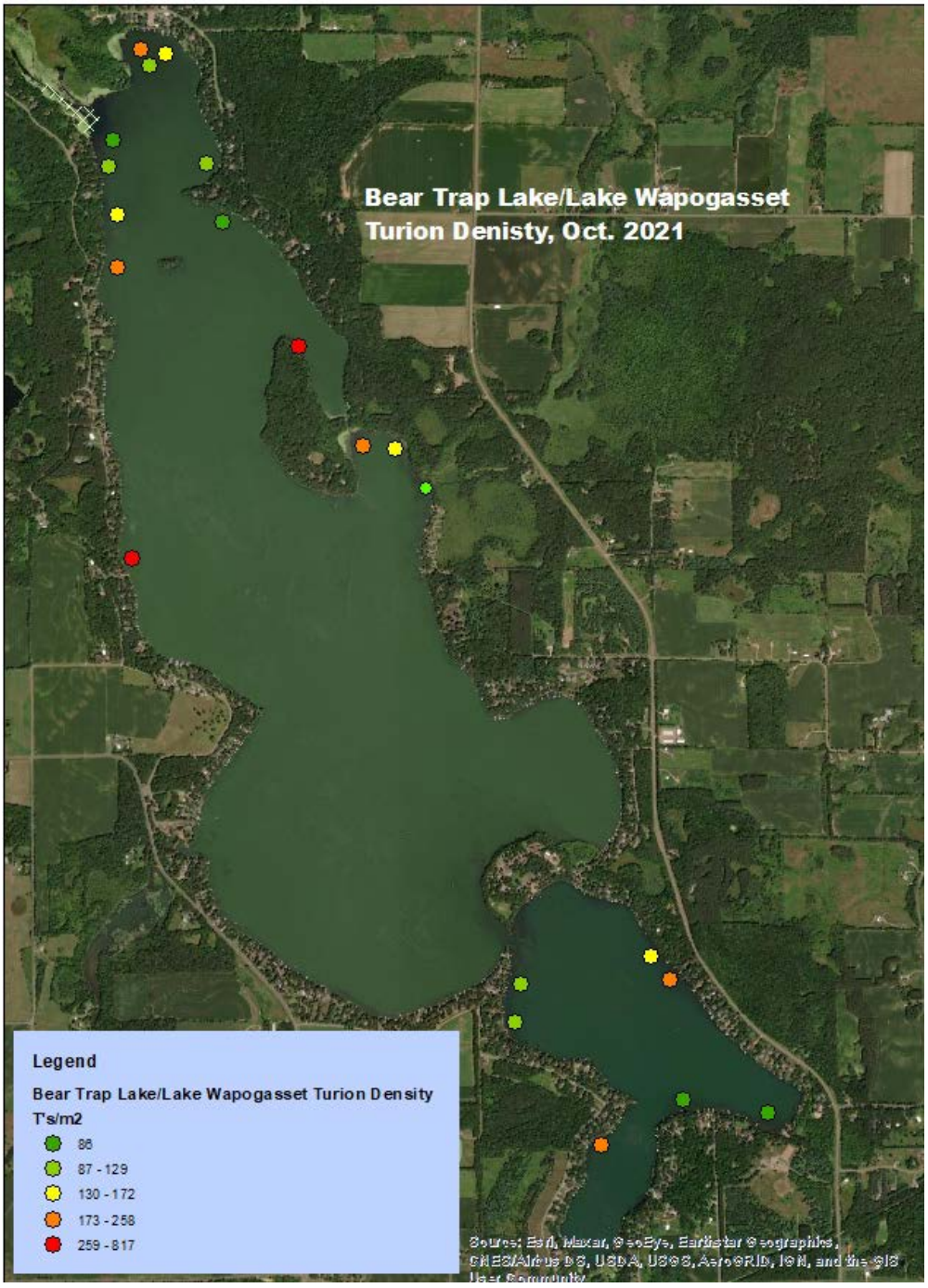

Figure 33. Turion Density at each Sample Site within Historically Harvested CLP Areas

Plan Goals and Strategies

This section of the plan lists goals and objectives for aquatic plant management for project lakes. It also presents strategies and actions that will be used to reach aquatic plant management plan goals.

An aquatic plant management action plan, included as Appendix B, outlines how each action will be accomplished listing a timeline, resources needed, and responsible parties. The implementation plan chart will be updated annually (or more frequently). Actions may be modified as new information becomes available.

Goals are broad statements of desired results.

Objectives are the measurable accomplishments toward achieving a goal.

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

Implementation Plan outlines timeline, resources needed, and responsible parties for each action item.

Aquatic Plant Management Goals

1. Preserve a healthy and diverse native plant community.
2. Prevent the introduction of new invasive species and address AIS introductions that may occur.
3. Reduce curly-leaf pondweed coverage and biomass.
4. Restore developed shorelines to native habitat.
5. Increase lake residents' and visitors' understanding of lake ecology and aquatic plant management.

Goal 1: Preserve a healthy and diverse native plant community.

Objective 1A: Aquatic plant management will limit negative impacts on native plants including wild rice in and near the Balsam Branch.

The native plant community is important to the lake ecosystem. Any aquatic plant management, including for aquatic invasive species (AIS) such as curly-leaf pondweed (CLP), must use practices that will preserve native plants.

Action (program guidance): Aquatic plant management practices will avoid adversely affecting floating vegetation such as water lily and will avoid sensitive areas.

The Balsam Branch has dense wild rice, with sparse rice coverage at the outlet into Lake Wapogasset. Because wild rice is present, no management of native plants will occur here. Management of AIS will be carefully planned to avoid adversely affecting the rice. Wild rice location and density of growth will be evaluated every three years to identify any changes in distribution.

Action (program guidance): Aquatic plant management will not occur in areas of wild rice.

Evaluation Action 1A - 1: Complete a wild rice inventory every three years to evaluate any changes in distribution.

Objective 1B: Native plant stands near lake resident properties are preserved.

Lake Wapogasset and Bear Trap Lake have a history of excess phosphorus and nuisance algae blooms. Native plants contribute to higher water clarity by absorbing nutrients from the bottom sediment and from the water column. Coontail *(Ceratophyllum demersum)* is a plant that is abundant in both lakes. This plant absorbs large amounts of phosphorus during growth, but can release phosphorus back when it dies (Lombardo et al, 2003). Therefore, maintaining a healthy population of coontail and other native plants could help maintain or improve water clarity and water quality.

Education is key for preservation of native plant stands. Educational messages will include information about the importance of native plants and limiting their removal. Communication actions are outlined under Goal 5.

Action: Provide information about native plants and aquatic invasive species (AIS) to lake residents. See Goal 5.

Objective 1C: The percent of sample sites with CLP present and no late season native plant growth decreases by 10 percent on Lake Wapogasset (between the 2020 and 2025 aquatic plant point intercept survey).

In Lake Wapogasset 45 percent of sample points with CLP present in the early season survey had no late season native vegetation in both 2014 (71/157 total CLP sites)and 2020 (50/ 111 total CLP sites). In Bear Trap Lake 20 percent of sample points with CLP in the early season survey had no late season native vegetation in 2014 (8/41). In 2020 that number was 2 percent (1/61).

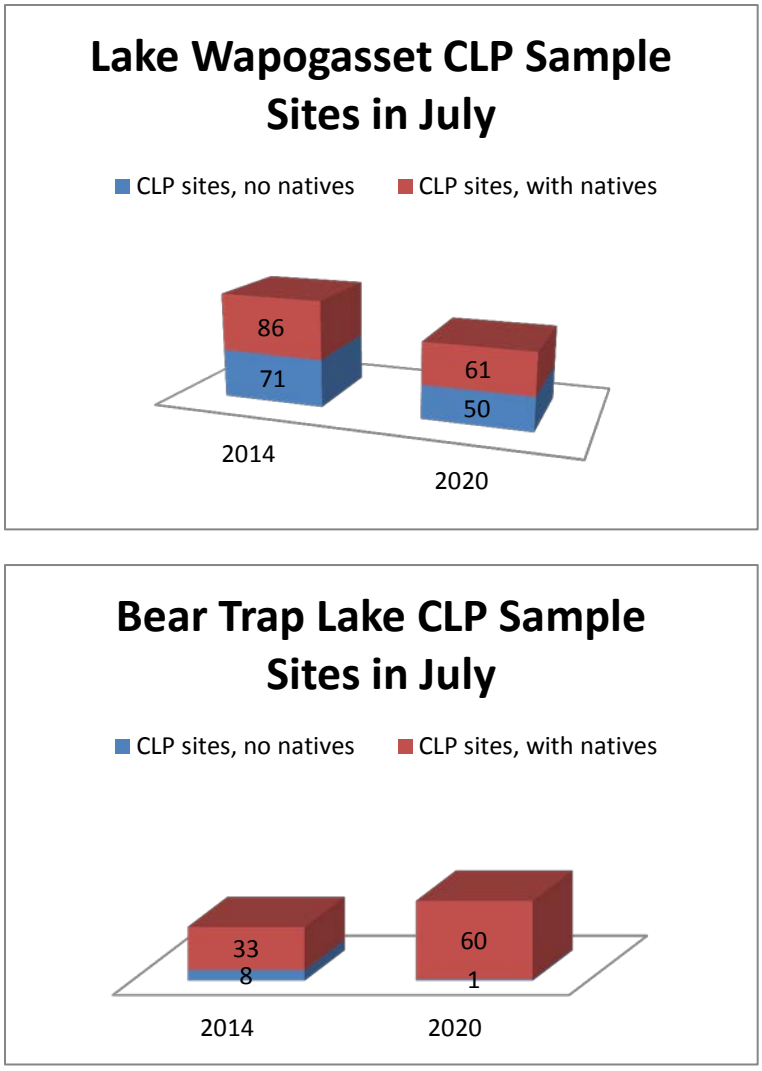

Figure 34. CLP sample sites in July (2014 and 2020)

Evaluation Action 1C - 1: Complete an aquatic macrophyte point intercept survey every five to seven years. Evaluate changes in late season native vegetation at points where CLP is present in the early season point intercept survey.

Goal 2: Prevent the introduction of new aquatic invasive species (AIS) and address AIS introductions that may occur.

Objective 2A: Boats, trailers, and equipment are screened, and boaters take action to prevent AIS introduction at boat landings.

The Lake Association operates a Clean Boats, Clean Waters (CBCW) program at the Town of Garfield Landing on County Highway F. To maintain DNR grant eligibility, the program must be operated a minimum of 200 hours at a landing or pair of landings. In 2021, CBCW staff reached 3,970 people at the Garfield Landing inspecting 1,868 boats with 327 paid hours.[17]

Action 2A - 1: Continue the Clean Boats, Clean Waters Program at the Town of Garfield Boat Landing with trained staff.

Action: 2A - 2: Add signage with aquatic invasive species messaging to complement security cameras already present at the Garfield Landing and when installed at the Sunrise Beach Landing.

Action 2A - 3: Install plant and debris removal tools at all landings with instructions on how to use them to remove aquatic invasive species.

Action (program guidance): Maintain emphasis on voluntary aquatic invasive species measures to increase participation.

[17] Wapogasset Lake - Access off 130th, Garfield Park (wi.gov)

Objective 2B: The lakes are regularly monitored for aquatic invasive species.

A comprehensive monitoring program can prevent the establishment of Eurasian water-milfoil and other invasive species and prevent the spread of existing aquatic invasive species in the lakes.

Action 2B - 1: Continue and expand volunteer aquatic invasive species monitoring program that includes the following components:

a. Recruit volunteers for AIS monitoring. Train additional volunteers to be able to increase teams to 5-6 people per lake section. The Polk County Land and Water Resources Department staff is available to train volunteers.
b. Volunteers will survey the entire littoral zone at least once per month. Develop a schedule with locations and assign volunteers.
c. If volunteers are limited, emphasize high priority areas (mapped in Figure 30) and boat landings.
d. If a potential invasive species is sampled, it will be collected in a plastic bag and forwarded to an aquatic plant specialist (Polk County Land and Water Resources Dept., Wisconsin DNR, or private consultant with expertise).
e. See Rapid Response Protocol for additional guidance.

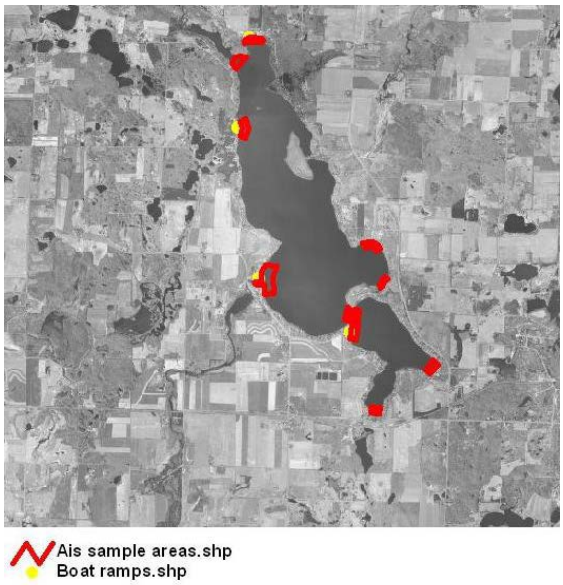

Figure 35. Priority AIS Monitoring Locations

Action 2B - 2: Conduct a professional AIS meandering survey at least once a year in late summer.

Action 2B - 3: Inventory and map yellow iris. Consider implementing control measures including chemical and manual removal following review of cost and efficacy.

Objective 2C: The Sanitary District and Lake Association are ready to respond to introduction of aquatic invasive species.

If a new aquatic invasive species (AIS) is located (or suspected), the rapid response protocol will be followed (see Appendix A) that includes:

1. Verification of AIS by Polk County AIS or Water Quality Specialist or the Wisconsin DNR.
2. Evaluation of degree of infestation and strategic planning (pioneer plants removed, herbicide treatments, etc.).
3. Creation of a rapid response file that contains a copy of the rapid response grant application, contacts made, and protocol steps initiated.

Action 2C - 1: A rapid response protocol will be on file with the Sanitary District and will be reviewed and updated annually. An amount of $6,700 will be reserved annually to cover potential, immediate response costs.

Goal 3: Reduce curly-leaf pondweed coverage and biomass.

Action 3 - 1: Mechanically harvest CLP beds to maximize CLP biomass removal.

a. The Sanitary District office will apply for the DNR aquatic plant management permit.
b. The Lake Scientist (or Harvesting Coordinator) will map beds annually to identify beds for harvesting.
c. The Harvesting Coordinator will prioritize beds and establish a harvesting schedule based on this information.
d. The Harvester Operators will collect harvesting information including date, lake, number of loads, total acres harvested, and observations of boating impairment from CLP.

CLP Bed Definition

- Mean rake density greater than "2" (from DNR protocol).
- Aerial coverage greater than 200 square feet.
- Plants at or near the surface at peak height.
- Plants impede navigation at peak growth.
- Beds are monotypic: >75 percent of bed density is CLP.

Program Standards

A. Water depth minimum is 3 feet to minimize bottom disturbance and meet DNR permit requirements. In practice, harvest depth minimums are limited to 4 feet to provide a margin of safety.
B. Harvest will not occur in areas where wild rice grows.
C. Harvesting CLP growth near boat landings is a priority to minimize transfer to other lakes.
D. Aquatic plant management practices will avoid adversely affecting floating vegetation such as water lily and will avoid sensitive areas.

Potential Process Improvements

The Sanitary District may consider a building for storage of harvesting equipment.

A trial of the use of barge to haul collected CLP to increase harvesting efficiency may be conducted.

Objective 3A: Early summer navigation is improved.

Evaluation Action 3A - 1: Loads harvested per day will be evaluated as a proxy for density of CLP growth (with greater CLP density, harvesting is more efficient and more is removed). Develop a form and record harvester operator observations of navigation impairment. Include results in annual CLP report.

Objective 3B: Annual targets for phosphorus removal through CLP harvesting are achieved: Lake Wapogasset—50 kg and Bear Trap Lake —15 kg.[18]

Both lakes have excessive nutrients. The intention is for CLP and resulting phosphorus removal to lead to later and less intense algae blooms.

Evaluation Action 3B - 1: Calculate the amount of phosphorus removed after harvest based upon estimates of CLP biomass. Include results in an annual CLP report.

[18] Average phosphorus removal from CLP for 2017- 2021, Lake Wapogasett: 46 kg, Bear Trap Lake: 13kg.

The following process will be used to calculate phosphorus removal from CLP harvest:

1. Operators will record truck load volumes to estimate wet mass of each load. Random truck weigh-ins with recorded volumes will provide volume to mass ratio.
2. Lake Scientist will calculate dry mass using dry mass to wet mass ratio of plant materials estimated in 2010 study (Schieffer, 2010) .
3. Determine the percent of CLP in harvested plant materials from random samples of harvested plant material.
4. Lake Scientist will calculate amount of phosphorus removed based upon the mean mass of phosphorus in CLP tissue from 2010 study.
5. Lake Scientist will prepare annual CLP harvest report including estimated phosphorus removal, loads harvested per day, and harvester operators observations of CLP density.

Objective 3C: –July total phosphorus and chlorophyll a decreases by 5 percent and Secchi depth increases by 1 foot in five years (based on 2022 baseline).

Evaluation Action 3C - 1: Collect and analyze weekly, deep hole surface total phosphorus and chlorophyll a samples in July in each lake every year.

Evaluation Action 3C - 2: Take weekly deep hole Secchi readings in July in each lake every year.

Objective 3D: Turion density is reduced by 50 percent in five years (based on 2021 baseline).

Evaluation Action 3D - 1: Complete post-harvest (October) turion sediment density (turions/m^2) analysis to evaluate CLP reductions within harvested beds in preparation for plan update.

Objective 3E: The probability of CLP transfer to other water bodies is decreased.

Program Standard: Harvesting CLP growth near boat landings is a priority to minimize transfer to other lakes.

Goal 4: Restore developed shorelines to native habitats.

Objective 4A: Homeowners install at least one native planting and three runoff control projects each year.

Action 4A - 1: Continue implementation of DNR Healthy Lakes projects with grant funding.

Action 4A - 2: Expand outreach to encourage implementation of projects to reduce shoreland runoff and improve habitat with or without grant funding. See Goal 5.

Evaluation Action 4A - 3: Track implementation of DNR Healthy Lakes projects, voluntary practices, and those required for shoreland permit mitigation.

Goal 5: Increase lake residents' and visitors' understanding of lake ecology and aquatic plant management.

Educational messages:

- The importance of preserving native aquatic species and controlling aquatic invasive species.
- Limit impacts to native aquatic plants by using only hand removal methods near docks and swimming areas, if necessary. Explain restrictions.
- Limit impacts to native plants by observing no-wake zones near shorelines (within 100 feet for boats, and 200 feet for personal watercraft/jet skis).
- Prevent Aquatic Invasive Species: inspect, clean, and drain boats and equipment.
- Wake boat ballast tanks can readily transport zebra mussel larvae/veligers. Drain and dry to prevent transport.
- State regulations and Polk County ordinance make it illegal to transport aquatic plants on public roads. Aquatic invasive species decontamination is required if a decontamination station is present at a lake access in Polk County.
- Describe new potential invasive species and why they are a threat.
- Be on the look-out for aquatic invasive species when you are boating on the lakes.
- Identification of aquatic invasive species and contact if suspected (include illustrations).
- Identification of curly leaf pondweed and methods for removal (include illustrations).
- Identification of yellow iris and methods for removal (include illustrations).
- Nutrient reduction goals of CLP harvesting. Report progress annually.
- How harvesting CLP enhances boating and other recreational activities on the lakes.
- Replacing turf grass and/or establishing infiltration areas (such as rain gardens) will reduce runoff and nutrient loading from residential lots.
- Healthy Lakes grant funding is available to support installation of native plants, diversions, and infiltration projects.
- Reducing nutrient loading reduces algae growth. Reducing sediment can improve fish habitat (especially walleye spawning areas) and reduce invasive plant growth.

Target audiences:

Lake residents with a focus on new residents

Lake visitors

Desired behaviors:

Lake residents minimize removal of native plants along their shorelines, both in the water and on the land.

Lake visitors and lake residents are careful to avoid aquatic invasive species introduction by following prevention procedures.

Lake residents can identify and will look out for aquatic invasive species when using the lake.

Lake residents understand and support aquatic plant management efforts.

Lake residents install native shoreline plantings.

Lake residents install diversions, rain gardens, rock infiltration, and other infiltration practices.

Objective 5A— Reach lake residents and visitors with multiple forms of communication.

Action 5A - 1: Publish the Lake Scene newsletter four times annually. The newsletter is a cooperative venture published by Mort's Marina, assembled and distributed to residents by Lake Association volunteers, and supported financially by the Lake Association. The newsletter will be posted on the Mort's Marina website and printed copies will be delivered to all residents. Each newsletter will contain articles addressing the educational messages outlined in this goal.

Action 5A - 2: Post the APM plan and annual CLP and other APM reports on the Sanitary District website. Include education materials on the Sanitary District (http://www.wapobear.com), Lake Association (http://www.wbtlakes.com), and Mort's Marina (https://www.lakewapogasset.com) websites.

Action 5A - 3: Present information at lake meetings and the annual Lake Association Spring Social through presentations, poster boards, and publications.

Action 5A - 4: Provide one educational activity each year to encourage healthy lakes practices (whether or not grant funded).

Action 5A - 5: Distribute owner packets to new lake residents.

Action 5A - 6: Distribute messages through the Lake Association member-authorized email list.

Action 5A - 7: Write content and coordinate delivery of educational messages in this goal with various communication tools.

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Appendix A. Rapid Response Protocol for Aquatic Invasive Species

Aquatic invasive species (AIS) plants are non-native species that can create ecological or economic harm to the aquatic ecosystem. See table below for the AIS present in Bear Trap Lake and Lake Wapogasset.

Table 10. Invasive Species in Project Lakes (2021)

Species	Bear Trap Lake	Lake Wapogasset
Curly-Leaf Pondweed	Present	Present
Yellow Iris	Present	Present
Narrow-Leaved Cattail	Present	Present
Reed Canary Grass	Present	Present
Aquatic Forget-Me-Not	Not Observed	Present

The following protocol is to be followed if an AIS is suspected:

1. Maintain a contingency fund for rapid response to an AIS discovery.
2. If a suspected AIS is found, contact the Polk County Land and Water Resources Deptartment (LWRD) AIS Coordinator, Lake Scientist, and Sanitary District Office.
3. Potential AIS identification will be confirmed with the Polk County LWRD (or professional with knowledge) or the Wisconsin DNR.
    a. Document the sample with a digital photo if possible.
    b. Record GPS location coordinates of collection location if possible. Alternatives are marking with a float and/or on a map.
    c. Fill out an AIS Incident Report from the Wisconsin DNR. This form can be found at: https://dnr.wisconsin.gov/topic/Invasives/report.html. Contact Wisconsin DNR and deliver plant samples to Polk County LWRD or Wisconsin DNR, 810 West Maple St., Spooner, WI 54801.
        - If the sample is a plant, collect 3-5 intact specimens and attempt to keep all parts of the plant present (roots, leaves, fruits, and flowers if present). Place in plastic, sealed bag(s) and refrigerate or put on ice.
        - If the sample is an animal, collect up to five specimens. Place in a jar with water, put on ice, and transport to refrigerator. Transfer specimen to a jar filled with rubbing alcohol (except for Jellyfish – leave in water).

4. If identification verifies AIS, the following will occur:
    a. Inform Sanitary District President, Lake Association President, Lake Scientist, and Polk County LWRD. The Sanitary District and Lake Association will coordinate informing residents.
    b. The location of the AIS may be marked with a more permanent marker or buoy.
    c. A notice will be posted at all boat landings about the presence of AIS and the general location.
5. Either the Polk County LWRD or a consultant with AIS expertise will be secured to evaluate the extent of AIS introduction. Any AIS locations will be recorded with GPS coordinates. If infestation is small, whole plants may be pulled, with efforts to remove all fragments.
6. The Sanitary District will work with the Wisconsin DNR and a consultant to select a control method plan. This may include hand pulling, manual removal with divers, herbicide application, or other approved method.
7. The Sanitary District will secure necessary permits for control.
8. Funding will be provided as needed by the Sanitary District. The Sanitary District will maintain an AIS rapid response reserve of $6,700.
9. The Sanitary District will work with Wisconsin DNR to secure an Early Detection and Rapid Response AIS Control Grant immediately.
10. Follow-up inspections will occur to evaluate status of AIS and if control measures were effective.

Contacts:

Lake Wapogasset/Bear Trap Lake Sanitary District

Office Assistant (Wendy Weyer)	sanidist@amerytel.net
	715-268-7761
President (David Erspamer)	erspamer@amerytel.net
	715-268-9704

Polk County Land and Water Resources Department

AIS Coordinator (Katelin Anderson)	katelin.anderson@polkcountywi.gov
	715.485.8637
Water Quality Specialist (Colton Sorensen)	colton.sorensen@polkcountywi.gov
	715-485-8639

Wisconsin Department of Natural Resources

Permits (Tyler Mesalk)	tyler.mesalk@wisconsin.gov
	(715) 635-4227
Grants and Lakes Coordinator (Alex Smith)	Alex.Smith@wisconsin.gov
	715-635-4124

Lake Scientist

Ecological Integrity Service (Steve Schieffer)	ecointegservice@gmail.com
	715-554-1168

Herbicide Contractors

Lake Restoration	763-428-1543
Northern Aquatic Services (Dale Dressel)	ddressel@centurytel.net
	715-755-3507

Appendix B. Aquatic Plant Management Action Plan

GOAL	Objective	Action *(actions listed as "program guidance" are not included here)*	Priority	Cost	Volunteer Hours	Organization/Committee	Assigned Lead	Partners	Frequency	When	Funding Sources	% grant	Notes
1	1A	1A-1: EVALUATION: Wild Rice Inventory	2	$ 800	0	SD	Wendy Weyer	Lake Scientist	Every 3 years	2024	DNR lake planning	67	Needed for CLP harvesting permit
1	1 ALL	1C-1: EVALUATION: Point Intercept Survey	3	$ 5,650	0	SD	Mark Jacobson	Lake Scientist	Every 5-7 years	2025	DNR lake planning	67	
2	2A	2A-1: Clean Boats, Clean Waters	1	$ 5,500	60	LA/SD	Rick Bazille	Polk County LWRD, WDNR	Annually	May - Sept.	DNR CBCW	75	SD applies for grant and manages payroll
2	2A	2A-2: Add signage with AIS messaging to complement security cameras at landings	1	$ 2,000	20	LA/SD	David Millard/ Wendy Weyer	Polk County LWRD, WDNR, Towns	As needed	2022/3	DNR lake planning	67	Work with towns
2	2A	2A-3: Install AIS removal tools at all landings	1	$ 1,000	20	LA/SD	David Millard/ Wendy Weyer	Polk County LWRD, WDNR, Towns	As needed	2022/3	DNR lake planning	67	Work with towns
2	2B	2B-1: Volunteer AIS Monitoring: recruit volunteers, complete training, develop schedule and assignments	1	cost for additional Kits	80	LA / AIS Monitoring	David Millard	Polk County LWRD	Ongoing	2022	DNR lake planning	67	Volunteer hours could match other grant activities
2	2B	2B-2: Professional AIS monitoring survey	1	$ 980	0	SD/LA	Mark Jacobson	Lake Scientist	Annually	July	DNR lake planning	67	Combine monitoring into single contract
2	2B	2B-3: Professional AIS yellow iris mapping	1	$ 440	0	LA/SD	Mark Jacobson	Lake Scientist	to be determined	2022	DNR lake planning	67	Combine monitoring
2	2C	Rapid Response Protocol - review annually	1	$6,700	5	LA/SD	Mark Jacobson	Polk County LWRD, WDNR, Lake Scientist	Annually	2023	DNR rapid response grant	75	$6,700 reserve for grant match
3	3 ALL	3-1: HARVEST: permit application	1	$ 300	0	SD	Wendy Weyer	WDNR	Annually	March	Portion of SD Bill		
3	3 ALL	3-1: HARVEST: bed mapping	1	$ 800	0	SD	Dennis Badman	Lake Scientist or Lead Harvester	Annually	May	Portion of SD Bill		Combine monitoring
3	3 ALL	3-1: HARVEST: operation & maintenance, schedule and prioritize harvesting	1	$ 20,000	0	SD	Dennis Badman	SD Engineer and Lead Operator	Ongoing	April/October	Portion of SD Bill		
3	3 ALL	3-1: HARVEST: debt service	1	$ 20,000	0	SD	Mark Tryggestad	SD Commissioners and Staff	Annually	November	Portion of SD Bill		Updates/storage shed/barge
3	3A	3A-1: Develop harvester operator observation forms, record data	1	$ 160	0	SD	Dennis Badman	Lake Scientist	Annually	November	Portion of SD Bill		Use for phosphate calculations
3	3A-C	3B-1: EVALUATION HARVEST: annual report	1	$ 480	0	SD	Dennis Badman	Lake Scientist	Annually	November	Portion of SD Bill		Communicate with residents
3	3C	3C-1 and 2: EVALUATION HARVEST: water quality (add weekly and Chla and P and Secchi)	1	$ 408	0	LA/Water Quality Monitoring	Ryan Hanson	WDNR	Weekly	July	DNR lake planning	67	Includes TP ($26), Chla ($32) and shipping $20). To evaluate lake quality initatives
3	3D	3D-1: EVALUATION HARVEST: turion analysis - bundle with point intercept survey	3	$ 1,200	0	SD	Mark Jacobson	Lake Scientist	Every 5-7 years	Oct-25	DNR lake planning	67	Contingent upon receiving grant funding
4	4A	4A-1: Healthy Lakes project installation	1	grant	45	LA	Mike Seidl	WDNR	Ongoing		DNR healthy lakes	75	Owner match
4	4A	4A-3: Healthy Lakes and other project tracking	1		0	LA	Mike Seidl	WDNR, Polk County Zoning	Annually			0	Continues, education
5	5A	5A-1: Newsletter	1	$ 2,000	80	LA	Marty Noonan	Mort's Marina	4X/year	quarterly	LA	0	Not grant elibible
5	5A	5A-2: Web sites	1	varies	40	SD and LA	Ryan Hanson/ Wendy Weyer	Jim Anderson	Ongoing	as needed	Each Organization	0	Link site information
5	5A	5A-3: Meetings, presentations and information distribution	1	varies	80	LA	Jim Anderson/ Mike Seidl	Polk County LWRD, WDNR, Lake Scientist	Ongoing	all year	DNR lake planning	67	Social, Katelin Anderson
5	5A	5A-4: Healthy Lakes educational activity	1	$ -	40	LA	Mike Seidl	Polk County LWRD, WDNR	Annually		DNR lake planning	67	
5	5A	5A-5: New owner packets	1	$ -	80	LA	Jim Anderson		Ongoing		DNR lake planning	67	Being worked on
5	5A	5A-6: Email list serve	1	Maintained by SD/LA	0	LA/SD	Wendy Weyer	LA??	Ongoing				
5	5A	5A -7: Write content and coordinate distribution	1	$ -	80		Jim Anderson	Polk County LWRD, WDNR, Lake Scientist	Ongoing		DNR lake planning	67	Develop communication plan
ALL	AS SHOWN	Grant writing	1	$500 - $1000		SD and LA	Wendy Weyer	Cheryl Clemens	Every 1 to 3 years	August - October			Summary to be provided