Aquatic Plant Management Plan
Church Pine, Round and Big Lakes
Polk County, Wisconsin

June 2021

Sponsored By

Church Pine, Round and Big Lakes Protection and Rehabilitation District

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Table of Contents

Tables

Figures

Executive Summary

This Aquatic Plant Management Plan for Church Pine, Round, and Big Lakes presents a strategy for managing aquatic plants through the year 2026 by protecting native plant populations, controlling curly-leaf pondweed, and preventing establishment of aquatic invasive species. The plan includes data about the plant community and reviews a history of aquatic plant management. This plan is an update of a plan first developed by the Lake District and an advisory committee in 2010 and updated in 2015. The Church Pine, Round and Big Lake Protection and Rehabilitation District (Lake District) also has a lake management plan which was completed in 2013. A comprehensive lake management plan will be developed later in 2021.

An aquatic plant point intercept survey and curly-leaf pondweed bed mapping were completed for the lakes in 2020. The aquatic plant surveys found that the lakes have healthy, abundant, and diverse plant communities. Native plants provide fish and wildlife habitat, stabilize bottom sediments, reduce the impact of waves against the shoreline, and prevent the spread of non-native invasive plants – all critical functions for the lake.

Plants grow at greater depths as water clarity increases from Big to Round to Church Pine Lake. Plant diversity also increases in the lakes in the same order. Aquatic invasive plants found in and around project lakes include curly-leaf pondweed, purple loosestrife, narrow-leaf cattail, yellow iris, and giant knotweed. Control efforts are recommended for curly-leaf pondweed, purple loosestrife, yellow iris, and giant knotweed. Previous control efforts have greatly reduced curly-leaf pondweed growth. Continued prevention efforts against establishment of Eurasian water milfoil, zebra mussels, and other aquatic invasive species are also important.

This aquatic plant management plan, developed with input from an advisory committee including lake property owners, will help the Lake District implement methods to meet aquatic plant management goals. The implementation plan describes the actions that will be taken toward achieving these goals.

A special thank you is extended to the Aquatic Plant Management Advisory Committee for assistance with plan development.

Plan Goals

1. Prevent introduction of aquatic invasive species and pursue any new introductions aggressively.
2. Manage the population and spread of curly-leaf pondweed, yellow iris, purple loosestrife, and other invasive aquatic plants.
3. Maintain navigable routes for boating.
4. Preserve and enhance our diverse native aquatic plant community.
5. Educate and engage the public regarding aquatic plant management.

Introduction

This aquatic plant management plan is sponsored by the Church Pine, Round, and Big Lake Protection and Rehabilitation District (Lake District). It is an update of a plan first developed by the Lake District and an advisory committee in 2010 and updated in 2015. The planning project is funded by a Wisconsin Department of Natural Resources Aquatic Invasive Species Grant and the Lake District.

The plan presents a strategy for managing aquatic plants by protecting native plant populations, controlling curly-leaf pondweed, and preventing the establishment of additional invasive species. The plan includes data about the plant community. 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 Lake District and the Wisconsin Department of Natural Resources in aquatic plant management for project lakes over the next five years (from 2022 through 2026).

A separate lake management plan, developed in 2012 and 2013, includes the results of a water quality study and sociological survey. A comprehensive lake management plan that incorporates this aquatic plant management plan will be developed later in 2021.

Public Input for Plan Development

The Aquatic Plant Management (APM) Advisory Committee provided input for the development of this plan. The APM Advisory Committee met three times. At the first meeting on March 24, 2021, the committee reviewed plan goals, identified plant management concerns, and reviewed the aquatic plant survey and curly-leaf pondweed management. At a second meeting on April 7, the committee finalized the curly-leaf pondweed management program, discussed aquatic invasive species prevention and monitoring and reviewed navigation management. The third meeting on May 5 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 Lake District board announced the availability of the draft Aquatic Plant Management Plan for review with a mailing to all lake residents and a public notice in the Osceola Sun the week of June 1. The plan was available to the public on the Lake District web site: bigroundpine.com. Comments were accepted through June 25, 2021. No comments 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 ranged from maintaining navigation through areas of native and invasive plant growth, preserving the benefits of native plants, establishing control thresholds for curly-leaf pondweed management, and best methods for preventing, monitoring and managing aquatic invasive species. Water quality concerns are outside the scope of this plan and will be deferred until the comprehensive lake management plan is developed.

Lake Information

The Lakes

The project area is in southwestern Polk County, Wisconsin in the towns of Alden and Garfield. Project lakes include Church Pine Lake (WBIC: 2616100), Round Lake (sometimes mapped and referred to as Wind Lake) (WBIC: 2616000), and Big Lake (WBIC: 2615900). Church Pine Lake is a 107-acre lake with a maximum depth of 45 feet. Round Lake is a 38-acre lake with a maximum depth of more than 24 feet.[1] Big Lake is a 259-acre lake with a maximum depth of 24 feet. Development around the lakes is moderate to heavy with much of the lakeshore developed for residential use.

Water flows from Church Pine, to Round, and then to Big Lake. North Creek flows into the north end of Big Lake, and Forest Creek flows from Big Lake on its west side. A dam on Forest Creek regulates the water levels in Big Lake at an established legal level between 95.5 and 96.5 feet. A timber dam was first constructed ¼ mile from the Big Lake outlet on this tributary in 1883.[2]

The maximum depth to which plants grow (the littoral zone) varies in project lakes. The littoral zone reached a depth of more than 26 feet in Church Pine Lake, 22 feet in Round Lake, and 18 feet in Big Lake in 2020. Table 1 summarizes information about project lakes.

Table 1. Lake Information

	Church Pine	Round (Wind)	Big
Size (acres)	107	38	259
Mean depth (feet)	23		17
Maximum depth (feet)	45	24+	24
Littoral zone depth (feet)	26.3	22.7	18.3
Average summer (July and August) secchi depth 2020 (feet)	14	11	8

A lake depth map which indicates public access locations is found on the following page as Figure 1.

[1] Although listed on Wisconsin DNR Lake Maps as 7 feet deep, the maximum depth recorded during the plant survey was in excess of 24 feet.

[2] Bigroundpine.com/history

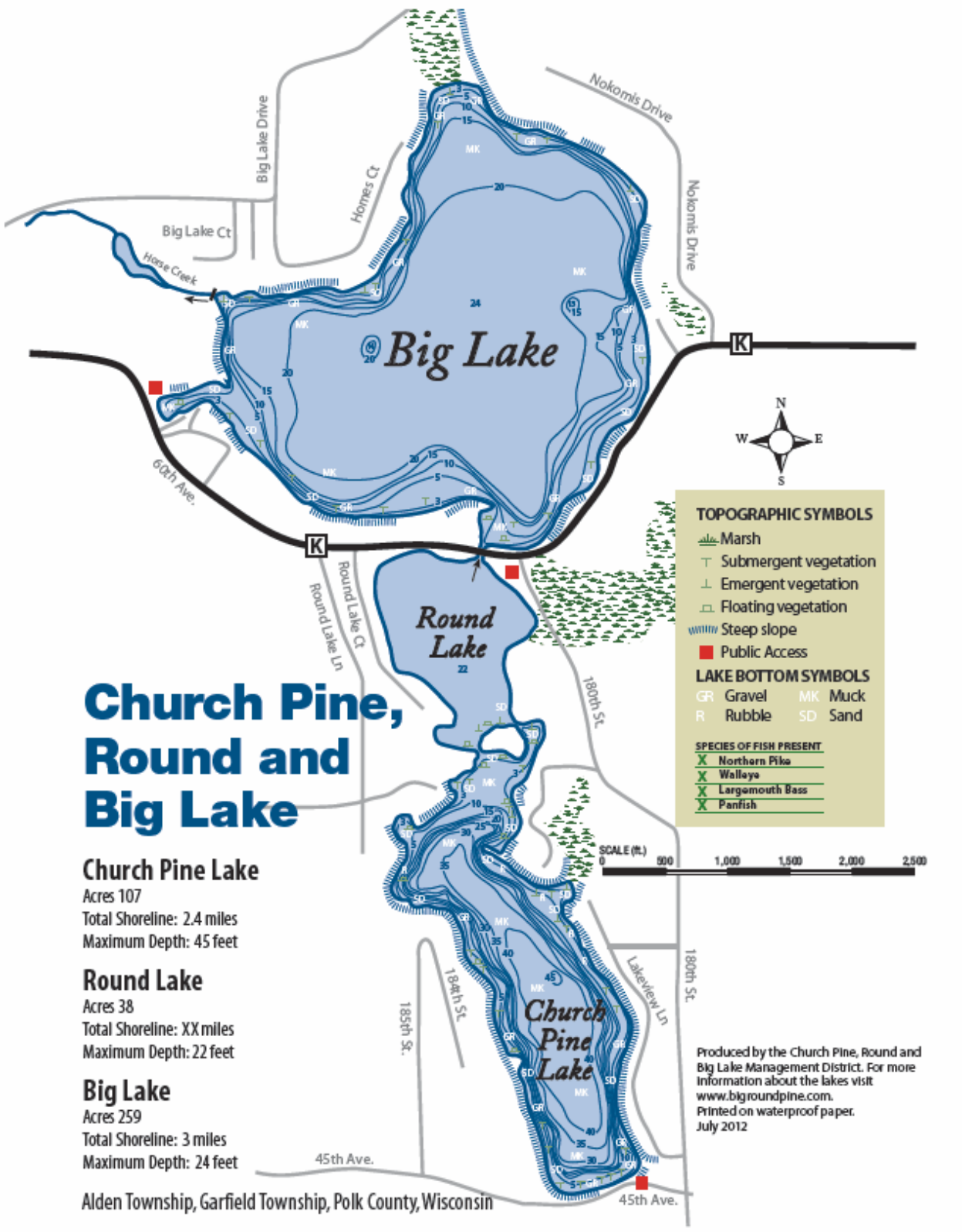


Figure 1. Big Lake and Church Pine Lake Contour Maps

Aquatic Habitats

Primary Human Use Areas

There are two boat landings in the project area. One is at the southern end of Big Lake along County Highway K. The second is at the southern end of Church Pine Lake. Many people use the Church Pine landing as a swimming area. There is additional parking within a block of the Church Pine boat landing at West Immanuel Lutheran Church. There are also two undeveloped town access points to the lakes. Needles Resort serves project lakes by renting cabins in a historic resort location.

Big Lake attracts around 250 anglers for an annual fishing tournament. Proceeds go toward walleye stocking.

Residential development is prevalent on the lake. Waterfront property owners and the general public use the lakes for a wide variety of activities including fishing, boating, swimming, and viewing wildlife.

Functions and Values of Native Aquatic Plants

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

Water Quality

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

Fishing

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

Waterfowl

Plants offer food, shelter, and nesting material for waterfowl. Birds eat both the invertebrates that live on plants and the plants themselves.[3]

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

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

species are described as opportunistic invaders. This means that they take over openings in the lake bottom where native plants have been removed. Without competition from other plants, these invasive species may successfully become established and spread in the lake. This concept of opportunistic invasion can also be observed on land in areas where bare soil is quickly taken over by weeds.

Removal of native vegetation not only diminishes the natural qualities of a lake, but it increases the risk of non-native species invasion and establishment. The presence of invasive species can change many of the natural features of a lake and often leads to expensive annual control plans. Allowing native plants to grow may not guarantee protection against invasive plants, but it can discourage their establishment. Native plants may cause localized concerns to some users, but as a natural feature of lakes, they generally do not cause harm.[4]

Sensitive Areas

The Wisconsin Department of Natural Resources (DNR) completed sensitive area surveys to designate areas within aquatic plant communities that provide important habitat for game fish, forage fish, macroinvertebrates, and wildlife as well as important shoreline stabilization functions. The DNR transitioned to designations of *critical habitat areas* that include both *sensitive areas* and *public rights features*.

Sensitive areas offer critical or unique fish and wildlife habitat (including seasonal or life stage requirements) or offer water quality or erosion control benefits to the area (Administrative code 107.05(3)(1)(1)). The Wisconsin Department of Natural Resources is given the authority for the identification and protection of sensitive areas of the lakes. *Public rights features* are areas that fulfill the right of the public for navigation, quality and quantity of water, fishing, swimming, or natural scenic beauty.

The *critical habitat area* designation provides a holistic approach to ecosystem assessment and protection of those areas within a lake that are most important for preserving the very character and qualities of the lake. Protecting these *critical habitat areas* requires the protection of shoreline and in-lake habitat. The *critical habitat area* designation provides a framework for management decisions that impact the ecosystem of the lake.

Special Lake Designations

The map titled *Critical Habitat Areas* shows Sensitive Areas for Big Lake and Church Pine Lake. It also indicates that Big Lake and Round Lake are classified as Areas of Special Natural Resource Interest (ASNRI).

The Department of Natural Resources completed Sensitive Area Designations in September of 1998. Purple loosestrife was identified in Big Lake Sensitive Areas A, C, and D. Curly-leaf pondweed was found in Big Lake Sensitive Area C.

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

Sensitive/Critical Habitat Area Recommendations

General

- Preserve/restore shoreline buffers at least 35 feet deep
- Limit aquatic vegetation removal to no more than 25-foot channels – hand pulling is the preferred method for management followed by harvesting and herbicide use
- Leave woody debris in place
- Prevent construction site erosion
- Limit rip rap for shoreline stabilization
- Strictly enforce zoning ordinances
- Control exotic species such as purple loosestrife

Church Pine

- Use conservation easements, deed restrictions, or zoning to protect sensitive areas

Resource values of each lake sensitive area were described in the same way: provides bass, panfish, and forage species habitat; northern spawning and nursery areas; and wildlife habitat. All major types of plants: emergent, floating, and submergent were recorded in each sensitive area.

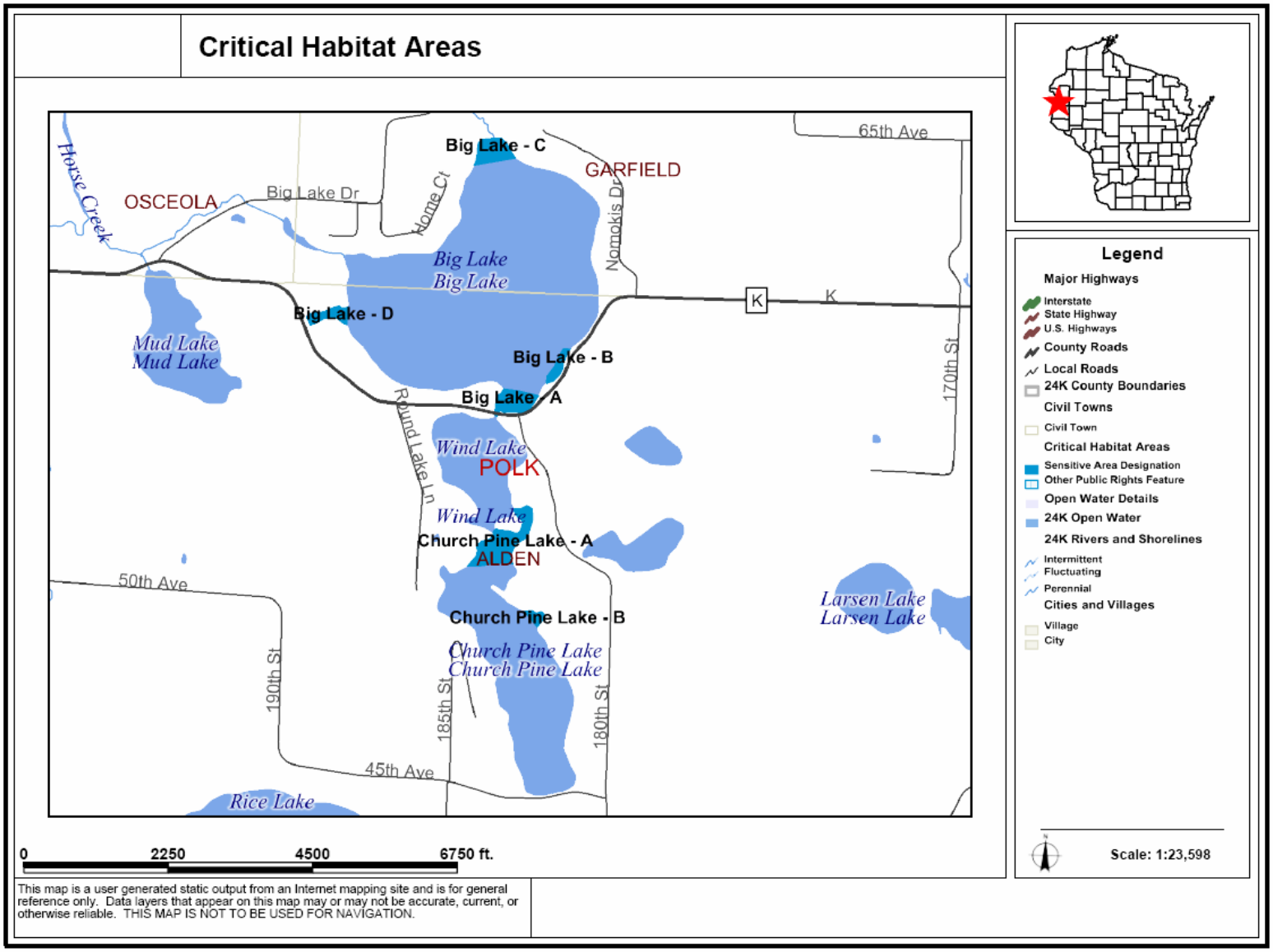


Figure 3. Sensitive Area/Critical Habitat Area Designations

Lakes Fishery

The three-lake chain is managed as a largemouth bass, panfish (bluegill, black crappie, pumpkinseed, and yellow perch), and northern pike fishery. Large fingerling walleye have been stocked for several years with Lake District funding. Continued stocking will be necessary to maintain a walleye fishery.

Table 2. Spawning Temperatures and Substrate Needs

Fish species[5]	**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 Pumpkinseed	Mid 60s to lower 70s	Build nests in 1-6 feet on hard bottom
Northern Pike	Upper 30s to mid-40s soon after ice-out	Broadcast eggs onto vegetation (eggs attach)
Smallmouth Bass	Usually between 60 to 70	Nests in circular, clean gravel
Walleye	Low 40s to 50 degrees.	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

Table 3. Fish Species of Project Lakes[6]

Lake	**Northern Pike**	**Walleye**	**Largemouth Bass**	**Panfish**
Church Pine	P	P	C	C
Round	P	P	C	C
Big	P	P	C	P

P = Present, C = Common

[5] Information from Aaron Cole. Wisconsin DNR Fisheries Biologist. 2015.
[6] *DNR Lakes Book*. 2009.

Plant Community

Aquatic Plant Survey Results

Ecological Integrity Service completed an aquatic plant inventory for project lakes in 2009, 2014 and 2020 according to the WDNR-specified point intercept method. A curly-leaf pondweed (CLP) survey was conducted to identify the locations of this aquatic invasive species in late June of each of these years. Since CLP typically dies in early July, CLP surveys are usually completed in late June while the CLP is robust. Native plant surveys are generally conducted in July or August.

The survey and data analysis methods and detailed results for the aquatic plant survey are found in the following report: *Aquatic Macrophyte Survey: Point Intercept Method Big Lake (WBIC:2615900), Churchpine Lake (WBIC: 2616100) and Round Lake (WBIC: 2616000) Polk County Wisconsin, June/August 2020*. A summary of the results most relevant to aquatic plant management are presented in this plan.

Church Pine Lake

Church Pine Lake has the highest aquatic plant diversity of the three lakes with 39 species. The Simpson's diversity index was high at 0.92. There were also numerous sensitive plants (with high conservatism value) surveyed in this lake.

Church Pine Lake has a narrow littoral zone (depth at which plants grow) with rapid drop-offs in many areas near shore. However, within the defined littoral zone, the coverage of plants is high. Plants were present at 80% of the sample points within the littoral zone. The maximum depth plants were sampled was 26.3 feet and the mean depth was 10 feet. Plants are found in deep water because of the lake's excellent water clarity which allows enough light penetration to grow plants at considerable depth.

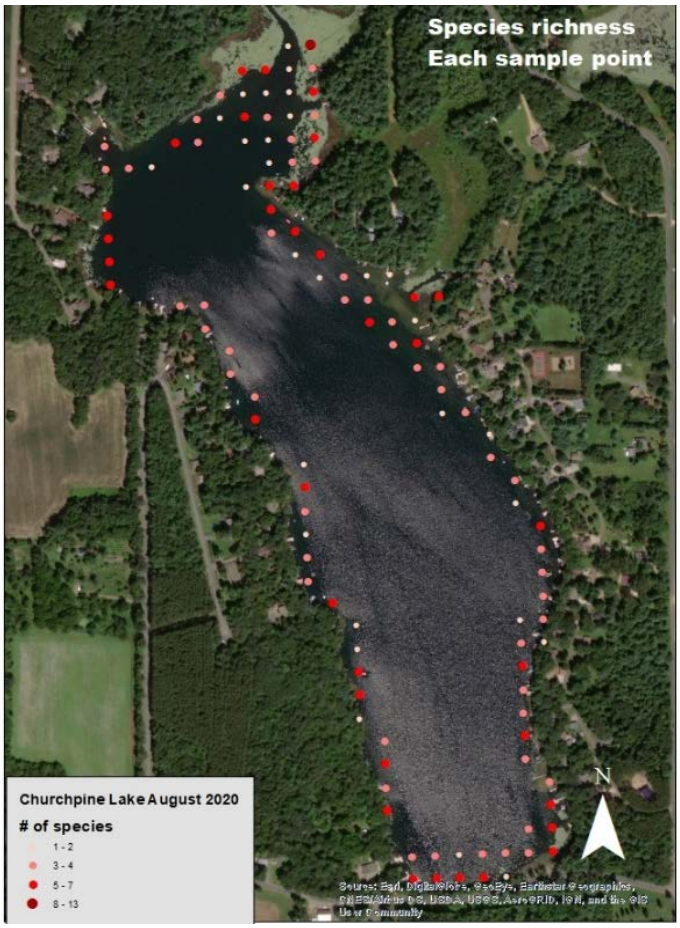


Figure 4. Church Pine Species Richness

There was a statistically significant decrease in six species from 2009 to 2020. Except for one species (*Nitella sp.)*, these decreases occurred from 2009 to 2014. The number of each of these species stayed lower from 2014 to 2020. There were significant decreases from 2014 to 2020 in four additional species. With no known plant management occurring on Church Pine Lake, the decreases are likely due to natural and/or sampling variation.

Round Lake

Round Lake also has a diverse aquatic plant community. There were 34 species sampled and two additional species viewed at the sample points. The Simpson's diversity index was high at 0.92. The coverage of plants was quite high with plants present at 72.7% of the sample points shallower than littoral zone depth. The maximum depth with plants was 22.7 feet, which demonstrates good water clarity.

The highest aquatic plant diversity in Round Lake occurred in a bay on the east shore and in the southeastern shore of the lake with some sample points having up to nine species of plants present on the sample rake. These locations contain numerous floating and emergent plants in a high nutrient substrate.

From 2009 to 2020, three species had statistically significant decreases. There were five species with significant decreases from 2014 to 2020. However, because plant management does not occur on Round Lake, the changes are likely natural variation.

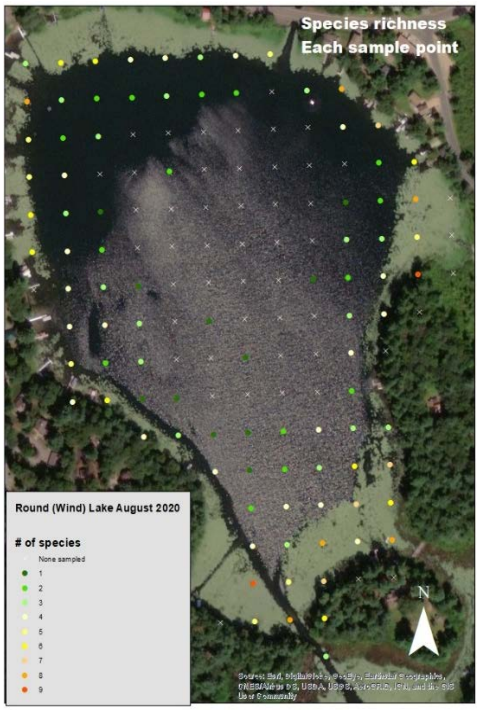


Figure 5. Round Lake Species Richness

Big Lake

Big Lake has a moderately diverse aquatic plant community with 26 species sampled and two additional species viewed. The Simpson's diversity was 0.86, lower than those of Round Lake and Church Pine Lake. Plants were found in up to 18.3 feet of water. Water clarity may be limiting the depths of plant growth. Within the littoral zone, plants were sampled in 65.75% of the sample points.

The highest diversity in Big Lake occurred in bays and at the lagoon on the west side of the lake. Some sample points have up to eight different species present on the rake.

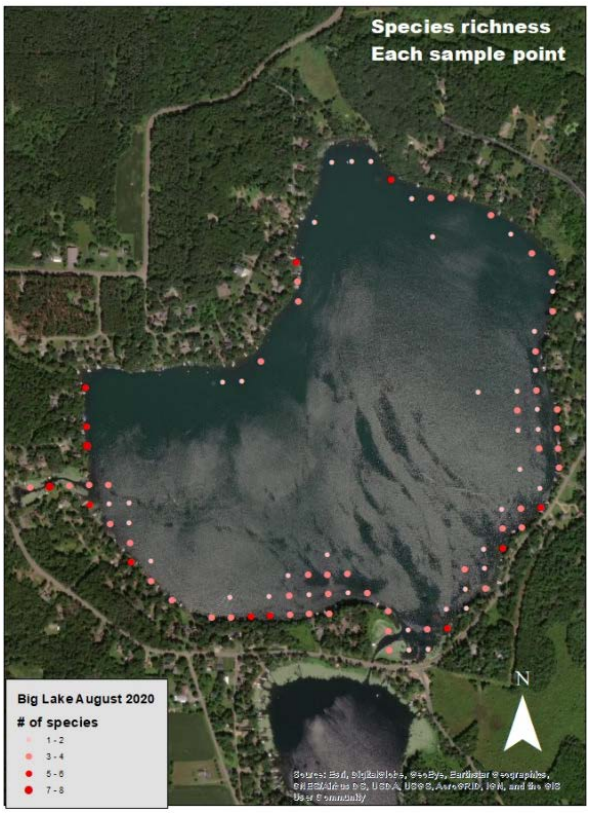


Figure 6. Big Lake Species Richness

Six aquatic plant species decreased significantly from 2009 to 2020 and only one species had a significant decrease from 2014 to 2020. So, most decreases occurred from 2009 to 2014. Because herbicides are used to treat CLP early in the season, natives are expected to be dormant during herbicide application. One indication of little effect on herbicide treatment on native plants is that coontail did not decline. Coontail grows early in the season, so is a plant likely to be affected by an early season Endothall (broad spectrum herbicide) treatment.

However, some of these plant decreases could potentially be from herbicide use. One species, flat-stem pondweed had a significant decrease after herbicide use in 2012. The 2014 and 2020 frequency of flat-stem pondweed was much lower than in 2009. It appears that flat-stem pondweed decreased prior to 2014 and hasn't rebounded to the 2009 frequency.

Table 4. Statistically Significant Decreases in Big Lake Aquatic Plants 2009 to 2020.

Species with a statistically significant decrease	Number sampled in 2009	Number sampled in 2014	Number sampled in 2020	2009-2020 Decrease?	2014-2020 Decrease?
Forked duckweed (*Lemna trisulca*)	19	26	1	Yes ($p=5X10^{-5}$)	Yes (p=9.9X10-7)
Clasping pondweed (*Potamogeton richardsonii*)	10	7	2	Yes (p=0.02)	No
Leafy pondweed (*Potamogeton foliosus*)	4	1	0	Yes (p=0.04) (very small sample)	No
Flat-stem pondweed (*Potamogeton zosteriformis*)	32	1	6	Yes ($p=2X10^{-5}$)	No
Large-leaf pondweed (*Potamogeton amplifolius*)	5	1	0	Yes (p=0.025) (very small sample)	No
Curly-leaf pondweed *(Potamogeton crispus*)	10	1	0	Yes (p=0.001)	No

During this same time period (2009 to 2020), there were significant increases in three aquatic plant species. Two species increased from 2014 to 2020 as shown in Table 5.

Table 5. Statistically Significant Increases in Big Lake Aquatic Plants 2009 to 2020

Species with a statistically significant increase	Number sampled in 2009	Number sampled in 2014	Number sampled in 2020	2009-2020 increase?	2014-2020 increase?
Illinois pondweed (*Potamogeton illinoensis*)	5	17	14	Yes (p=0.04)	No
Southern naiad *(Najas guadalupensis*)	0	0	48	Yes (p=9.3X10-13)	Yes (p=9.3X10-13)
Slender waterweed (*Elodea nutalli*)	0	0	4	Yes (p=0.04) (very small sample)	Yes (p=0.04) (very small sample)

Aquatic Invasive Species

Yellow Iris *(Iris pseudacorus)*

The yellow iris locations shown in Figure 7 represent individual plants rather than large beds. However, this attractive yellow flower can be very invasive, and control is recommended. 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.

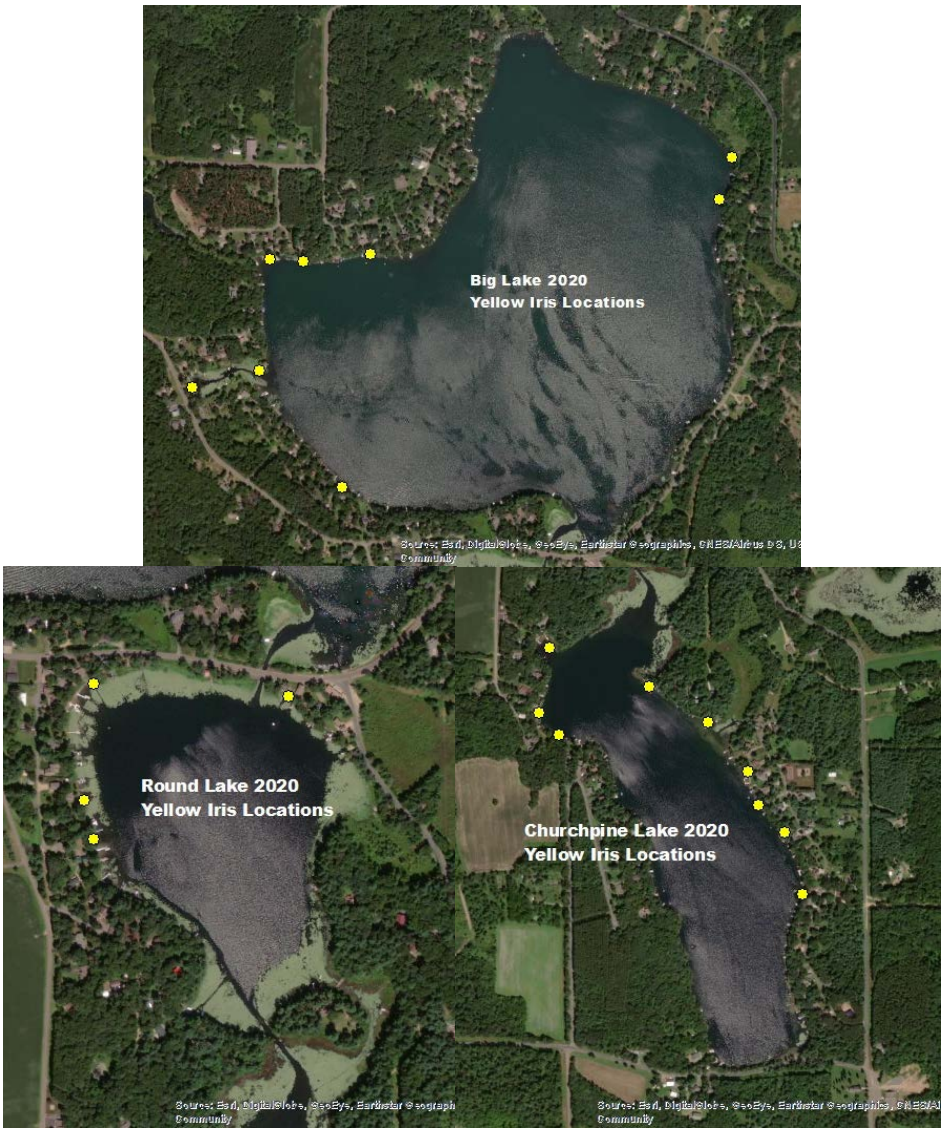


Figure 7. Yellow Iris Locations on Big, Round, and Church Pine Lakes, 2020

Purple Loosestrife *(Lythrum salicaria)*

Purple loosestrife is actively managed on the lakes. Locations observed during an August 2020 survey completed by Dale Dressel, Northern Aquatic Services, are shown below. Purple loosestrife is present in 29 locations around Big Lake. The "point" on Big Lake has the densest stand with more than 150 plants present. Purple loosestrife is present in seven locations on Round Lake, mostly on the north end. One area on the northeast swampy shoreline of Round Lake has about 50 plants scattered along a 200 yard stretch.

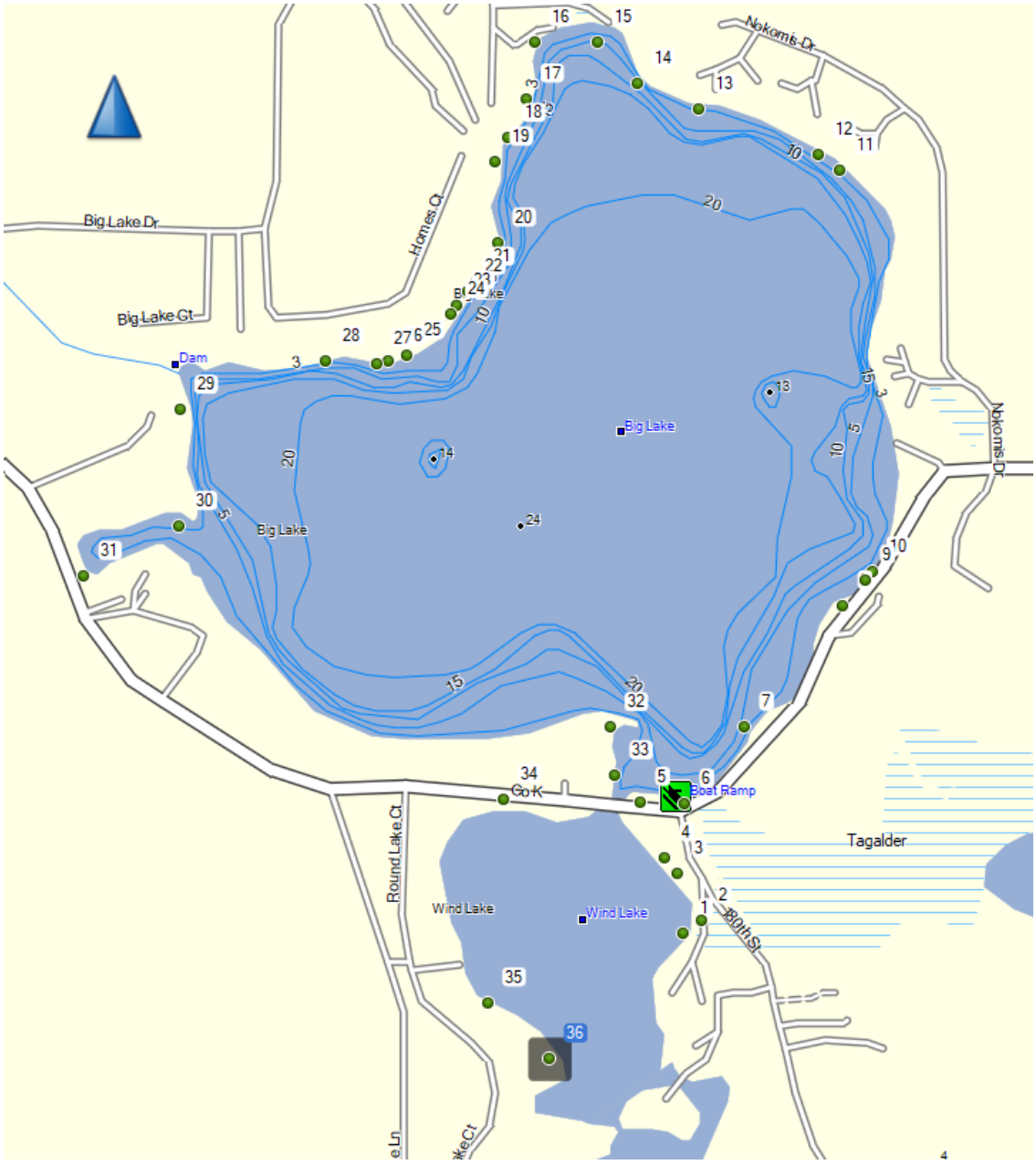


Figure 8. Purple Loosestrife Locations August 2020.

Reed Canary Grass *(Phalaris arundinacea)*

Reed canary grass was observed in several shoreline locations during the aquatic plant survey, and it is likely present in other shoreline locations. Reed canary grass is a wide-spread species, and is rarely managed as a result. Reed canary grass removal is sometimes attempted as part of a native plant restoration project such as in the Healthy Lakes Program.

Figure 9. Reed Canary Grass Locations August 2020

Narrow-leaf Cattail (*Typha angustifolia)*

Narrow-leaf cattail was observed in a few locations as shown in Figure 10. Narrow-leaf cattail is an introduced species and according to the Wisconsin DNR, is potentially invasive.[7] 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.[8] 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 have not been delineated, it is not known if the plant is spreading.

Figure 10. Narrow-leaf Cattail Locations August 2020

[7] Dr. Susan Knight, Wisconsin DNR personal communication.

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

Giant Knotweed *(Polygonum sachalinense)*

Locations of giant and Japanese knotweed were found near or adjacent to project lakes in a survey completed by the Polk County Land and Water Resources Department in 2012. Dale Dressel, Northern Aquatic Service, indicated he did not find any shoreline locations where knotweed was present in August 2020.

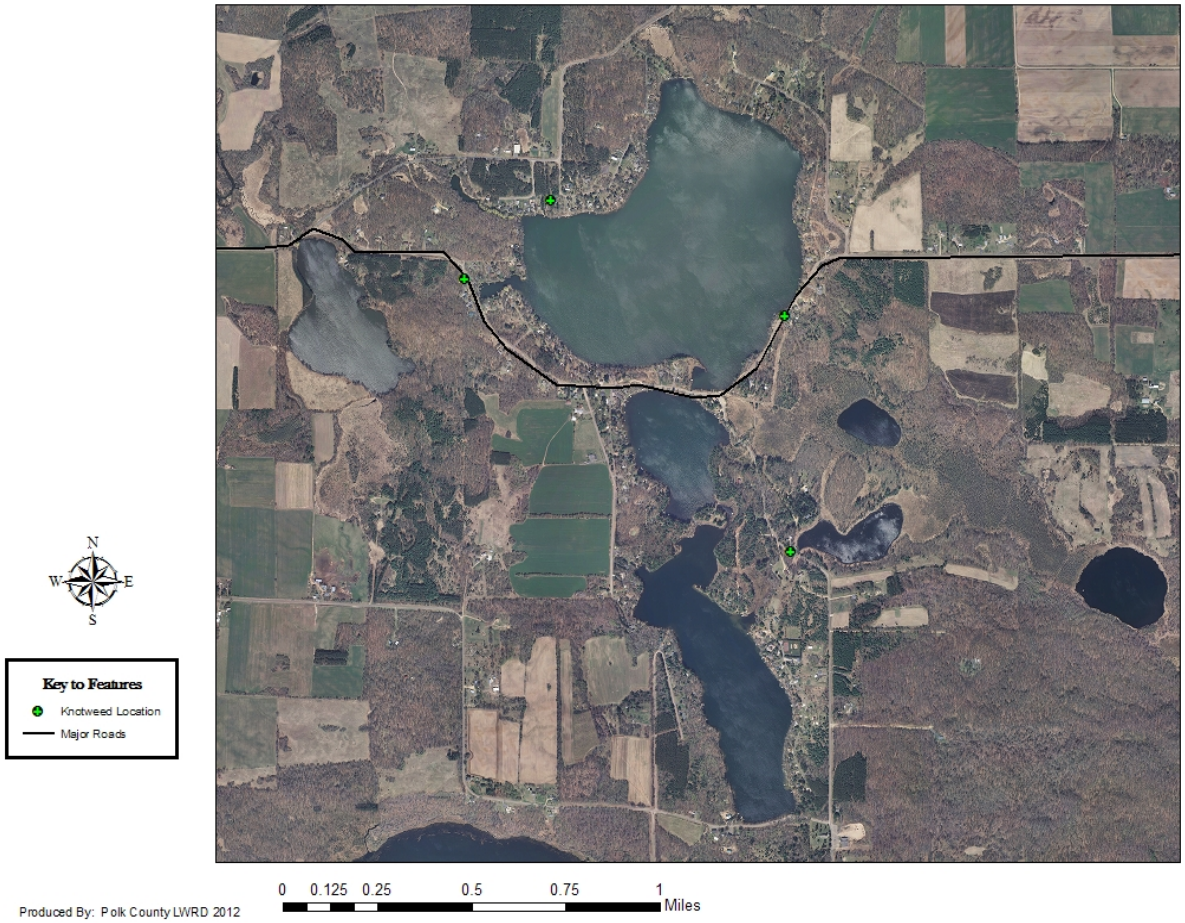


Figure 11. Giant and Japanese Knotweed Locations near Big Lake 2012

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.

Past Aquatic Plant Management

Previous aquatic plant management plans and a pilot project to evaluate curly-leaf pondweed control methods including herbicide treatment with Reward, harvesting, and lime slurry treatment are summarized in the 2015 aquatic plant management (APM) plan. Results of the pilot project were mixed, and further use of the lime slurry treatment was not permitted by the Wisconsin DNR.

The DNR Northern Region released an Aquatic Plant Management Strategy in the summer of 2007 to protect the important functions aquatic plants provide in lakes. As part of this strategy, the DNR prohibited management of native aquatic plants in front of individual lake properties after 2008 unless management was designated in an approved aquatic plant management plan.[9] Native plant populations are important for habitat, protection against erosion, and as a guard against invasive species infestation. Therefore, plant removal with herbicides must be carefully reviewed before permits are issued for individual property owners. The DNR did not allow removal after January 1, 2009 unless the "impairment of navigation" and/or "nuisance" conditions were clearly documented.

Individual Corridors

Until 2006, some homeowners contracted with herbicide applicators to remove aquatic plants in front of their properties. A summary of these treatments is included in the 2015 aquatic plant management plan. Acres treated annually ranged from 0.34 – 2.49 on Church Pine Lake and 0.34 to 4.36 on Big Lake. The stated purpose of these treatments was threefold: to maintain shoreline access for boating, swimming, fishing, and to reduce nuisance algae accumulation.

Current Aquatic Plant Management

Purple Loosestrife

The Lake District hired Dale Dressel, with Northern Aquatic Services, to chemically treat purple loosestrife from 2009 through 2020. Dale conducts an annual inventory along with control efforts. Purple loosestrife costs have declined with successful herbicide treatments (however, not all areas with purple loosestrife present are treated). Cost of herbicide treatment was $3,126 in 2009 and remained below $1,000 through 2020 when the cost was $500. A single 0.63-acre site on the eastern shore of Big Lake was treated with the herbicide Rodeo (an aquatic formulation of glyphosate) on August 6, 2020.

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

In 2010, beetles were raised by Lake District volunteers and introduced in the large wetland area surrounding the North Creek inflow to Big Lake to control purple loosestrife. Dale Dressel found some evidence of the beetles during his 2019 and 2020 inventories.[10]

Knotweed Control

The Polk County LWRD found and treated Giant/Japanese Knotweed on Big Lake. This treatment ended in 2013.

Curly-leaf Pondweed Control[11]

The Lake District successfully implemented an early season herbicide control program for curly-leaf pondweed from 2011-2020. Treatment early in the season, before many native plants are growing, is critical because Endothall, the herbicide used, is a broad spectrum herbicide. Herbicide treatment was almost entirely in Big Lake with one small bed treated in Round Lake. These treatments resulted in nearly complete seasonal removal of CLP each year, with treatment acres declining over the years.

Measures of CLP control success from 2011 to 2020 include:

- ✓ Decreased acreage of CLP in beds (25.6 to 6.1)
- ✓ Decreased pre-treatment frequency in beds (75 to 18.8 percent CLP at all sample points)
- ✓ Decreased mean turions in sediment (44 to 3.5 turions/m^2)

Impacts on native plant growth[12]

Importantly, reductions in CLP seem to have occurred without many significant impacts to native plants. While pre- and post-monitoring surveys and comparison of aquatic plant point intercept surveys showed some declines in native plants, these changes may have been due to natural variability in growth. A potential exception noted previously is flat-stem pondweed where reductions occurred following a 2012 herbicide treatment.

There are native plants growing in the areas of the CLP beds. However, few significant increases have occurred in native plant species between point intercept surveys, so increases in native plants following reductions of CLP are not evident. It was expected that reductions in CLP density and coverage would reduce competition for native plants early in the summer as native plants leave dormancy.

With less CLP growth, herbicide use has been reduced over the years on Big Lake. Further reductions, potentially to no herbicide use, could lead to native plant responses that are evident in future point intercept surveys.

[10] Personal email communication. Dale Dressel. 02/16/2020.

[11] Schieffer, Steve. Ecological Integrity Service. *Herbicide Treatment Analysis for Potamogeton Crispus (CLP) Big Lake Polk County, WI. 2011-2020.*

[12] Paraphrased from Schieffer, Steve. Ecological Integrity Service. *Aquatic Macrophyte Survey: Point Intercept Method Big Lake (WBIC: 2615900), Churchpine Lake (WBIC: 2616100) and Round Lake (WBIC: 2616000), Polk County Wisconsin June/August 2020.*

Table 6. CLP Treatment Summary 2011 – 2021

Year	Acres	Target ppm	Temp. in F reported at treatment	Reported wind speed[13]	Seasonal Decline in CLP Frequency	Significant Declines in Native Plants	Notes
2011	25.6	1.25 to 2	54	3-6 mph	76% to 4% 95% decline	NA	Data not available
2012	20.7	1.25 to 2	50 to 51	2-5 mph	75 to 11% 85% decline	Some pondweeds	Coontail increased (grows early season)
2013	20.9	1.5 to 2.5	59.9	2-6 mph	81 to 9% 89% decline	Wild celery	Coontail not affected
2014	14.1	1.5 to 2.5	55	3 mph	70% to 2% 97% decline	None	
2015	14.03	1.5 to 2.5	50-60	0-3 mph	80% to 5%	Coontail	
2016	13.75	1.5 to 2.5	50-60	3-5 mph	56% to 3%	None	
2017	12.96	1.5 to 2.5	53	calm	62% to 1%	Waterweed Forked duckweed	
2018	11.81	1.5 to 2.5	59	0-2 mph	43% to 0%	Northern water milfoild	
2019	8.4	1.5 to 2.5	47	0-4 mph	42% to 14%	Coontail Forked duckweed	Increase in southern naiad
2020	6.1	1.5 to 2.5	52	0-4 mph	68% to 9%	Waterweed	
2021	4.95	2.5	50	1-2 mph	NA	NA	Data not available

[13] As reported by applicator in aquatic plant management treatment records.

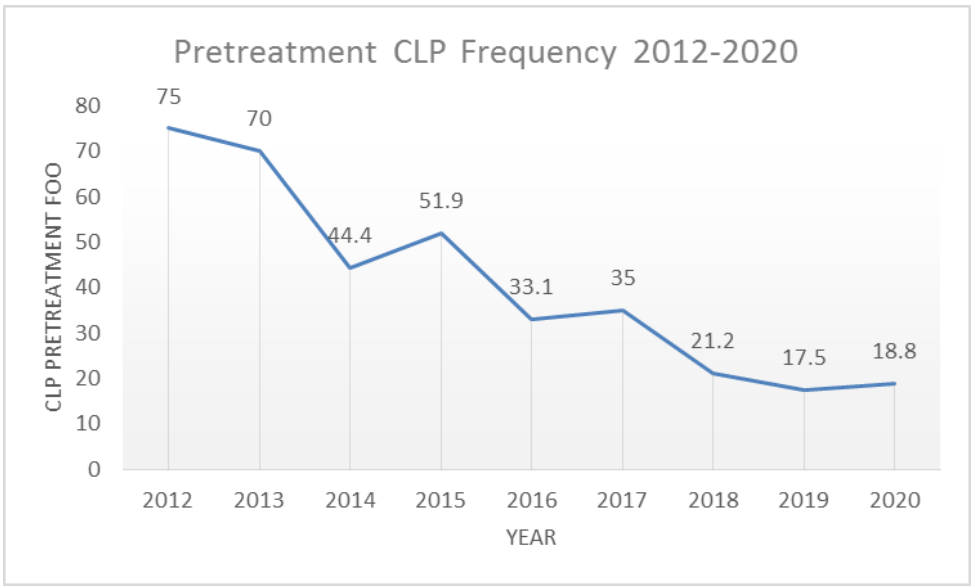


Figure 12. Pre-treatment Frequency of CLP using the Same Sample Points from 2012 to 2020

Figure 12 shows a long-term trend of CLP pre-treatment frequency reduction. The same sample points are used for each measurement, so results are comparable. The decrease has leveled in the last few years, which indicates some CLP is returning each spring.

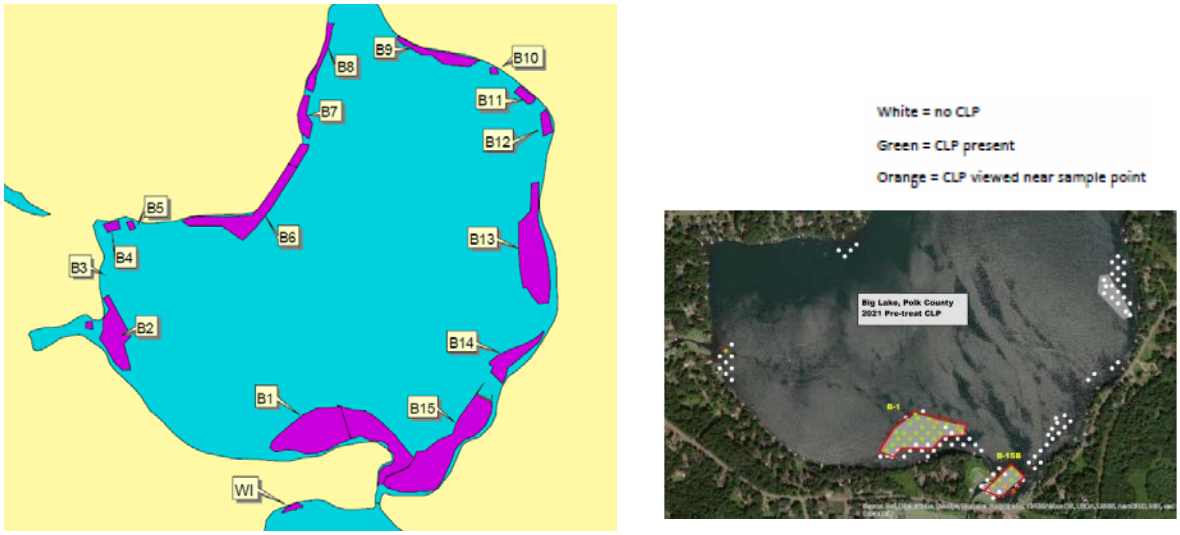


Figure 13. CLP Treatment Beds 2011and 2021

Herbicide Concentration Monitoring[14]

Herbicide residual concentration following CLP treatment was monitored as part of a Department of Natural Resources study in 2013 and 2014. Results from both years show that herbicide concentrations are below the target amount initially and dissipate rapidly. Results are presented in the 2015 aquatic plant management plan.

CLP Turion Survey Results[15]

Most CLP reproduction occurs from turions which are small pinecone-like structures produced by plants prior to when they die back in early summer. CLP turions sprout through late fall or early winter in lake sediments, and the plants grow under the ice. The plants grow rapidly early in the spring following ice-out. Ecological Integrity Service monitored curly-leaf pondweed turions in Big Lake from 2011 through 2020.

Figure 14. Germinating CLP Turion [16]

Research suggests that approximately 50% of turions germinate in a growing season while the rest remain dormant until the following growing season when another 50% will germinate (Johnson 2012). Because latent turions may be able to survive for over 5 years in the sediment, it may take several years of control to exhaust the "turion bank" (R. Newman – U of M unpublished data).

[14]Skogerboe, John. *Draft: Big Lake, Polk County (WBIC 2615900), Dipotassium Salt of Endothall Herbicide Concentration Monitoring Summary, 2013 and 2014.*

[15] Schieffer, Steve. Ecological Integrity Service. *Herbicide Treatment Analysis for Potamogeton Crispus (CLP) Big Lake Polk County, WI.* 2011-2020.

[16] Photo from Berg, Matthew. *Curly-leaf Pondweed (Potamogeton Crispus) Post Herbicide Turion Survey Balsam Lake – WBIC: 2620600 Polk County, Wisconsin. November 2014.*

Long-term CLP reduction can be indicated by comparing annual sediment turion densities. If treatment is successful at reducing CLP in any given year, the plants produce fewer turions to be added to the sediment. Lower sediment turion density generally results in less CLP growth the following spring.

Turion density varied from 2012 to 2020. However, the turion density (by bed and overall) was lower in 2020 than any year dating back to 2012. Figure 15 shows the turion density in each of the 2020 treatment beds from 2012 to 2020. Figure 20 shows the turion density from all sample points from 2012 to 2020.

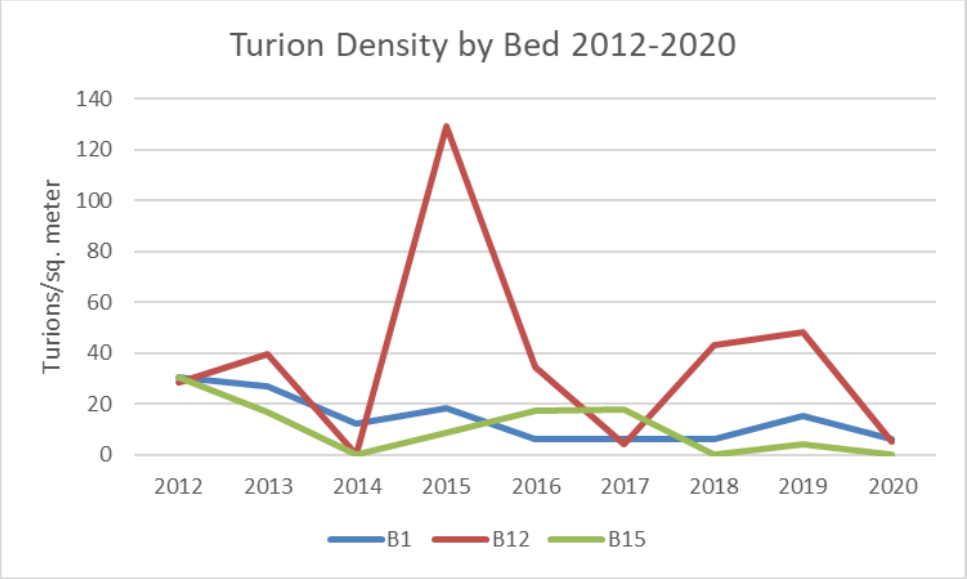


Figure 15. Turion density in each 2020 CLP bed (B1, B12, B15) from 2012 to 2020

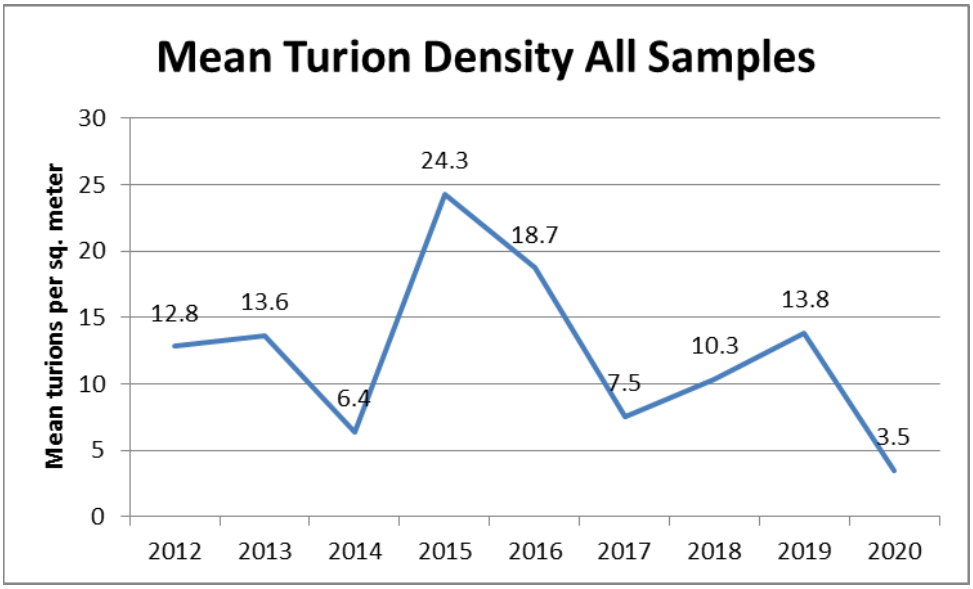


Figure 16. Turion density in all Sample Points from 2012 to 2020

Table 7 provides annual turion density for each bed treated in 2020 and the mean turion density for all sample points. Individual data for 2011 beds are not included in the table because the beds were not numbered consistently between 2011 and 2012. A map of the turion density at each sample point in 2020 is included as Figure 21.

Table 7. Mean Turion Density by Bed (turions/m^2)

Bed	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
B1		30.7	27	12.4	18.4	6.2	6.1	6.1	15.4	6.5
B12		28.7	39.7	0	129	34.4	4.4	43	48.4	5.5
B15		30.7	16.7	0	8.6	17.2	17.7	0	4.3	0
All*	**44**	**12.8**	**13.6**	**6.4**	**24.3**	**18.7**	**7.5**	**10.3**	**13.8**	**3.5**

*Includes turion measurements in historic CLP beds

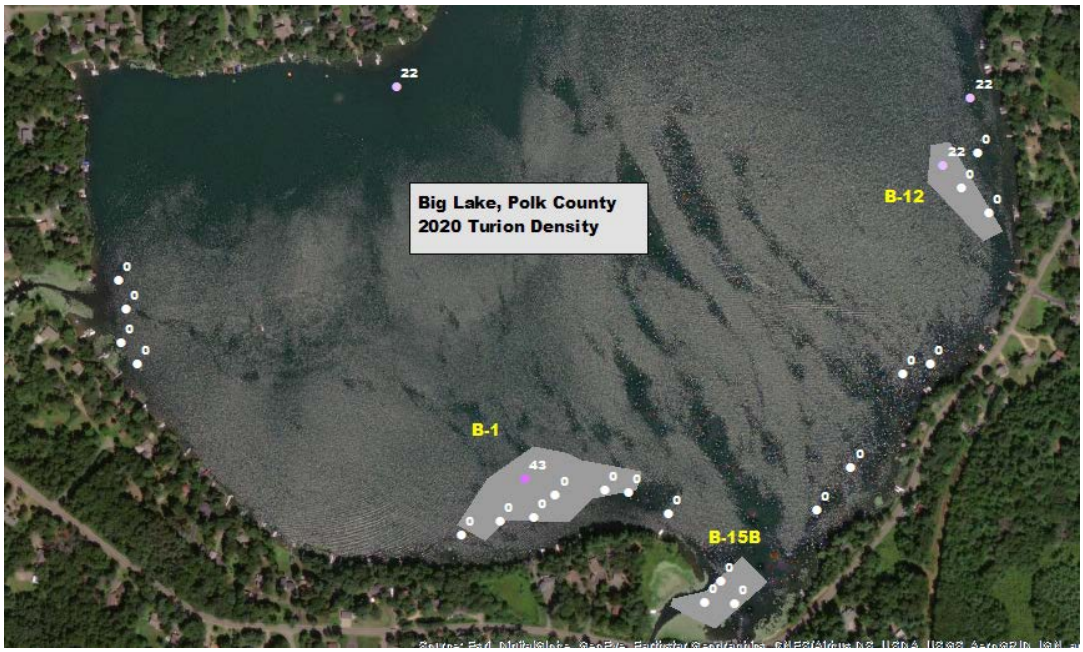


Figure 17. Big Lake Turion Density 2020

Turion density in Big Lake is low compared with other area lakes with CLP control programs. Standards to identify CLP beds are similar between these programs with from 40 – 80 percent pre-treatment frequency of occurrence of CLP. Of these programs, Big Lake CLP treatment has resulted in the largest percentage reductions of acres of CLP in beds and the largest percentage reductions in turion concentration measured in sediment.

Table 8. Polk County, WI Lakes with Long Term CLP Control Programs

Lake	WBIC	Lake Size (Acres)	CLP Treatment Area (most recent treatment)	Percentage of lake acres treated
Big	2615900	259	6.1 (2020)	2.3%
Bone	2628100	1667	25.23 (2020)	1.5%
Deer	2619400	786	12.48 (2020)*	1.6%
Long	2478200	272	33.65 (2017)	12.4%

*Because of contractor error, more CLP acres were treated than measured in beds in the pre-treatment survey.

Table 9. Polk County Lakes CLP Control Program Results

Lake	Acres Start (date)	Acres in dense beds 2020	Reduction in CLP Acres in Treated Beds	Turions m^2/ Start (date)	Turions/m^2 2020	Reduction in Turions
Big	25.6 (2011)	6.1	76%	44 (2011)	3.5	92%
Bone* (beds 2-5)	13.21 (2011)	8.72	34%	296 (2011)	22.8	92%
Bone* (beds 6-8)	19.03 (2014)	16.51	13%	358.8 (2014)	145	60%
Deer	23.6 (2010)	7.71	67%	83.8 (2013)	73.1	13%
Long (2014)	65 (2010)	26.6 (2013)	60%	NA	16.07 (2013)	NA
Long (2020)	65 (2010)	16.97 (2020)	74%	16.07 (2013)	44.02 (2020)	273% increase

*Not all CLP beds identified in Bone Lake are treated due either to proximity to wild rice or expectation of poor results because of bed location.
Turion measurement standards may vary (only in treatment beds at Bone Lake vs. continued measurement of historical points at Big Lake, Deer Lake, and Long Lake).

Long Lake had CLP control results similar to Big Lake in each year of CLP treatment. The Long Lake Protection and Rehabilitation District established standards for CLP treatment beginning in 2015 due to low CLP densities and lack of treatment effectiveness when small beds of CLP and low overall acres were treated in 2014. These standards are documented in the *Long Lake 2017 Aquatic Plant Management Plan*. Because CLP growth did not meet treatment standards, the LLPRD opted not to treat CLP in 2018, 2019, and 2020. While CLP turion densities have increased as a result, native aquatic plants have also shown signs of recovery. This result is in line with the Long Lake APM plan goal: *Protect and restore healthy rooted native aquatic plant communities.*

Matt Berg, who completed a point intercept survey of aquatic plants in Long Lake in 2019[17] commented as follows:

> *Past aggressive management of Curly-leaf pondweed in Long Lake has significantly reduced the overall area and density of this exotic invasive species. With improvements in water clarity coupled with a pause in chemical treatments over the last two years, native vegetation has shown an impressive rebound. Many species that were absent in early surveys such as Leafy pondweed, Small pondweed, Clasping-leaf pondweed, and Sago pondweed have colonized the lake and are expanding into areas formerly occupied by CLP. Other non-target species that declined after treatments to the point of being undetectable like Northern water-milfoil – one of the lake's most important habitat plants – have now firmly reestablished. Many of these newly established natives, especially Leafy and Small pondweed are high sensitive to Endothall and are likely to be severely impacted by future treatments. With that in mind, we continue to encourage the LLPRD to strive for minimal herbicide applications that still meet their CLP management goals.*

Long Lake Curly-leaf Pondweed Treatment Thresholds

25 - acre minimum overall treatment area, minimum 5-acres/bed

>30% Frequency of Occurrence within treatment beds

Suspend treatment until CLP in beds reaches 25 acres

Use sediment turions to forecast following year treatment. Guideline (may be updated): Sediment Turion Density: >50 turions/yd^2 (per bed), >20 turions/yd^2 (mean over all beds)

Changes in water clarity can also influence aquatic plant growth. Water clarity improvements on Long Lake are the result of alum treatments which occurred in 2018 and 2020.[18] Water clarity improvements are likely the cause of increased maximum depth of plant growth and are also likely drivers of increases in native plant growth in Long Lake.

[17] Berg, Matthew. Endangered Resource Services. *Curly-leaf pondweed (Potamogeton crispus) Point-intercept and Bed Mapping Surveys, and Warm-water Point-intercept Macrophyte Survey Long Lake (WBIC: 2478200) – Polk County, Wisconsin.* 2019.
[18] James, William. Long Lake, Wisconsin - *Limnological Response to Alum Treatment: 2020 Interim Report.* October 2020.

Education and AIS Prevention Activities

Lake homeowners education occurs primarily through the Church Pine, Round, and Big Lakes web site (www.bigroundpine.com), a spring newsletter, and the summer Lake District meeting. Lake District meeting topics have included water clarity, purple loosestrife, aquatic plant harvesting, and authorization for funds for aquatic plant management. Several educational handouts and brochures support educational efforts including a map with AIS messages developed specifically for the project lakes. The Lake District coordinates training and educational activities with the Polk County Land and Water Resources Department. County staff also provides plant identification assistance.

Clean Boats, Clean Waters

The Clean Boats, Clean Waters (CBCW) program educates lake users regarding actions that prevent invasive species from entering lakes and records lake users' behavior. CBCW inspections were launched in 2007. Residents who attended training in 2006 provided training for other volunteers. Coordinators were assigned for the Church Pine and Big Lake boat landings, and aquatic invasive species (AIS) signs were posted at these landings.

The figures below show boats inspected for aquatic invasive species from 2009 through 2019. Although 57 boats were inspected in 2007 and 24 were inspected in 2008, records were not entered into the DNR system. Although a CBCW program operated in 2020, results are not yet recorded in the DNR system.

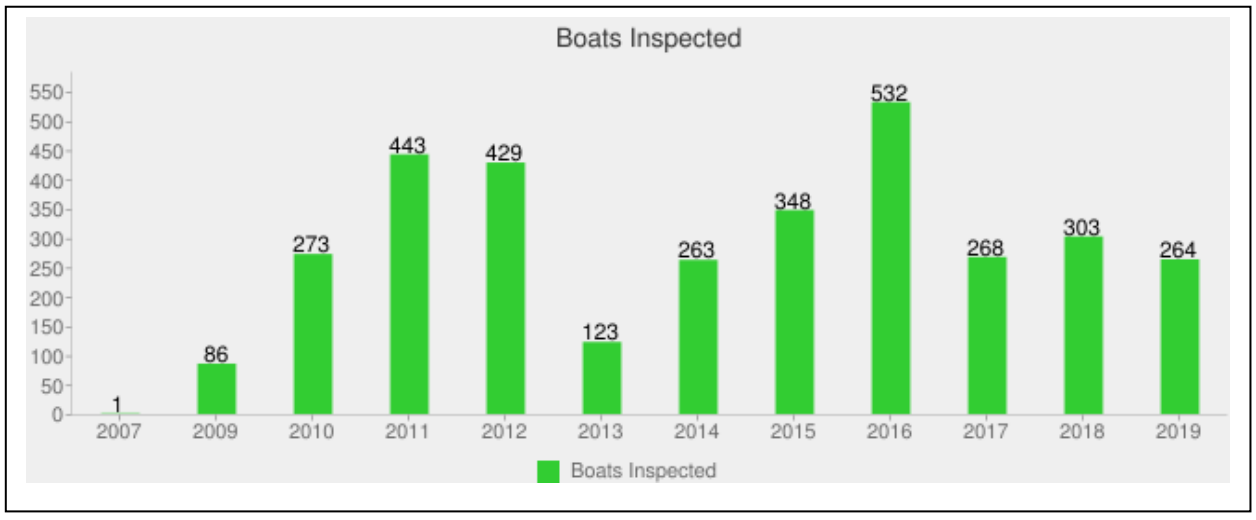


Figure 18. CBCW Inspections at the Big Lake Landing 2007 - 2019

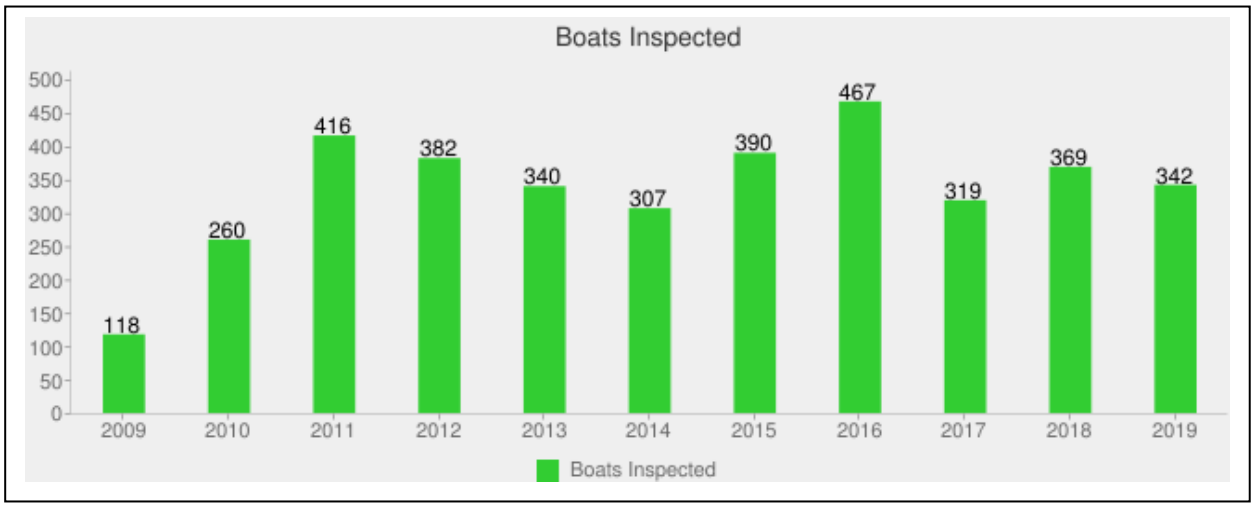


Figure 19. CBCW Inspections at the Church Pine Lake Landing 2009 - 2019

Department of Natural Resources grants supported the Clean Boats, Clean Waters program in from 2010 through 2019. A CBCW grant was also secured for 2021. Inspectors staff the boat landings one weeknight, Saturdays, Sundays, and holidays beginning the weekend before Memorial Day and ending the weekend after Labor Day. They are paid $14 to $16 per hour. The CBCW manager coordinates the program including training and recruiting staff.

Landing Signs and Kiosks

AIS educational kiosks are maintained at both boat landings. These kiosks create an obvious display of AIS-related material and serve as a presentation tool for CBCW inspectors. The signs and information at the kiosk provide reminders of the Polk County and State of Wisconsin do not transport ordinance and regulation. It is illegal to transport aquatic vegetation on boats and equipment in Polk County.

Figure 20. Landing Signs and Kiosk Displays

South Landing Camera
The Lake District purchased and Environmental Sentry Protection, LLC (ESP) installed a video camera and signage at the Church Pine Boat Landing in August of 2011. The camera monitors boater use and behavior at the landings. It also serves as a reminder for boaters to clean boats and trailers upon entering and leaving the lake. While the 2010 aquatic plant management plan called for a second camera at the Big Lake Landing, the Polk County Highway Department would not allow camera installation in the right-of-way of County Road K.

Boat Landing Monitoring
Ecological Integrity Services surveys the Big Lake and Church Pine boat landings annually. Chinese mystery snail was identified in 2011,[19] but no additional aquatic invasive species were found during consultant boat landing inspections from 2012-2020.[20]

Rapid Response for New Invasive Species
The activity is intended to identify any new invasive species introduced into the lake early and rapidly initiate control measures. The updated aquatic invasive species rapid response protocol is found in Appendix A. The Lake District sets aside $15,000 in an AIS rapid response fund.

Additional AIS Monitoring and Prevention Options

Volunteer Aquatic Invasive Species Monitoring
As previously mentioned, professional monitoring is completed for the lakes' boat landings. Another option available for AIS plant monitoring is annual consultant or volunteer meandering surveys of the entire littoral zone of the lake. On some lakes, volunteers monitor for aquatic invasive plant species in a coordinated effort.

Zebra Mussel Monitoring
Because of the threat posed by zebra mussel introduction from the St. Croix River, Deer Lake, and other lakes, increased monitoring for zebra mussels is recommended. Clean Boats, Clean Waters records show that many boats entering project lakes come from these water bodies.

Because zebra mussels attach to hard surfaces, cinder blocks or plate samplers placed in shallow water and checked regularly provide a good monitoring method. Net tows aim to collect zebra mussel veligers (the larval stage). Early July is the best time to collect veliger tows.

[19] Schieffer, Steve. *Big Lake and Churchpine Lake SCUBA Survey*. 2011
[20] Steve Schieffer. Personal Communication. February 2021.

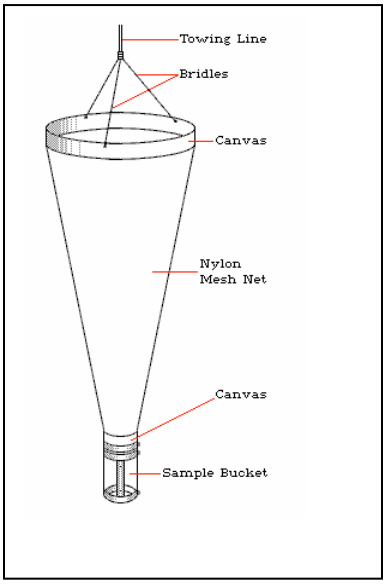


Figure 21. Monitoring Equipment: Cinder Blocks, Sampling Plates, and Nets for Veliger Tows

Boat Washing Stations

Boat washing stations use hot water and high pressure to remove potential aquatic invasive species from boats, trailers, and equipment. The hot water kills the AIS, and the high pressure removes them. There are no soaps, bleaches, or chemicals used or recommended at this time. Chemicals are not as reliable as temperature for killing AIS. At 140°F, a hot water rinse for 10 seconds in each spot will kill all adult mussels. At 120°F, a contact time of two minutes is needed to destroy zebra mussels (MNDNR 2017). Use of boat washing stations is voluntary in Wisconsin unless there are local ordinances to require decontamination. Burnett and Washburn Counties have ordinances in place which require decontamination if offered at a public or private water access.

Several lake organizations in Burnett and Washburn County, Wisconsin have installed boat washing stations which use a mild bleach solution to decontaminate boats. The solution of two tablespoons of household bleach/gallon of water is sprayed on boats and trailers. A contact time of ten minutes is required when using this solution. The bleach solution must be replaced regularly – daily replacement is preferred. Signage is installed to provide instructions for and encourage use (NW WI ZM Team 2018).

Polk County Land and Water Resources Department (LWRD)

The Polk County Land and Water Resources Department offers a variety of volunteer opportunities that implement statewide aquatic invasive species programs at the local level. Training such as Project RED , Citizen Lake Monitoring for AIS , and the AIS Bridge Snapshot Day provide training for invasive species identification and provide resources for volunteers to monitor for invasive species. The office also provides trainings for the Clean Boats, Clean Waters program and supplies and training to raise beetles for purple loosestrife control .

Polk County has a Do Not Transport Ordinance and has placed signs at public landings to remind lake users about ordinance requirements. It is illegal to transport aquatic vegetation on boats and equipment in Polk County.

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 implementation plan chart, 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 each year. Actions may be modified as new information becomes available. An Aquatic Invasive Species Committee will be created and supported to oversee plan implementation. The board will approve updated implementation plans including modified management actions.

Goals = broad statements of direction. Goals are listed in no particular order of priority.

Objectives = measurable steps toward the goal.

Actions = activities undertaken to accomplish objectives.

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

Plan Goals

1. Prevent introduction of aquatic invasive species and pursue any new introductions aggressively.
2. Manage the population and spread of curly-leaf pondweed, yellow iris, purple loosestrife, and other invasive aquatic plants.
3. Maintain navigable routes for boating.
4. Preserve and enhance our diverse native aquatic plant community.
5. Educate and engage the public regarding aquatic plant management.

1. Prevent introduction of aquatic invasive species and pursue any new introductions aggressively.

Objectives

A. Boaters inspect, clean, and drain boats, trailers, and equipment.

B. Identify new aquatic invasive species as soon as possible if they are introduced to the lakes.

C. Rapidly and aggressively respond to new introductions of invasive species such as Eurasian water milfoil.

Actions

1. Continue a successful Clean Boats, Clean Waters program. (Objective A)
2. Monitor regularly for invasive species introduction at areas of high public use such as the boat landings using volunteers, consultants, divers, and/or other comprehensive, reliable methods. (Objective B)
3. Conduct annual consultant AIS meandering survey. (Objective B)
4. Follow the Aquatic Invasive Species Rapid Response Strategy (Appendix A). (Objective C)
5. Monitor for zebra mussels using plate samplers, cement blocks, dock checks, and other available methods through use of volunteers. (Objective B)
6. Monitor surveillance cameras at the Church Pine boat landing. (Objective A)

2. Manage the population and spread of curly-leaf pondweed, yellow iris, purple loosestrife, and other invasive aquatic plants.

Objectives: Curly-leaf pondweed (CLP)

<u>Church Pine and Round Lakes</u>

A. Eradicate curly-leaf pondweed if found in Church Pine or Round Lake.

<u>Big Lake</u>

B. Control CLP in Big Lake to avoid navigation impairment especially near the boat landing.

C. Keep total acres of CLP in beds in Big Lake at less than 6 acres.

Actions

1. Hand pull any curly-leaf pondweed (CLP) found growing in Church Pine or Round Lake. Use herbicide treatment only if hand pulling is not effective or practical. (Objective A)
2. Control CLP growing in dense beds using low-dose, early season Endothall treatment or other accepted method. (Objectives B and C)

DEFINITIONS
CLP Bed: area delineated in pre-treatment survey with CLP frequency of occurrence (FOO) of 30% or more.
Navigation Impairment: will generally mean vegetation grows thickly and forms mats on the water surface.

Church Pine and Round Lake Herbicide Treatment Standards

Minimum Bed Size for Treatment:

0.5 acre

Endothall Concentration

Treated beds <10 acres: 3.0 ppm

Treated beds >10 acres: see Big Lake standards

Big Lake Herbicide Treatment Standards

If CLP beds are present and likely to impair navigation from the boat landing, treatment will occur.

If beds are not likely to impair navigation near the boat landing or other critical, common navigation area, CLP treatment will proceed only if total CLP in beds exceeds 6 acres.

Minimum Bed Size for Treatment:

1 acre

Predicting Navigation Impairment

- Rake density >1.5
- Frequency of Occurrence > 50%
- Turion Density >20/m^2
- Early ice out, low snow cover

Endothall Concentration
Treated beds <10 acres: 2.5ppm
Treated beds >10 acres:
Beds <10 acre ft: 2.5 ppm
Beds >10 acre ft: 1.5 ppm

a. Select tentative beds for treatment in December of previous year.
b. Select APM contractors (Herbicide Contractor, APM Monitor) in January.
c. Apply for APM permits in January.

3. Conduct DNR specified and required third-party pre- and post-treatment monitoring for CLP herbicide treatment. (Objective B and C)
4. Map beds of curly-leaf pondweed annually. Look for curly-leaf pondweed growth in Church Pine where reported in 1997 in transects 11 and 13 and where bed was previously present in Round Lake. (Objectives A-C)
5. Monitor sediment turions. (Objectives B and C)

Objectives: Purple Loosestrife, Yellow Iris, and Giant and Japanese Knotweed

A. Eradicate individual plants.

B. Reduce populations in larger, established areas.

Actions

1. Hire contractor to cut/apply herbicides to control larger infestations of purple loosestrife. (Objective A and B)
2. Investigate release of beetles in large, inaccessible patches (purple loosestrife only). (Objective B)
3. Educate lake residents about invasive plants and encourage appropriate control measures. (Objective A)
4. Map purple loosestrife, yellow iris, and knotweed growth annually to monitor progress toward objectives. (Objective A, B)

Objective: Narrow-Leaf Cattail

A. Ensure that the plant doesn't spread to additional areas of the lake.

Actions

1. Map beds of narrow-leaf and broad-leaf cattail annually (coincide with purple loosestrife mapping).
2. Consider control measures if narrow-leaf cattail shows signs of spreading.

3. Maintain navigable routes for boating.

Objectives:

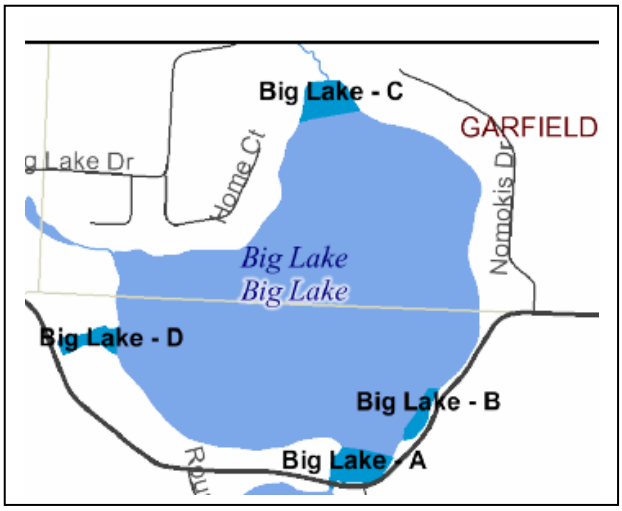
A. Reduce nuisance conditions when native and invasive plant growth creates problems/nuisances in common boating routes. The common boating routes with potential navigation impairment currently identified are Sensitive Area D in Big Lake, the channel between Church Pine Lake and Round Lake, and under the bridge between Round Lake and Big Lake.

B. Allow access through native and invasive aquatic plants to individual waterfront corridors.

Actions

1. Monitor to identify navigation impairment. (Objective A)

2. Seek permit and address confirmed navigation impairment using appropriate method. (Objective A)
Herbicide application will generally be used to manage impaired navigation areas. The herbicide will target species present in problem area. Floating aquatic species such as water lilies may be addressed in subsequent years with preventative treatment measures (i.e., early June application).



Individual Access Corridors are the openings from a waterfront property owner's shoreline out into the lake to the point where plants no longer inhibit navigation. These corridors may be a maximum of 30 feet wide (25 feet in a sensitive area) and must remain in the same location from year to year. Herbicide treatment or harvesting may be permitted for individual corridors in front of waterfront property to control invasive or native plants.

Action

3. Allow individual landowners to apply for permits and treat individual access corridors. (Objective B)
   These treatments may focus on invasive or native plants. Landowners would bear the cost of these treatments. Hand removal methods are recommended as a first choice for navigation impairment created by native plants. Hand removal does generally not require a permit when limited to a 30-foot opening. Native plants provide an important shield against invasion by Eurasian water milfoil and other invasive aquatic plant species.

Procedure for Individual Corridor Permitting and Monitoring

<u>Document nuisance conditions (landowner/herbicide contractor provide in permit application in February/March)</u>

- Indicate when plants cause problems and how long problems persist.
- Include dated photos of nuisance conditions from previous season (or location relative to curly-leaf pondweed bed map).
- List depth at end of dock.
- Provide examples of specific activities that are limited because of presence of nuisance aquatic plants.
- Describe practical alternatives to herbicide use or harvesting that were considered. These might include:
  - Hand removal/hand raking of aquatic plants
  - Extending dock to greater depth
  - Altering the route to and from the dock
  - Use of another type of watercraft or motor, i.e., is the type of watercraft used common to other sites with similar conditions on this lake?
- Herbicide use for curly-leaf pondweed may occur along the entire length of a waterfront property owner's shoreline.
- Aquatic Herbicide Contractor to provide information regarding nuisance conditions in permit application based on information from the landowner.

<u>Verify/refute nuisance conditions and/or navigation impairment</u>

- Landowner requests Lake District Lake Management Chair or designee review of their property prior to submitting a permit application to DNR.
- The Lake District Lake Management Chair or designee visits site, reviews documentation and provides a written opinion of navigation impairment i.e., is herbicide treatment or harvesting warranted?
- Standards for Lake District review: degree of navigation impairment, narrow corridors may be recommended in sensitive areas or for lots less than 100 feet in width.
- Landowner/applicator applies for permit to WDNR including photographic documentation and identification of plants causing navigation problems.
- For curly-leaf pondweed treatment, verification must occur the year before treatment in May or June. Once CLP nuisance is verified and a permit is approved, additional verification is not needed for three subsequent years (although permit applications must be completed each year). Treatment for CLP must occur with water temperatures from 50 - 58 degrees F.
- WDNR will contact herbicide contractor and owner with a notice to proceed with treatment or denial of permit application.

4. Preserve and enhance our diverse native aquatic plant community.

Objectives

A. Maintain native plants to prevent AIS introduction.

B. Protect native plant sensitive/critical habitat areas – especially areas with emergent vegetation like rushes and native cattails.

C. Increase residents' understanding of the role and importance of native aquatic plants and their benefits.

Actions

1. Limit native plant management in sensitive areas to narrow corridors (25 feet maximum width). (Objective A and B)

2. Implement strict adherence with treatment standards (early CLP treatment prior to native plant growth) and monitoring methods prior to and following herbicide treatment. (Objective A and B)

3. Limit removal of native plants to areas with severe navigation problems or nuisance conditions. (Objective A, B, C)

4. Use methods outlined in Goal 5 to deliver messages regarding native plant values. (Objective A, B, C)

5. Educate and engage the public regarding aquatic plant management.

Audience
Lake residents (full-time and part-time)
Lake users/visitors – anglers, recreationists
General public

Desired Behaviors
Preserve native plants (that aren't impeding navigation) to protect the lake
Report navigation concerns to the Lake District
Look for aquatic invasive species and report potential AIS observed
Owners take responsibility to control upland invasive species
Clean sediment and plants from boats, trailers, and equipment (including docks, rafts, fishing buckets, etc.)
Don't dump bait in the lakes
Drain live wells
Don't use aquatic herbicides without a permit
Share lake stewardship messages with others
Look for zebra mussels on docks when you pull them from the water (and before they are put in)

Messages
<u>Aquatic plant management plan</u>
Why we are implementing the plan; who is doing it; when actions will be completed.
Report progress toward plan goals and objectives.
Lake stewardship is a shared responsibility; healthy lake benefits are also shared

<u>Navigation</u>
Inform landowners of the process for applying for individual corridor permits.
Encourage reporting of navigation concerns.
Promote access with respect
Preserve native plants that aren't impeding navigation

<u>Invasive species prevention</u>
Identify curly-leaf pondweed, purple loosestrife, yellow iris, and Eurasian water milfoil with photos and descriptions.
Identify nearby water bodies where zebra mussels and Eurasian water milfoil are present.
Clean aquatic vegetation from boats and trailers. Drain water from boat compartments.
Only you/individual actions can prevent aquatic invasive species.
AIS are everywhere; don't let them hitchhike on your boat and equipment
Our lakes are clean for a reason. You and the rest of us are keeping AIS out. We need to be more vigilant.
Polk County and the state of Wisconsin prohibit transporting aquatic plants on boats and trailers and require draining boat compartments. Fines may result if you don't obey the law.
Recommend information to be included with DNR licenses – boat registration and operation.

Invasive species control
Explain proper removal techniques to control and avoid spread of invasive species.
Control of invasive species on the land and margins of the lake is the owner's responsibility.
This generally includes purple loosestrife and yellow iris.
Permits are required for herbicide use in the water.
Show maps of invasive species on the district lakes.

Native plant benefits
Native plants prevent invasive species from getting established.
Residents should understand the need for a balance and not attempt to eliminate all aquatic plants.
Identify ways to encourage native plant growth.
Explain specific links between native aquatic plants and wildlife.

Methods

- Website (include pictures)
- Newsletters (consider 2 issues each year)
- Signs and kiosks (review and improve)
- Clean Boats, Clean Waters inspectors and handouts
- Landing camera
- Lake District meetings: annual meeting, special meetings - use food to encourage attendance
- Talk to your neighbor campaign
- Welcome boat for new owners
- Expert site visits for native and invasive plant identification and control measures
- Plant identification workshops, pontoon classrooms, presentations – cooperate with other lake organizations
- Neighborhood/smaller group parties and picnics, social events – hand out information
- Mailings:
    - Information/reports to all lake property owners
    - DNR license holders – get addresses for outreach to anglers
- Local newspapers – PR articles
- Personal visits to lake residents
- Pictures
- Handout distribution: Big Lake store, fishing tournaments

Monitoring and Assessment

Aquatic plant (macrophyte) surveys are the primary means for tracking achievement toward plan goals.

Action. Conduct whole-lake aquatic plant surveys approximately once every five years to track plant species composition and distribution. The next survey is scheduled for 2025.

The whole-lake surveys will be conducted in accordance with the guidelines established by the Wisconsin DNR. Any new species sampled will be saved, pressed, and mounted for voucher specimens.

Aquatic Invasive Species Grants

Aquatic Plant Management on project lakes is funded with a combination of Lake District tax levy and Wisconsin Department of Natural Resources grant funding. The Lake District has a long history of successful grant projects as shown in Table 10.

Department of Natural Resources Aquatic Invasive Species (AIS) grants are available to assist in funding some of the action items in the implementation plan. Maintaining navigation channels to alleviate nuisance conditions and the newsletter are exceptions. Grants provide up to 75 percent funding. Applications are accepted each year with a digital deadline of November 1. Draft applications are due September 2.

Table 10. WDNR Aquatic Invasive Species Grants to Lake District

Start Date	End Date	Grant Number	Amount	Tasks
04/1996	06/1997	LPL-382	$10,000	Church Pine, Big, & Round Lakes Macrophyte Management Plans
04/1997	06/1998	LPL-471	$9,975	Church Pine and Round Lakes Macrophyte Survey
09/2007	12/2001	LPT-067	$73,126.25	Big Lake Macrophyte Plan Implementation
04/2009	12/2009	SPL-208-09	$3,000	Big and Church Pine Aquatic Plant Surveys
04/2009	06/2011	LPL-1299-09	$10,000	Big, Round, Church Pine Aquatic Plant Management Plan
10/2009	12/2011	AEPP-212-10	$15,660	Clean Boats, Clean Waters
04/2011	12/2014	ACEI-099-11	$93,220.50	CLP Control and Monitoring
10/2013	12/2016	ACEI-145-14	$46,942.50	CLP, Purple Loosestrife, and Knotweed Control and Monitoring; Aquatic Plant Management Plan; AIS Prevention Monitoring
04/15/2018	12/31/2021	ACEI21118	$38,460	CLP, Purple Loosestrife, and Knotweed Control and Monitoring
02/15/2020	12/31/2021	AEPP59920	$9,995.25	Point Intercept Survey and Aquatic Plant Management Plan
02/15/21	12/31/2021	CBCW93221	$8,000	Clean Boats, Clean Waters

Adaptive Management Approach

The treatment areas, standards, and methods will be reviewed each year to see if they are effective and cost efficient. Changes may be made to the treatment approach based upon project results, the experience of other lake groups, and/or recommendations from the Department of Natural Resources. Minor changes to these and other actions will be documented in the implementation chart each year. Significant changes will be documented as brief addendums to the aquatic plant management plan to be reviewed by the Lake District Board, the APM Advisory Committee, and the Department of Natural Resources.

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Appendix A. Rapid Response Strategy for Aquatic Invasive Species

<u>Definition: Aquatic Invasive Species (AIS)</u> are non-native species that can out-compete and overtake native plant species damaging native lake habitat and sometimes creating nuisance conditions. AIS currently in the Church Pine, Round, and Big Lake system include curly-leaf pondweed (CLP), purple loosestrife (PL), yellow flag iris, narrow-leaf cattail, and giant and Japanese knotweed. Additional AIS threaten the lakes and will be monitored by professional monitors or volunteers when species are added to the training program.

1. Maintain a contingency fund for rapid response for aquatic invasive species (Lake District Board).

2. Conduct volunteer (Clean Boats, Clean Waters Crew) and professional monitoring (APM Monitor) at designated public boat landings and other likely areas of AIS introduction. If a suspected invasive species is found, contact the AIS ID Volunteers.

3. Direct lake residents and visitors to contact the AIS ID Volunteers if they see a plant in the lakes they suspect might be an aquatic invasive species such as Eurasian water milfoil (EWM). Signs at the public boat landings, web pages, and handouts at annual meeting will provide plant photos and descriptions, contact information, and instructions.

   If plant is likely AIS, AIS ID Volunteers will confirm identification with Polk County Land and Water Resources Department and the WDNR, and inform the rest of the Lake District Board.

   a. Take a digital photo of the plant in the setting where it was found (if possible). Then collect 5 to 10 intact specimens. Try to get the root system, and all leaves as well as seed heads and flowers when present. Place in a zip lock bag with no water. Place on ice and transport to refrigerator.
   b. Fill out plant incident form http://dnr.wi.gov/lakes/forms/3200-125-plantincident.pdf
   c. Contact WDNR staff, then deliver collected plants to the WDNR (810 West Maple Street, Spooner, WI 54801) as soon as possible to the location they specify. WDNR may confirm identification with the herbarium at the University of Wisconsin – Stevens Point or the University of Wisconsin – Madison.

4. Mark the location of suspected AIS (AIS ID Volunteers). Use GPS points (in decimal degrees and WGS 84 datum), if available, or mark the location with a small float.

5. If identification is positive:[21]
    a. Inform the person who reported the AIS and the board (AIS ID Volunteers), who will then inform Polk County LWRD, herbicide contractor, and lake management consultant.

    b. Consider marking the location of AIS with a more permanent marker. Special EWM buoys are available (AIS ID Volunteers).

    c. Post a notice at the public landing and include a notice on the website. Notices will inform residents and visitors of the approximate location of AIS and provide appropriate means to avoid its spread (Lake District Board).

6. Hire a consultant to determine the extent of the AIS introduction (Lake District Board). A diver may be used. If small amounts of AIS are found during this assessment, the consultant will be directed to identify locations with GPS points and hand pull plants found. All plant fragments will be removed from the lake when hand pulling.

7. Select a control plan in cooperation with the WDNR (Lake District Board). The goal of the rapid response control plan will be eradication of the AIS. Additional guidance regarding EWM treatment is found in DNR's *Response for Early Detection of Eurasian Water Milfoil Field Protocol*.

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

8. Implement the selected control plan including applying for the necessary permits. Regardless of the control plan selected, it will be implemented by persons who are qualified and experienced in the technique(s) selected.

9. Lake District funds may be used to pay for any reasonable expense incurred during the implementation of the selected control plan, and implementation will not be delayed by waiting for WDNR to approve or fund a grant application.

[21] **If it is an animal other than a fish:**

- Be sure the suspected invasive species has not been previously found on the waterbody.
- Take a digital photo of the animal in the setting where it was found (if possible). Then collect up to five specimens. Place in a jar with water; put on ice and transport to refrigerator. Transfer specimen to a jar filled with rubbing alcohol (except for Jellyfish – leave in water).
- Fill out form 3200-126 – Aquatic Invasive Animal Incident Report.
- Contact DNR staff.

10. The Lake District Board will work with the WDNR to confirm, as soon as possible, a start date for an Early Detection and Rapid Response AIS Control Grant. Thereafter, the Lake District shall formally apply for the grant.

11. Frequently inspect the area of the AIS to determine the effectiveness of the treatment and whether additional treatment is necessary (Lake District Board, APM Monitor).

12. Review the procedures and responsibilities of this rapid response plan on an annual basis. Changes may be made with approval of the Lake District Board.

EXHIBIT A[22]

CHURCH PINE, ROUND, AND BIG LAKE PROTECTION AND REHABILITATION DISTRICT

AIS ID Volunteers	??
Board Contacts	Mike Reiter: 715-294-3950 (home)

POLK COUNTY LAND AND WATER RESOURCES DEPARTMENT

AIS Coordinator	Katelin Anderson: 715-485-8637
Director	Eric Wojchik: 715-485-8644

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Grants and AIS Notice	Alex Smith: 715-635-4124
Permits	Tyler Mesalk: 715-635-4227
EWM Identification and Notice	Spooner Lakes Team: 715-635-4124

HERBICIDE APPLICATOR

Bid each December

APM MONITOR

Ecological Integrity Services	Steve Schieffer: 715-554-1168

DIVERS

Ecological Integrity Services	Steve Schieffer: 715-554-1168

[22] This list will be reviewed and updated each year.

Appendix B. Implementation Plan

Goal 1. Prevent introduction of aquatic invasive species and pursue any new introductions aggressively.				
Actions[24]	Timeline	Annual Cost (2021)	Volunteer Hours (Annual)	Responsible Parties
1. Clean Boats, Clean Waters (CBCW93221)[25]	Memorial Day through Labor Day	$8,000	20	Clean Boats, Clean Waters Committee
2. Monitor areas of high public use for AIS (ACEI21118)[26]	July/August	$400		Consultant/Diver
3. Consultant AIS meandering survey	June/July/August	$600		Consultant
4. Rapid response strategy update			2	AIS Committee/Board
5. Volunteer zebra mussel monitoring (grant eligible)	July/August		20	AIS Committee
6. Maintain and monitor surveillance camera video from the Church Pine boat landing	May	$2,600	5	Environmental Sentry Protection, LLC
SUBTOTAL GOAL 1		**$11,600**		
2021 CBCW grant funding and AIS monitoring (not video) @ 75%		$6,000 $750		

[24] More detailed action item descriptions are found on pages 33-41.
[25] Grant CBCW93221 is funded through December 31, 2021 and is renewable annually
[26] Grant ACEI21118 is funded through December 31, 2021.

Goal 2. Manage the population and spread of curly-leaf pondweed, yellow iris, purple loosestrife, and other invasive aquatic plants.				
Actions	Timeline	Annual Cost (2021)	Volunteer Hours (Annual)	Responsible Parties
Curly-leaf Pondweed Control (ACEI21118)				
1. Hand pull curly-leaf pondweed in Church Pine Lake or Round Lake	June		Only if needed – to be determined	Board/Volunteers
2. Control CLP with low dose, early season Endothall				
a. select beds for treatment	December (prev. Year)	$100	2	Lake Management Committee Chair Monitoring Consultant
b. select APM contractors	January	$400	2	Lake District Board
c. apply for APM permits and notify	January	$300	2	Lake Management Committee Chair Herbicide Contractor
d. complete herbicide treatment	May	$5,200	1	Lake Management Committee Chair Herbicide Contractor
3. Conduct pre- and post-monitoring	May and June	$1,500		Monitoring Consultant
4. Map beds of curly-leaf pondweed	June	$500		Monitoring Consultant
5. Complete turion monitoring	October/Nov.	$500		Monitoring Consultant
Purple Loosestrife Control (ACEI21118)				
1. Cut/treat plants	July/August	$500		Herbicide Contractor
2. Grow and release beetles	May – July	0	20	AIS Committee
3. Lake resident education (see Goal 5)				
4. Map purple loosestrife, yellow iris, and knotweed locations and extent	September	$250		Monitoring Consultant or Herbicide

Goal 2. Manage the population and spread of curly-leaf pondweed, yellow iris, purple loosestrife, and other invasive aquatic plants.				
Actions	Timeline	Annual Cost (2021)	Volunteer Hours (Annual)	Responsible Parties
				Contractor
Narrow-Leaf Cattail Monitoring				
1. Map beds of narrow-leaf and broad-leaf cattail		$500 (?)	5	Monitoring Consultant
SUBTOTAL GOAL 2		**$9,250 - $9,750**	**80**	
2021 grant funding @ 75%		$6,937.50		

Goal 3. Maintain navigable routes for boating.				
Actions	Timeline	Annual Cost (2021)	Volunteer Hours (Annual)	Responsible Parties
1. Monitor to identify navigation impairment[26]	July/August		5	Lake District Board/Volunteer Herbicide Contractor
2a. Seek permit if navigation problems identified		$45	2	Lake District Board Herbicide Contractor
2b. Control nuisance plant growth with permitted method	Summer	$400		Lake District Board Herbicide Contractor
3. Allow individuals to apply for permits to maintain access corridors	Summer		5	Lake Residents Herbicide Contractor
SUBTOTAL GOAL 3 Activities are not grant eligible		**$445**		

[26] Navigation route to be defined if impairment is identified.

Goal 4. Preserve and enhance our diverse native aquatic plant community. (All actions carried out as components of other goals.)				
Actions	Timeline	Annual Cost (2021)	Volunteer Hours (Annual)	Responsible Parties
1. Sensitive area management limited to 25 foot corridors	Ongoing	$0	0	Lake District Board Herbicide Contractor
2. Follow treatment standards and monitoring protocol	Ongoing	$0	0	Lake District Board Herbicide Contractor Monitoring Consultant
3. Limit removal of native plants	Ongoing	$0	0	DNR Lake District Board
4. Deliver educational messages	Ongoing	$0	0	Lake District Board

Goal 5. Educate and engage the public regarding aquatic plant management.				
Actions	Timeline	Annual Cost (2021)	Volunteer Hours (Annual)	Responsible Parties
1. Update web site	Ongoing	$100		Lake District Board
2. Annual meeting/special meetings	Summer/Fall	$100		Lake District Board
3. Workshops/small group meetings	Summer	$100		Lake District Board AIS Committee DNR Polk LWRD
4. Mailings/handouts	Ongoing	$500		Lake District Board AIS Committee
5. CBCW Brochures, Kiosk & Landing Signs	Ongoing	$500		Lake District Board AIS Committee
6. Newsletter		$500		
SUBTOTAL GOAL 6 All activities except newsletter are grant eligible		**$1,300**		
2021 grant funding @75%		**$600**		