Aquatic Plant Management Plan

Balsam Lake (WBIC: 2620600)

Polk County, Wisconsin

AUGUST 2021

Sponsored By

Balsam Lake Protection and Rehabilitation District

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
810 W. Maple Street
Spooner, WI 54801

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April 13, 2022

Tom Kelly
Balsam Lake P&R District
PO Box 202
Balsam Lake, WI 54810

Subject: Balsam Lake Aquatic Plant Management Plan Approval Request

Dear Mr. Kelly,

Thank you for your efforts to understand, protect, and improve Balsam Lake! This letter is to notify you that the August 2021 Aquatic Plant Management (APM) Plan meets the criteria under Administrative Code NR 193, and thus the DNR has approved the APM Plan.

Approved activities in the plan are eligible for funding under the Surface Water Grants program subject to the application requirements of the program.

Please note: Aquatic plant control for the purposes of nuisance relief or navigation are *not* grant eligible activities. The Department reserves the right to inspect nuisance or navigation conditions prior to permitting aquatic plant treatments. The harvesting map (Figure 20) that DNR produced following the 2015 site visit may be subject to change according to annual plant conditions. Harvesting expenses such as operation, maintenance, trucking, disposal, staff time, etc. are not grant eligible.

Thanks to you and the lake community for continuing your efforts to protect Balsam Lake.

Sincerely,

Alex Smith
Lake Biologist

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

Aquatic Plant Advisory Committee

Lake Resident Members

Walter Coombe

Doug Fuller

Terry Nigon

Tom Vannelli

Jack Weix

Commissioners

Tom Kelly, Chairman

Bill Mork, Vice Chairman

Gary Schneider, Treasurer

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Prepared By

Harmony Environmental	Plan Writing and Facilitation
Endangered Resource Services, LLC	Aquatic Plant Surveys and Mapping

Funded By

Balsam Lake Protection and Rehabilitation District

A Wisconsin Department of Natural Resources Grant

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EXECUTIVE SUMMARY

This Aquatic Plant Management Plan for Balsam Lake presents a strategy for managing aquatic plants by protecting native plant populations, managing curly leaf pondweed, and preventing establishment of invasive species through the year 2026. The plan reviews a history of aquatic plant management on Balsam Lake. It also includes data about the plant community, watershed, and water quality of the lake. Some of this information is incorporated by reference to previous planning documents.

An aquatic plant point intercept survey and curly leaf pondweed bed mapping were completed for Balsam Lake in 2020. The aquatic plant survey found that Balsam Lake has a healthy, abundant, and diverse plant community. However, reductions in native plant diversity and abundance that occurred in East Balsam between 2009 and 2014 have not yet rebounded completely. 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.

This aquatic plant management plan, developed with input from an advisory committee including lake property owners, guides the Balsam Lake Protection and Rehabilitation District in 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 advisory committee for assistance with plan development.

PLAN GOALS

1. Manage established aquatic invasive species and eradicate newly introduced aquatic invasive species to reduce their impacts to the lake.
2. Prevent and detect the introduction of aquatic invasive species.
3. Maintain navigation for fishing and boating, access to lake residences, and comfortable swimming at the village beach.
4. Engage lake residents and visitors in reaching aquatic plant management goals.
5. Value the diverse native aquatic plant community in Balsam Lake.

INTRODUCTION

The Aquatic Plant Management Plan for Balsam Lake is sponsored by the Balsam Lake Protection and Rehabilitation District (BLPRD). The planning project is funded by a Wisconsin Department of Natural Resources Aquatic Invasive Species grant and the BLPRD.

This aquatic plant management plan presents a strategy for managing aquatic plants by protecting native plant populations, managing curly leaf pondweed, and preventing the establishment of additional invasive species. The plan includes data about the plant community, watershed, and water quality of the lake (some data is incorporated by reference to previous plans).[2] Based on this data and public input, goals and strategies for the sound management of aquatic plants in the lake are presented. This plan will guide the BLPRD and the Wisconsin Department of Natural Resources in aquatic plant management for Balsam Lake over the next five years (from 2022 through 2026).

This plan was developed when the Wisconsin Department of Natural Resources Aquatic Plant Management Program was undergoing revisions for both NR107 which guides chemical aquatic plant management and NR109 which guides mechanical/manual aquatic plant management. This rule revision process will continue at least through the winter of 2021 – 2022. Guidance for plan contents for mechanical aquatic plant management such as harvesting is included in NR 109. Although this plan is funded under previous state grant rule (NR198), it uses the planning framework in 2020 DNR Surface Water Grant guidelines. This document is an update of a plan approved by the Department of Natural Resources in October 2015.

PUBLIC INPUT FOR PLAN DEVELOPMENT

The BLPRD 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 April 6, 2021, the committee reviewed aquatic plant management planning requirements, plant survey results, discussed aquatic plant management concerns, and reviewed curly leaf pondweed (CLP) management. At a second meeting on April 27, 2021 the committee discussed the CLP strategy, aquatic invasive species prevention, harvesting efforts, and management to maintain access to individual corridors around resident docks. At a third meeting on May 11, 2021, the committee finalized the implementation plan focusing on aquatic invasive species prevention and outreach and education. All meetings were held virtually.

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[2] Harmony Environmental and Balsam Lake Protection and Rehabilitation District. *Aquatic Plant Management Plan, Balsam Lake, Polk County, Wisconsin*. 2015 and 2010.

Harmony Environmental and Balsam Lake Protection and Rehabilitation District. *Long Range Plan. East Balsam Basin Water Quality Amendment.* November 2019.

Harmony Environmental and Balsam Lake Protection and Rehabilitation District . *Balsam Lake Long Range Plan.* August 2012.

The BLPRD board announced the availability of the draft Aquatic Plant Management Plan for review with a public notice in the Inter-County Leader the week of June 28, 2021. Content was reviewed at the BLPRD annual meeting July 17, 2021, and comments were accepted through August 1, 2021. No comments were received.

RESIDENT CONCERNS

The APM Committee expressed a variety of concerns that are reflected in the objectives for plan development and in the goals for aquatic plant management in this plan. Management concerns identified included: maintaining navigation through areas of dense aquatic plant growth, curly leaf pondweed impacts, managing aquatic plants with the harvester, prevention of aquatic invasive species, plant identification, and water quality. Water quality concerns were deferred to the updated on the Balsam Lake Long Range Plan. Resident concerns related to aquatic plant management planning were captured in a 2010 property owner survey and reflected in the 2015 aquatic plant management plan.

LAKE INFORMATION

Balsam Lake (WBIC 2656200) is located in central Polk County, Wisconsin in the towns of Balsam Lake, Milltown, Georgetown, and Apple River. The lake has a surface area of 2,054 acres and a maximum depth of 37 feet. The average depth is 16.8 feet. Little narrows in the northwestern part of the lake and big narrows in the eastern part separate the lake into three basins.[3] Balsam Lake is a stratified, drainage lake. Two main streams enter Balsam Lake. Rice Creek originates north of and flows through Rice Lake, is joined by Otter Creek, then flows into the northwestern end of Little Balsam. Harder Creek flows from Half Moon Lake into the north side of Balsam Lake's main basin to the Stumps area.

Balsam Lake is mesotrophic to slightly eutrophic with water quality varying between lake basins.[4] See Table 1 for lake basin area. The littoral zone (the depth at which plants grow) remained at a similar depth between 2009 and 2020 except in East Balsam where it decreased from 19 feet in 2009, to 15.5 feet in 2014, and 14.5 feet in 2020 (Berg, 2020).[5] The bottom substrate is variable with muck bottoms in most bays and rock and sand bars in the narrows and around the lake's many islands. A lake map is included as Figure 1. Water quality and watershed information is compiled in Appendix A and summarized in the 2015 plan.

Table 1. Lake Basin Area

Acres	Main Basin – 1,270	Little Balsam - 86	East Balsam - 550	Total – 20,054

[3] U. S. Geological Survey. *Water and Phosphorus Budgets and Trophic State, Balsam Lake, Northwestern Wisconsin.* 1987 – 1989. Water Resources Investigations Report 91-4125.

[4] Based on July and August averages from 1987-2020, although citizen lake monitoring reports are not included for every year at each location. dnr.wi.gov/lakes/CLMN/reportsanddata.

[5] Berg, Matthew. *Warm Water Point Intercept Macrophyte Survey Balsam Lake Polk County, Wisconsin.* 2020.

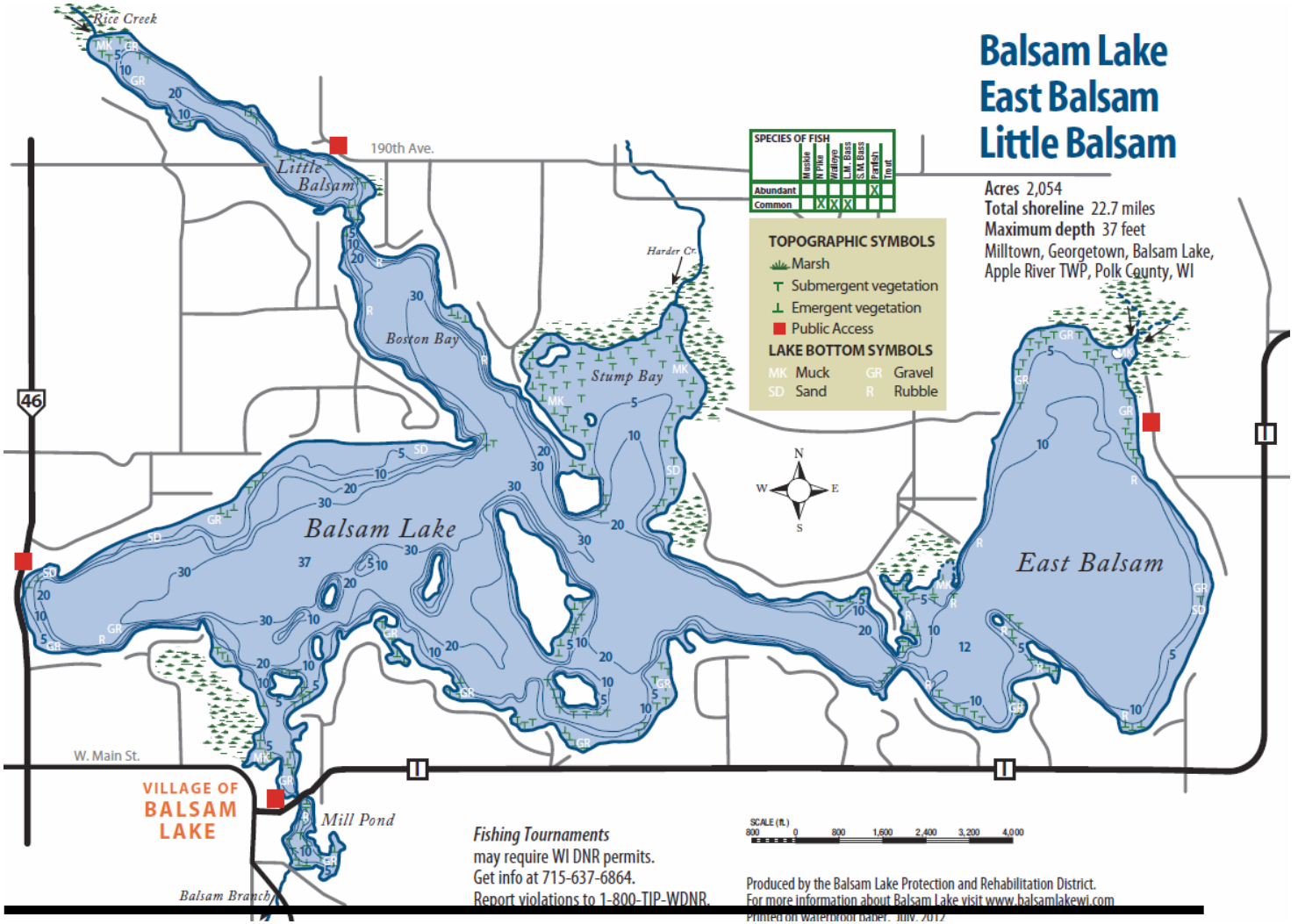

Figure 1. Balsam Lake Map

AQUATIC HABITATS

PRIMARY HUMAN USE AREAS

Residential development generally surrounds the lake. Waterfront property owners and the general public utilize Balsam Lake for a wide variety of activities including fishing, boating, swimming, and viewing wildlife.

Balsam Lake is a highly-used lake for fishing, and is the location for professional and amateur fishing tournaments (10 – 12 per year). There are four main boat landings for public use: the Highway 46 landing just north of the Village of Balsam Lake, the County I landing in the Village of Balsam Lake, the East Balsam landing off of County I (North), and the Town of Milltown landing on Little Balsam. There are a total of 46 parking spaces for boats and trailers at these landings. Public boat landings increase the use of the lakes, and therefore increase the risk of introduction of invasive species.

FUNCTIONS AND VALUES OF NATIVE AQUATIC PLANTS

Naturally occurring native plants are extremely beneficial to the lake. 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. The rush, reed, and rice populations around Balsam Lake are particularly important for reducing erosion along the shoreline, but these populations are also vulnerable to nutrient loading and the resultant algae growth in the lakes. Northern wild rice (*Zizania palustris*) is present at the Rice Creek and Harder Creek inlets.

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.[5]

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, 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.[6]

AQUATIC INVASIVE SPECIES

Curly leaf pondweed is scattered throughout Balsam Lake, and if uncontrolled, interferes with navigation around the lakes and to waterfront property. Other invasive species present along the Balsam Lake shoreline included purple loosestrife, aquatic forget-me-not, narrow leaf cattail, and reed canary grass.

There is a high risk that Eurasian water milfoil (EWM) and other aquatic invasive species may become established in Balsam Lake. As described previously, there are four heavily used boat landings on the lake. The lake is popular for bass fishing – including tournament fishing. Many fishermen travel from the Twin Cities, Minnesota area, and access the lake at the boat landings. With Eurasian water milfoil present in many urban Twin Cities lakes, there is potential to transport plant fragments on boats and motors. Department of Natural Resource scientists have also found or verified Eurasian water milfoil in the nearby Wisconsin counties of Burnett (Big Trade, Little Trade, Ham, Shallow, and Round Lakes), Barron (Beaver Dam, Horseshoe, Sand, Kidney, Shallow, Duck, Lower Vermillion, Rice, and Echo Lakes), and St. Croix (Bass Lake, Cedar Lake, Goose Pond, Little Falls Lake, Lake Mallalieu, Lake St. Croix, the New Richmond Flowage, and Perch Lake). In Polk County, EWM is found in Cedar, North Twin, South Twin, Pike Lake, Long Trade, Horseshoe and Pike Lakes and the Indianhead Flowage.[7]

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

[6] Wisconsin Department of Natural Resources. *Aquatic Plant Management Strategy. DNR Northern Region.* Summer 2007.

[7] https://dnr.wi.gov/lakes/invasives/AISLists (accessed 01/19/2021).

Although not an aquatic plant, invasive Asian mussels are also a threat to Balsam Lake. Zebra mussels were discovered in nearby Deer Lake in 2016 and have since spread throughout that lake. Residents reported finding zebra mussels covering the bottom of boats, motors, docks, and along the shoreline in the fall of 2020.[8] The larval form of zebra mussels called veligers were also detected at a concentration of 0.040/L in Deer Lake water in July 2020. Veligers were also found in Big McKenzie Lake in Burnett County at a rate of 6.34/L in July 2020. None were detected in Balsam Lake or Bone Lake in Polk County.[9] Zebra mussels were first discovered in Big McKenzie Lake in 2016.[10]

SENSITIVE AREAS

The Wisconsin Department of Natural Resources 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 Department of Natural Resources transitioned to designations of *critical habitat areas* that include both *sensitive areas* and *public rights features*. 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.

Critical habitat areas include *sensitive areas* that 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.

[8] Deer Lake Improvement Association. *Deer Tales* newsletter. Fall 2020.

[9] RMB Environmental Lab Reports for National Park Service St. Croix National Scenic Riverway. 2020.

[10] *Washburn County WDNR Aquatic Invasive Species Project. Final Report AEPP-51417 July 2017- Dec 2019.*

SENSITIVE AREA STUDY

The Wisconsin Department of Natural Resources completed an Aquatic Plant Management Sensitive Area Assessment in 1989. The assessment identified 26 areas on Balsam Lake with aquatic plant values and described management requirements for each sensitive area. These areas are mapped in Figure 2. The full report is found at http://dnr.wi.gov/lakes/criticalhabitat/.

Twenty-four of the areas contain aquatic plant communities that provide important fish and wildlife habitat. Certain areas (11 out of 26) provide gravel and coarse rock rubble habitat important for walleye spawning. The report describes the sensitive area guidelines below as good recommendations for the entire lake.

The BLPRD purchased two properties along Park Drive to protect one sensitive area and the 18.5-acre Peterson property and the 34-acre Soltau property to protect another sensitive area. The acquisition of these parcels carried out a recommendation specifically mentioned in the DNR Balsam Lake Sensitive Area Study.

There are sensitive areas surrounding or very near each of the lake's four main boat landings. Educational efforts and watercraft inspections take place at the boat landings.

Sensitive Area Guidelines for Walleye Spawning Areas

1. No alterations to gravel and coarse rock substrate unless alterations are to improve walleye spawning.
2. Erosion control is especially critical.
3. Chemical treatment and mechanical removal of aquatic plants need not be quite as restrictive as in aquatic plant sensitive areas.

Sensitive Area Guidelines to Protect Fish and Wildlife Habitat

1. Limit vegetation removal to navigation channels or to no removal at all.
2. Control purple loosestrife.
3. Prohibit alterations to the near shoreline (covered by Chapter 30 permits).
4. Leave large woody debris (logs and stumps) in the water near the shoreline.
5. Maintain a natural shoreline buffer.
6. Prevent erosion, especially from construction sites.
7. Strictly enforce zoning ordinances.
8. Eliminate nutrient inputs caused by lawn fertilizers, failing septic systems, and other sources.
9. Consider acquisition of property in the Stumps area.

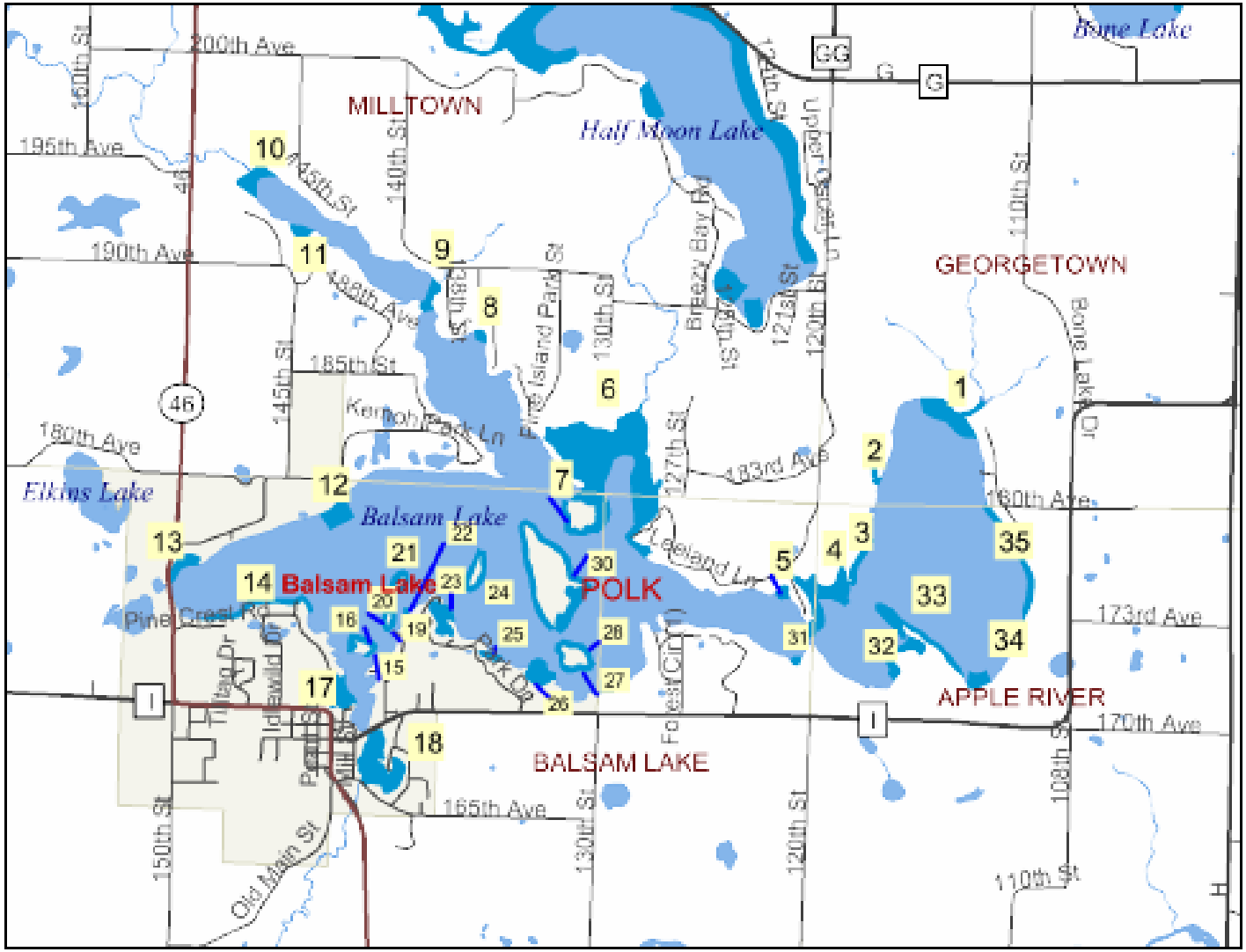

Figure 2. Balsam Lake Sensitive Area/Critical Habitat Area Designations

FISHERY[11]

The Balsam Lake fishery consists of largemouth bass, walleye, northern pike, bluegill, black crappie, yellow perch, and pumpkinseed. According to Aaron Cole, WDNR fisheries biologist, Balsam Lake has always had a reputation of being a good fishing lake, but there have been some changes in the fish community. It had a better walleye population in the late 1980s. In 1989 the walleye population was 3.4 adults/acre. The walleye population has since declined and, in 2017 during the most recent survey, the walleye population had a density of 0.5 adults/acre which was a slight increase from the 2014 survey (0.3 adults/acre). Both are considered low density populations. The decline of the walleye population has occurred despite extensive walleye stocking efforts with fry, small fingerlings, and low levels of large fingerlings. Beginning in 2016, Balsam Lake was stocked with about 19,000 large fingerling walleye every other year (a rate of about 10 fish/acre).[12] The minimum length for walleye harvest is 18 inches with a three-fish bag limit.

The largemouth bass population has increased in Balsam Lake, and it has a high density, low size structure. Largemouth bass have been managed with several regulations in recent years. In 2002, the WDNR liberalized bass regulations on Balsam Lake because bass growth rates declined, and the overall condition of bass was poor when compared to past fish surveys. Anglers were able to keep one bass less than 14 inches as part of their daily bag limit of five bass. This regulation sunset in 2012 and the limits reverted back to the statewide 14-inch minimum length limit for the 2012 and 2013 fishing seasons. Beginning in spring 2014, largemouth bass were managed with a no minimum length limit and five fish daily bag limit regulation. Anglers are encouraged to harvest largemouth bass. If the bass population can be reduced, the size structure of largemouth bass should improve, and walleye stocking success could potentially improve.

With the high density largemouth bass population, panfish populations are in good shape with many fish of desirable size. The majority of the angling effort on Balsam Lake is directed at panfish species. During the last several creel surveys, anglers directed over 50% of the total effort towards panfish species, mainly bluegill and crappie. Anglers are allowed to harvest 25 panfish each day on Balsam Lake.

When considering fish in lake and watershed management, the following should be considered:[13]

1. Walleye spawn on clean gravel beds. Sedimentation can render these areas useless as spawning beds. It is important to keep sedimentation to these areas to a minimum. Waterfront runoff reduction projects and shoreline buffers of native vegetation can reduce sedimentation. The beds designated for walleye spawning areas (11 out of 35 total sensitive areas) include: 3, 7, 14, 16, 20, 21, 24, 28, 30, 33, and 35.

2. Black crappie spawn when the water temperature is the same as that recommended for CLP treatment. This treatment should be timed accordingly, prior to crappie spawning.

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[11] Benike, Heath M. *Balsam Lake Treaty Assessment Survey. Polk County, Wisconsin (MWBIC: 2620600).* Wisconsin DNR. April 2010. Updated by Aaron Cole, DNR Fisheries Biologist, January 2021.

[12] Fish Stocking | Wisconsin DNR accessed 01/18/2021.

[13] Ecological Integrity Services. *Aquatic Plant Management Plan Lake Wapogasset and Bear Trap Lake.* August 2009.

3. Since northern pike spawn when water temperatures are in the 40s F, and herbicide treatments occur when the water temperatures are higher, herbicide application should not coincide with or disrupt northern pike spawning.

Table 2. Spawning Temperatures and Substrate Needs

Fish species[14]	**Spawning Temp. in Degrees 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
Northern pike	Upper 30s to mid-40's 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 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

[14] Benike, Heath. Wisconsin DNR Fisheries Biologist. 2006.

PLANT COMMUNITY

AQUATIC PLANT SURVEY RESULTS

Endangered Resource Services completed an aquatic plant inventory in August of 2020 according to the WDNR-specified point intercept method. Previous surveys were completed in 2014 and 2009. An early season point intercept survey to verify curly leaf pondweed (CLP) locations will be completed in June 2021.

Aquatic plant point intercept surveys are used to assess the relative health of a plant community and guide management actions. Treatment results can be compared from lake to lake, and the condition of the state's aquatic plant community can be tracked over time. In addition, these data can be used to assess how management is affecting non-target native plant populations.[15]

Detailed descriptions of aquatic plant survey methods and 2020 Balsam Lake results are found in the report:

Warm Water Macrophyte Point/Intercept Survey, Balsam Lake – WBIC 2620600 Polk County, Wisconsin. August 7-9, 2020. This report is incorporated by reference into this aquatic plant management plan.

A summary of notable results from the report follows:

PLANT DIVERSITY AND NUMBER OF SPECIES

Overall diversity was exceptionally high in Balsam Lake with a Simpson Diversity Index value of 0.92 – identical to 2014 and up slightly from 0.90 in 2009. Species richness was moderate with 48 species found growing in and immediately adjacent to the water – nearly unchanged from 46 in 2014 and 47 in 2009.

CHANGES IN PLANT SPECIES

Significant changes in the Balsam Lake aquatic plant community from 2009 to 2020 are almost entirely due to changes in East Balsam. Further, the declines in specific plants suggest that the herbicide treatments to control curly leaf pondweed (especially between 2009 and 2014) are the cause of these changes. The plant survey conducted August 7-9, 2020, found macrophytes (aquatic plants) growing at 370 points. This amounted to 33.8% of the entire lake bottom and 72.8% of the 15.0 ft. littoral zone (the depth at which plants grow). This was nearly identical to 2014 results as shown in Table 3. However, it still represented a highly significant decline from 2009 when plants were growing at 600 points. In 2009 plants covered 54.8% of the entire lake bottom and 88.8% of the then 19.0 ft. littoral zone.

In 2009, almost all of East Balsam had plants present with 97.4% coverage. In 2014 aquatic plants covered only 33.3% of the lake bottom at depths to 15.5 ft. This zone contracted further to 14.5 ft. in 2020, but the number of points with vegetation was almost unchanged with 32.4% total coverage.

[15] Wisconsin Department of Natural Resources. *Strategic Analysis of Aquatic Plant Management in Wisconsin.* June 2019.

From 2009 to 2014, 11 aquatic plant species showed significant distribution changes in East Balsam. Results suggested that species that over winter vegetatively, as well as those that start growing early in the spring prior to herbicide application, suffered the biggest declines, while species that reproduce from seeds/oogonia and start growing later in the spring expanded – presumably into habitat vacated by other species. There is good evidence that large scale herbicide treatments are impacting native plants in East Balsam.

NORTHERN WILD RICE

Northern wild rice (*Zizania palustris*) was present at three points with a mean rake fullness of 1.67 – similar to three points and mean rake fullness of 1.33 in 2014, but up from one point with a rake fullness of 2 in 2009. (Rake fullness ranges from 0 – none present to 3 – most dense.) Dense rice beds occurred at the Rice Creek Inlet while rice at the Harder Creek Inlet was patchy and of poorer quality. Although valuable for wildlife, both areas had limited human harvest potential due to very shallow water which made them generally inaccessible.

FILAMENTOUS ALGAE

Filamentous algae were present at 97 sites with a mean rake fullness of 1.47. This was a moderately significant decline in distribution and a significant decline in density from 2014 when they were present at 145 sites with a mean rake fullness of 1.45. It was also a further decline from 2009 when these algae were present at 184 sites with a mean rake fullness of 1.59.

MEASURES OF PLANT COMMUNITY QUALITY

The 39 native index species found in the rake during the August 2020 survey (up from 37 in both 2014 and 2009) produced an above average mean Coefficient of Conservatism of 6.3 (identical to 2014 and up from 6.1 in 2009), and a Floristic Quality Index (FQI) of 39.4 (up from 38.1 in 2014 and 37.2 in 2009) that was nearly double the median FQI for this part of the state.

AQUATIC INVASIVE SPECIES

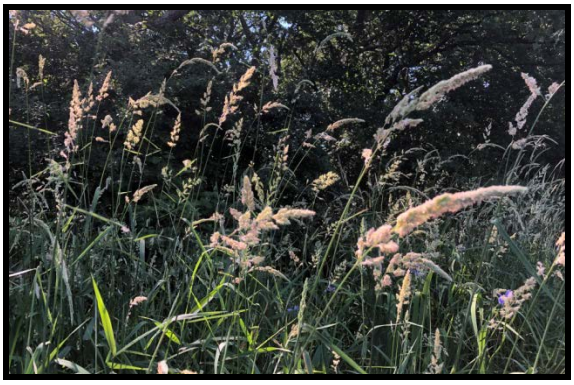
In addition to curly leaf pondweed (CLP), four other aquatic invasive species (AIS) were found along the shores of Balsam Lake in a recent aquatic plant survey.[16] Reed canary grass (*Phalaris arundinacea*) was present and well-established throughout the lake. Purple loosestrife (*Lythrum salicaria*) was scattered in the bays south of First Island, in Idlewild Bay, near the village beach, and in Raskin Bay. There were Galerucella beetles present on most plants. The Polk County Land and Water Resources Department released these beetles as a control measure in 2014. The Department has also removed purple loosestrife plants and treated the stems with herbicide near the village beach.[17] Plant surveyor, Matt Berg, first documented purple loosestrife there in 2009.

Figure 3. Purple Loosestrife Locations

[16] Berg, Matthew. *Warm Water Point Intercept Macrophyte Survey Balsam Lake Polk County, Wisconsin.* 2020.

[17] Williamson, Jeremy, Polk County LWRD Personal communication. October 2009.

Common forget-me-not (*Myosotis scorpioides*) was also found at a few scattered locations in the bays south of First Island and near the village beach. A single but well-established stand of hybrid cattail (*Typha* X *glauca*) was growing along the immediate shoreline southwest of Paradise and Big Islands.



Reed canary grass (Berg 2020)

Purple loosestrife (Cameron 2018)

Purple loosestrife cluster east of Idlewild Bay (Berg 2017)

Common forget-me-not (Raymond 2011)

Figure 4. Balsam Lake Shoreline Invasive Species

In addition, giant and Japanese knotweed was located on the Millpond and at a private residence by the Polk County Land and Water Resources Department as part of a rapid response project.[18] Giant knotweed is a prohibited species listed in NR40.04(2)). Curly leaf pondweed is found in many locations around the lake and is the focus of an ongoing BLPRD control effort. More information about these species is included in the Aquatic Plant Management Companion Plan Document.[19]

[18] Wojchik, Eric. Polk County Land and Water Resources Department. Personal Communication. January 2015.

[19] Harmony Environmental. *Managing Aquatic Plants in Northern Wisconsin. Aquatic Plant Management Plan Companion Document.* 2021.

Table 3. Aquatic Macrophyte Point Intercept Surveys Summary Statistics (Berg, 2020)

Summary Statistics:	2009	2014	2020
Total number of sites visited	1,095	1,095	1,095
Total number of sites with vegetation	600	377	370
Total number of sites shallower than the maximum depth of plants	676	538	508
Frequency of occurrence at sites shallower than maximum depth of plants	88.8	70.1	72.8
Simpson Diversity Index	0.90	0.92	0.92
Maximum depth of plants (ft.)	19.0	15.5	15.0
Mean depth of plants (ft.)	10.0	7.3	7.3
Median depth of plants (ft.)	10.0	7.0	7.5
Number of sites sampled using rake on rope (R)	116	148	0
Number of sites sampled using rake on pole (P)	537	509	589
Average number of all species per site (shallower than max. depth)	3.13	2.44	2.63
Average number of all species per site (vegetated sites only)	3.53	3.49	3.61
Average number of native species per site (shallower than max. depth)	2.97	2.38	2.59
Average number of native species per site (sites with native vegetation only)	3.35	3.41	3.55
Species richness	38	38	40
Species richness (including visuals)	39	38	42
Species richness (including visuals and boat survey)	47	46	48
Mean rake fullness (vegetative sites only)	2.32	2.03	2.24

Figure 5. Balsam Lake Areas

CURLY LEAF PONDWEED

CLP BED MAPPING SURVEYS

Endangered Resource Services mapped beds of curly leaf pondweed annually since 2013. A CLP bed was defined by the following criteria: 1) CLP plants made up greater than 50% of all aquatic plants in the bed, and 2) the CLP had canopied at the surface or was close enough to the surface that the growth would likely interfere with normal boat traffic. CLP bed maps track growth from year to year and provide information for management including results of herbicide control and locations for harvesting. Detailed descriptions of each CLP bed are included in the annual bed mapping reports. Bed mapping is conducted following herbicide treatment and prior to harvesting operations. Harvesting operations began in August 2016. The BLPRD conducted early season herbicide treatments from 2009 – 2017 and again in 2020. There was no CLP herbicide treatment in 2018 or 2019.

Growth of CLP varies from year to year due to climatic factors such as thickness of ice and snow cover and date of ice-out. In addition, management efforts may lead to changes in CLP growth: reductions when control measures are effective and potentially to increases when control measures do not effectively decrease turion production. Annual changes in CLP growth are illustrated in bed maps shown in the following figures. A detailed summary of bed size and treatment history is included in the 2020 CLP pre and post monitoring report (Berg, 2020).

It is too early to tell if harvesting of CLP is impacting its occurrence and density. The CLP bed mapping does indicate loss of total acres and general decline in density from 2019 to 2020. However, the author's conclusion is that 2020 growing conditions were not as favorable for CLP as they were in 2019.

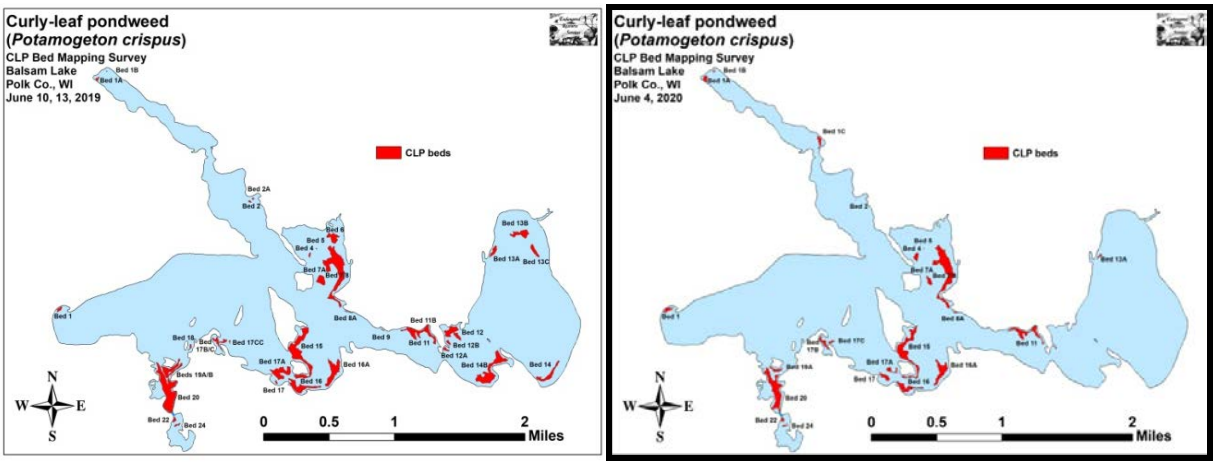


Figure 6. 2019 and 2020 Balsam Lake June CLP Beds

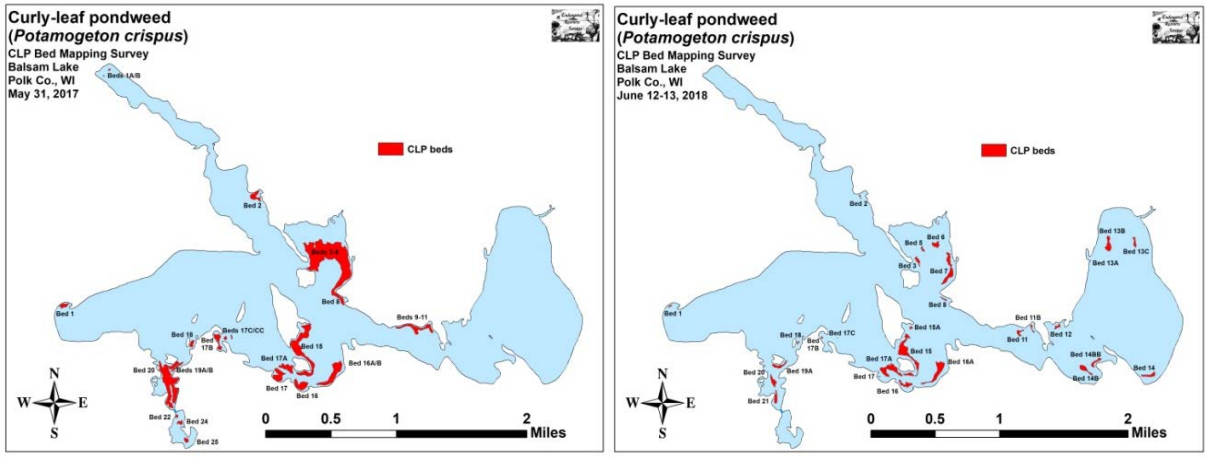


Figure 7. 2017 and 2018 Balsam Lake June CLP Beds

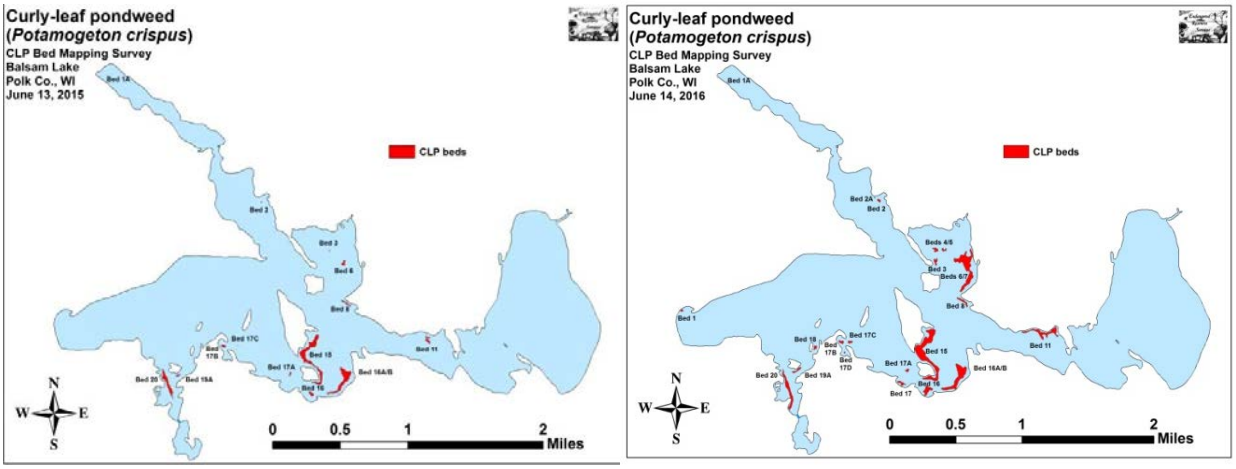


Figure 8. 2015 and 2016 Balsam Lake Late May/June CLP Beds

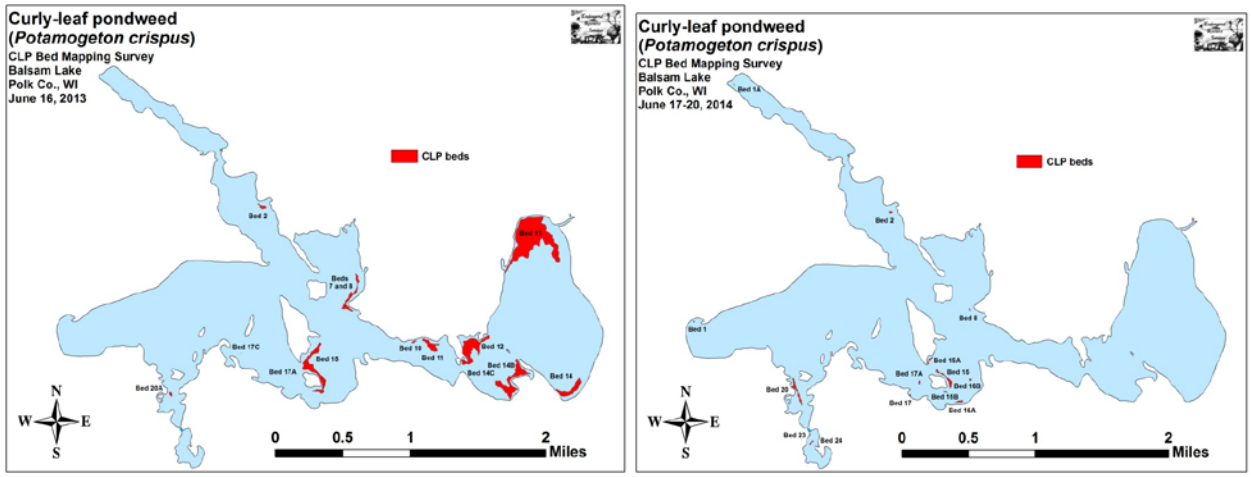


Figure 9. 2013 and 2014 Balsam Lake CLP Beds

A summary of the total acres of CLP in Balsam Lake including the acres treated with herbicide is shown in Figure 10.

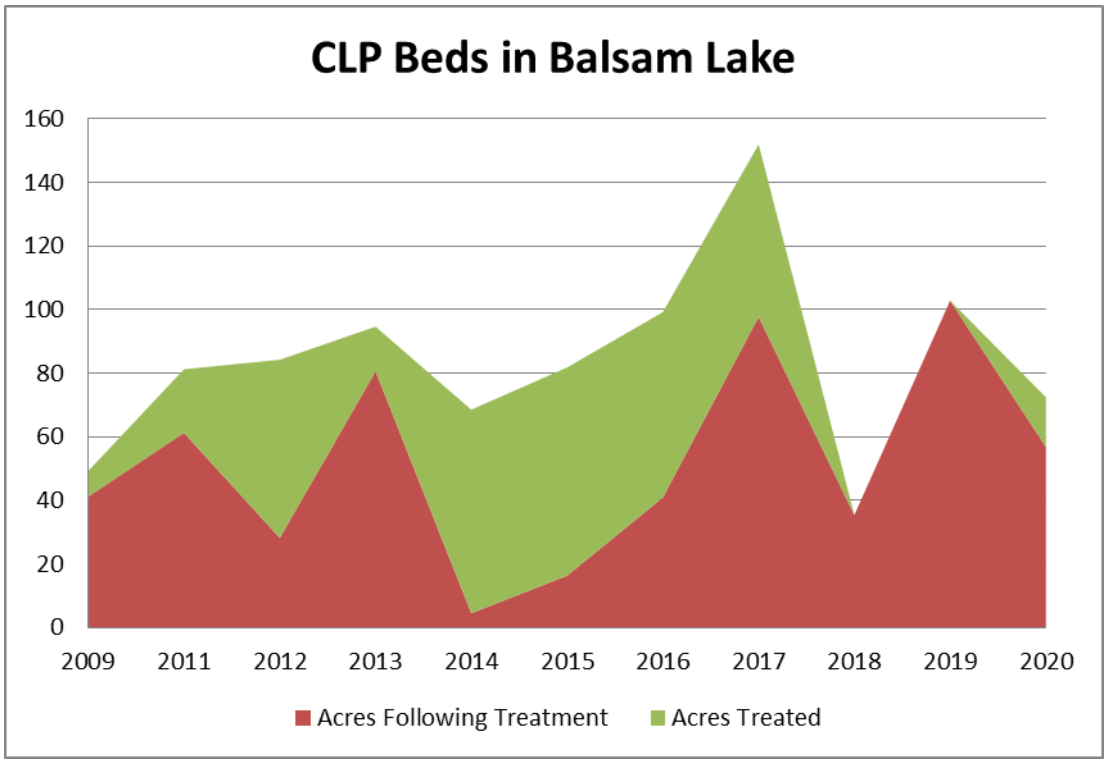


Figure 10. CLP Beds in Balsam Lake 2009 – 2020

AQUATIC PLANT MANAGEMENT

Potential aquatic plant management methods available are summarized in the APM companion document. This section reports aquatic plant management activities on the lake. A timeline of Balsam Lake aquatic plant management efforts is found below.

A TIMELINE OF BLPRD AQUATIC PLANT MANAGEMENT EFFORTS

1974	Balsam Lake Homeowners Association formed
1976	Balsam Lake Protection and Rehabilitation District established
1977	Aquatic plant harvesting began – contract with Aquatic Nuisance Control
2000	Macrophyte management plan (Barr Engineering) adopted by BLPRD
	Application of herbicide to lake navigational channels began, ended harvesting
2007	Clean Boats, Clean Waters Program began
2009	Early season curly leaf pondweed herbicide treatment began (8 acres in East Balsam)
2012	Early season curly leaf pondweed expanded to 56 acres
2013	Navigation channel inspection for herbicide treatment discontinued
2016	BLPRD purchased aquatic plant harvester and began harvesting navigation lanes in August
2017	BLPRD began CLP harvesting in June

BALSAM LAKE AQUATIC PLANT MANAGEMENT

Early Balsam Lake management efforts included the use of chemicals to control aquatic plants and algae. From 1960 through 1985, the most commonly used chemicals were copper sulfate and endothall compounds. Copper sulfate use is a concern since copper is a heavy metal that can build up in lake sediments. Between 1960 and 1985, over 7.7 tons of copper sulfate were applied to Balsam Lake (not including chemical applications made directly by homeowners).[21]

Native aquatic plants were managed by the BLPRD primarily by harvesting through 1999. When the contracted harvester operator passed away, new management methods were considered. There were many complaints about floating, drifting plant fragments when harvesting was used. From 2000 through 2006, herbicides were used to manage nuisance native aquatic plants.

According to WDNR staff, herbicide use on Balsam Lake was common beginning in the 1950s. In the early 1980s through 2007 many property owners hired contractors to use herbicides to create openings in front of their parcels, generally treating twice each year. Copper compounds were also commonly used to treat planktonic (floating) algae. In the late 1990s the DNR permitted only filamentous algae treatments, and copper treatments for planktonic algae control were discontinued. At that same time, individual treatment widths were limited to 50 feet.[22] However, according to treatment records, copper compounds had still been used (in the form of Cutrine Plus and as part of an applicator designated "efficacy mix") at the boat landings and for individual homeowner corridors.

The DNR Northern Region released an Aquatic Plant Management Strategy in the summer of 2007 to protect the important functions of aquatic plants 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 is designated in an approved aquatic plant management plan.[23] Because of the importance of the native plant population for habitat, protection against erosion, and as a guard against invasive species infestation, plant removal with herbicides as an option for individual property owners must be carefully reviewed before permits are issued. The DNR did not allow removal after January 1, 2009 unless the "impairment of navigation" and/or "nuisance" conditions are clearly documented.

CURLY LEAF PONDWEED EARLY SEASON HERBICIDE TREATMENT

Early season curly leaf pondweed (CLP) herbicide treatment using Endothall began as a pilot project in 2004 and 2005 with treatment of 13 acres in East Balsam. An eight-acre bed along the south shore of East Balsam was

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[21] Lim Tech Consultants. *Analysis of Balsam Lake (Polk County, Wisconsin) with Recommendations for Improved Lake Management.* September 1986. Report No. LT-R46902.

[22] Email communication. Mark Sundeen. 2/14/2010.

[23] Wisconsin Department of Natural Resources. *Aquatic Plant Management Strategy. DNR Northern Region.* Summer 2007.

treated again on May 14, 2009.[24] Pre- and post-monitoring using standardized DNR methods began in 2009. Pre- and post-monitoring reports[25] were used to create a recent history of CLP early season herbicide treatments in Table 6 below. In general, CLP treatment was less effective in small and narrow beds – especially with lower target herbicide concentration, next to steep drop offs, with higher wind speed, and in areas where water flows.

The objective of early season treatment is to selectively target curly leaf pondweed. Studies have demonstrated that curly leaf pondweed can be controlled with Aquathol K (a formulation of endothall) in 50 to 60 degree F water, and that treatments of CLP this early in its life cycle can prevent turion (reproductive structure) formation.[26] Many native plants are still dormant at these water temperatures, and the intent is to limit damage to the native plant community.[27]

TREATMENT TIMING

With frequent high spring winds, it can be difficult to find a treatment window with low wind speeds following a pretreatment survey. Curly leaf pondweed treatments have frequently exceeded recommended temperature maximum on Balsam Lake (Figure 11 and Table 6), and significant declines in aquatic macrophytes have been documented in post herbicide treatment in CLP beds and warm season aquatic macrophyte surveys in East Balsam.

[24] Endangered Resource Services. June 2009.

[25] Berg, Matthew. *Curly-leaf Pondweed Pre/Post Herbicide Surveys First and Pine Island and Big Narrows Areas Balsam Lake, WBIC:2620600 Polk County, Wisconsin 2010*.

Berg, Matthew. Pre/Post CLP Surveys 2009-2020.

[26] *Research in Minnesota on Control of Curly Leaf Pondweed.* Wendy Crowell, Minnesota Department of Natural Resources. Spring 2002.

[27] Jones, Ajay Robert. *Effects of Repeated Early Season Herbicide Treatments of Curlyleaf Pondweed on Native Macrophyte Assemblages in Minnesota Lakes.* University of Minnesota Masters Thesis. 2010.

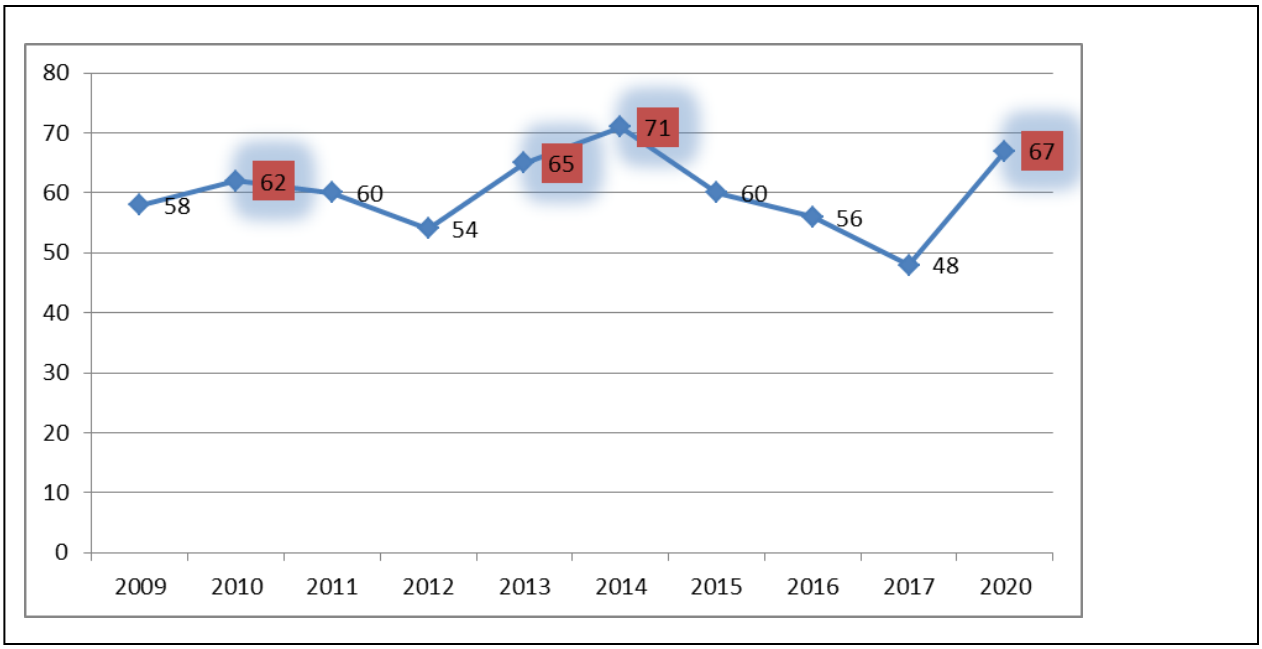

Figure 11. Water Temperatures during Balsam Lake Curly Leaf Pondweed Herbicide Treatment (2009 – 2020)

SMALL SCALE TREATMENTS

To be effective, herbicide must have adequate concentration and exposure time (CET). Herbicides applied at a small-scale (defined as less than 10 acres or 10 percent of the water body in NR107) in aquatic environments dissipate quickly, presenting challenges in meeting target CET values (Nault, 2015).[28] Due to this rapid herbicide dissipation, the efficacy of treatments to small areas can be unpredictable, and control of the target species can be difficult to achieve and maintain.[29]

In fact, herbicide concentration monitoring in Balsam Lake demonstrated that herbicide applied to narrow bands of vegetation in small beds is likely to drift, rapidly decrease in concentration, and be rendered ineffective. Early season CLP treatment of 14 acres in two long, narrow beds in 2013 resulted in herbicide concentrations that did not meet target concentrations and did not reduce CLP frequency.[30] Because of lack of effectiveness, small beds outside of East Balsam have not been treated with herbicide since 2013. Harvesting operations began throughout the lake in 2017.

LARGE SCALE TREATMENTS

Large-scale herbicide treatments (treatments covering more than 10 acres or 10% of a lake's littoral zone) are generally more predictable in terms of anticipated CET and target species efficacy but are also likely to have greater non-target (e.g., plants and animal) impacts lake-wide (DNR, 2019). Large scale treatments of 54 to 64

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[28] Nault, M., S. Knight, S.V. Egeren, E. Heath, J. Skogerboe, M. Barton, and S. Provost. 2015. *Control of Invasive Aquatic Plants on a Small Scale.* North American Lake Management Society (NALMS) LakeLine. 35(1):35-39.

[29] Wisconsin DNR. *Strategic Analysis of Aquatic Plant Management in Wisconsin.* June 2019.

[30] Skogerboe, John. *Draft Balsam Lake, Polk County Endothall Concentration Monitoring Summary 2013.* November 2013.

acres in East Balsam in 2012 and 2014 – 2017 effectively decreased CLP growth. However, declines in native plant growth were evident beginning with the near complete removal of small pondweed in 2012. Herbicide monitoring in 2014 verified that herbicide concentrations exceeded target levels of 1.5 ppm for 24 to 36 hours following treatment. Herbicide monitoring in 2015 found that lowered target herbicide concentration of 1.0 ppm, was reached in the largest bed (15) only for a period of 5 hours. The report indicates that winds above 10 mph may have been a factor in decreasing CET.[31] Treatment effectiveness decreased from complete removal of CLP in East Balsam in 2014 to a 74% decline in 2015. Summaries of herbicide concentration monitoring in 2013 and 2014 are found in the 2015 Balsam Lake Aquatic Plant Management Plan.

Results from Balsam Lake demonstrate the importance of following early season CLP treatment guidance:

1) Small scale herbicide treatment throughout much of Balsam Lake has not been effective.
2) To minimize damage to native plants, do not treat when water temperatures exceed 60 degrees F. This temperature serves as a proxy for when there is significant growth of native plants.
3) Set herbicide concentrations at minimum levels for effective treatment – currently 1 ppm for large scale treatment of East Balsam beds.
4) Do not conduct herbicide treatments when wind is >10 mph or is forecast to exceed 15 mph including gusts within 24 hours of treatment.

COST OF TREATMENT AND MONITORING

The cost of herbicide treatments varies with acres treated, but monitoring costs are quite stable from year to year. Two recent years' treatment costs are shown in Table 4 and monitoring costs are shown in Table 5.

Table 4. CLP Herbicide Treatment Cost

Year	Year Annual Cost	Acres Treated	Cost/Acre	Grant Funding
2017	$37,101	54.18	$684.17	75%
2020	$17,424	15.6	$1,117	75%

Table 5. Annual CLP Monitoring Costs (2020)

	Cost	**Grant Funding (ACEI 21218)**
Pre and Post Treatment Survey	$2,425	
CLP Bed Mapping	$850	
CLP Turion Survey	$1,750	
TOTAL	$5,025.00	75%

[31] Skogerboe, John. *Balsam Lake, Polk County (WBIC 322800), Endothall Herbicide Concentration Monitoring Summary, 2015.* January 2016.

Table 6. CLP Treatment Summary (2009 – 2020)

Year	Acres	Target ppm	Temp. in F reported at treatment	Reported wind speed	Decline in CLP Frequency	Significant Declines in Native Plants	Notes
2009	8	?	58	NA	Yes (66% decline)	Coontail	East Balsam SE of Big Narrows
2010	8	0.75	62	5-10 mph	Yes (33% decline)	Coontail Robbin's pondweed Flat stem pondweed	Turions formed prior to treatment. Poor control.
2011	20	1.0	58-62	5-10 mph	Yes (73% decline)	Fern pondweed Large leaf pondweed White water crowfoot	Poor control in bed 11
2012	56	1.5	52-56	0-6 mph	Yes (100%)	Coontail Duckweed Robbin's pondweed Northern WM Small pondweed	Many native plants completely eliminated pre- to post-survey
2013	14	1.5	65	3-5 mph	No	No	Poor control in beds 11 and 15
2014	64	1.5	71	1-2.5 mph	Yes (100%)	Coontail	Still low growth of native plants in East Balsam
2015	65.45	1.0	60	5.5-9.8 mph[32]	Yes (74% decline)	Coontail	Wind velocity may have exceeded 10 mph during or following treatment
2016	58.27	1.0 – 1.5	56	1.1 – 3.5 mpg	Yes (96% decline)	White stem pondweed	
2017	54.2	1.0 - 1.5	48	6-9.5 mph	Yes (94% decline)	No	Northern water milfoil and coontail significant increases
2018	0						No treatment
2019	0						No treatment
2020	15.6	1 – 1.5	67	6 mph	Yes (south beds effective)		CLP may have formed viable turions prior to treatment

[32] Wind data collected at nearby official weather stations in Osceola and Siren, WI showed wind was 10 to 20 mph from the east, south east. (Skogerboe, 2016).

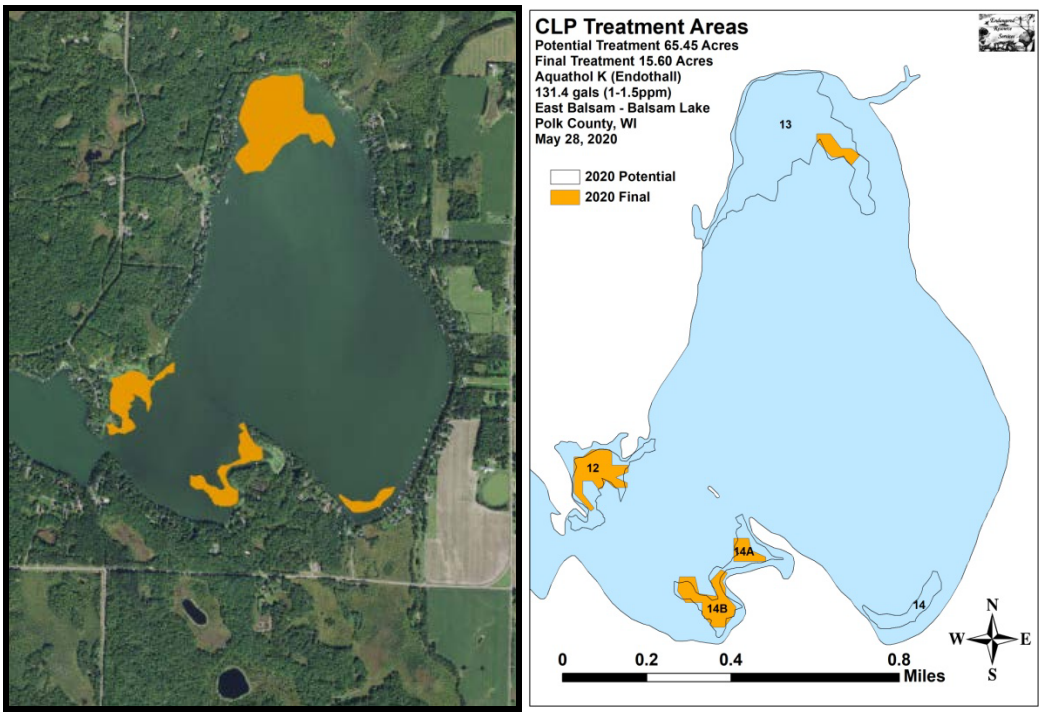


Figure 12. Balsam Lake CLP Treatment Areas 2017 and 2020

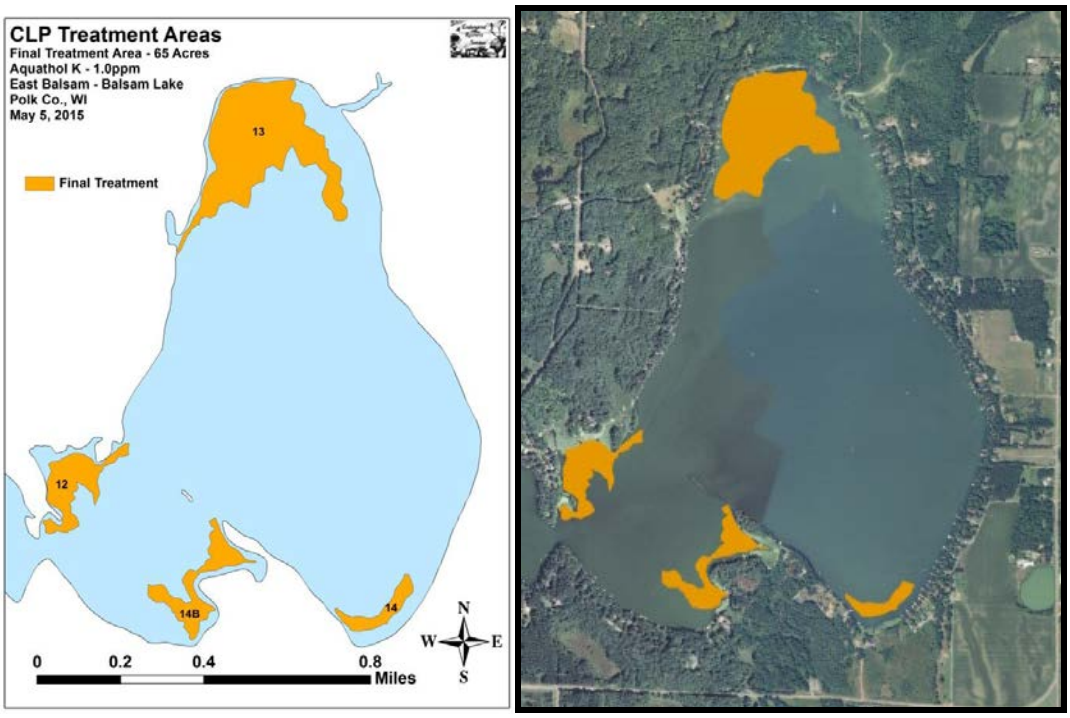


Figure 13. Balsam Lake CLP Treatment Areas 2015 and 2016

Figure 14. Balsam Lake CLP Herbicide Treatment Areas 2013 and 2014

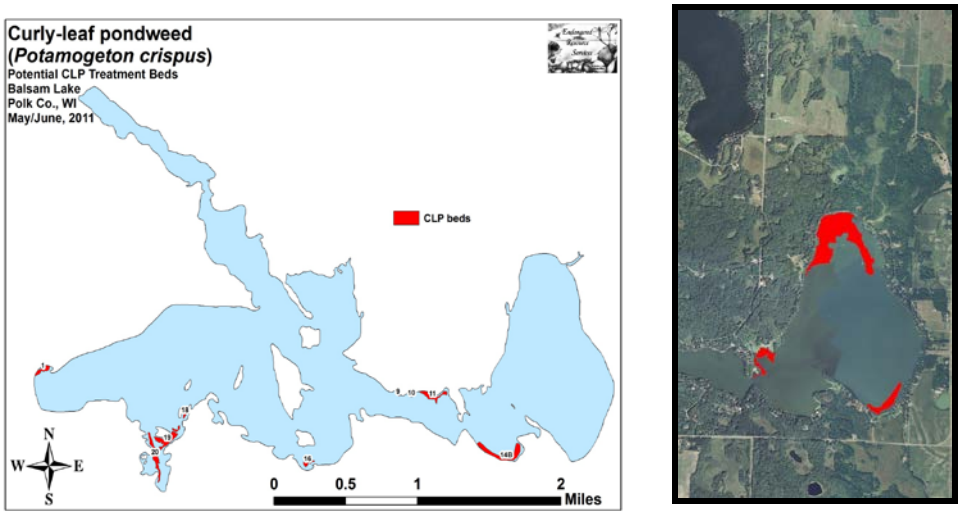


Figure 15. Balsam Lake CLP Herbicide Treatment Areas 2011 and 2012

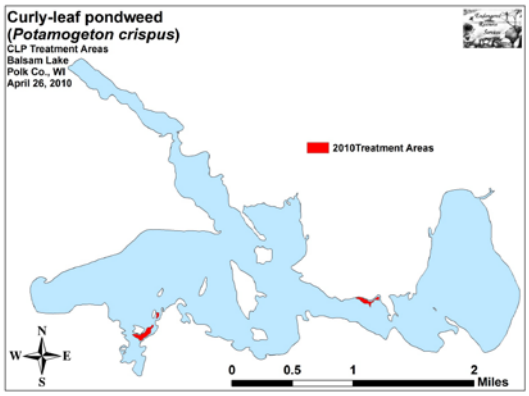


Figure 16. Balsam Lake CLP Treatment Beds 2010

CLP TURION SURVEY RESULTS[32]

Curly leaf pondweed turions were monitored in East Balsam from 2014 – 2020 by Endangered Resource Services. Most CLP reproduction occurs from turions which are 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.

Figure 17. Germinating CLP Turion

Research suggests 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). Depending on the level of turions at a given location, and knowing that latent turions may be able to survive for more than 5 years in the sediment, it may take several years of control to exhaust the "turion bank" (R. Newman – U of M unpublished data).

Turion survey results from 2020 are illustrated in Figure 19. These results can be used to predict potential growth and level of navigation impairment for the coming season. A review of turion results from 2014 – 2020 illustrates steady declines in turion frequency and density through 2018, with slight increases in 2019 following no herbicide treatment in 2018 and 2019. Because of the late treatment in 2020 (water temperatures were 67 degrees F) viable turions may have formed prior to herbicide treatment.

[32] Berg, Matthew. *Curly-leaf Pondweed (Potamogeton crispus) Post Herbicide Turion Survey Balsam Lake – WBIC: 2620600 Polk County, Wisconsin.* November 2020.

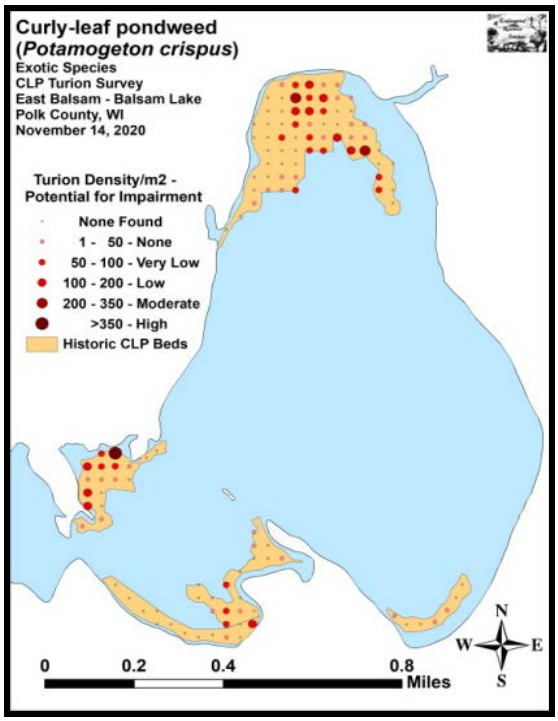
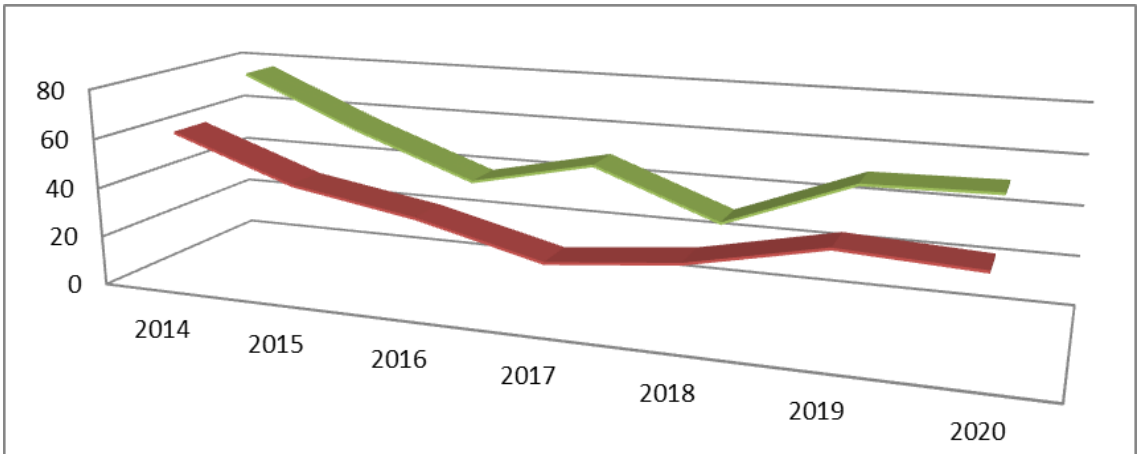


Figure 19. Curly Leaf Pondweed Turion Survey 2020



	2014	2015	2016	2017	2018	2019	2020
Mean Density (turion/m2)	61.53	44.13	35.7	23.32	28.52	39.47	36.78
Turions present (% of sample points)	77	56	38	49	30	50	51

Figure 18. Curly Leaf Pondweed Turion Survey Mean Density and Frequency 2014 - 2020

CURLY LEAF PONDWEED HARVESTING

Following award of a Department of Natural Resources grant ($59,725.75 - WBF1546) in January 2016, the BLPRD purchased a harvester and began operations on August 2, 2016. Costs for purchasing the harvester and associated equipment and building are shown in Table 7 below. The BLPRD borrowed the remaining amount due after the grant payment from the Board of Commissioners for Public Lands in a 10 year loan. Annual debt service costs for harvester equipment is currently $11,316 per year, although the BLPRD has prepaid to accelerate the pay-off term.

Table 7. Harvester Capital Costs (from purchase contract)

Item	Cost
Shore Conveyor	$22,425
Trailer	$9,500
Harvester	$132,320
Diesel Engine	$1,800
Shipping	$1,500
Total	$167,645
DNR Recreation Boating Facilities Grant	($59,725.75)
Harvester Storage Building	$48,000[33]
Harvester Transport Truck	$9,000[34]

According to the BLPRD annual meeting minutes, the BLPRD employs six harvester operators. The focus of early season harvesting has been on CLP beds located outside of East Balsam where chemical treatment occurs. Commissioner, Rod Preble summarized results of CLP and navigation lane harvesting in the fall 2020 issue of the BLPRD Dockside newsletter.

> *We began harvesting curly leaf pondweed this year on June 16 and ended on August 27, as compared to 2019 when we started on June 2 and ended on September 10. This year we started later than in previous years due to the late emergence of CLP. Winter snow cover and spring water temperatures are the major factors in CLP growth. Again, this year CLP was mixed with native aquatic plants in most areas we harvested and was sparse and spaced in the beds. CLP beds were smaller in area than past years.*
>
> *In past years we have published the year-over-year comparison of the major harvesting statistics. This year we added average pounds per day, one more metric to track harvester operating efficiency. We use this data to do a self-assessment of how well we managed hours to accomplish our goals. Comparing to previous years, 2020 was very similar to 2018, with 2019 being similar in average pounds per day but requiring more days to harvest. In 2019 the beds were larger than this year and sparser in growth. This required more time/days to cover the same water surface area. The outlier is 2017. That was the year we had a major outbreak of CLP, mostly east of Big Island and around Paradise Island, approximately 100 acres of CLP in those two areas alone.*

[33] Personal communication, Rod Preble, BLPRD Commissioner, 01/21/2021.

[34] Personal email communication, Rod Preble, BLPRD Commissioner, 01/22/2021.

Our efficiency in these areas was greatly improved due to the close proximity to Forest Circle landing where we unload the harvested plants. Another metric is total cost of operation (Table 8).

Costs in Table 8 include both CLP and navigation channel harvesting operations. Of the 50 harvester loads collected in 2020, 28 loads or 56 percent was reported to be loads of CLP. In 2017 which was described as having a major outbreak of CLP, 64.5 loads or 72 percent was reported to be loads of CLP from mapped CLP beds.

Table 8. Harvesting Annual Records

Harvesting Daily Record (Full Year)	2017	2018	2019	2020
Harvester loads	89	49	61	50
Truck loads	43	24	24	25
Total volume (cubic ft.)	40,050	21,825	30,375	25,000
Total weight (pounds)	653,705	356,233	495,781	408,050
Days worked	22	21	27	23
Average pounds per day	29,714	16,963	18,362	17,741

2020 Total Cost of Operation, Expenses	
Total Payroll Cost	$5,118.00
Total Maintenance Cost	$469.71
Total Fuel Cost	$432.15
Total Operating Cost	$6,019.86

Total pounds harvested	408,050
Total man hours worked	355.50
Cost per pound	$0.015
Cost per man hour	$16.93

MONITORING CLP HARVESTING RESULTS

There is no formal monitoring program to assess the short- or long-term effectiveness of CLP harvesting efforts. Short-term effectiveness could simply be a measure a seasonal navigability following harvesting. Harvesting records from 2017 indicate that some beds were harvested at about weekly intervals throughout the summer, so re-growth was evident.

Long-term effectiveness might be measured through turion production, rake density measurements, and total bed size although, as previously mentioned, CLP growth varies considerably from year to year.

NAVIGATION CHANNEL MANAGEMENT

DNR records document herbicide treatment of designated "navigation channels" in Balsam Lake. These navigation channels were mapped as part of previous aquatic plant management planning efforts. Records for navigation channel permits exist in 2006 and 2009. In 2006 11.5 acres were treated. The 2009 herbicide treatments for navigation in Raskin Bay and the Millpond totaled 2.8 acres according to permit records.

HARVESTING NAVIGATION CHANNELS

Harvesting of native plants resumed following the BLPRD purchase of a harvester in 2016. The Wisconsin Department of Natural Resources permits harvesting in designated areas (Figure 20) only where navigation impairment occurs or is imminent.[35] These navigational channels were first designated in cooperation with WDNR in 2015. Corridor length and width was identified in the 2018 permit as shown in Table 9. The permitted harvesting area totals 7 acres.

Table 9. Harvest Navigation Channels

LANE	LENGTH (FT.)	AREA SQUARE FEET (LANES = 30 FT WIDE)
A	1600	
B	250	
C	400	
D	800	
E	400	
F	250	
G	325	
H	900	
I	400	
J	450	
K	150	
L	250	
M	1800	
N	150	
O	300	
P	300	
Q	100	
R	125	
SUBTOTAL	8950	268,500
RASKIN BAY		32,500
TOTAL		301,000

[35] DNR Balsam Lake Mechanical Harvesting Permit 2016 – 2020.

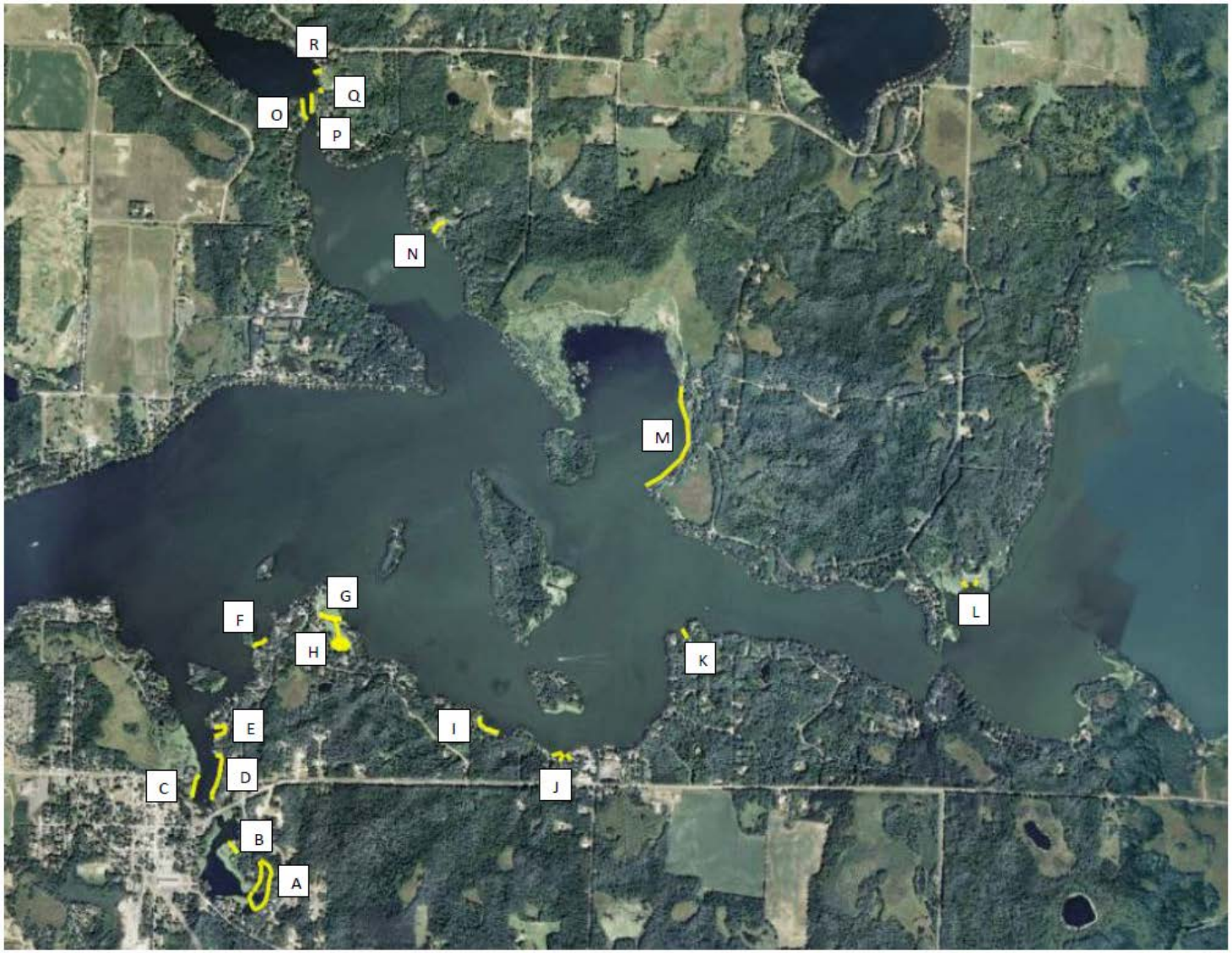


Figure 20. Designated Native Plant Harvesting Lanes

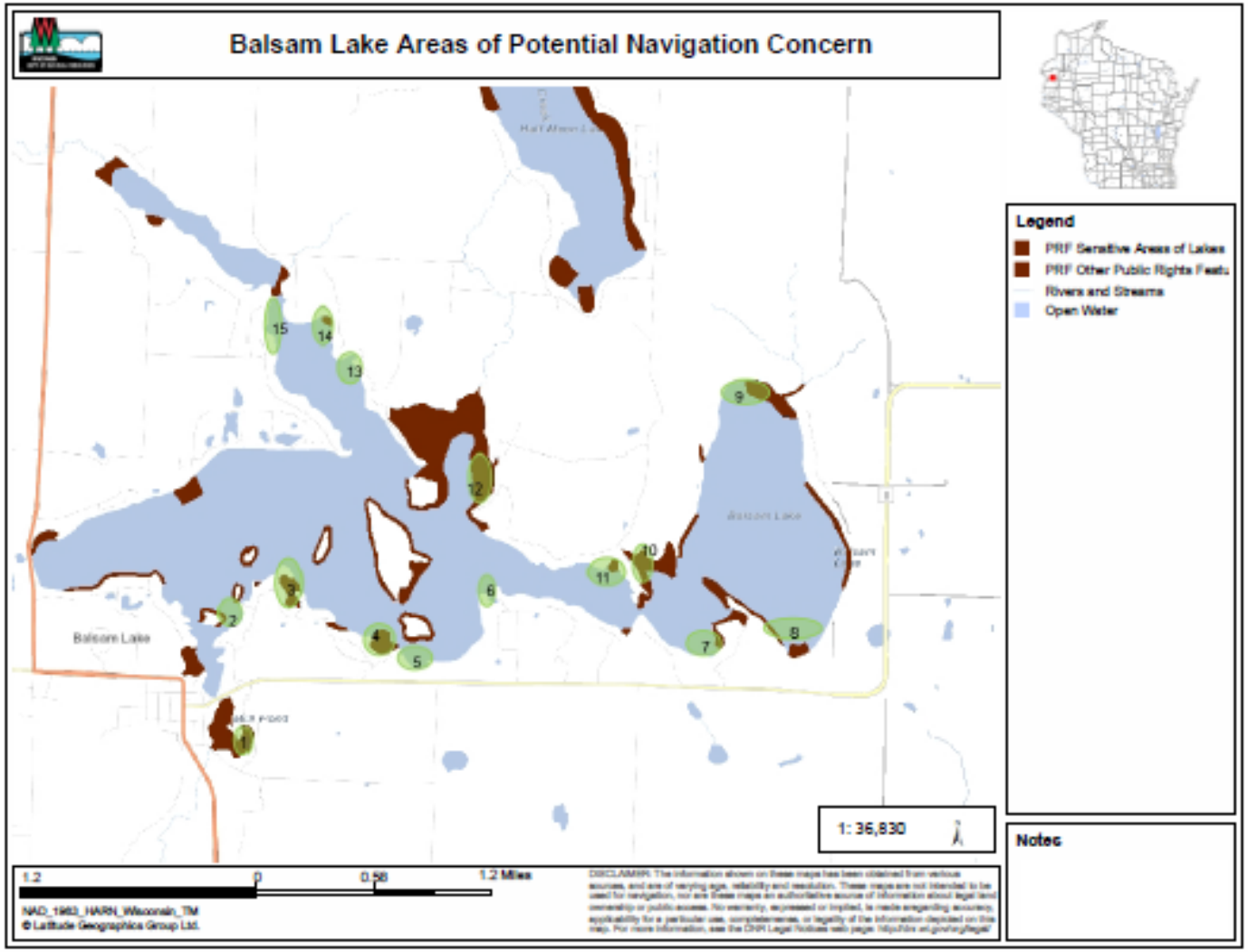


Figure 21. Areas of Potential Navigation Concern

HARVESTING CONSIDERATIONS

Key considerations for harvesting are

- access for a harvester (boat landings, depend on harvest location)
- distance of travel for harvesting and disposal
- availability of disposal/beneficial use sites for harvested plant materials
- timing of harvesting
- cost of harvester purchase
- operation and maintenance cost and logistics
- permitting and monitoring process

A harvester will travel about two miles per hour, so considerable time can be needed to simply get the harvester to the harvesting and disposal locations.

ACCESS FOR A HARVESTER

The four main landings serve as access points for harvester entry and unloading collected material. The harvesting program currently uses public landings at Idlewilde and Forest Circle.

AVAILABILITY OF DISPOSAL/BENEFICIAL USE SITES

Harvested aquatic plants can be land applied and/or composted as a soil amendment. It is possible to find sites where plant material is accepted at no charge, but there are generally costs for hauling. Farmers and nurseries will likely want harvested material. County and state "do not transport" regulations restrict moving aquatic plants on roadways, but transport is allowed for disposal as part of a harvest or control activity conducted under a DNR aquatic plant management permit.

The BLPRD currently hauls harvested aquatic plantings to the Village of Balsam Lake compost site.

DEPTH

According to 2020 WDNR permit conditions, cutting is allowed in water to a minimum depth of 3 feet.[36] A harvesting depth to 30 inches might be considered in some circumstances. Harvester heads should be kept at least 2 feet off the bottom no matter the water depth to prevent disturbing sediment (dredging), damaging heads (stumps, logs,) and to maintain vegetated habitat.

BLPRD-owned equipment could be used to create a lake depth map of potential harvesting areas.

[36] WDNR permit NO-2020-49-7884M.

TIMING OF HARVESTING

Selecting the timing and depth of harvesting is critical and varies depending upon aquatic plant management objectives. Curly leaf pondweed harvesting must occur when plants have grown enough for harvester blades to reach (within about 6 feet of lake surface), and plants should be cut prior to turion formation.

Early season harvesting of CLP has generally been outside of East Balsam where an herbicide treatment program was contracted through 2020. Harvesting may be used in East Balsam for beds not treated with herbicide and for late season CLP growth.

PERMITTING

The Department of Natural Resources regulates the removal of aquatic plants when chemicals are used, when plants are removed mechanically, and when plants are removed manually from an area greater than thirty feet in width along the shore. The requirements for manual and mechanical plant removal are described in *NR 109 – Aquatic Plants: Introduction, Manual Removal & Mechanical Control Regulations*.[37] The WDNR is currently updating aquatic plant management rules.[38]

A permit application is submitted in January or February indicating all potential CLP and corridor harvesting areas.

[37] More information regarding DNR permit requirements and aquatic plant management contacts is found on the DNR web site: www.dnr.state.wi.us.

[38] Aquatic Plant Management Rules | Wisconsin DNR

INDIVIDUAL CORRIDORS HERBICIDE TREATMENT

As stated above, some homeowners contracted with herbicide applicators to remove aquatic plants in front of their properties until 2008. A summary of past treatment is included in Table 10. Emergent, floating, and submerged aquatic plants and algae were targeted. The stated purpose of these treatments was "to maintain shoreline access for boating, swimming, and fishing, and to reduce nuisance algae accumulation." Since the 2010 Balsam Lake Aquatic Plant Management Plan was approved, the only area where native plant herbicide control has been permitted was at the Village Beach in 2011.

Table 10. Past Waterfront Herbicide Treatments on Balsam Lake

Year	Individual Properties (#)	Acres Treated w/ Herbicide
2005	73	13.46
2006	66	11.61
2007	64	11.30

In past years, the BLPRD applied chemicals at the public landings in an attempt to prevent the introduction of Eurasian water milfoil. This technique for EWM prevention is not described in the 2005 or 2010 aquatic plant management plans. DNR records document herbicide treatment of 100-foot-wide swaths at the Balsam Lake boat landings. There were a total of 0.55 acres treated at all 5 landings in 2005. In 2006 and 2007, reports indicated that 4 landings (not including Sunnyside) were treated with the herbicide Reward (diquat).

AQUATIC INVASIVE SPECIES PREVENTION EFFORTS

There are four major elements of the BLPRD program to prevent aquatic invasive species (AIS) introduction to Balsam Lake: education to lake users, lake monitoring for new invasive species, Clean Boats Clean Waters program, and a rapid response program for any new invasive species.

EDUCATION TO LAKE USERS

Education efforts focus on identification and prevention of new invasive species which are highlighted in the semi-annual newsletter Dockside and on the website at Balsam Lake Protection and Rehabilitation District (blprd.com) . There is also an AIS lake map handout and boat landing signs both with AIS messaging.

AQUATIC INVASIVE SPECIES MONITORING

Endangered Resource Services monitors Balsam Lake boat landings for the presence of Eurasian water milfoil and other invasive species monthly from June to October. Surveys are conducted at four public landings, two undeveloped public landings, and at the private Sunnyside Marina as shown in Figure 22.

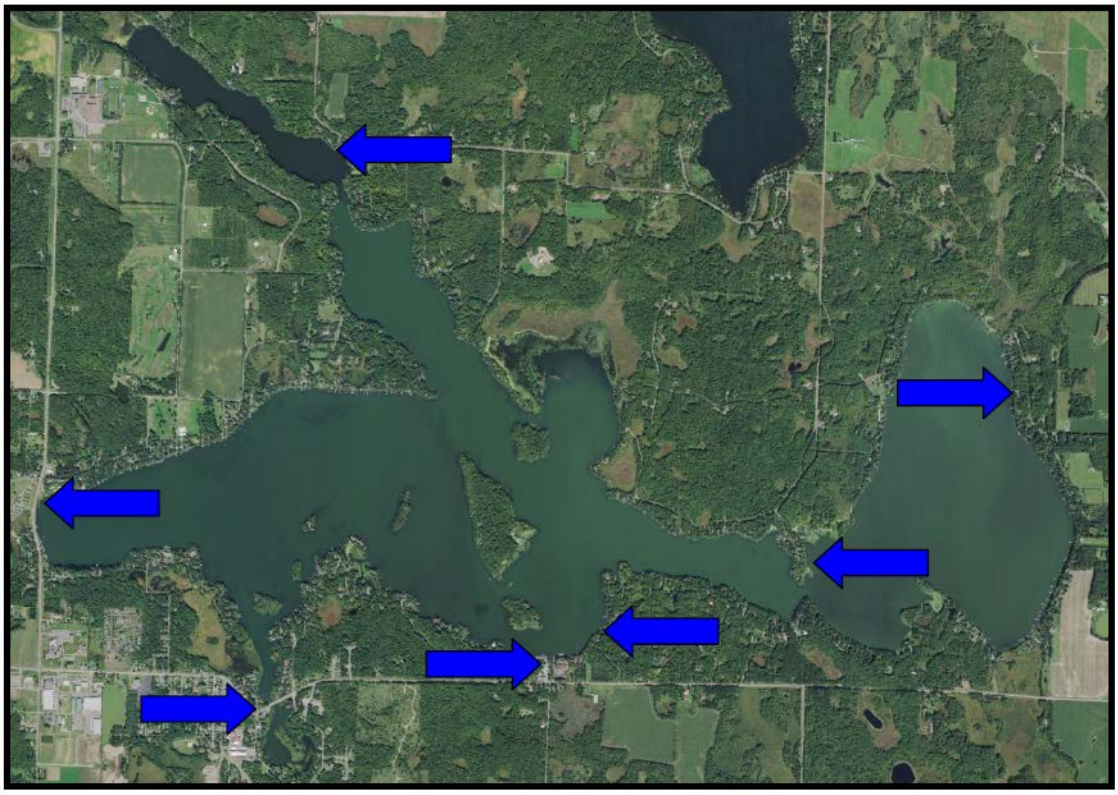


Figure 22. Landing AIS Inspection Locations

During the 2020 growing season, there was no evidence of Eurasian water-milfoil or any other new fully aquatic non-native invasive species. New invasive species discovered along the Balsam Lake shoreline in 2020 included common forget-me-not (*Myosotis scorpioides*) and narrow-leaved/hybrid cattail (*Typha angustifolia*). Common forget-me-not was present near the village beach landing. Plants were relatively few in number and could be hand pulled without too much effort. Narrow-leaved cattail was not found near a landing, but was located on the southern shoreline southwest of Big/Paradise Island. Purple loosestrife continues to be limited to the village beach landing area and Idlewild and Raskin Bays.

ZEBRA MUSSEL MONITORING

Because of the threat posed by zebra mussel introduction from Deer Lake and other lakes, increased monitoring for zebra mussels is recommended. Clean Boats, Clean Waters records show that many boats entering Balsam Lake come from waters infested with zebra mussels such as Mille Lacs in Minnesota, Deer Lake in Wisconsin, and the St. Croix and Mississippi Rivers.

Because zebra mussels attach to hard surfaces, cinder blocks or plate samplers placed in shallow water and checked regularly provide a good monitoring method. The United States Fish and Wildlife Service currently places five plate samplers around Balsam Lake. Net tows aim to collect zebra mussel veligers (the larval stage). Early July is the best time to collect veliger tows. The Polk County Land and Water Resources Department currently collects a veliger sample in early July on Balsam Lake. Samples are processed through the St. Croix River Association.[39]

Figure 23. Monitoring Equipment: Cinder Blocks, Sampling Plates, and Nets for Veliger Tows

[39] Anderson, Katelin, Polk County Land and Water Resources Department. Personal communication. February 2, 2021.

CLEAN BOATS CLEAN WATERS

The Clean Boats, Clean Waters (CBCW) program inspects boats and trailers for invasive species, educates boaters on invasive species and the local and state aquatic invasive species (AIS) rules, and gathers data.

The BLPRD completed its fourteenth year with the Clean Boats and Clean Waters (CBCW) program in 2020. Staff for Clean Boats, Clean Waters includes high school and college students, and adults. A landing leader is designated to coordinate hours for each landing. The program is funded with the help of a DNR Aquatic Invasive Species grant in each year of the program. Figures below report boats inspected at each landing over the years. All CBCW data collected is entered into the State DNR SWIMS database and can be accessed at [Clean Boats, Clean Waters (CBCW) | Wisconsin DNR](). .

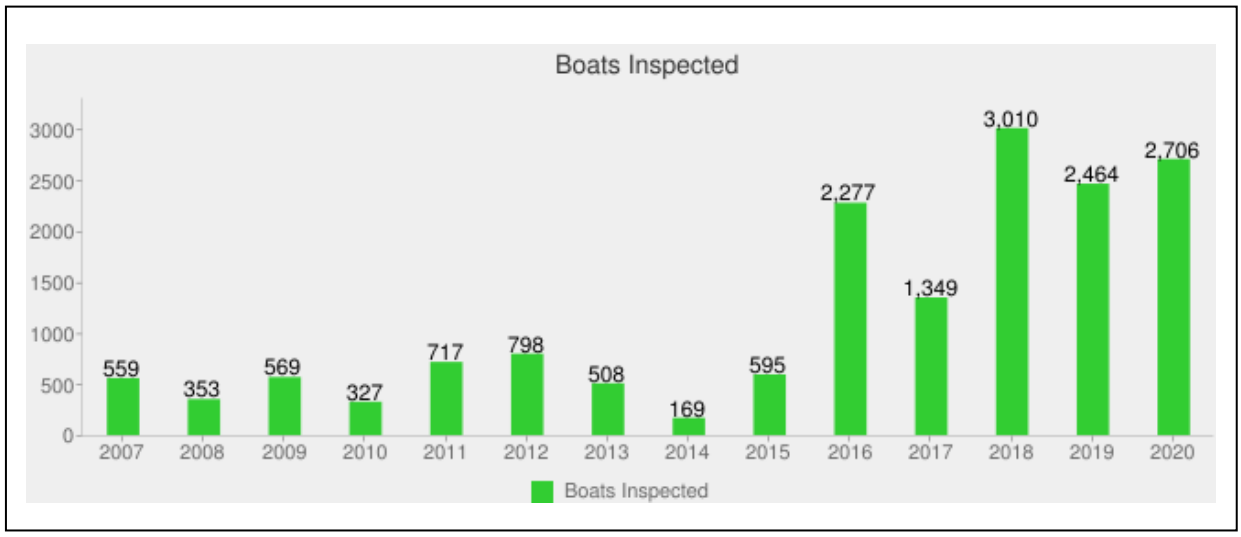


Figure 24. Clean Boats, Clean Waters Boats Inspected at the Village Beach 2007-2020

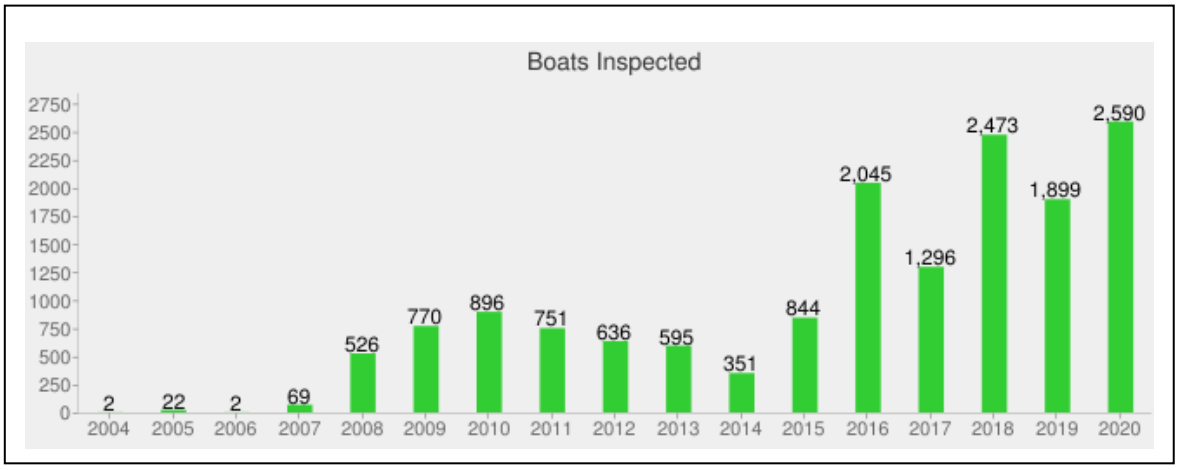


Figure 26. Clean Boats, Clean Waters Boats Inspected at the HWY 46 Landing 2004 – 2020

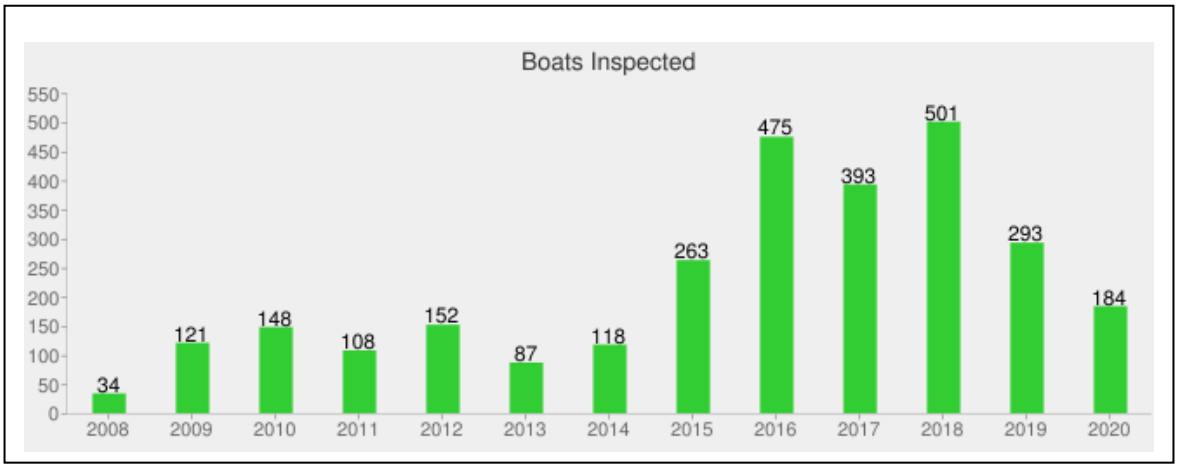


Figure 27. Clean Boats, Clean Waters Boats Inspected at the Little Balsam Landing 2008 - 2020

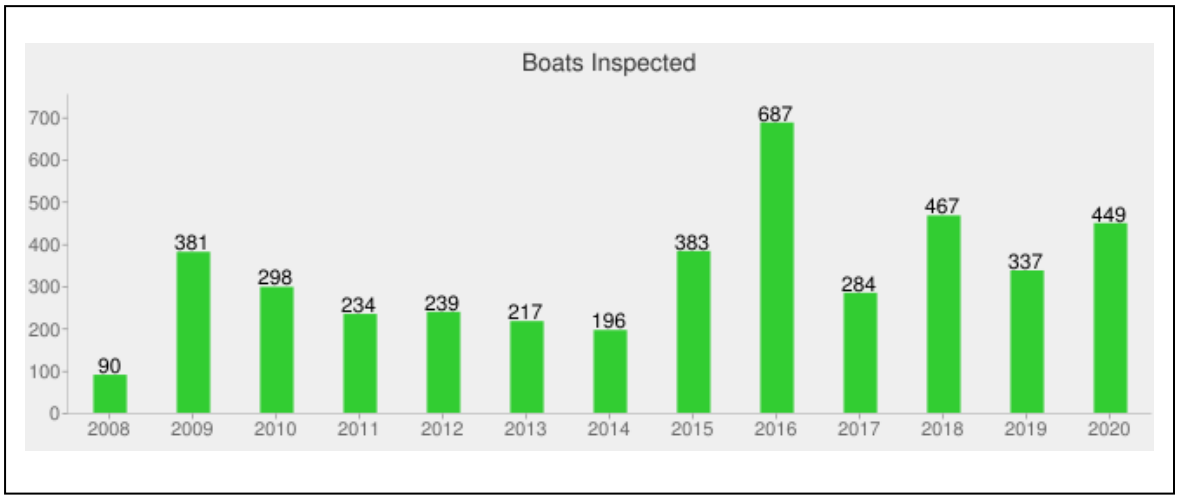


Figure 25. Clean Boats, Clean Waters Boats Inspected at the East Balsam Landing 2008 - 2020

RAPID RESPONSE FOR NEW INVASIVE SPECIES

The activity is intended for early identification of any newly introduced invasive species and to rapidly initiate control measures. The updated aquatic invasive species rapid response protocol is found in Appendix C. The BLPRD sets aside $20,000 in a contingency fund for AIS rapid response.

ADDITIONAL AIS MONITORING AND PREVENTION OPTIONS

LANDING SURVEILLANCE CAMERAS

Some lake organizations install video cameras at the public landings. The cameras are positioned to record watercraft being launched to assess if they have vegetation attached. At nearby Bone Lake, suspected violations of the ordinance that prohibits transporting and launching boats and trailers with vegetation attached are reviewed and enforced by the Polk County Sheriff's Department. The camera also serves as a reminder for boaters to check their equipment before launching and serves in that capacity as an educational tool. Cameras provide coverage for Bone Lake landings when CBCW inspectors are not present. Based on camera surveillance, CBCW crews are able to inspect 33 percent of the boats launched at the North Landing and 70 percent of the boats launched at the South Landing on Bone Lake.[40]

VOLUNTEER AQUATIC INVASIVE SPECIES MONITORING

As previously mentioned, professional monitoring is completed for Balsam Lake 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.

BOAT WASHING STATIONS

Boat washing stations use hot water and high pressure to remove potential aquatic invasive species (AIS) from boats, trailers, and equipment. The hot water kills the AIS, and the high pressure removes them. Chemicals are not as reliable as temperature for killing AIS. At 140°F, a hot water rinse for 10 seconds on 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. Bayfield, Burnett, and Washburn Counties have ordinances which require decontamination if offered at a public or private water access.

Several lake organizations in Burnett and Washburn County have installed boat washing stations which use a mild bleach solution to decontaminate boats. 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 and encourage use. (NW WI ZM Team 2018)

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[40] Harmony Environmental and Bone Lake Management District. *Bone Lake Aquatic Plant Management Plan.* 2020.

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. Programs 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 its requirements. It is illegal to transport aquatic vegetation on boats and equipment in Polk County.

AQUATIC PLANT MANAGEMENT FUNDING

Aquatic Plant Management on Balsam Lake is funded with a combination of the BLPRD tax levy and Wisconsin Department of Natural Resources grant funding. The BLPRD has a long history of successful grant projects as shown in Table 11. The remaining grant balance for aquatic plant management including planning and control efforts is $79,444 with reimbursement through 2020 expenses.

Table 11. WDNR Aquatic Invasive Species Grants to BLPRD

Start Date	End Date	Grant Number	Amount	Tasks
April 2007	Dec 2009	AEPP-073-07	$13,645	Clean Boats, Clean Waters Program
Oct 2009	Dec 2011	AEPP-205-10	$49,999	Clean Boats, Clean Waters Program Aquatic Plant Survey APM Plan Update
Oct 2011	Dec 2014	ACEI-102-12	$31,280	Curly Leaf Pondweed Control CLP Pre- and Post-Monitoring AIS Monitoring
Oct 2011	Dec 2014	AEPP-321-12	$49,670	Clean Boats, Clean Waters AIS Monitoring
April 2014	Dec 2015	AEPP-430-14	$15,919	Aquatic Plant Survey APM Plan Update CLP Pre- and Post-Monitoring
Feb 2015	Dec 2015	CBCW-148-15	$16,000	Clean Boats, Clean Waters Program
Feb 2015	Dec 2017	ACEI-170-15	$74,898.50	Curly Leaf Pondweed Control and Monitoring Purple Loosestrife and Knotweed Control
Feb 2018	Dec 2022	ACEI-21218	$107,643.75	Curly Leaf Pondweed Control and Monitoring Aquatic Plant Point Intercept Survey APM Plan Update Purple Loosestrife Management

PLAN GOALS AND STRATEGIES

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

Goals are broad statements of desired results.

Objectives are measurable results toward the goal.

Actions are activities to take to accomplish objectives.

The **Implementation Plan** outlines timelines, resources needed, partners, and funding sources for each action item. The Implementation Plan table will be updated each year prior to the annual meeting. Implementation tables are found in Appendix D.

PLAN GOALS

1. Manage established aquatic invasive species and eradicate newly introduced aquatic invasive species to reduce their impacts to the lake.
2. Prevent and detect the introduction of aquatic invasive species.
3. Maintain navigation for fishing and boating, access to lake residences, and comfortable swimming at the village beach.
4. Engage lake residents and visitors in reaching aquatic plant management goals.
5. Value the diverse native aquatic plant community in Balsam Lake.

Responsible Parties for Aquatic Plant Management (APM) Implementation

Balsam Lake Protection and Rehabilitation District Board (BLPRD) – elected/appointed officials responsible for oversight of the lake management district. Some actions such as hiring a contractor or consultant require a vote of the board.

APM Lead – makes day-to-day aquatic plant management (APM) decisions, manages harvesting operations, and directs contractors in lake monitoring and herbicide treatments. The commissioner will have volunteers and consultants to assist in these activities.

AIS Lead – leads and coordinates Aquatic Invasive Species (AIS) prevention activities including Clean Boats, Clean Waters monitoring and education at the boat landings.

Herbicide Contractor – the herbicide applicator hired by the District Board to complete herbicide treatment as permitted by the Wisconsin Department of Natural Resources.

APM Monitor– a consultant hired to complete monitoring under the direction of the APM Lead and the BLPRD Board.

DNR – APM staff will review aquatic plant management permit applications and enforce permit conditions.

Polk County LWRD – Staff from the Polk County Land and Water Resources Department will assist with education and plant identification.

GOAL 1. MANAGE ESTABLISHED AQUATIC INVASIVE SPECIES AND ERADICATE NEWLY INTRODUCED AQUATIC INVASIVE SPECIES TO REDUCE THEIR IMPACTS TO THE LAKE.

OBJECTIVES

A. Control curly leaf pondweed (CLP) growth to maintain navigation to homes, businesses, and public boat landings.

B. Protect and restore native plants during and following aquatic invasive species (AIS) management efforts.

C. Understand and prevent the release of phosphorus from CLP.

D. Locate and remove purple loosestrife and giant and Japanese knotweed.

E. Eliminate any new AIS introduction.

ACTIONS

Curly Leaf Pondweed Control with Herbicide and Harvesting

1. Control CLP growing in dense beds using early season Endothall treatment or other accepted method in East Balsam if herbicide treatment standards are met. (OBJ A, B, C)

   East Balsam Herbicide Treatment Standards

   - Beds consist of at least 50% CLP (or other invasive plant).
   - CLP beds total at least 25 acres.
   - Beds top out at the surface (at least 1 meter stem height).
   - Average rake fullness rating equal to or greater than 2.

   a. Establish long-term (5-year) contract for early season CLP treatment. Include maximum wind and temperature conditions in the contract.

   b. Select tentative beds for treatment and apply for APM permits March/April (Contractor and APM Lead).

   c. Verify treatment areas with pre-monitoring in April or May (monitoring consultant and APM Lead).

   d. Complete herbicide treatment (Contractor).

e. Conduct DNR specified and required third-party pre- and post-herbicide monitoring for CLP herbicide treatment. (OBJ A, B, C)

2. Map beds of CLP throughout the lake. (OBJ A)

3. Use harvesting as a CLP control method throughout the lake. Track areas and quantities of CLP harvested. (OBJ A, B, C)

4. Monitor sediment CLP turions in areas being managed with herbicide and in selected harvesting areas to assess effectiveness of control efforts. (OBJ A)

5. Monitor native plant recovery in East Balsam and investigate options to restore native plants if needed. (OBJ B)

Purple Loosestrife, Giant Knotweed, and Japanese Knotweed Control

6. Provide info to Balsam Lake residents so they can identify purple loosestrife (PL), giant knotweed, and Japanese knotweed and know who to contact if they have a suspected plant. (AIS Lead and/or Polk County LWRD) (OBJ D)

7. Monitor the lake for new PL and knotweed growth each year and mark locations with GPS points. (APM Monitor, APM Lead, APM Monitor) (OBJ D)

8. Use best control methods for PL and giant knotweed and Japanese knotweed. Purple loosestrife control may include hand pulling, herbicide, and biocontrol. Knotweed will be controlled with herbicides. New methods may be used as they become available. (APM Lead, Polk County LWRD) (OBJ D)

Rapid Response for Aquatic Invasive Species

9. Review the need for updates to the Rapid Response Plan for Aquatic Invasive Species. The current AIS Rapid Response Plan is included as Appendix C. Increase the contingency fund from $20,000 to $30,000. (OBJ E)

GOAL 2. PREVENT AND DETECT THE INTRODUCTION OF AQUATIC INVASIVE SPECIES.

OBJECTIVES

A. 100% of boaters inspect, clean, and drain boats, trailers, and equipment.

B. New aquatic invasive species are identified as soon as possible after being introduced to the lake. Include Eurasian water milfoil, purple loosestrife, zebra mussels and rusty crayfish at a minimum.

C. Decontaminate boats and equipment to prevent introduction of AIS including zebra mussels.

D. 100% enforcement of Polk County's Do Not Transport Ordinance.

ACTIONS

1. Continue a successful Clean Boats, Clean Waters monitoring and education program at each boat landing using paid staff. (OBJ A)
2. Monitor boat landings and other areas with high potential for introduction of AIS including zebra mussels. (APM Monitor and APM Lead) (OBJ B)
3. Conduct AIS meandering survey in July and/or August. (APM Monitor and APM Lead) (OBJ B)
4. Investigate methods for aquatic invasive species decontamination at the boat landings. Consider decontamination especially if a county ordinance requires visitors to decontaminate if available at a landing. (OBJ C)
5. Work with the Polk County Sheriff's Department to encourage enforcement of the Do Not Transport Ordinance. (OBJ D)

GOAL 3. MAINTAIN NAVIGATION FOR FISHING AND BOATING, ACCESS TO LAKE RESIDENCES, AND COMFORTABLE SWIMMING AT THE VILLAGE BEACH.

OBJECTIVES

A. Maintain navigation for fishing and boating.

B. Allow waterfront property owners the option of maintaining individual access corridors by manual, chemical, or mechanical means.

C. Address aquatic plant nuisances to swimming at the Village of Balsam Lake public beach (in partnership with the Village of Balsam Lake).

D. Conduct all herbicide treatments legally and according to permit conditions. Permits are required for all aquatic application of herbicides in Wisconsin.

ACTIONS

1. Identify areas of potential navigation concern caused by native plant growth. *Note: currently identified common navigation areas of concern are identified in Figures 20 and 21, and the process is outlined in more detail on the following page.* (OBJ A)

2. Seek permit and address confirmed common navigation impairment using appropriate method. (OBJ A and D)

3. Allow individual landowners to apply for WDNR permits and contract with a licensed contractor to treat individual access corridors. These treatments may focus on invasive or native plants. Landowners would bear the cost of these treatments. Hand removal methods will be recommended as a first choice for navigation impairment created by native plants in individual access corridors. Generally, hand removal does 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 aquatic invasive aquatic plant species. (OBJ B and D)

4. The aquatic plant control method for the public beach will be selected by the Village of Balsam Lake. The plan allows for herbicide use, harvesting, hand control, or a combination of these methods. The Village would apply for necessary permits and pay for any treatment. (OBJ C and D)

Addressing Impaired Navigation Conditions – Common Navigation Areas or Nuisance Conditions

1. Common Navigation Areas of Concern

- Current navigation areas of concern are identified in Figures 20 and 21.
- New areas may be identified in the following manner:
  - Residents notify APM Lead or designee of potential concern.
  - Area is inspected by APM Lead. If navigation impairment is confirmed, document impairment as described below.

2. Documenting Navigation Impairment

- Locate navigation routes with GPS coordinates.
- Provide dimensions (length, width, and depth).
- Indicate when plants cause problems and how long problems persist.
- List adaptations or alternatives considered to lessen problem.
- List the species of plants causing the nuisance.

3. Documenting Nuisance Conditions

- Indicate when plants cause problems and how long problems persist. (An example nuisance condition is drift of uprooted wild celery.)
- Include photos of nuisance conditions.
- Provide examples of specific activities that are limited because of the presence of nuisance aquatic plants.

4. Addressing Common Navigation in DNR Sensitive/Critical Habitat Areas

- The appropriate control method will consider sensitive area functions.
- The most likely modification is to limit any navigation routes in sensitive areas to no more than 30 feet in width.

5. Selecting Appropriate Control Method

- Harvesting will be the preferred method for maintaining common navigation areas.
- If herbicides are used to control the growth of nuisance native aquatic plants, the herbicide proposed for use will be based on the plant species, stage of growth, and other environmental factors.

INDIVIDUAL CORRIDOR ACCESS

The only time a permit is not required to control aquatic plants is when a waterfront property owner manually removes (i.e., hand-pulls or hand rakes), or gives permission to someone to manually remove, plants (except wild rice) from his/her shoreline. The area must be 30 feet or less in width along the shore and must not be within a designated Sensitive Area. This removal can create a corridor to areas where navigation is not impeded by aquatic plants. The non-native invasive plants (Eurasian watermilfoil, curly leaf pondweed, and purple loosestrife) may be manually removed beyond 30 feet without a permit, as long as native plants are not harmed. Wild rice removal always requires a permit.

Individual Access Corridors are the openings from a waterfront property owner's shoreline out into the lake. These corridors may be a maximum of thirty feet wide 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.

INVASIVE PLANT CONTROL IN INDIVIDUAL CORRIDORS

Currently the only invasive fully aquatic plant prevalent in Balsam Lake is curly leaf pondweed. Curly leaf pondweed grows early in the summer, then dies back by early July. Nuisance conditions must be verified for herbicide treatment. The 2020 or2021 curly leaf pondweed bed map will verify nuisance conditions for 2022 treatment. The 2020 map is included as Figure 27.

Areas on curly leaf pondweed bed map

- Early season endothall treatment may be permitted for 3 years, although permits must be applied for each year.

Areas outside of curly leaf pondweed bed map

- Nuisance conditions created by curly leaf pondweed must be verified the year before treatment.
- Early season endothall treatment may be permitted for a 3-year period following this verification.

The BLPRD will inform waterfront property owners of the process and limits of individual corridor access management options.

Areas with purple loosestrife present may also be controlled by individuals. Permits are required for any herbicide use in the water.

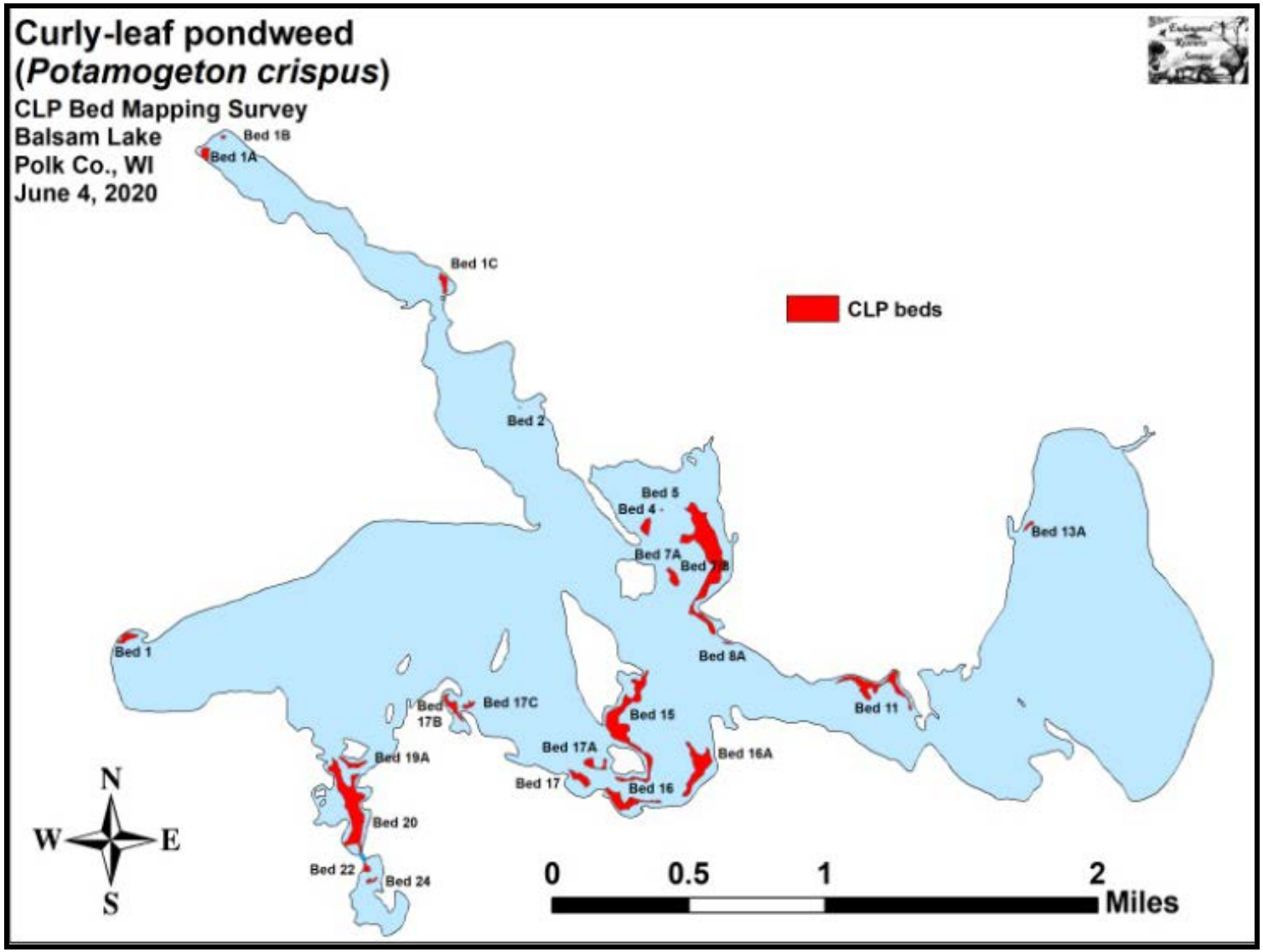

Figure 28. Balsam Lake Curly Leaf Pondweed Beds 2020

Procedure for Individual Corridor Permitting and Monitoring

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

- Indicate when plants cause problems and how long problems persist.
- Include dated photos of nuisance conditions.
- 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 with a WDNR permit. Herbicide use in areas with wild rice will not be permitted.
- Aquatic Herbicide/Harvesting Contractor to provide this information in permit application based on information from the landowner.

Verify/refute nuisance conditions and/or navigation impairment

- Landowner applies for permit to WDNR including photographic documentation and identification of plants causing navigation problems
- The landowner is responsible for permit and treatment costs related to individual corridor aquatic plant control.
- A licensed applicator must complete the herbicide application.
- 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 landowner with a notice to proceed with treatment or denial of permit application and copy BLPRD.

GOAL 4. ENGAGE LAKE RESIDENTS AND VISITORS IN REACHING AQUATIC PLANT MANAGEMENT GOALS.

DESIRED BEHAVIORS

Lake Residents

- Are able to identify aquatic invasive species present in Balsam Lake including curly leaf pondweed, purple loosestrife, giant knotweed, and Japanese knotweed.
- Are able to identify priority AIS that could potentially be introduced into Balsam Lake including Eurasian water milfoil, zebra mussels, and rusty crayfish.
- Know what to do if you find an aquatic invasive species.
- Speak up – if you notice something, say something – encourage others to do the right thing!
- Use hand removal methods if you wish to open up individual navigation access – contractors are available.
- Follow approved process if you wish to seek manual or chemical assistance to open up individual navigation access.
- Employ only licensed contractors to use chemicals in the water, and allow them to do so only with a permit.

Lake Residents and Visitors

- Clean boats, trailers, and other equipment, and drain live wells to prevent AIS introduction.
- Observe no-wake zones.

Dock Service Providers

- Inspect docks and lifts prior to installation and when removed from the lake.

MESSAGES

1. Provide executive summary of APM plan, notice of public meeting, and how to get full APM plan.
2. List of APM dos and don'ts.
3. Contact list for APM: include web resources.
4. Emphasize importance of native aquatic plants.
5. Aquatic plants are not weeds – describe their benefits such as fish habitat.
6. Limit impacts on native aquatic plants by traveling with no wake in shallow areas, using hand removal methods near docks and swimming areas, etc.
7. The DNR is not against aquatic plant management to allow navigation, but management must be balanced with an understanding and concern for native plant benefits.
8. Explain procedure for individual corridor herbicide applications and conditions where herbicide treatment may be allowed. Nuisance conditions must be documented.
9. Explain location and procedures for curly leaf pondweed herbicide treatment.
10. The aquatic plant management efforts included in the plan.
11. Identification of curly leaf pondweed and methods for removal (include illustrations).
12. Identification of purple loosestrife and methods for removal (include illustrations).
13. Identification of Eurasian water milfoil and contact if suspected (include illustrations).
14. Locations of nearby lakes with Eurasian water milfoil, zebra mussels, and other AIS.
15. New potential invasive species and why they are a threat.

16. Native plant identification.
17. Inspect, clean, and drain boats and equipment.
18. Polk County has an ordinance that makes it illegal to transport aquatic plants on public roads.

METHODS

Newsletter articles (Dockside and Lake Association newsletter)
Web site – frequently asked questions, high-quality plant and zebra mussel identification pictures
Annual meeting presentations
Partnerships with dock service providers, incentives for staff
Direct mail campaigns
Articles for newspapers
Aquatic invasive species Identification cards with photos
Lake map with AIS prevention methods, add slow, no-wake zones
Info at bait shops, restaurants, bars, other businesses
Social media tools like Twitter and Facebook (work with Balsam Lake Homeowner's Association)

GOAL 5. VALUE THE DIVERSE NATIVE AQUATIC PLANT COMMUNITY IN BALSAM LAKE.

OBJECTIVES

A. Implement strict adherence with treatment standards (early curly leaf pondweed treatment prior to native plant growth) and monitoring methods prior to and following herbicide treatment.

B. Monitor recovery of native plants in East Balsam.

C. Follow WDNR aquatic plant management permitting requirements.

D. Increase Balsam Lake residents' understanding of the role and importance of aquatic plants and their impacts on them.

DISCUSSION

The plant community in Balsam Lake is very diverse. It is important to understand that these plants play a critical role in the lake ecosystem. Aquatic plants in the lake provide habitat for fish. They also provide protection from shoreline erosion. Removing native plants could lead to adverse effects on the lake. Healthy native plant populations prevent colonization by invasive plants such as Eurasian water milfoil. Erosion and runoff from waterfront property may alter sediment characteristics encouraging spread of invasive plants. Boating disturbances near the shoreline can remove aquatic plants and the valuable functions they provide.

ACTIONS

1. Follow DNR requirements and BLPRD and APM plan guidelines to allow native plant removal only in areas with severe navigation impairment or nuisance conditions for common and individual navigation corridors. (OBJ C)

2. Follow DNR requirements that limit navigation channels in sensitive areas to not more than 30 feet in width, or take other measures to protect these areas when removing native plants. (OBJ C)

3. Review results of pre- and post-treatment monitoring and point intercept surveys in East Balsam, comparing statistically significant changes in native plant frequency of occurrence between surveys. (OBJ A and B)

4. Conduct a point intercept survey of the lakes every five years. (OBJ B and D)

5. Update the aquatic plant management plan beginning in 2025. (OBJ A, B, C, D)

   Educational activities are detailed in the discussion for Goal 4. (OBJ D)

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

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 are an exception. 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 12. BLPRD Aquatic Invasive Species Grants

Start Date	End Date	DNR Grant	Amount	Tasks
Feb 2018	Dec 2022	ACEI-21218	$107,643.75	Curly Leaf Pondweed Control and Monitoring Aquatic Plant Point Intercept Survey APM Plan Update Purple Loosestrife Management
Feb 2021	Dec 2021	CBCW-95521	$16,000	Clean Boats, Clean Waters Education

APPENDIX A. WATER QUALITY

Water quality is frequently reported by the trophic state or nutrient level of the lake. Nutrient-rich lakes are classified as eutrophic. These lakes tend to have abundant aquatic plant growth and low water clarity due to algae blooms. Mesotrophic lakes have intermediate nutrient levels and only occasional algae blooms. Oligotrophic lakes are nutrient-poor with little growth of plants and algae.

Secchi depth readings are one way to assess the trophic state of a lake. The Secchi depth 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. Secchi depth readings, phosphorus concentrations, and chlorophyll measurements can each be used to calculate a Trophic State Index (TSI) for lakes. TSI values range from 0 – 110. Lakes with TSI values greater than 50 are considered eutrophic (light green in graphs on following pages). Those with values in the 40 to 50 range are mesotrophic (teal in graphs on following pages). Lakes with TSI values below 40 are considered oligotrophic (blue in graphs on following pages).

Citizen lake monitoring volunteers and staff have collected data from the lake almost annually since 1987. Citizen lake monitoring generally includes secchi depth and may also include chorophylla (a measure of algae growth), total phosphorus, and temperature and oxygen profiles. There are three data collection sites on Balsam Lake, one each in the Main Basin, East Balsam, and Little Balsam. Data collection is inconsistent. For example, secchi data was not collected in the main basin from 2009 - 2015. Total phosphorus has not been recently sampled in Little Balsam. Although not reported in Citizen Lake Monitoring results, East Balsam has been sampled extensively in recent years.

Balsam Lake is classified as mesotrophic to eutrophic. A eutrophic TSI usually suggests decreased clarity, fewer algal species, oxygen-depleted bottom waters during the summer, evident plant overgrowth, and only warm-water fisheries (pike, perch, bass, etc.).[41]

[41] Reports and Data: Polk County. WDNR website. February 2021. <http://www.dnr.state.wi.us/lakes/CLMN/reportsanddata/>

Figure 28 illustrates the July and August Secchi depth averages for the main basin. Figure 29 graphs the July and August Trophic State Index for the main basin, based upon Secchi depth, chlorophyll, and total phosphorus results. Figures 30 and 31 depict Little Balsam's Secchi depth and Trophic State Index, respectively. Figures 32 and 33 show East Balsam results.

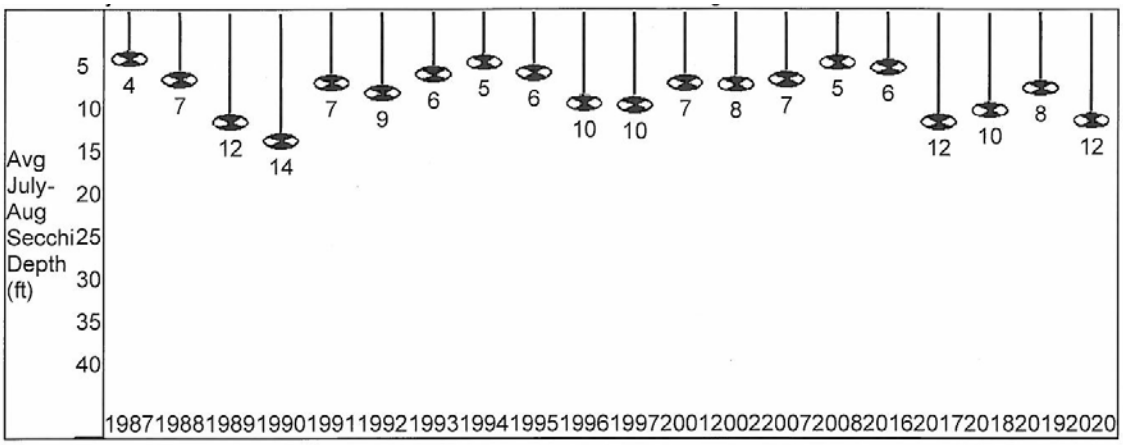

Figure 29. Main Basin Summer Average Secchi Depths 1987-2020

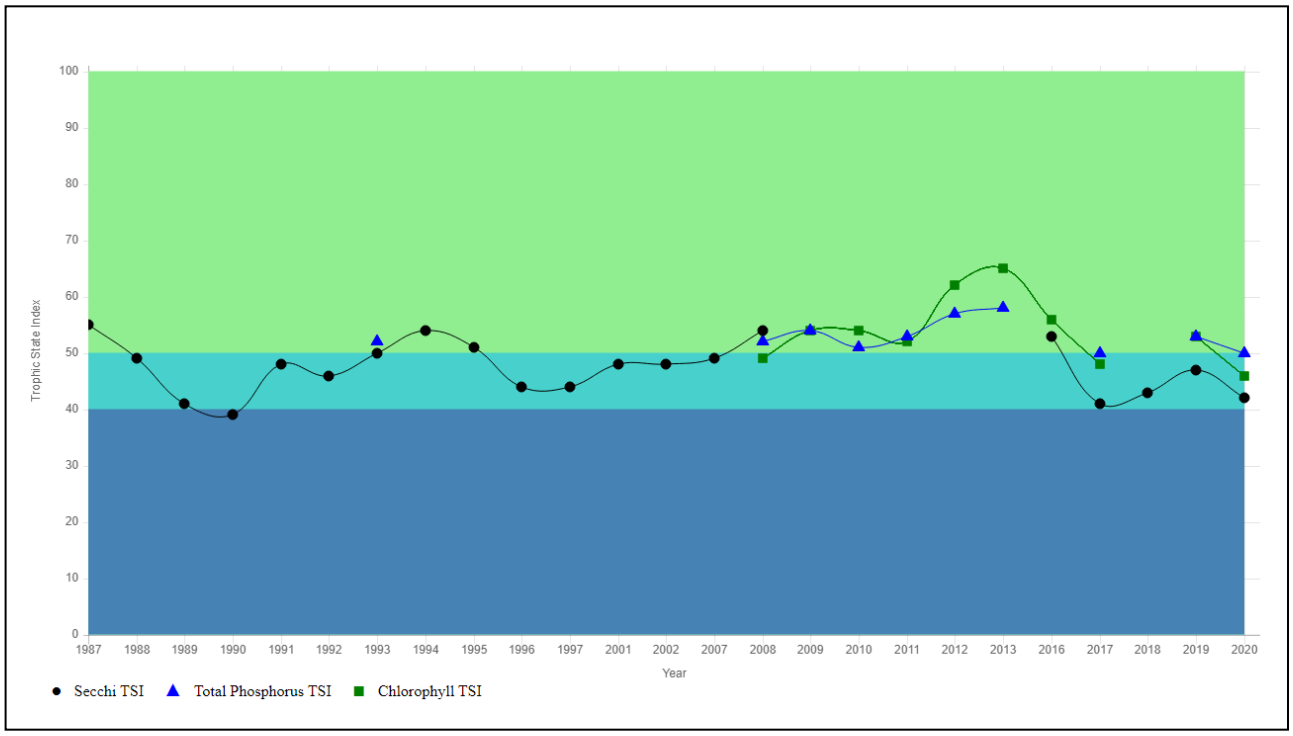

Figure 30. Main Basin Trophic State Index 1987-2020

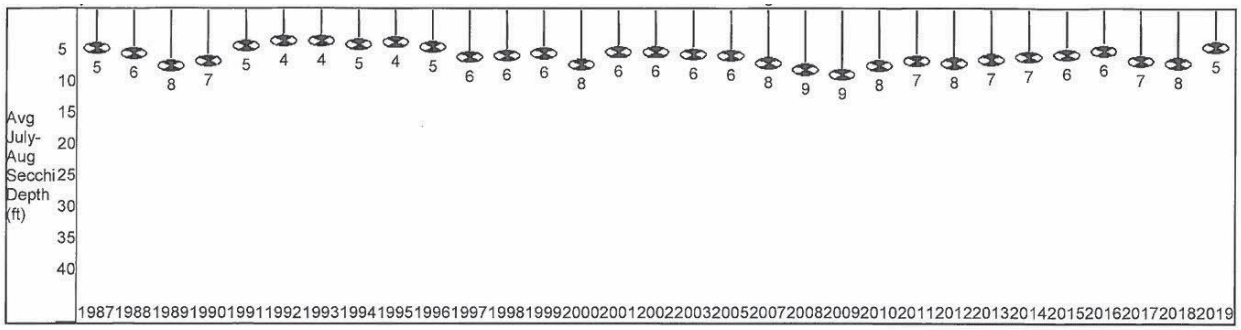

Figure 31. Little Balsam Secchi Depths 1987-2019

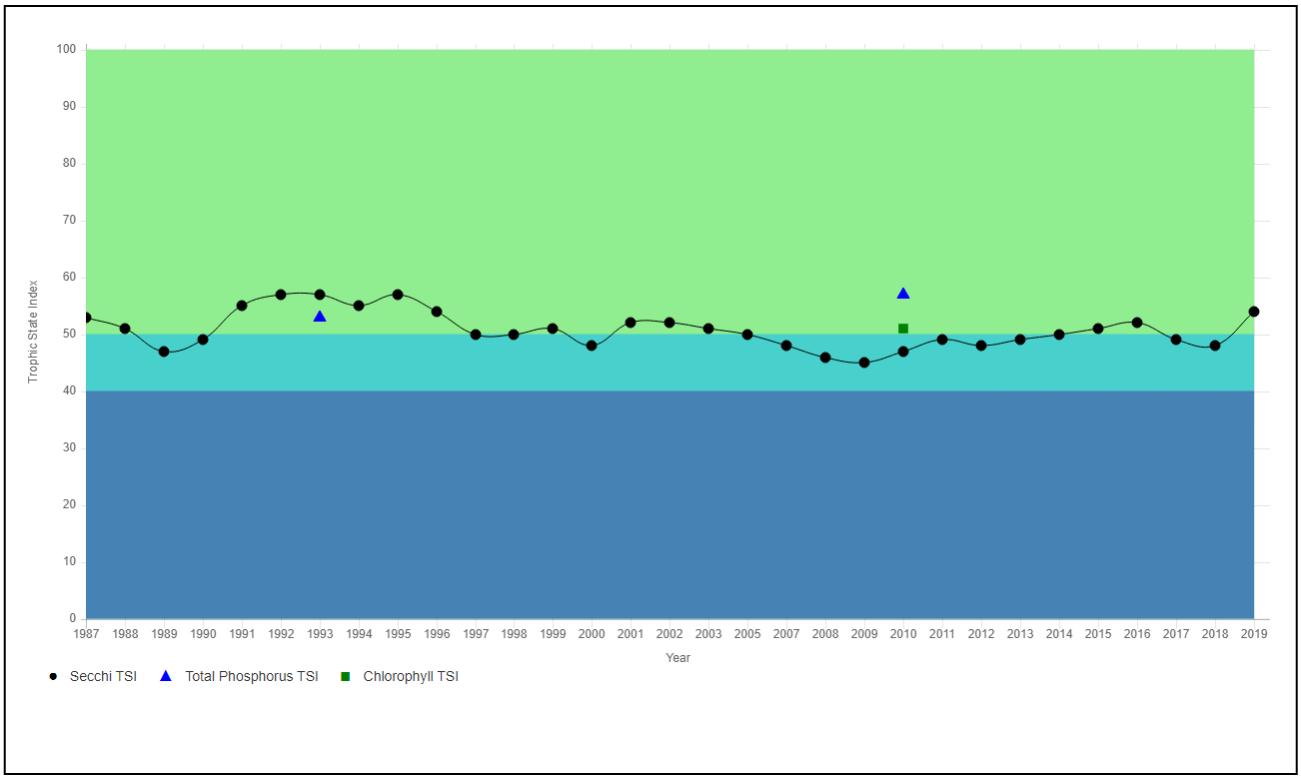

Figure 32. Little Balsam Trophic State Index 1987-2019

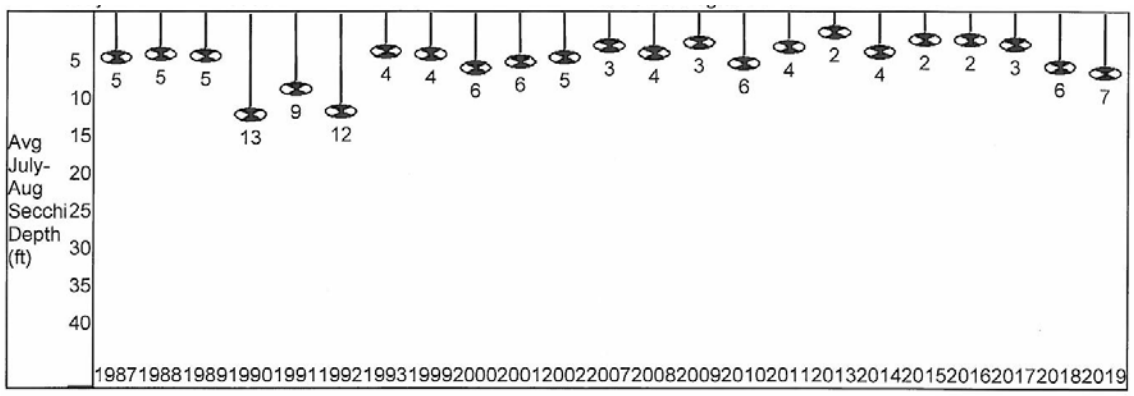

Figure 33. East Balsam Secchi Depth 1987-2019

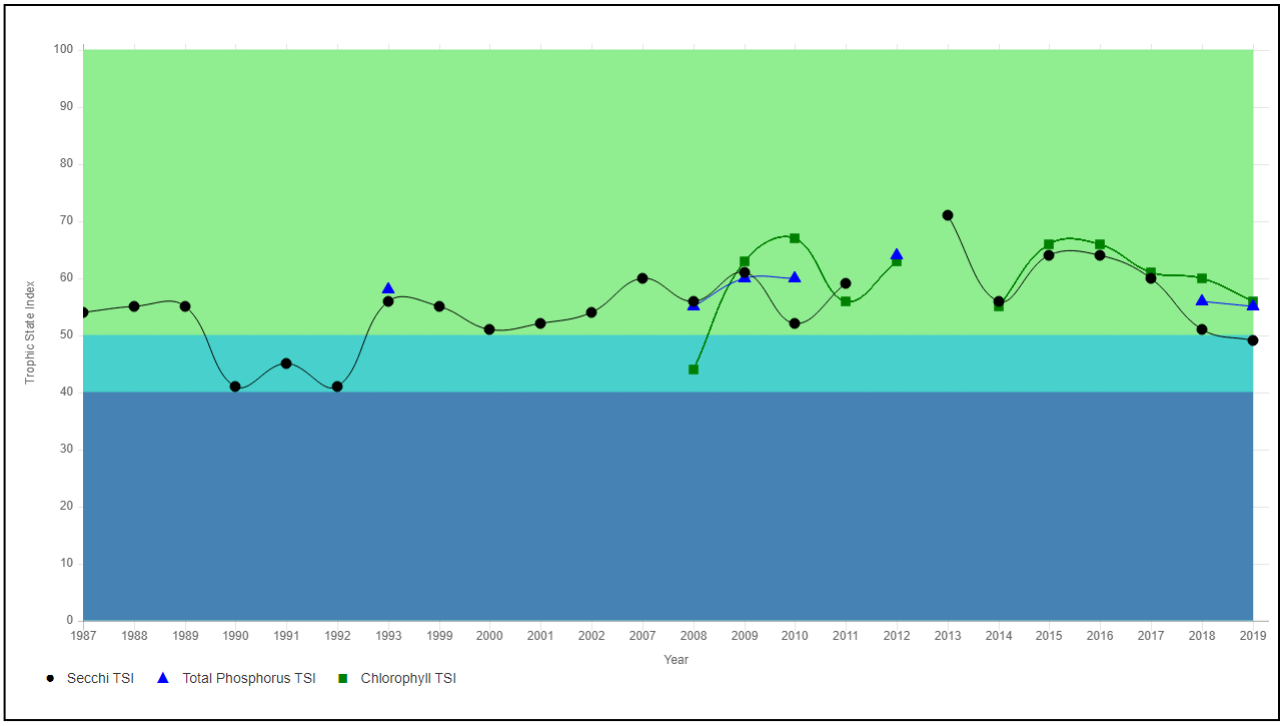

Figure 34. East Balsam Trophic State Index 1987-2019

IMPAIRED WATERS

Every two years, Section 303(d) of the Clean Water Act requires states to publish a list of all waters that do not meet water quality standards. The Wisconsin Department of Natural Resources listed East Balsam Lake (WBIC 2620600) as an impaired water for excess algae growth in 2014. It was listed because it had chlorophyll samples that exceeded the threshold for recreational use for a shallow lowland lake. It did not exceed the total phosphorus standard at the time of the listing. Results of samples taken from June 15 through September 15 are used for the impaired waters listings.[42]

EAST BALSAM ALUM TREATMENTS

To address water quality impairment, the Balsam Lake Protection and Rehabilitation District membership approved a series of alum treatments for the East Balsam Basin at its 2019 Annual Meeting. Alum treatments are predicted to result in removal of East Balsam from the Wisconsin Department of Natural Resources Impaired Waters list.

The decision to complete an alum treatment followed consideration of various alternatives to address the internal phosphorus load which drives algae blooms in East Balsam. The results of in-lake and sediment studies and modeling of anticipated results led to a BLPRD Board of Commissioners recommendation to treat East Balsam with alum. More detail about the alum treatment and a summary of these studies are included in an amendment to the Balsam Lake Long Range Plan.[43]

The Long Range Plan Amendment establishes new water quality objectives for East Balsam Lake.

GOAL. Improve and maintain water clarity and quality in Balsam Lake.

IMPAIRED WATERS OBJECTIVE. Remove East Balsam Lake from the impaired waters listing by achieving TP<40 µg/L and Chla<27 ug/L in the June 15 – Sept 15 period.

TOTAL PHOSPHORUS OBJECTIVE. Mean summer total phosphorus is <30 µg/L (predicted value = 24 µg/L).

CHLOROPHYL A OBJECTIVE. Mean summer chlorophyll a is <20 µg/L (predicted value = 14 µg/L).

The first alum treatment occurred in June 2020, and initial water quality results are positive. Mean (July-September) surface total P was only 31 µg/L (53% reduction over the pre-treatment average). Mean bottom total P and SRP were 32 µg/L (66% reduction) and not detectable (98% reduction), respectively.

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[42] Impaired Waters Detail - Balsam Lake (wi.gov)

[43] Balsam Lake Protection and Rehabilitation District. *Long Range Plan. East Balsam Basin Water Quality Amendment.* November 2019.

Mean chlorophyll was 16.3 µg/L (72% reduction), and mean Secchi transparency was 6.3 ft. (86% improvement) in 2020.[44]

Alum treatments are designed to reduce phosphorus load from the lake sediments. Internal loading of phosphorus from lake sediments was identified as a primary source of phosphorus that fuels algae blooms in East Balsam Lake in studies by Barr Engineering (2010) and William James (2015 and 2018).

WATER AND PHOSPHORUS BUDGET

The Balsam Lake hydrologic budget is an accounting of the water inflows to, outflow and evaporation from, and storage in Balsam Lake. Barr Engineering completed a water quality study for the BLPRD in 2011.[45] Information about the water and phosphorus budget is found in this report and summarized in the 2015 Balsam Lake Aquatic Plant Management Plan.

WATERSHED DESCRIPTION

The Balsam Lake watershed (HUC 12: 070300050801) is located in the Lower St. Croix Basin (HUC 8: 07030005). A 2011 study delineated a watershed area of 26,691 acres which includes the area draining to Rice Lake and Half Moon Lake which eventually flow to Balsam Lake (Figure 34). The land use in the entire watershed area from this study is shown in Figure 35. Of the entire watershed, 36 percent was cropland, 31 percent was forested, 8 percent was wetland, 5 percent was grassland, 4 percent was open water, and 3 percent was pasture. Residential and commercial lands made up the remaining area (11 percent). "Other" uses were listed as 2 percent.

The Balsam Lake watershed is found in an area of glacial end moraine composed of till and stratified sand and gravel to the north and south of the lake. Glacial drift in areas east and west of the lake is pitted outwash composed of stratified sand and gravel. A thin (0.5 feet to 2 feet) layer of loess overlying the drift is the parent material for most topsoil. Most soils are loams, silt loams, or peat. Much of the watershed area drains to wetlands and small pothole lakes.[46] These areas of closed depressions result in water that is temporarily captured before it drains to the lake.

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[44] East Balsam Lake, Wisconsin - Limnological response to alum treatment: 2020 interim report.

[45] Barr Engineering. *Balsam Lake Water Quality Study*. Prepared for Balsam Lake Protection and Rehabilitation District. June 2011.

[46] *Water and Phosphorus Budgets and Trophic State, Balsam Lake, Northwestern Wisconsin.* 1987 – 1989. U. S. Geological Survey. Water Resources Investigations Report 91-4125.

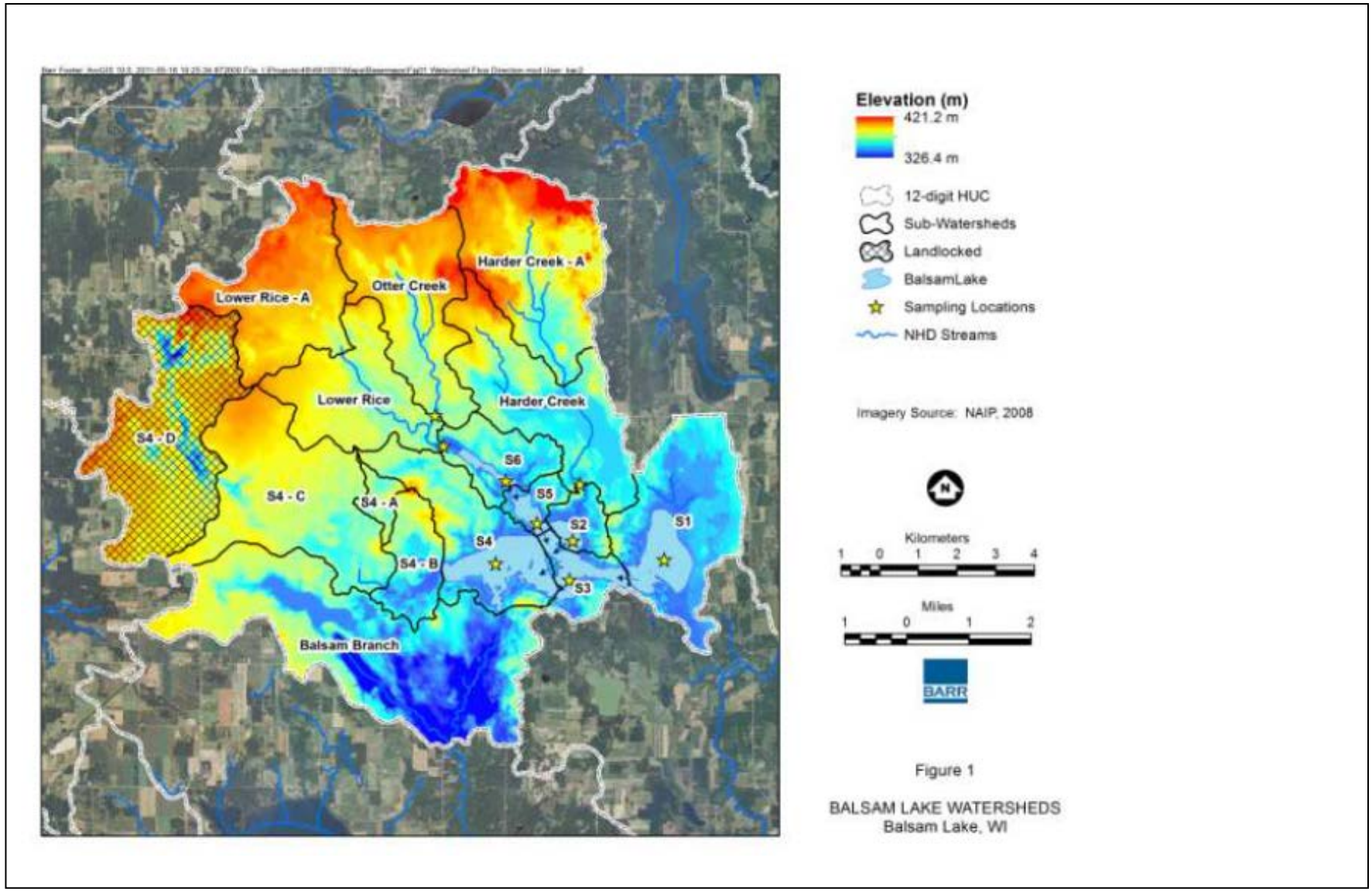

Figure 35. Balsam Lake Watershed and Drainage Area (from Barr 2011)

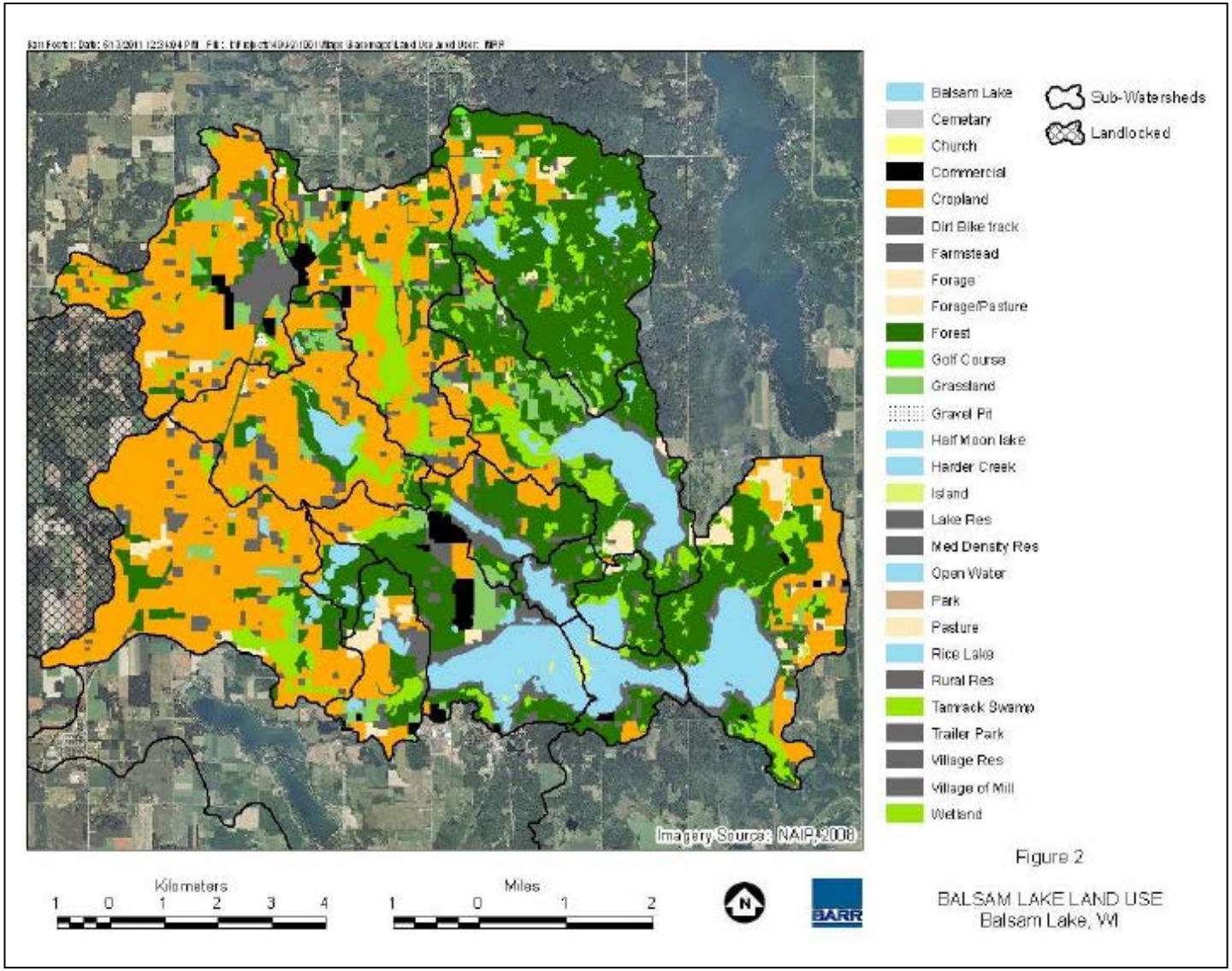

Figure 36. Balsam Lake Land Use (from Barr 2011)

PHOSPHORUS FROM WATERSHED RUNOFF

Phosphorus is a primary nutrient, essential for healthy plant and algae growth. However, increased phosphorus levels speed up the process of eutrophication - where excess nutrients stimulate plant growth and cause extensive algae blooms. Prolific plant growth may lower dissolved oxygen levels when plants decay and consume oxygen.

Phosphorus loading in Balsam Lake is the result of non-point sources. Non-point sources include rain falling on the lake and runoff from within the watershed. Phosphorus can be dissolved in the runoff water as well as carried in soil particles that erode from bare soil.

The amount of phosphorus runoff from the watershed is determined by land use in the lake's watershed along with watershed soils and topography. Agricultural and residential development tends to increase runoff and the amount of phosphorus that makes its way to the lake as a result. Land maintained in a natural, vegetated state, on the other hand, is beneficial to soil and water quality. With natural vegetation, soil erosion is reduced and fewer pollutants are able to enter and impact the lake via runoff. Tall vegetation slows the flow of water, while forest groundcover and fallen leaves allow runoff water to soak into the soil.

The 2015 Aquatic Plant Management Plan summarizes information about phosphorus load from the watershed and efforts to control phosphorus runoff to Balsam Lake. These efforts included:

Balsam Branch Priority Watershed Project: 1996 - 2006

Waterfront Runoff Reduction Program: 2008 - 2013

East Balsam Lake Agricultural Assessment: 2015

Conservancy Property Set Aside: 1994 - present

A *Timeline of BLPRD Efforts* in the 2015 APM plan summarizes these and other lake district projects and programs.

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APPENDIX C. RAPID RESPONSE STRATEGY FOR AIS

Purpose:

The purpose of this procedure is to direct a response necessary to eradicate or control Aquatic Invasive Species (AIS) upon discovery of introduction to Balsam Lake or its tributaries. This procedure also directs notification of government offices.

Definition:

Aquatic Invasive Species (AIS) are aquatic plants or aquatic animals that are non-native species to Balsam Lake or its tributaries. Their introduction may cause damage to native lake habitat.

Caution:

- Collection methodologies, if improperly performed, may result in inadvertent proliferation of the AIS.
- Attempting to capture live animals may result in injury. Many animals have defensive mechanisms that bite, pinch, or sting to avoid capture. Use protective gloves and clothing when handling live animals.

Procedure:

Collection of Suspected AIS

1. Bag It! If the suspect AIS is a plant, slip a plastic bag over the plant, close the bag around the plants stem and remove as much of the plant as possible including plant roots.
    a. The purpose of this step is to protect the lake or environment from the plant, the plant's seeds or broken bits of the plant.

2. If the suspect AIS it is an animal, safely capture the animal.
    a. BLPRD will make available bait traps or live traps for use in capturing animals if necessary.

3. Preserve specimen.
    a. If a plant, place it in a plastic bag with no water and store in the refrigerator.
    b. If an animal, store in rubbing alcohol.

4. Date, Describe, and Deliver! Record the date your sample was removed. Describe where it was found. Add your contact information. Deliver it to Polk County Land and Water offices located on the first floor of the Polk County Government Center in Balsam Lake.

Confirmation of AIS

5. If identification of the AIS is positive, Polk County Land and Water will notify the BLPRD.

6. The APM Lead shall perform the following immediate actions:
   a. Confirm identification with Polk County LWRD and the WDNR and notify the BLPRD Board.[47]
   b. Complete an AIS incident form 3200-125-plantincident.xls (wisconsin.gov)
   c. Contact WDNR staff, and 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.

Develop Action Plan

7. APM Lead shall develop an action plan in cooperation with the Board. The following are considerations for that action plan:
   a. Mark the location of AIS with a permanent marker. (Polk County LWRD AIS Coordinator or APM Lead).
   b. Post a notice at the public landing (WDNR has these signs available) and include a notice on the website and in the next newsletter. Notices will inform residents and visitors of the approximate location of the AIS and provide appropriate means to avoid its spread (Board).
   c. Inform the person who reported the AIS and the BLPRD Board of Commissioners of initial findings.
   d. Mark the location of suspected AIS (Polk County LWRD AIS Coordinator or APM Lead. Use GPS points (in decimal degrees and WGS 84 datum), if available, or mark the location with a small float.
   e. Hire a consultant to determine the extent of the AIS introduction. A diver may be used. If small amounts of AIS are found during this assessment, the consultant

[47] **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

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.

8. The APM Lead and BLPRD Board will select a control plan in cooperation with the WDNR. 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.

   The goal of the rapid response control plan will be eradication of the AIS.

9. 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.

10. The BLPRD will maintain a contingency fund of $30,000 for rapid response to aquatic invasive species.

11. BLPRD 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.

12. The APM Lead or the AIS Lead 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 BLPRD shall formally apply for the grant.

13. Frequently inspect the area of the EWM to determine the effectiveness of the treatment and whether additional treatment is necessary (BLPRD, APM Monitor).

14. Procedures and responsibilities of this rapid response plan will be reviewed on an annual basis. Changes may be made with approval of the BLPRD Board of Commissioners.

EXHIBIT A[48]

BALSAM LAKE PROTECTION AND REHABILITATION DISTRICT

APM Lead	Jack Weix: 612-325-8530 weixjack@gmail.com
Chairman	Tom Kelly: 612-508-0879 tkelly56@comcast.net
AIS (Clean Boats, Clean Waters) Lead	Bill Mork: 952-926-3110 bmork@wmmorkco.com

POLK COUNTY LAND AND WATER RESOURCES DEPARTMENT

AIS Coordinator	Katelin Anderson: 715-485-8637 katelin.anderson@co.polk.wi.us
County Conservationist	Eric Wojchik: 715-485-8631 ericw@co.polk.wi.us

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Grants	Alex Smith: 715-635-4124 Alex.Smith@wisconsin.gov
Permits	Austin Dehn: 715-919-8059 austin.dehn@wisconsin.gov
EWM Identification and Notice	Tyler Mesalk: 715-635-4227 Tyler.mesalk@wisconsin.gov

HERBICIDE APPLICATOR

Clean Lakes Midwest, Inc. a Clarke Company	Amy Kay: (715) 891-6798 akay@clarke.com

APM MONITOR

Endangered Resource Services	Matt Berg: 715-483-2847 saintcroixdfly@gmail.com

DIVERS

Ecological Integrity Services	Steve Schieffer: 715-554-1168

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

APPENDIX D. IMPLEMENTATION TABLE[50]

Goal 1. Manage established aquatic invasive species and eradicate newly introduced aquatic invasive species to reduce their impacts to the lake.

A. Control curly leaf pondweed (CLP) growth.

B. Protect and restore native plants.

C. Understand and prevent the release of phosphorus from CLP.

Actions[51]	Timeline	Board/Committee Assignment	$ Estimate	Funding Sources[52]	Partners
1. CLP Control - Herbicide Treatment				Grant ACEI-21218 (reapply 11/2022)	
a. select APM contractors	Every 5 years	APM Lead	$0		Board
b. select beds for treatment and apply for APM permits	March/April	APM Lead	$695 - $1,270		Herbicide Contractor
c. verify CLP treatment beds	April/May	APM Lead	(see pretreatment)		APM Monitor
d. complete herbicide	Late May	APM Lead	$20,000-		Herbicide Contractor

[50] Costs are annual costs estimated for initial implementation. These costs will be reviewed each year during the BLPRD budgeting process.

[51] See previous pages for action item detail.

[52] Grant ACEI-21218 is a 75% grant funded through 12/31/22.

Goal 1. Manage established aquatic invasive species and eradicate newly introduced aquatic invasive species to reduce their impacts to the lake.

A. Control curly leaf pondweed (CLP) growth.

B. Protect and restore native plants.

C. Understand and prevent the release of phosphorus from CLP.

Actions[51]	Timeline	Board/Committee Assignment	$ Estimate	Funding Sources[52]	Partners
treatment			$40,000		
e. Conduct pre- and post-treatment monitoring	April/May Mid-June	APM Lead	$2,425	Grant ACEI-21218	APM Monitor
2. Map CLP beds	Late May	APM Lead	$850	Grant ACEI-21218	APM Monitor
3. Harvest and track harvesting of CLP beds	May/June	APM Lead	See Goal 3	BLPRD	Harvester Operators
4. Monitor sediment turions					
a. CLP beds treated w/herbicide	Oct/Nov	APM Lead	$1,750	Grant ACEI-21218	APM Monitor
b. Town bay harvested bed (includes pre- and post-treatment survey of this area)	Oct/Nov	APM Lead	$1,400	Grant ACEI-21218	APM Monitor
5. Monitor native plant recovery in East Balsam		APM Lead	Included in pre/post and turion monitoring		APM Monitor

Goal 1. Manage established invasive species and eradicate newly introduced invasive species to reduce their impacts to the lake. **D. Locate and remove purple loosestrife and giant knotweed and Japanese knotweed.**					
Actions[53]	**Timeline**	**Board/Committee Assignment**	**$ Estimate**	**Funding Sources[54]**	**Partners**
6. Provide purple loosestrife ID and contact info to residents	July	AIS (Education) Lead	$350	Grant ACEI-21218	Polk County LWRD
7. Monitor for purple loosestrife and knotweed growth and mark locations for control	July	APM Lead	In landing inspections/ meandering survey	Grant ACEI-21218	APM Monitor
8. Use best control methods for purple loosestrife and knotweed	Summer	APM Lead	$0	Grant ACEI-21218	Polk County LWRD
9. Review rapid response – increase contingency fund	July 2021	Board	$10,000	BLPRD	

[53] See previous pages for action item detail.

[54] Grant ACEI-21218 is a 75% grant funded through 12/31/22.

Goal 2. Prevent and detect the introduction of aquatic invasive species.					
Actions[55]	**Timeline**	**Board/Committee Assignment**	**$ Estimate**	**Funding Sources**	**Partners**
1. CBCW Program	May – Sept.	AIS Lead	$48,000	CBCW- 95521[56]	Polk County LWRD WDNR UWEX
2. Monitor boat landings for AIS	Summer	APM Lead	$650	Grant ACEI-21218	APM Monitor
3. Conduct AIS meandering survey	July and August	APM Lead	$375	Grant ACEI-21218	APM Monitor
4. Consider AIS decontamination	Summer	Board	$0		Polk LWRD
5. Encourage sheriff enforcement of Do-Not-Transport ordinance		AIS Lead			Polk LWRD

[55] See previous pages for action item detail.

[56] Clean Boats, Clean Waters grants are renewable annually. Maximum available grant for four boat landings is $16,000.

Goal 3. Maintain navigation for fishing and boating, access to lake residences, and comfortable swimming at the village beach.					
Actions[57]	**Timeline**	**Board/Committee Assignment**	**$ Estimate**	**Funding Sources**	**Partners**
1. Identify areas of navigation concern	Summer	APM Lead	$0	BLPRD	WDNR
2a. Harvester, equipment, and building debt service	Ongoing	APM Lead	$19,880	BLPRD	WDNR
2b. Apply for harvesting permit	February	APM Lead	$300	BLPRD	WDNR
2c. Operate and maintain harvester	Summer	APM Lead	$6-8,000	BLPRD	WDNR
2d. Create lake depth map for harvesting areas	Spring 2022	APM Lead	?	BLPRD	
3. Owners manage individual corridors	Summer	Property Owners	$0	Owners	Herbicide Contractors
4. Vegetation control at the Village beach	Summer	Village of Balsam Lake	$0	Village of Balsam Lake	Herbicide Contractor

[57] See previous pages for action item detail.

Goal 4. Engage lake residents and visitors in reaching aquatic plant management goals.					
Actions[58]	**Timeline**	**Board/Committee Assignment**	**$ Estimate**	**Funding Sources**	**Partners**
1. Dockside newsletter	Two times each year	Board Chair	$10,000	BLPRD	
2. Web site	Ongoing	AIS Education Lead	$1,000	BLPRD	
3. Annual meeting presentations	July	Board Chair	$300	BLPRD	
4. Handouts and other materials (mailings)		AIS Education Lead	$2,000	BLPRD	
5. Dock service provider campaign/incentives		AIS Education Lead	$1000	BLPRD	

[58] See previous pages for action item detail.

Goal 5. Value the diverse native aquatic plant community in Balsam Lake.					
Actions[59]	**Timeline**	**Board/Committee Assignment**	**$ Estimate**	**Funding Sources**	**Partners**
1 and 2. Follow DNR requirements for permitting	Ongoing	APM Lead	$0	NA	WDNR
3. Review East Balsam aquatic plant recovery	Annually	APM Lead	$0	NA	APM Monitor
4. Conduct point intercept survey	2025	APM Lead	$5,000	WDNR grant (apply 11/2024)	APM Monitor
5. Update aquatic plant management plan	2025/26	APM Lead	$9,000	WDNR grant (apply 11/2024)	Planning Consultant

[59] See previous pages for action item detail.