Bone Lake Aquatic Plant Management Plan

2023 Amendment

Bone Lake, Polk County, Wisconsin

Sponsored By Bone Lake Management District

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Introduction

The Bone Lake Management District completed the Bone Lake Aquatic Plant Management (APM) Plan with the help of an advisory committee in April 2020. The plan was approved by the Wisconsin Department of Natural Resources on May 15, 2020. This plan amendment reflects a major change in how curly leaf pondweed is managed on Bone Lake with a shift from chemical treatment to harvesting. Curly leaf pondweed management is included in Goal 3 of the 2020 APM plan. With a change to harvesting CLP, there is also an option to use harvesting as a method for maintaining navigation channels when impaired by native plant growth. This is covered in Goal 1 of the APM plan. Goal 1 and Goal 3 along with related objectives, and actions are detailed in this plan amendment. No other changes are made to the 2020 Bone Lake Aquatic Plant Management Plan. The plan amendment implementation is expected in 2024 or 2025 depending upon budgeting and logistics.

The Bone Lake Management District managed the aquatic invasive species curly leaf pondweed (CLP) with early season Endothall treatments from 2008 through 2022. The goal of the treatments was to minimize navigation problems and protect native plant populations. Long-term herbicide treatment has enhanced navigation by removing CLP each year and reducing the density of its growth over the long term. However, the area (acres) of CLP growth in dense beds (≥50% CLP) has changed little over the years.

Early season treatments are conducted in order to avoid damage to native aquatic plants. In fact, statistically significant declines in native plant species frequencies occurred when comparing a treatment year to the previous year in all treatment years except two (from 2010-2019). However, it is not clear if declines were the result of herbicide or normal fluctuations of growth in native species from year to year.

Turions are the reproductive structures from which new CLP plants germinate in late summer, fall, and early spring. CLP turions can live in lake sediments for many years. A primary objective of the CLP herbicide treatment program was to kill CLP plants before they could form turions, thereby depleting the turion bank in the sediments and preventing future CLP growth. While declines in turion density were evident in Bone Lake CLP treatment beds, turion density fluctuated from year to year. There was considerable rebound in turion density after 2018 when no treatment occurred. Turion density remained comparably high in beds where CLP treatment has been generally less effective.

A recent change to WDNR policy requires a minimum bed size of 5 acres for permits for endothall treatment beginning in 2024.[2] This requirement applies regardless of funding source. In 2023 Bone Lake CLP treatment bed sizes ranged from 1.85 to 3.1 acres. Because dense CLP growth is limited to the size of current beds and there are drops-offs adjacent to many of the beds, it is not practical to expand CLP bed size in most cases. As a result, the Bone Lake Management District is pursuing harvesting as a means to achieve CLP management goals and objectives.

This plan amendment makes only one change to plant management goals and objectives. It adds an objective of phosphorus removal for curly leaf pondweed management. This objective was included in previous Bone Lake APM plans, but was removed in the 2020 update because of the limitations of phosphorus removal with chemical treatment of CLP.

[2] Email communication. February 6, 2023. Austin Dehn, WDNR Water Resources Management Specialist.

The 2020 plan stated that adaptive management would be used. From the plan: "other methods, such as harvesting, may be considered to meet curly leaf pondweed management objectives in the future." This amendment provides detail of how a harvesting program for CLP management would be implemented on Bone Lake.

A harvester would also provide the opportunity to maintain summer navigational channels where navigation becomes severely impaired, another objective of the 2020 Bone Lake Aquatic Plant Management Plan.

Aquatic Plant Harvesting[3]

Aquatic plant harvesters are floating machines that cut and remove vegetation from the water. The cutter head uses sickles similar to those found on farm equipment, and generally cut to depths from 1 to 6 feet. A conveyor belt on the cutter head brings the clippings onboard the machine for storage. Once full, the harvester travels to shore to discharge the load of weeds off of the vessel.

The size, and consequently the harvesting capabilities, of these machines vary greatly. As they move, harvesters cut a swath of aquatic plants that is between 4 and 20 feet wide and up to 10 feet deep. The on-board storage capacity of a harvester ranges from 100 to 1,000 cubic feet (by volume) or 1 to 8 tons (by weight).

In some cases, the plants are transported to shore by the harvester itself for disposal. In other cases, a barge is used to store and transport the plants. The plants are deposited on shore where they can be transported to a local farm for use as a soil amendment (the nutrient content of composted aquatic plants is comparable to that of cow manure) or to an upland landfill for proper disposal. Most harvesters can cut between 2 and 8 acres of aquatic vegetation per day, and the average lifetime of a mechanical harvester is 10 years.

Mechanical harvesting of aquatic plants presents both positive and negative consequences to any lake. Its results—open water and accessible boat lanes—are immediate, and can be enjoyed without the restrictions on lake use which follow herbicide treatments. In addition to the human use benefits, the clearing of thick aquatic plant beds may also increase the growth and survival of some fish. By eliminating the upper canopy, harvesting reduces the shading caused by aquatic plants. The nutrients stored in the plants are also removed from the lake, and the sedimentation that would normally occur as a result of the decaying of this plant matter is prevented. Additionally, repeated treatments may result in thinner, more scattered growth.

Aside from the obvious effort and expense of harvesting aquatic plants, there are environmentally-detrimental consequences to consider. The removal of aquatic species during harvesting is non-selective. Native and invasive species alike are removed from the target area.[4] This loss of plants results in a subsequent loss of the functions aquatic plants perform, including sediment stabilization and wave absorption. Shoreline erosion may therefore increase. Other organisms such as fish, reptiles, and insects are often displaced or removed from the lake in the harvesting process. This may have adverse effects on these organisms' populations as well as on the lake ecosystem as a whole. Harvesting may result in re-suspension of contaminated sediments and the excess

[3] Information from *APIS (Aquatic Plant Information System)*. U.S. Army Corps of Engineers. 2005 and the *Wisconsin Aquatic Plant Management Guidelines.*

[4] However, harvesting early in the year when CLP growth is at its peak and native plant growth is limited, increases the selectivity to invasive species.

nutrients they contain.[5] Disposal sites are a key component when considering the mechanical harvesting of aquatic plants. The sites must be on shore and upland to make sure the plants and their reproductive structures do not make their way back into the lake or to other lakes. The number of available disposal sites and their distance from the targeted harvesting areas will determine the cost and efficiency of the operation.

Timing is also important. The ideal time to harvest, in order to maximize the efficiency of the harvester, is just before the aquatic plants break the surface of the lake. If the harvesting is conducted too early, the plants will not be close enough to the surface, and the cutting will not be effective. If too late, CLP may have died back and therefore not be removed by harvesting.

If the harvesting work is contracted, the equipment should be inspected before and after it enters the lake. Since these machines travel from lake to lake, they may carry plant fragments with them, facilitating the spread of aquatic invasive species from one body of water to another. Prevailing winds may also blow cut vegetation into open areas of the lake or along shorelines.

[5] The Wisconsin DNR permits establish minimum (generally 3 feet) harvest depth requirements to avoid sediment suspension.

CONSIDERATIONS FOR HARVESTING ON BONE LAKE

Cost of equipment (budget for purchase approximately $250,000– pursue Waterways Commission grant)

- Harvester (10 ft cutter blade)
- Conveyor
- Trailer
- Truck or tractor (purchase or rely on others to transport harvester and collected loads)

Annual operation and maintenance(anticipated to be $10,000 to $20,000)

Storage and O&M of harvesting equipment (budget for storage and equipment O&M)

Transportation and disposal of aquatic plant material

- Select off-loading sites to minimize transport time
- Identify nearby disposal locations
- Available trucks for hauling

Staffing harvesting operations (budget for payroll)

- Harvesting Coordinator: Mike Musial (select and prioritize harvesting sites, timing for harvesting, coordinate scheduling)
- Harvesting Lead Operator
- Operators
- Payroll

Insurance (budget)

- Workers compensation
- Liability
- Equipment

Permitting

Obtain WDNR APM Harvesting permit (potential for 3-year permit)

Options for coordination with the Town of Bone Lake (which owns the North Landing) are under investigation.

RESPONSIBLE PARTIES FOR APM IMPLEMENTATION AND MONITORING

Bone Lake Management District Board – elected/appointed officials responsible for oversight of the lake management district.

APM Lead – Commissioner or lake volunteer who makes day-to-day APM decisions and directs contractors in herbicide treatments and related monitoring. The APM Lead is assisted by volunteers and consultants. Bob Boyd is currently the volunteer APM Lead. Cary Olson is currently the board APM contact.

Consultants –complete monitoring and coordination activities under the direction of the District Board and the APM Lead.

DNR – APM staff review aquatic plant management permit applications and the Aquatic Plant Management Plan.

Harvesting Coordinator (NEW) – Research and make recommendations for harvesting equipment purchase and operations. Prioritize beds and establish a harvesting schedule.

Lead Harvesting Operator (NEW) – Coordinate schedules, train operators, ensure that harvesting data is collected (Coordinator and Lead Operator could be the combined).

Proposed updates to the Bone Lake Aquatic Plant Management Plan follow. Goals and objectives are as stated in the 2020 plan with one re-instated objective for Goal 3.

GOAL 1. MAINTAIN RECREATIONAL USES IMPORTANT TO LAKE RESIDENTS AND USERS WHILE PRESERVING IMPORTANT NATIVE AQUATIC PLANT FUNCTIONS AND THEIR VALUES.

OBJECTIVE: MAINTAIN SUMMER NAVIGATIONAL CHANNELS WHERE NAVIGATION BECOMES SEVERELY IMPAIRED.

OBJECTIVE: ALLOW INDIVIDUAL CORRIDOR SUMMER SWIMMING AND BOAT ACCESS WHERE SEVERE NUISANCE CONDITIONS OCCUR.

OBJECTIVE: PROTECT NATIVE PLANT POPULATIONS.

ACTION ITEMS

SUMMER NAVIGATION CHANNELS

Monitor areas of navigation impairment in response to resident complaints or volunteer monitor observations to identify when and where herbicide treatment or harvesting is appropriate. To minimize impacts to native plants, harvest or treat only when and where navigation is severely impaired as identified with DNR and outlined on the following page.

Apply for permits for navigation channel harvesting or herbicide treatment if navigation impairment is identified.

Supervise and direct contracted applicator.

Conduct harvesting or treatment according to permit conditions.

Provide follow-up monitoring on effectiveness of treatment (record volunteer observations, is harvested channel navigable throughout the entire growing season, or is repeat harvesting needed?).

Consider marking navigation channels with buoys to identify their location to boaters. Installation of marker buoys requires a permit from the WDNR.

DEFINITION

Navigation Channels are the common navigation routes for general use. They do not provide access to resident and/or association docks. Maintaining access to and from individual properties is the responsibility of the property owner.

PROCEDURE FOR SUMMER NAVIGATION CHANNEL PERMITTING AND MONITORING

(responsible parties in parenthesis)

Document impairment of navigation (provide in permit) (APM Lead with guidance from Monitoring Consultant).

- 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.
- This information will be provided in the permit application based upon information in the Aquatic Plant Management Plan and authorized by the APM Lead.

Verify/refute impairment of navigation (APM Lead with assistance from volunteers unless noted)

- Inspect as a response to complaints or observations.
- If navigation impairment is identified, document conditions with photographs and measurements of navigation impairment.
- Prepare and send APM permit application to WDNR to receive authorization for harvesting.
- WDNR informs APM Lead if treatment or harvesting is authorized.
- APM Lead informs Harvesting Coordinator (or herbicide applicator) when harvesting (or herbicide treatment) is authorized by WDNR.

GOAL 3. MANAGE CURLY LEAF PONDWEED TO MINIMIZE NAVIGATION PROBLEMS AND PROTECT NATIVE PLANT POPULATIONS.

OBJECTIVE: PROTECT NATIVE PLANT POPULATIONS.

OBJECTIVE: IMPROVE SPRING NAVIGATION.

OBJECTIVE: IMPROVE WATER QUALITY BY REMOVING PHOSPHORUS FROM THE LAKE.

OBJECTIVE: REDUCE TURION DENSITY IN TARGETED BEDS.

OBJECTIVE: CONTINUALLY IMPROVE CLP MANAGEMENT ON BONE LAKE.

ACTION ITEMS

Mechanically harvest CLP beds.

The Bone Lake Management District will apply for the DNR aquatic plant management permit based upon historical CLP bed locations.

The Harvesting Coordinator will prioritize beds and establish a harvesting schedule based upon providing the most navigation relief and phosphorus removal in an efficient manner. The Monitoring Consultant may assist in this effort.

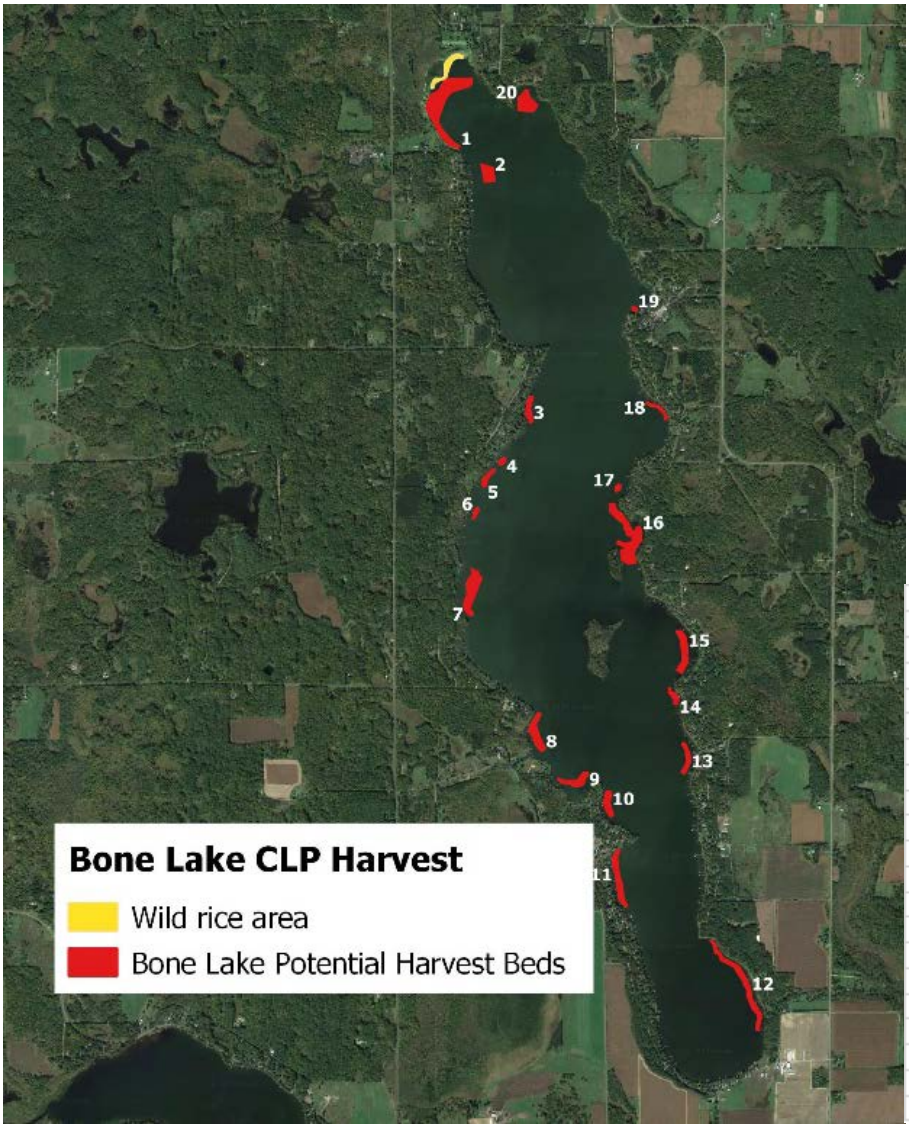
The Harvester Operators will collect harvesting information including date, number of loads, total acres harvested, and observations of navigation impairment from CLP.

Standards for CLP harvesting:

- identified as a spring navigation concern (based partially on number of nearby residences)
- May/June curly leaf pondweed stem growth reaches surface and is thick enough to impede navigation (stem height ≤2 feet from the surface)
- bed is estimated to consist of at least 75% CLP and 25% or less of native plants
- density rating averages >2 (on a 0-3 scale)
- water depth must be at least 3 feet (at least 5 feet in areas near wild rice growth)

Area for Potential CLP Harvest

The beds for potential CLP harvest area shown in Figure 1. Beds are based on CLP treatment areas and mapped CLP beds following treatment for years 2016 through 2022. Bed 1 (near wild rice) has a minimum depth of 5 feet, and beds 2-20 have a minimum depth of 3 feet based on anticipated DNR permit harvesting restrictions.



Bed #	Area (acres)
1	16.2
2	3.08
3	1.9
4	0.59
5	1.32
6	0.63
7	6.92
8	4.31
9	2.87
10	2.5
11	4.62
12	6.64
13	2.02
14	1.22
15	4.26
16	11.2
17	0.5
18	0.96
19	0.28
20	4.82

Figure 1. Bone Lake Areas for Potential CLP Harvest

EVALUATION AND MONITORING

Monitor and track sediment turions in historical CLP beds in the year when the aquatic plant point intercept survey is completed.

Track phosphorus removal resulting from CLP control. Harvester operators will complete a tracking sheet to record information including: date, number of hours of operation, number of loads harvested, % CLP of average load, bed numbers or region of the lake harvested. Harvesting Coordinator will provide results to Monitoring Consultant who will estimate phosphorus removal from harvesting and # loads/hour of effort. Wet weight of example loads will be measured and an average used to calculate total wet mass of plant material removed.

Tracking sheet will also include acres harvested, for permit reporting requirements.

ADAPTIVE MANAGEMENT

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

Estimating Phosphorus Load Removal from CLP Harvesting:

1. Calculate Wet Mass: Operators will record truck load volumes to estimate wet mass of each load. Ratio of volume to wet mass will be based on random truck weigh-ins with recorded volumes.
2. Calculate Dry Mass: Dry mass to wet mass ratio of plant materials was estimated in 2010 study (Schieffer, 2010) .
3. Calculate Dry Mass of CLP: based on percentage of CLP reported for each load.
4. Estimate Phosphorus Removal: Results of a CLP nutrient analysis conducted in 2010 on Bone Lake determined amount of phosphorus removed based upon the mean dry mass of phosphorus in CLP tissue. *It was determined that the mean tissue content of phosphorus was 0.34% (3.4 mg/g dry mass CLP). The mean biomass was 294 g/m2, resulting in a total phosphorus content in Bone Lake CLP of 187 kg* (Schieffer, 2010).
5. Estimate Percent of Total P Load Removed from CLP Harvesting: The total phosphorus load to Bone Lake was most recently estimated at 3,186 kg in a 2018-19 groundwater study (Schieffer, 2018-2019).