Big Chetac Chain Lakes Association

Aquatic Invasive Species Grant ACEI 133 13

2013 through 2015 Summary Progress Report

Dated: February 22, 2016

Prepared by: BCCLA Board of Directors

As Required by: AIS Grant 133 13

Note: Final report not due until conclusion of grant, which was extended to 12/31/2016

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INTRODUCTION

Big Chetac Lake (WBIC 2113300) is a 1,920-acre stratified drainage lake in southwestern Sawyer County, Wisconsin in the Town of Edgewater (T37N R09W S19NE NE). It reaches a maximum depth of 28ft in the narrows between the islands in the south basin and has an average depth of approximately 14ft (Busch et al. 1967). The lake is eutrophic (nutrient rich) in nature with summer Secchi readings averaging 3.3ft over the past 16 years (WDNR 2013). The lake was placed on the Wisconsin list of impaired waterways due to the excessive levels of phosphorous. 84% of the annual phosphorous release comes from the existing lake sediment (69%) and the annual early die of Curly Leaf Pondweed (Potamogeton crispus) (CLP – 15%). That phosphorous results in blue-green algal blooms across the lake throughout the lake each summer. (SEH, 2010).

Lake Chetac is the headwaters for the entire Red Cedar River Watershed and has been incorporated into the TDML plan: A River Runs Through Us: A Water Quality Strategy for the Land and Waters of the Red Cedar River Basin". The poor water quality of our lake negatively impacts the water quality of the entire watershed and economies of the communities who live along its shores. Therefore, the improvement of the water quality of this lake is not only important to the Lake Association whose mission it is to protect and improve that water, but to the entire state of Wisconsin. As required by the Environmental Protection Agency (EPA) of the Federal Government, the state of Wisconsin must develop a plan to improve the water quality of all impaired waterways. The Lake Association with the help of the WDNR has not only developed that plan, but has started its implementation. The findings of the work done to date indicate that the water quality of the lake can be significantly improved through continued CLP management with herbicides and the sealing of a portion of the sediment in the lake with alum.

The bottom substrate of Lake Chetac is predominately muck in the lake's side bays and throughout the north and south ends, and a mixture of sand and rock along exposed shorelines, the mid-lake narrows and around the islands (Busch et al. 1967). Curly-leaf pondweed, an exotic invasive species, is abundant in Big Chetac Lake. The 2008 spring point intercept survey found CLP dominated approximately 30% of the lake's surface area, and, especially in the lake's muck bottom bays, almost always formed a solid canopy in up to 10ft of water, excluded most native plants, and often made boating difficult (ESR, 2008).

Additionally, CLP's natural annual senescence in late June/early July contributes significantly to phosphorus loading (James et al. 2002) making it a factor in the lake's summer algae blooms that negatively impact water clarity and quality.

In 2010, after years of study and discussion among board members, residents, local businesses, and the WDNR, the Big Chetac Chain Lake Association adopted its first formal Lake Management Plan (BCABLA, 2010). That plan called for among other things the management of CLP through the use of herbicides and the study of the effectiveness of an alum treatment to seal the release of phosphorous from the lakes sediment. The purpose of both of these activities was to improve the overall water quality and clarity of the lake to reduce the number of days each summer the lake suffers from blue-green algal blooms and to help reduce the navigation issues caused by CLP throughout the lake. With some 30% of the lakes surface area negatively impacted by CLP, navigation issues were causing serious problems.

In 2010, the WDNR Technical Review Team recommended (see Appendix V) the Lake Association start the implementation of their Lake Management Plan by conducting a 3 to 5 year study of the efficacy of the Herbicide treatment on the management of CLP in the lake and to have an alum study conducted to

determine the efficacy of an alum treatment to help accomplish the goals established by the Lake Management Plan (Appendix V).

In 2013, the Lake Association applied for and received a 3 year WDNR exotic species control grant in the amount of $164,008.50 to begin actively managing CLP chemically and to determine its efficacy and the native plant response to that treatment. That grant also required the establishment of a clean-boats-clean waters program and an invasive species monitoring and reporting program as well. The grant was amended over those three years to conduct a second whole lake plant study in 2014 and the creation and administration of a property owner survey in the Spring of 2015. In addition, the grant was extended from 12/31/2015 to 12/31/2016.

As of 12/31/2015, there was still $30,953.80 remaining in the grant allowing enough for a fourth year of treatment. However, the Lake Association has the money necessary to pay for a fourth year of treatment outside of the grant. Therefore, the Lake Association is in the process of determining how best to use these remaining funds. They expect to apply for an amendment to the grant to incorporate several additional activities into the remaining year of the grant. They expect to apply for that amendment by the end of March 2016.

As previously noted, the 2010 WDNR technical team recommended testing the efficacy of chemical treatment in the same area for three to five years. As the results of the first three years of treatment (which follow) clearly indicate that Aquathol k can control CLP and long term control will be necessary to reduce turions in the sediment.

In 2013 the Lake Association also applied for and was awarded a grant to study the efficacy of an alum treatment to seal a portion of the lakes sediment to prevent the release of phosphorous into the lake. That study conducted in 2013 determined that an alum treatment of 462 acres in the north end of the lake (just south of the CLP treatment area) would result in a 47% reduction of total annual phosphorous released into the lake, reducing blue-green algal blooms by 74% to just 19% of the open water days each summer (James, 2013).

As noted in the results that follow, the maintenance of the north-end treatment area is required in order to not only to insure the efficacy of the treatment, but to allow us to pursue an alum treatment as recommended by the WDNR (Appendix VI). The TDML plan approved by EPA makes us eligible for federal funding to offset a part of the cost of an alum treatment in our lake, assuming we maintain the area we treated over the last three years with herbicide. If we do not maintain that area, we will not only lose the substantial ground we have gained over the last three years, but we will potentially lose hundreds of thousands of dollars in federal funds. While there is no guarantee that we would be awarded a grant, the odds are good given the work we have done to date. In addition, the WDNR technical review teams 2016 review of an amended lake management plan and the alum study recommend pursuit of an alum treatment in that area and to maintain the CLP in that area to enable that treatment (See Recommendation in Appendix VI).

This report summarizes the activities and results of those activities conducted in conjunction with the AIS Treatment Grant ACEI 133 13 for 2013 through 2015. The final report is not due and will not be prepared until we close out the grant on 12/31/2016, its extended deadline. That final report will incorporate our 2016 activities into it. We will start by providing a summary of the herbicide treatment for the last three years and the associated results, including the native plant response to that treatment. We will follow that

with a discussion of the other grant related activities undertaken during this same time period and conclude with overall remarks regarding the grant activities and their efficacy to date.

CLP Management

After evaluating the 2008 full lake plant study maps, it was determined that the expansive CLP beds in the north-bay (~95 acres) and the boat landing bay (~10 acres) would be chemically treated. This choice was made with a long range plan in mind (management of CLP throughout the lake). The prevailing flow of waters in the lake are north to south so treating in the north end first made sense to prevent quick reintroduction of CLP into that area from currents moving turions back into a treated area. Once efficacy was proven, the thought from day one was to manage CLP throughout the lake, as recommended by the 2010 SEH study. The second smaller area (DNR Landing bay) was chosen entirely for the navigation issues caused by CLP in that bay (not only at the public landing there, but to the residents in that bay). However, due to concerns over proximity to wild rice, the DNR landing bay was never treated. It was subsequently used as a second control bay for comparison purposes. Combined, the originally planned for treatment areas totaled 105 surface acres. The primary control bay chosen was that in front of the Fred Thomas Resort (~25 acres) (Figure 1).

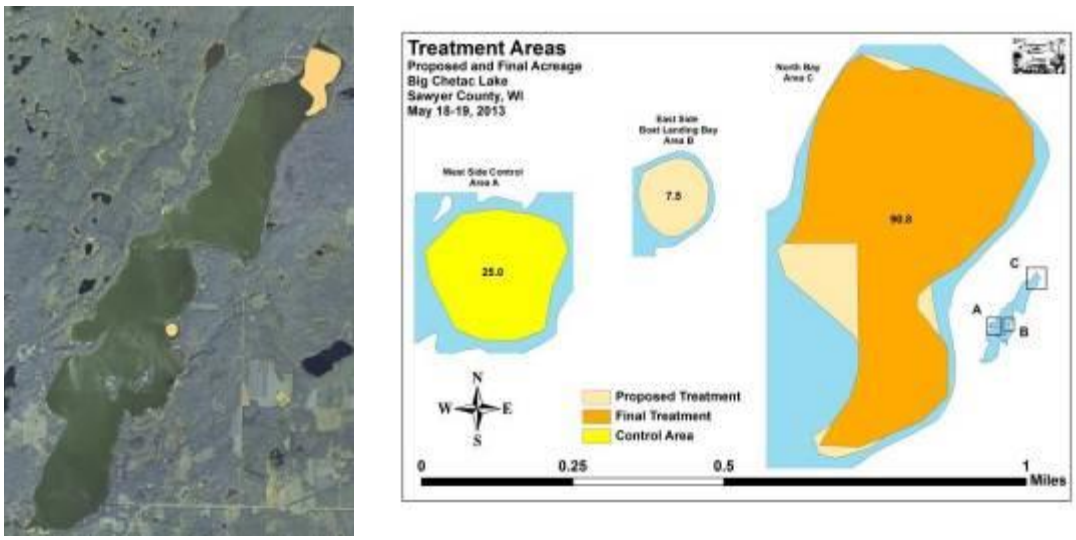


Figure 1: Proposed & Final 2013 Spring CLP Treatment Areas

Finalization and Results of 2013 Treatment Areas (Per ERS, 2013a):

CLP

As stated above, initial expectations were to treat two beds totaling 105.0 acres with Aquathol at a concentration of 1.5 ppm. However, due to concerns about Northern wild rice (*Zizania palustris*) presence in the "Bull Pen" bay directly south of the boat landing bay, treatment was cancelled in this area pending further review. In the north bay, the pretreatment survey determined that approximately 6.7 acres in deep water (>12ft) did not have sufficient CLP to warrant treatment. Because of this, the final treatment conducted by Midwest Aqua Care, Inc. on May 28th totaled 90.8 acres (Figure 1).

Following the May 28th application of Aquathol K at a concentration of 1.5ppm, we returned to the lake on June 17-18, 2013 to assess the effectiveness of the treatment. CLP showed a highly significant reduction in the north bay for all rake fullness values as well as overall as it was nearly completely eliminated. We found it at only two of the 416 survey points (0.5%), and each rake was represented by a single CLP plant. We also noted evidence of residual control of CLP throughout the north basin at a distance of up to two miles downstream of the treatment area. In both the control area and the east boat landing bay, CLP showed a significant increase in rake fullness rating of 3 as plants continued to grow and canopy during the growing season (Figure 2 comparison of Pre- and Post – Treatement on CLP) (ERS, 2013a).

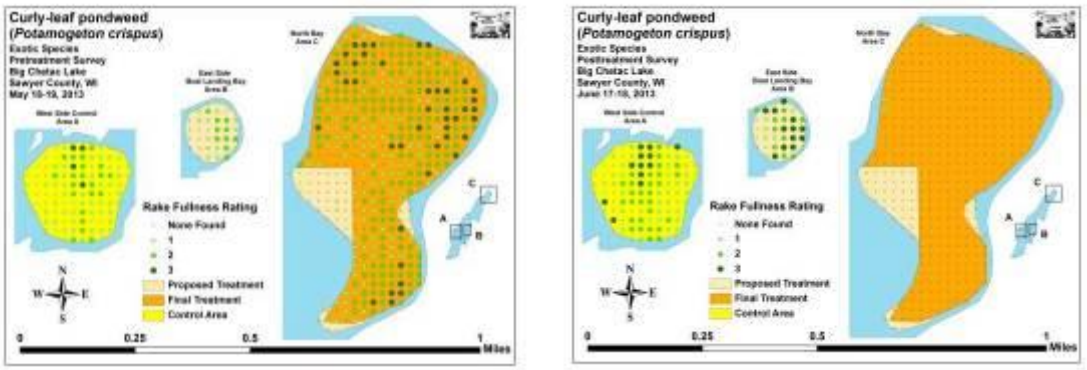


Figure 2: Comparison of Pre- and Post- 2013 Treatment of CLP

Native Plants

Small pondweed (Potamogeton pusillus) and Coontail (Ceratophyllum demersum), the most common native plants in the north bay prior to treatment demonstrated highly significant declines; and Flat-stem pondweed (Potamogeton zosteriformis) exhibited a moderately significant decline. Conversely, Forked duckweed (Lemna trisulca) showed a highly significant increase, and filamentous algae a moderately significant increase. Native plants in the control area and boat landing bay were nearly unchanged.

Turions (Per ERS, 2013b)

Turions were also reduced by the 2013 Treatment. In 2013 the mean density went from 158.59 pre-treatment down to 71.33 post-treatment, a significant reduction of 55.27% with total sites having turions going down from 73 to 56 of the 85 points sampled in the treatment area, a significant reduction of 23.29% (ERS, 2013b):

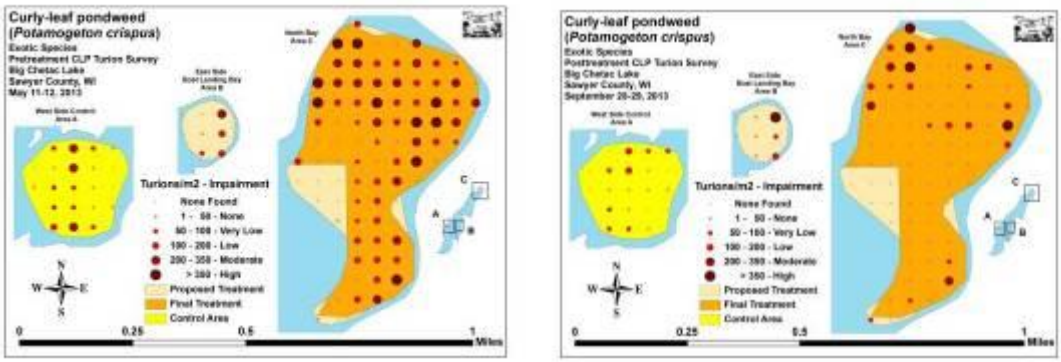


Figure 3: Comparison of Turion Count Pre- and Post- 2013 Treatment

The 2013 treatment provided effective control of CLP throughout the lake's entire upper basin (ERS, 2013).

Finalization and Results of 2014 Treatment Areas (Per ERS, 2014a):

CLP

Prior to conducting a treatment in 2014, so as to compare the same areas year-over-year, we again surveyed the original 550 point grid used in 2013: 416 points in the north bay, 34 in the boat landing bay, and an additional 100 control points in a bay on the lake's west side. During the May17-18, 2014 pretreatment survey, we found CLP at 205 of 416 sample points in the north bay (60.1% - down from 340 points - 81.7% in 2013), at 19 of 34 points in the boat landing bay (55.9% - down from 24 points - 70.6% in 2013), and at 45 of 100 points in the western control bay (45% - down from 70 points -70.0% in 2013).

Using these data, it was determined that the north bay treatment area would be the same 90.8 acres treated in 2013. It was also decided that, out of concern for the Northern wild rice (Zizania palustris) located in the "Bull Pen" bay immediately south of the boat landing area, that treatment of the entire 7.5 acres in this area would again be cancelled.

Following the May 21st application of Aquathol K at a concentration of 1.0ppm (down from 1.5ppm in 2013), we returned to the lake on June 14-15, 2014 to assess the effectiveness of the treatment. We found CLP at 37 of 416 points (8.9%) – a decline of nearly 82% from the 205 points in the pretreatment survey. Statistically speaking, our findings demonstrated a highly significant reduction of total CLP, as well as rake fullness 3, 2, and 1. The only CLP plants remaining in the treatment area were widely scattered and small (<12inches tall). During the posttreatment survey, we also noted evidence of residual control of CLP throughout the north basin at a distance of up to two miles downstream of the treatment area. In both the untreated areas (control bay and the east boat landing bay), CLP showed a significant increase in rake fullness rating of 3 as plants continued to thicken and canopy as the growing season progressed. In the untreated boat landing bay, overall CLP abundance was unchanged (present at 19 points pre and post). However, in the control bay, overall CLP demonstrated a significant decline (45 points pre/28 post) (Figure 4) (ERS, 2014a).

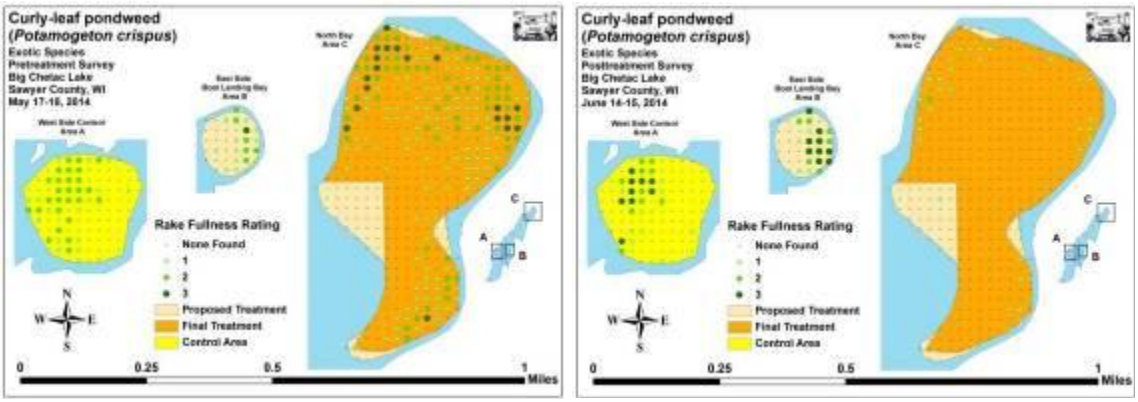


Figure 4: Comparison of Pre- and Post- 2014 Treatment of CLP

Native Plants

Forked duckweed (Lemna trisulca) and Coontail (Ceratophyllum demersum) were the most common native plants in the north bay prior to treatment. Forked duckweed demonstrated a significant decline posttreatment while Coontail remained unchanged. Conversely, filamentous algae showed a highly

significant increase and Wild celery (Vallisneria americana) showed a significant increase. Native plants in the control area and boat landing bay were nearly unchanged.

Initial diversity within the north bay was extremely low with a Simpson Diversity Index value of 0.44. This value increased significantly to 0.65 posttreatment. The boat landing bay also had an exceptionally low index value of 0.36 in May that rose to 0.46 in June. The control area had the highest starting value at 0.60, but it increased only slightly to 0.64 in June.

Mean native species richness was extremely low in all three areas. The north bay treatment area averaged 0.23 native species at littoral points pretreatment and only 0.19 posttreatment. Even at sites that had natives present, only the boat landing bay (1.60) averaged more than 1.20 species/site, and no point had more than three native species in any rake during either the pre or posttreatment surveys.

Total species richness was also very low in all three areas with just two to four species being found in each area pretreatment. During the posttreatment survey, we found only four species in the boat landing bay and three in the western control bay. However, the treatment area had jumped to nine – the most ever found there.

Turions (Per ERS, 2014b)

When compared to September 2013, the November 2014 survey demonstrated a 12.5% reduction in overall turion coverage in the north treatment area with 49 of 85 points having live turions present (57.65%). This was also a nearly 33% reduction from the 73 points turions were found at during the original 2013 baseline pretreatment survey. Overall mean turion density in the treatment area decreased by 35.1% (46.29 turions/m_2) when compared to fall 2013 (71.33 turions/m_2), and by 70.8% when compared to the pretreatment baseline (158.59 turions/m_2). Despite this positive outcome, we noted that it was less than the 50% decline we would have expected if the treatment had killed all turions that should have germinated. This may mean that some turions germinated after the treatment due to the late spring, or it could mean that conditions allowed for a "second crop" in late summer when additional CLP plants germinated, grow, and set turions. (Figure 5) (ERS, 2014b):

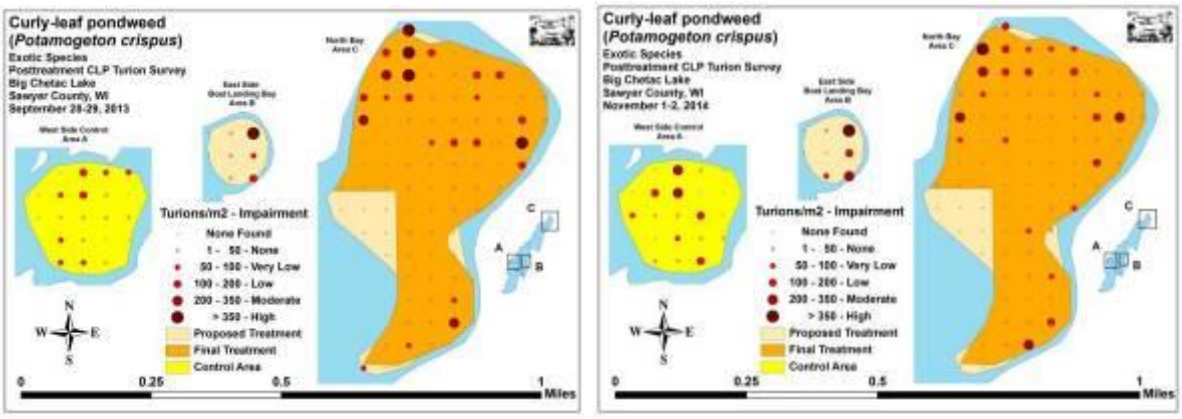


Figure 5: Comparison of Turion Count Post 2013- and Post- 2014 Treatment

With a project goal being to significantly reduce CLP prior to beginning the restoration of native plants (BCABLA 2010), both the 2013 and the 2014 herbicide applications have to be considered successes. (See Appendix I: DNR 2014 Report on AIS Treatment) By starting the restoration process on the

upstream/north end of the lake, the treatment provided the additional benefit of preventing recolonization of CLP from turions washing in from elsewhere (ERS, 2014).

Finalization and Results of 2015 Treatment Areas (Per ERS, 2015a):

CLP

Prior to conducting a treatment in 2015, so as to compare the same areas year-over-year, we again surveyed the original 550 point grid used in 2013/2014: 416 points in the north bay treatment area, 34 control points in the boat landing bay, and an additional 100 control points in a bay on the lake's west side. During the April 25-26th, 2015 pretreatment survey in the north bay treatment area, we found CLP at 107 of 416 total points with a mean rake fullness of 1.57 (25.7% coverage - down from 60.1% in 2014 and 81.7% in 2013). In the boat landing control area, it was present at 15 of 34 points with a mean rake fullness of 1.20 (44.15% coverage – down from 55.9% in 2014 and 70.6% in 2013). The western control bay had CLP present at 32 of 100 points with a mean rake fullness of 1.66 (32% coverage - down from 45% in 2014 and 70% in 2013).

Using these data, it was determined that the north bay treatment area would be reduced from the proposed 90.8 acres to 55.2 acres – a decline of 35.6% from the originally proposed acreage and the total area treated in 2013 and 2014.

Following the May 4th application of Aquathol K at a concentration of 1.0ppm, we returned to the lake on May 30-31, 2015 to assess the effectiveness of the treatment. We found CLP at 16 of 416 points (3.8%) with a mean rake fullness of 1.19. This was a decline in distribution of over 85% from the 107 points in the pretreatment survey. Statistically speaking, our findings demonstrated a highly significant reduction of total CLP, as well as rake fullness 3, 2, and 1. The only CLP plants remaining in the treatment area were either small sprouts (<12inches) that appeared to have germinated from turions after the treatment or were severely burned and their long term survival was questionable. In the boat landing control bay, CLP experienced a non-significant declined to 14 points, but the mean rake fullness increased to 1.36. In the western control bay, we documented a non-significant increase in both distribution (44 sites) and density (1.77) (Figure 6) (ERS, 2015a).

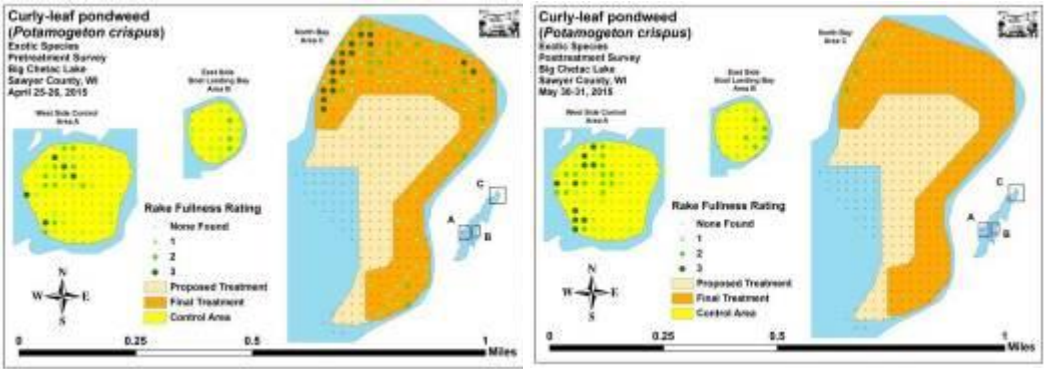


Figure 6: Comparison of Pre- and Post- 2015 Treatment of CLP

Native Plants

Other than CLP, no other species experienced a significant decline in the north bay treatment area. However, Forked duckweed (Lemna trisulca), Common water weed (Elodea canadensis), and Nitella (Nitella sp.) demonstrated significant increases, and filamentous algae experienced a highly significant

increase. No species demonstrated significant changes in the boat landing control bay, but Coontail (Ceratophyllum demersum), the most common native plant in the western control bay, suffered a significant decline – presumably as other species expanded.

Initial diversity within the north bay was extremely low with a Simpson Diversity Index value of 0.41. This value increased significantly to 0.59 posttreatment. The boat landing bay also had a low index value of 0.51 in May that increased slightly to 0.55 in June. Although the control area had the highest values (0.73 in May and 0.76 in June), in our experience, these numbers are still quite low when compared to other lakes in northern Wisconsin with similar bottom type and clarity.

Initial diversity within the north bay was extremely low with a Simpson Diversity Index value of 0.39. This value increased significantly to 0.78 posttreatment. The boat landing bay also had a low index value of 0.43 in April that rose slightly to 0.53 in May. The western control bay had the highest starting value at 0.63, and it was essentially unchanged at 0.62 in May.

Mean native species richness was also low in all three areas. The north bay treatment area averaged 1.9 native species at littoral points pretreatment and 0.12 posttreatment. Even at sites that had natives present, only the western control bay (1.29) averaged more than 1.20 species/site, and no point in any area had more than three native species in any rake during either the pre or posttreatment surveys.

Total species richness was very low in all three areas with just three to six species being found in each area in April/pretreatment. During the May/posttreatment survey, we found four species in the boat landing bay and six in the western control bay. However, the treatment area had jumped to nine – similar to posttreatment in 2014.

Turions (Per ERS, 2015b)

As a follow up to the initial pre/posttreatment turions surveys in 2013 and 14, on October 17-18th, 2015, we conducted a Petite Ponar dredge survey in both the treatment and boat landing bay/western control bay areas. The survey found CLP turions at 37 of 85 survey points (43.53%) in the north bay treatment area. This was a 24.5% reduction from 2014 coverage (49 points – 57.65% coverage) and a nearly 50% reduction from the 73 points (85.88% coverage) they were found at prior to the 2013 treatment.

Despite this overall decline in coverage, the mean turion density in the treatment area increased by 39.3% from 46.29 turions/m2 with a standard deviation of +/-74.52 turions in 2014 to 64.50 turions/m2 with a standard deviation of +/-203.48 turions/m2 in 2015.

Collectively, the three years of treatment produced a nearly 85% reduction from the initial baseline of 26 predicted nuisance points (30.59% of all points). In the control bays, there were four nuisance points which was identical to the pretreatment baseline. When comparing 2014 to 2015, these results demonstrated a non-significant increase in mean turion density in the north bay treatment area ($t = 0.87$, $p = .19$), and a non-significant decrease in the control bays ($t = -0.87$, $p = .20$) (Figure 7) (ERS, 2015b).

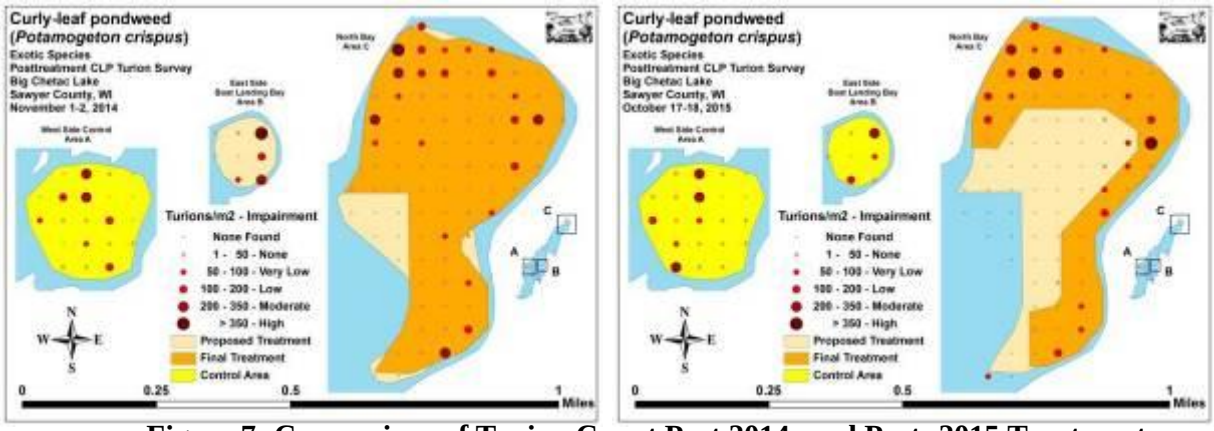


Figure 7: Comparison of Turion Count Post 2014- and Post- 2015 Treatment

Summary of 2013 – 2015 Herbicide Treatment Results

CLP: The treatment area of 90.18 acres in the north end was treated with Aquathol at a concentration of 1.5ppm in 2013, and at 1.0ppm in 2014. As a result of the effectiveness of the 2013 and 2014 treatments, the treatment area was reduced to just 55 acres in 2015 and treated with Aquathol at a concentration of 1.0ppm. While still effective in reducing CLP in 2015, CLP was found growing in the treatment area post treatment. While we are still waiting on the herbicide sampling report on samples taken post the 2015 treatment, raw data suggests that the concentration of chemical never got to the level needed to effectively kill the CLP. This could be the result of weather conditions, the reduction in the size of the treatment area, or other factors. Future treatments of this area may require using the DNR's recommended dosage of 1.5ppm to insure its efficacy. The final decision as to the concentration to use is the DNR's.

Overall, the use of Aquathol to manage CLP in Lake Chetac has been shown to be extremely effective.

Native Plants: The overall results from 2013 through 2015, show that two species of native plants have been negatively impacted. However, we have seen an increase of number of species present in the treatment area, indicating a positive response by natives in the area. However, we are not yet seeing native plants return to deeper waters. The WDNR, 2016 Technical Team Review suggests that is solely the result of poor water clarity (Appendix VI). They are recommending pursuit of an alum treatment as soon as possible to improve the water clarity to allow for the native plant community to return to deeper waters in the north end once dominated by CLP. They support our plan to manage CLP in the north end area through the use of herbicides. However, they have requested that we hold off on plans to manage CLP throughout the lake until we either see a significant increase in native plants in the north end treatment area, or to the water clarity in the lake.

Turions: The overall results from 2013 through 2015 show close to a 50% decrease in number of turions present in the north end treatment area. While a very positive result, if left unmanaged, these turions will germinate and CLP will quickly recapture the area we have eliminated the CLP from over the last three years. What we have learned is that it takes more than three years to effectively get a CLP bed under control. As the 2010, WDNR Technical Review Team recommended, we need to continue to treat an area for at least three to five years (Appendix V). These findings support our request to amend

the AIS Control Grant ACEI 133 13 to include a fourth year of treatment.

In addition, this request is in line with both the intent of both the 2010 and 2016 WDNR Technical Review Team's recommendations for our Lake Association (Appendix V & VI). As previously stated, our lake is eligible for federal funds to help offset the cost of the WDNR's recommended alum treatment for our lake. In order to remain eligible for those funds, we need to maintain the CLP in the treatment area. Without that maintenance, not only will CLP resurge in the treatment area, we will lose hundreds of thousands of dollars in federal funds.

Other Grant Related Activities 2013 – 2015

Volunteer Invasive Species Monitoring

As required by the AIS grant, we implemented an invasive species monitoring and rapid response program. After three years of invasive species monitoring, no new invasive species have been found in the lake. This is an important program that will enable us to take action quickly should a new species be found. We could not support this program without the volunteers who donate their time to look for invasive species. They have spent over 160 hours doing this work. The Association plans to continue to operate this important program.

Clean Boats, Clean Waters Program

This program is funded by its own grant. However, it is also a requirement of the AIS grant. This program has really helped to get the word out about invasive species and how they can be transported from one water body to another. Over 420 hours of time have been spent on this program. Most boaters approached at boat landings are already aware of the issue and take the appropriate actions when putting in or taking out their boats. The Association plans to continue to operate this important program.

Manual Harvesting of CLP

Manual Harvesting is not practical for a CLP bed of any real size. It is really difficult to do, and is extremely labor intensive. However, it does work to remove the CLP. As part of the AIS grant, in 2013 and 2014 years we had CLP manually pulled from the boat landing area at Old Hayes Road and in various other areas around the lake. Volunteers spent approximately fifty hours manually removing CLP.

In areas where the use of herbicide is restricted or viewed to be ineffective for some reason, the use of manual harvesting is worth pursuing. For instance, the use of manual harvesting in front of properties in areas near wild rice, manual harvesting can help. Manual harvesting may also be used as a maintenance activity in an area which has already been treated with herbicide. The Lake Association will continue to promote manual harvesting and sponsor CLP hand pulling days.

Protecting and Enhancing the Fishery

We need to insure that we do not endanger the excellent fishing Lake Chetac provides. The quality of the fishery is also a great concern for the DNR. DNR studies in our lake confirm that our activities to date have not had any negative impact to our fishery. See DNR Fishery Survey Report in Appendix II. We will continue our ongoing activities promoting the stocking of Walleye in the lake and making sure whatever activities we

do pursue keep concern for the fishery at the forefront. We will also continue to support the DNR's fish studies in our lake.

Transplantation of Native Plants in CLP Treatment Area

Since CLP is an early germinator, we are able to treat it early in the season (water temps up to 60 degrees) when few other plants have germinated. We are encouraged by just how quickly the native plants have returned to areas we have already treated. We have tried to minimize the impact to native plants in our management of CLP. To help quicken the return of native plants, in 2015, as part of the AIS grant, we transplanted hundreds of native plants into the CLP treatment area. We plan to transplant many more native plants into that same area in 2016. We are following the DNR's Aquatic Plant Management Strategy (See Appendix IV).

Community Education and Promotion of Best Shoreline Practices

Over the last three years have worked tirelessly to educate the public on the water quality issues our lake faces, including the importance of the work the Lake Association is doing, and how they can positively impact the water quality of the lake themselves. This education has taken the form of public meetings, newspaper articles, newsletters sent to all lakeshore owners on both Birch and Lake Chetac, parade floats and educational booths. We have produced FAQ's, presented at public meetings, held open Association Meetings, responded to phone calls and emails all in an effort to make sure the public had accurate information about the poor water quality the lake has. We created a new Website for the Association and added a Facebook Page for the Association as well. Those two sites are kept up to date with all the latest happenings and information we have. The level of work that has gone into this area is unprecedented in the history of our organization. The Lake Association plans to continue this work into the future.

2015 Property Owner Survey

To determine the level of support of the Lake Chetac lakeshore property owners surrounding all the water quality initiatives the Lake Association has undertaken, a DNR approved survey was mailed out to all Chetac lakeshore property owners on March 10th, 2015. The survey was administered by a survey company out of Minnesota. The results will be used to determine the activities that should be pursued moving forward to further improve the water quality of the lake. The survey has several parts: Demographics about the respondents; water quality concerns; satisfaction with the Association activities to date; water quality activities they want to pursue moving forward; how to fund these activities; and, local governmental concern and support.

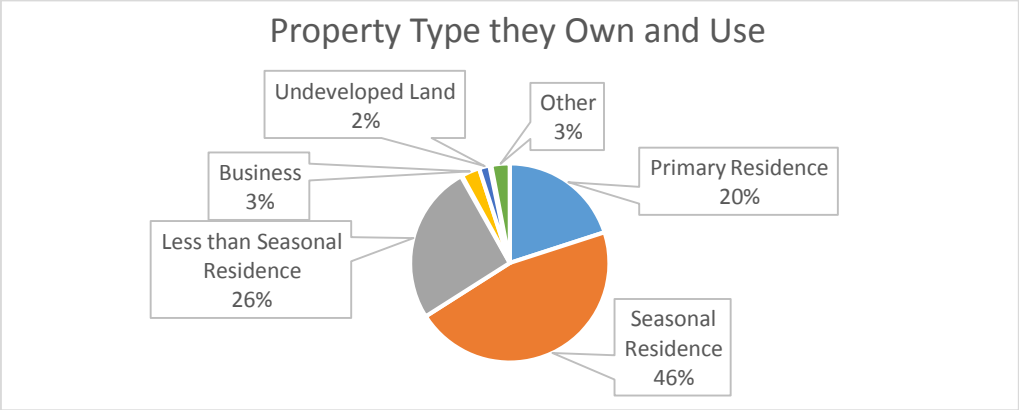
The full survey results can be found in Appendix III. However, what follows are excerpts about the respondents, what they think about water quality and the activities they want pursued to improve the water quality in Big Chetac.

Survey Facts:

- Survey mailed to all 390 property owners (list supplied by Sawyer County).
- 244 people returned completed surveys, representing a 62.5% response rate.
- As a result of the outstanding response rate, the findings are considered statistically representative of the whole group.

Part 1: Big Chetac Lakeshore Owner Demographics (what do we know about them?):

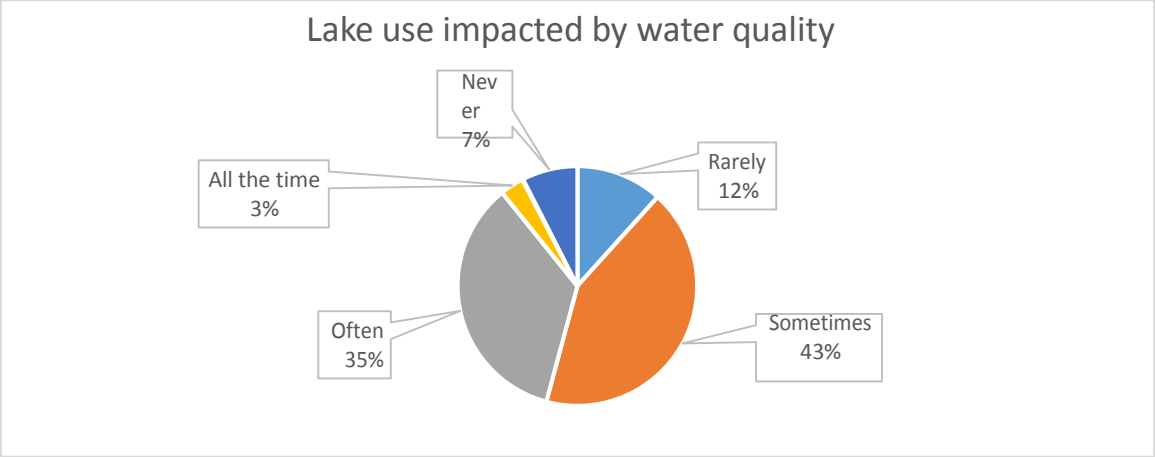
- **Property Type they own and use:**



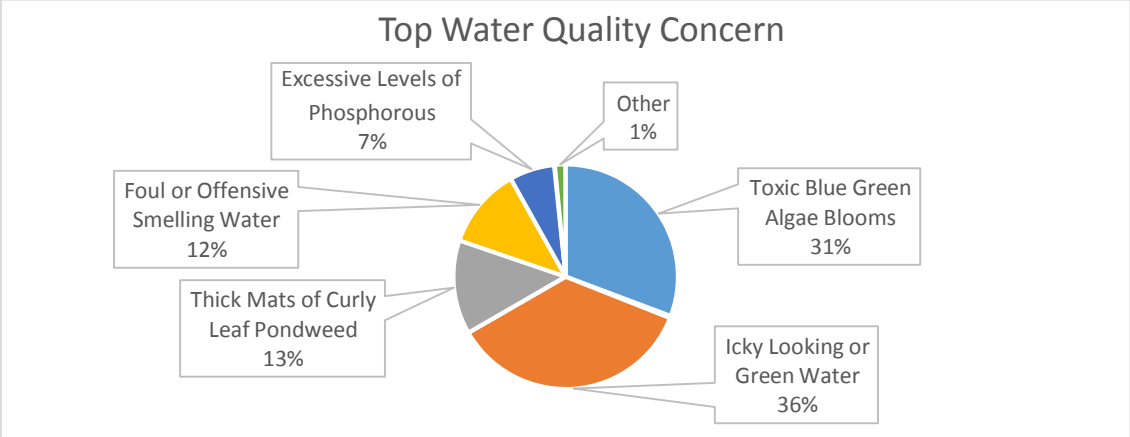
- **Length of Ownership:** Average of 19.74 years, with 34.57% owning their property over 20 years.
- **Days they use their property each year:** 45.19% over 100 days; 46.44% from 26 to 100 days; and, 8.37% less than 26 days each year.
- **Number of people using property when in use:** 48.55% 2 or less; 35.68% 3 to 5; 12.03% 6 to 10; and, 3.73% over 10.
- **What activities they participate in on Big Chetac:** #1 Fishing from a boat (93%); #2 Fishing from shore (86%); #3 Rest/Relaxation (83%); and, #4 Pontoon Boating (70%).
- **What activities they participate in most often:** #1 Fishing from a boat (73%); #2 Pontoon boating (58%); #3 Fishing from Shore (41%); and, #4 Rest/Relaxation(37%).

Part 2: What Big Chetac Lakeshore owners think about water quality on the lake:

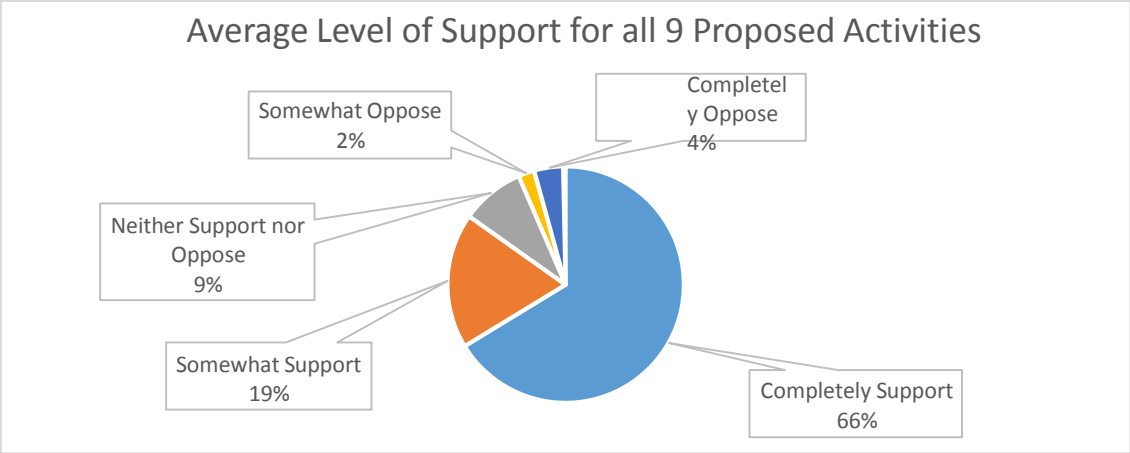
- **During open water season, how often does the water quality of the lake negatively impact their enjoyment of the lake?:** Of 240 responses to this question, 92.5% indicated being impacted.



- **How do they rate the water quality of Big Chetac:** 77% consider the water quality of the lake to be fair to very poor, 22% considering it good and 1% as excellent.
- **What indicator of poor water quality concerns them the most:**



What activities do Big Chetac lakeshore owners want the Lake Association to pursue in the future to improve water quality on Big Chetac?:



9 Specific Activities:

1. Any Activity recommended or approved by the DNR – Support 82.13%, Neutral 10.64%, Oppose 7.23%
2. Continued use of Aquatic Herbicide to control CLP – Support 83.76%, Neutral 7.27%, Oppose 8.97%
3. Develop and Implement whole lake plan to reduce CLP – Support 84.81%, Neutral 6.75%, Oppose 8.44%
4. Individual Property Herbicide Treatment Permits – Support 82.83%, Neutral 7.72%, Oppose 9.45%
5. Reducing phosphorous by controlling CLP – Support 85.53%, Neutral 7.23%, Oppose 7.24%
6. Reducing phosphorous with ALUM treatment – Support 80.42%, Neutral 11.06%, Oppose 8.52%
7. Continuation of Clean Boats Clean Waters Education – Support 89.66%, Neutral 6.90%, Oppose 3.44%
8. Continuation of Invasive Species Monitoring – Support 90.60%, Neutral 6.84%, Oppose 2.56%
9. Funding studies to improve water quality – Support 84.55%, Neutral 11.16%, Oppose 4.29%

The above indicates extremely significant support for all 9 of the proposed water quality activities, and very few individuals being opposed to the suggested activities. Please note item number 2 above specifically addresses level of support for the use of Aquatic Herbicide to control CLP in Lake Chetac and item 6 above specifically addresses an alum treatment to reduce phosphorous. There is overwhelming support for both these activities by the primary stakeholders, the lakeshore property owners. The Riparian Owners in Wisconsin are the one group that the state legislature in concerned about. The Lake Association only pursues those activities supported by the majority of those riparian owners. With a support level of 83.76% for herbicides and 80.42% for alum, it is quite clear what direction the Lake Association should be taking and what activities the WDNR should support on this lake.

Concluding Remarks

The work completed to date through the AIS grant has been extremely successful, but there is more to be done. As previously stated, this grant was not only the start of the work contemplated in the WDNR approved and Association Adopted 2010 Lake Management Plan, but a test of the efficacy of the use of herbicides to control CLP in Lake Chetac and an evaluation of native plant response to that treatment. The WDNR's Technical Review Team recommended in 2010 that we test the efficacy of herbicides to control CLP in the same area of the lake for three to five years before we expanded our CLP control plans throughout the lake. As a part of that efficacy test they wanted us to look at the response of native plants to that treatment.

In a test of some 90 acres in the north end of Lake Chetac, we have found that the treatment to date has been very effective in reducing the CLP that grows in that area each of the last three years. However, we have reduced the live Turions in that area by just 49% (ERS, 2015b). This indicates that we need to continue to treat in this area to see if we can get that number significantly reduced to a point where perhaps manual harvesting could be considered as a maintenance process in lieu of herbicides.

Finally, as indicated by the 2015 Lake Chetac property owner survey, there is overwhelming support for the work the Lake Association has been doing. These findings indicate that AIS grant activities we have undertaken to date have been successful in the eyes of the primary stakeholder group: the riparian owners of Lake Chetac.

A final report will be prepared on December 31, 2016 the date this grant is closed out.

Works Cited

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James, W.F., J.W. Barko, H.L. Eakin, and P.W. Sorge. 2002. Phosphorus budget and management strategies for an urban Wisconsin lake. Lake and Reserv. Manage. 18(2): 149-163

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ESR. 2013b. Big Chetac Curly-Leaf Pondweed Pre/Post Herbicide Turion Survey (October 2013) Available from http://bcabla.com/lake-management-plan-and-related-studies.html

ESR. 2014a. Big Chetac Curly-Leaf Pondweed Pre/Post Herbicide Treatment Surveys (June 2014) Available from http://bcabla.com/lake-management-plan-and-related-studies.html

ESR. 2014b. Big Chetac Curly-Leaf Pondweed Pre/Post Herbicide Turion Survey (November 2014) Available from http://bcabla.com/lake-management-plan-and-related-studies.html

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Lake Chetac, Sawyer County
2014 Curly Leaf Pondweed
Herbicide Treatment & Fish Survey Results

This fact sheet provides an overview of the 2014 herbicide treatment conducted by the Big Chetac and Birch Lake Association to control the aquatic invasive species, curly leaf pondweed. Full reports and fact sheets are available on Wisconsin Department of Natural Resources Lake Chetac and Big Chetac and Birch Lake Association' s (BCABLA) websites. Please contact the individuals listed below if you have questions.

Alex Smith, DNR Lakes Biologist 715-635-4124 or Alex.Smith@Wisconsin.gov
Max Wolter, DNR Fish Biologist 715-634-9658 Ext. 3509 or Max.Wolter@Wisconsin.gov
Bill Miller, President BCABLA 715-254-9559 or bcabla@hotmail.com

Project Purpose and Background:

- Big Chetac and Birch Lake Association developed a comprehensive lake management plan for Big Chetac with an overarching goal of improving lake health. One of the management objectives identified in the plan is to control the aquatic invasive species curly leaf pondweed through herbicide treatments. The goal is to reduce the weed's abundance in order to increase native plant diversity and abundance, thus improving habitat for fish and other aquatic organisms. A study conducted by the lake association consultant has also shown that curly leaf pondweed biomass is a significant source of phosphorus (15 percent) to the lake system. The elevated phosphorus levels on are contributing to the toxic blue-green algae blooms that occur annually on Lake Chetac. By reducing the source of phosphorus to the lake, it is anticipated toxic blue-green algae blooms will decrease, resulting in healthier lake conditions for recreational use.

- The lake association received a DNR aquatic invasive species control grant in 2013 to control curly leaf pondweed as outlined the association's DNR approved lake management plan. As a part of the lake association's grant project, herbicide treatments were conducted in 2013 and 2014, with another treatment planned for 2015.

- The lake association applied for, and was granted, an aquatic plant management permit from DNR to control the non-native aquatic invasive plant curly leaf pondweed in 2013, 2014 and 2015. All permit and treatment notification requirements were met by Big Chetac and Birch Lakes Association as outlined in Wisconsin law. The lake association hired a licensed applicator to conduct the herbicide treatments.

- A DNR lakes biologist reviewed the following reports to evaluate and prepare the 2014 herbicide treatment results summary below: (1) a pre- and post-treatment aquatic plant survey report developed by the lake association's consultant, Endangered Resource Services; (2) a curly leaf pondweed turion or reproductive structure monitoring report developed by the lake association's consultant; and (3) a herbicide residual monitoring report developed by DNR's consultant. Final reports are available at the websites listed above.

2014 Treatment Results Summary (please reference pages 3 and 4 for more detailed results)
The herbicide, Aquathol K, was applied by the lake association's applicator at a concentration of 1.0 parts per million (ppm) active ingredient to 90 acres of North Bay on May 20th, 2014. The **herbicide treatment was significantly effective in controlling the weed within the north bay** treatment area. Curly leaf pondweed was found at 205 points pre-treatment and 37 points post- treatment, resulting in an **82 percent reduction of the aquatic invasive species.**

- **Following herbicide treatment, the post treatment plant surveys of the north bay documented an increase in native plants**: three additional native species were present after treatment. Five native aquatic plants species were found prior to treatment in the north bay treatment area and eight native aquatic plants species (not including filamentous algae) were found after treatment.

Fisheries Evaluation Results

The Lake Chetac fishery has been surveyed several times by DNR Fisheries staff both before and after the 2013 and 2014 herbicide treatments. These surveys were conducted to address questions received by the public. Below is a summary of the findings.

Young-of-year panfish from a mini-fyke net set in the herbicide treatment area in Lake Chetac during August 2014.

- **Panfish abundance (crappie and bluegill primarily) has been increasing** over the last decade or so. This appears to be completely unrelated to the herbicide treatment.

- Because panfish abundance has been increasing, **size of panfish has been decreasing.** This is a very common pattern that has been observed in many lakes throughout the area over the same time span.

- **There is no indication that fish of any species are avoiding the treatment area.** Catch rates in fishery surveys are as high or higher in the area treated with herbicide.

- There is **no indication that the herbicide treatment has hurt natural reproduction** of panfish. Young panfish have been found throughout the lake.

- There is **no indication** based on the fish condition and length/weight ratio **that the herbicide treatment has caused fish to be limited by food availability.**

- There is **no indication that the herbicide treatment has caused die-offs of fish**. However, die-offs from naturally occurring bacteria called "columnaris" are common in the spring.

Walleye recruitment continues to be poor but is similar to other area lakes. The DNR plans to continue stocking walleye. **2014 Treatment Results and Report Information**

- The herbicide Aquathol K was applied to 90 acres of the north bay of Lake Chetac on May 20, 2014 to control the aquatic invasive plant curly leaf pondweed. The herbicide was applied at a concentration of 1.0 ppm by the lake association's contractor, Midwest Aquacare with DNR onsite for supervision. The 2014 approved herbicide concentration was reduced by two-thirds following the results of the 2013 treatment.

- Aquathol K is a dipotassium salt formulation of endothall and is commonly used for curly leaf pondweed control on many lakes throughout Wisconsin. Aquathol K is approved by the EPA for aquatic plant control and the fact sheets are available online at: http://dnr.wi.gov/lakes/plants/factsheets/EndothallFactsheet.pdf and http://dnr.wi.gov/lakes/plants/factsheets/GeneralherbicideFAQ.pdf .

- Two bays were used as control areas to assess curly leaf pondweed and native plants under non-treatment conditions: the bay adjacent to the DNR boat launch and the bay adjacent to Fred Thomas Resort. No herbicide was applied to these bays.

- On the day of treatment, the wind was reported as 4-9 mph from the SW and the water temperature was 57.4°F.

- As a part of DNR research efforts to better understand herbicide movement, herbicide concentration monitoring occurred at three sites within the treatment area and six additional sites outside the treatment area for seven days after treatment. A final report is available at the websites listed below.

- As expected, low levels of herbicide were detected at the herbicide monitoring sites outside the treatment area. Herbicide dissipation within lakes is expected and has been demonstrated on many aquatic invasive species control projects throughout the state. Requiring treatments to occur in early spring before native plants are actively growing and during relatively calm weather conditions minimizes impacts to non-target plants.

- Aquatic plant monitoring (pre- and post-treatment) was conducted by scientists from the lake association's consulting firm, Endangered Resource Services using the point-intercept method per DNR guidance. The pre-treatment aquatic plant survey occurred on May 17-18, 2014 and the post-treatment aquatic plant survey occurred on June 14-15, 2014. The plant survey report is available at the websites listed below.

- Monitoring of curly leaf pondweed turions occurred on November 1-2, 2014 by the lake association consultants from Endangered Resource Services. Turions are curly leaf pondweed reproductive structures in the lake sediment. The turion report is available at the websites listed below.

Full reports and fact sheets are available on DNR' s Lake Chetac and Big Chetac and Birch Lake Association's (BCABLA) websites.

North Bay Treatment Area Results

- The herbicide treatment was effective at controlling the aquatic invasive plant, curly leaf pondweed within the 90 acre treatment area. The aquatic invasive species was found at 205 points pre-treatment and 37 points post-treatment. Mean rake densities were reduced from 1.49 pre-treatment to 1.02 post treatment. The plants that were present after treatment were small plants that likely germinated after the treatment.
(Rake density is based on a 1-3 scale with 3 being most dense; i.e. a rake full of the plant.)

- Five native aquatic plants species were found prior to treatment in the North Bay and eight native aquatic plants species (not including filamentous algae) were found after treatment. Forked duckweed was the only native plant species that declined after treatment in the treatment area. Forked duckweed is not rooted but rather floats around on the surface of the lake and thus is subject to movement due to wind and wave action. Any reductions or increases in duckweed are likely influenced by natural movement; thus it is difficult to draw any conclusions about herbicide effects on duckweed.

- Herbicide concentration monitoring results indicate that herbicide concentrations within the treatment area dissipated to less than the target concentration (1.0 ppm) by six hours after treatment.

- The 2014 turion monitoring data demonstrate a significant decline in turion densities within the north bay treatment area when compared with the fall 2013 data. The 2014 turion density increased in the non-treatment bays compared with fall 2013 data.

Fred Thomas Bay Results (Non Treatment Bay)

- Herbicide concentration monitoring results indicate that herbicide was detected at very low concentrations beginning three days after treatment.

- During the pre-treatment plant survey, curly leaf pondweed was documented at 46 sites with a mean rake density of 1.60. After treatment, it declined significantly to 28 sites with a mean rake density of 2.00. As noted in the report, the curly leaf pondweed on the east side of this bay seemed to have orange margins, likely as a result of the herbicide.

- The same three plant species were found before and after treatment. One native plant species, white stem pondweed, increased significantly after treatment.

Boat Landing Bay Results (Non Treatment Bay)

- During the pre-treatment plant survey, curly leaf pondweed was documented at 19 sites with a mean rake density of 1.42. After treatment, it was documented at 19 sites with a mean rake density of 2.26.

- One native aquatic plant species was found pre-treatment. Three native aquatic plant species were found after treatment (not including filamentous algae).

Evaluation of Herbicide Impacts on the Fish Community of Lake Chetac

Max Wolter- Sawyer County Fisheries Biologist WDNR

Introduction

This document was prepared to address fishery concerns on Lake Chetac that have been raised in response to the herbicide treatment of 90.8 acres of the north end of Lake Chetac (shown in Figure 1). The Hayward fish team surveyed Lake Chetac in 2009 and 2013 as a part of our baseline monitoring schedule. We returned in the spring and late-summer of 2014 to gather more data regarding possible fishery impacts from herbicide treatments that occurred in the spring of 2013 and 2014.

We have conducted several special evaluations on this lake to address questions raised by concerned stakeholders and to understand any possible effects that herbicide treatments in the lake might be having. Bluegill are a primary species of interest in Lake Chetac and are thus the focal species in this report. This report is organized under major questions that stakeholders have raised concerning the fishery which we hope to address within this report. The questions are:

Question 1: Are fish avoiding the herbicide treatment area?
Question 2. Are the bluegill in Lake Chetac in worse condition, or skinnier, because of the herbicide treatment?
Question 3. Has herbicide treatment hurt reproduction of panfish?

Question 1: Are fish avoiding the herbicide treatment area?

Fishery survey data presented in this section is from boom electrofishing surveys conducted in the spring of the year. In 2009 only one transect was surveyed (approximate location of T4 in Figure 1). In 2013 locations T1, T2, T3, and T4 were surveyed. In 2014 locations T1 and T2 were surveyed again and T5 was added to provide a sample from the immediate vicinity of the herbicide treatment.

Figure 1. Map of Lake Chetac showing the herbicide treatment area and the fishery survey locations in spring of 2013 and 2014.

The 2013 and 2014 surveys were both conducted after the herbicide treatment for that year had already occurred (Table 1). During electrofishing surveys all species of fish were captured and counted which provides a relative estimate of species abundance and size.

Table 1. Herbicide treatment and fishery survey dates on Lake Chetac.

Year	Herbicide Treatment Date	Fish Survey Date
2009	None	5-19
2013	5-28	6-8
2014	5-20	5-27

Electrofishing capture rates for bluegill by transect are summarized in Table 2. In general, electrofishing capture rates were **highest** on the north end of the lake in both 2013 and 2014. Surveys in T5 (immediately adjacent to and within the herbicide treatment area) showed capture rates and sizes of bluegill that were similar if not higher than other areas of the lake. There is limited evidence that abundance has increased since 2009, but the 2009 survey included only one transect and may not have been representative of the whole population. Size of bluegill surveyed is shown in Table 3 as the percentage of bluegill in each sample that were over 7 inches in length. Size appears to be declining in Lake Chetac over time (Table 3).

Table 2. Relative abundance of bluegill (# caught per mile surveyed) across transects in 3 different survey years. See Figure 1 for transect locations. Transects are shown in geographic order from north (T5) to south (T4).

	Year		
Transect	2009	2013	2014
T5	-	-	250
T1	-	324	288
T2	-	204	146
T3	-	184	-
T4	153	84	-
Average	153	199	228

Table 3. Relative size of bluegill (% of fish over 7 inches) across transects in 3 different survey years. See Figure 1 for transect locations. Transects are shown in geographic order from north (T5) to south (T4).

	Year		
Transect	2009	2013	2014
T5	-	-	20.8
T1	-	23	17
T2		25	11
T3	-	25	-
T4	42.5	21	-
Average	42.5	23.5	16.3

Conclusions on Question 1

There is no evidence from electrofishing data that bluegill are avoiding the area of Lake Chetac that received herbicide treatment or that the treatment has decreased abundance of bluegill. In fact, both the abundance and size of bluegill in 2013 and 2014 appear to be generally higher in the north end of the lake where herbicide treatments occurred, and decrease as you go south.

Question 2. Are the bluegill in Lake Chetac in worse condition, or skinnier, because of the herbicide treatment?

To answer this question we collected 51 bluegill from throughout the lake ranging in length from 4 to 8 inches. Length and weight were measured on each fish which allowed us to calculate "relative weight". Relative weight is a measurement that compares the actual weight of each fish to a "standard" weight for a fish of that length. Standards are calculated using bluegill from across North America. A relative weight value of 100 represents the 75th percentile for the species, or a fish with above average weight for its length. Values of 80-100 were common in Chetac bluegill and fall within a normal range for a bluegill population (Figure 2). Relative weight looked similar across all sizes of fish

examined. It should also be noted that weight of fish fluctuates seasonally and relative weight would be higher in the spring when fish are preparing to spawn.

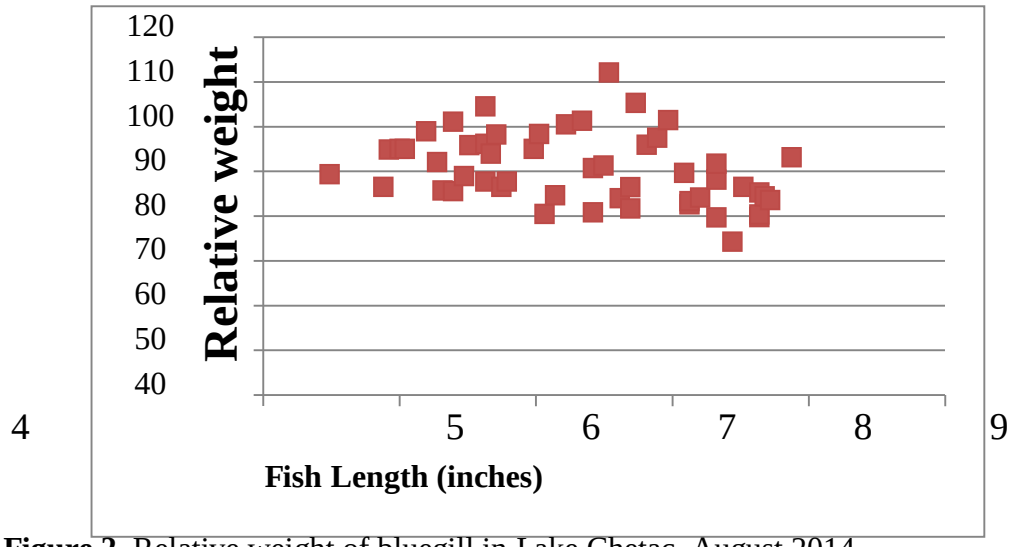


Figure 2. Relative weight of bluegill in Lake Chetac, August 2014.

Conclusions on Question 2. There is no indication that bluegill in Lake Chetac are in poor condition or are skinnier than a normal bluegill population. Relative weight can be used as an indicator that these fish have access to enough food to maintain normal body condition.

Question 3. Has herbicide treatment hurt reproduction of panfish?

To address this question we conducted a mini-fyke netting survey in August with several nets inside the area affected by the herbicide treatment and several nets in other areas of the lake (Figure 3).

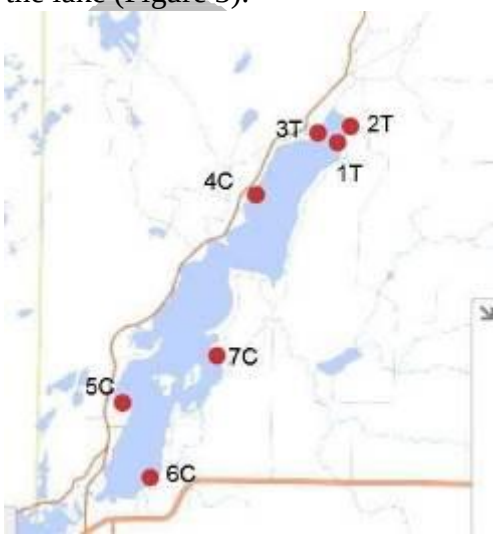


Figure 3. Net locations for the mini-fyke netting survey conducted on Lake Chetac in August of 2014. Nets denoted with a "T" were in proximity to the herbicide treatment area and those denoted with a "C" were away from the treatment area and are considered controls.

We used mini-fyke net catch rates as a measure of relative abundance of young-of-year panfish (i.e. fish born earlier that same year, 2014). Catch rates for bluegill were high in both the treatment and control areas with averages of 29.7 and 41.3 respectively (Figure 4). Catch rates for black crappie and yellow perch were both considerably higher in the treatment area.

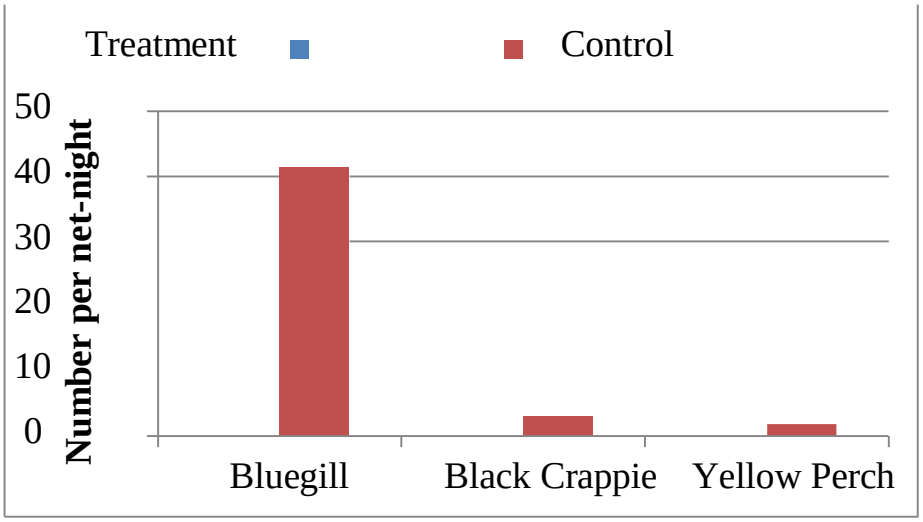


Figure 4. Capture rates of three species of young-of-year panfish captured with mini-nets in Lake Chetac, August 2014. Young-of-year panfish were considered to be fish less than 3 inches in length.

Figure 5. Photograph of young-of-year panfish from a mini-fyke net in Lake Chetac, August 2014.

Conclusions on Question 3

There is no indication that herbicide treatments have prevented successful spawning or recruitment of panfish. Capture rates for juvenile panfish were as high or higher in the treatment area as the rest of the lake.

Other species were captured in the mini-fyke nets in addition to panfish. Twelve different fish species were observed in both the treatment area and control area, indicating that there is no avoidance of the treatment area and providing further support for the conclusions related to Question 1.

Overall conclusions

While herbicide treatments are likely to have some kind of impact on the aquatic community, to date, there is no indication that treatments on Lake Chetac have caused an area of the lake to be avoided by panfish, decreased body condition of panfish, prevented successful reproduction of panfish, or had a meaningful effect on the fish population that would result in a decrease in the quality of fishing. The area treated with herbicide appears to still be occupied by fish and even shows catch rates of fish in surveys that are consistently higher than the rest of the lake. This area is also still productive in terms of panfish recruitment. During the course of this survey we observed several people
catching many fish in the treatment area as well as other areas of the lake.

This is not to say that the fishery of Lake Chetac currently has no problems. Panfish size has been declining over the course of many years and walleye recruitment has dwindled to exceptionally low levels while largemouth bass abundance has increased (see report found here for more information on these other species). This is a pattern that has been mirrored on many other lakes in the area (see Sissabagama, Nelson, Smith as examples)
and appears to be completely unrelated to herbicide application. However, steps are being taken to counteract these negative trends in the fish population including regulation changes and stocking.

Appendix III 2015 Property Owner Survey – Visual Snapshot of Results

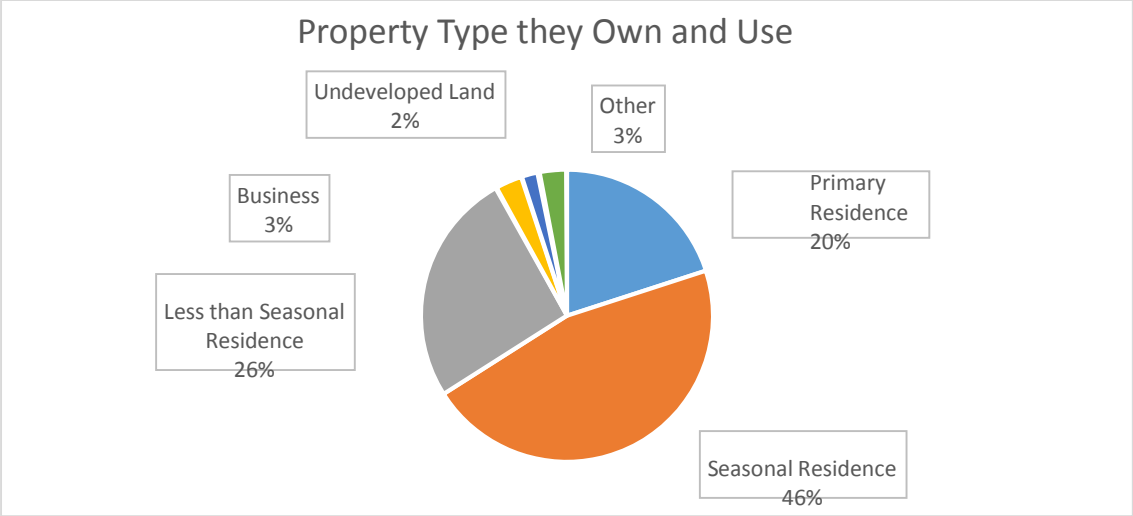
Big Chetac Lakeshore Property Owner Survey Results "At a Glance"

Survey Facts:

- Survey mailed to all 390 property owners (list supplied by Sawyer County).
- 244 people returned completed surveys, representing a 62.5% response rate.
- As a result of the outstanding response rate, the findings are considered statistically representative of the whole group.

Part 1: Big Chetac Lakeshore Owner Demographics (what do we know about them?):

- **Property Type they own and use:**



- **Length of Ownership:** Average of 19.74 years, with 34.57% owning their property over 20 years.
- **Days they use their property each year:** 45.19% over 100 days; 46.44% from 26 to 100 days; and, 8.37% less than 26 days each year.
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- **What activities they participate in on Big Chetac:** #1 Fishing from a boat (93%); #2 Fishing from shore (86%); #3 Rest/Relaxation (83%); and, #4 Pontoon Boating (70%).
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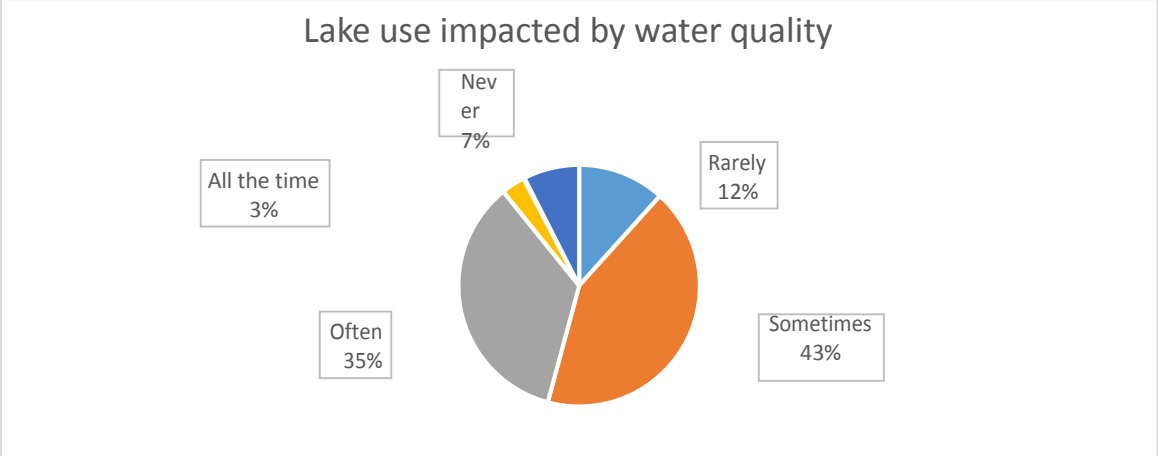
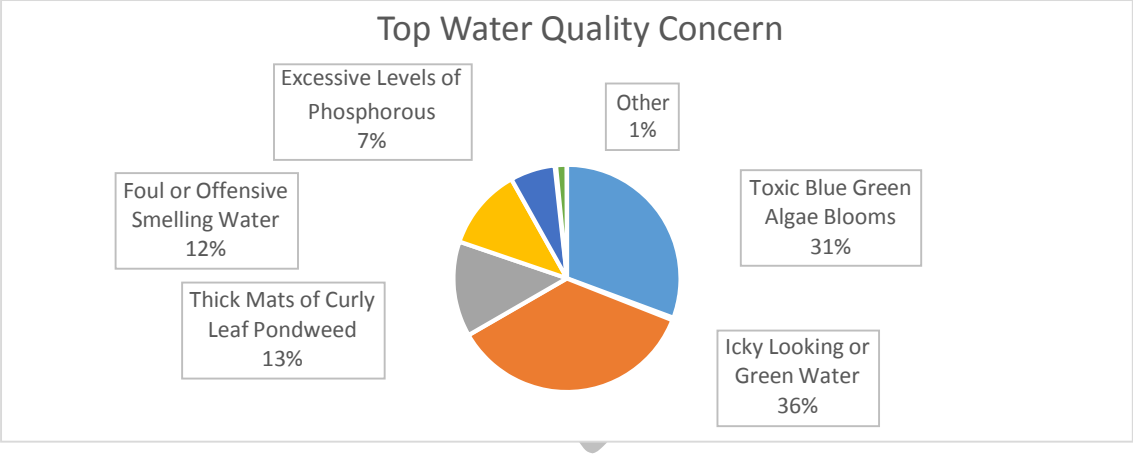
~~**Part 2: What Big Chetac Lakeshore owners think about water quality on the lake:**~~

- **During open water season, how often does the water quality of the lake negatively impact their enjoyment of the lake?:** Of 240 responses to this question, 92.5% indicated being impacted.

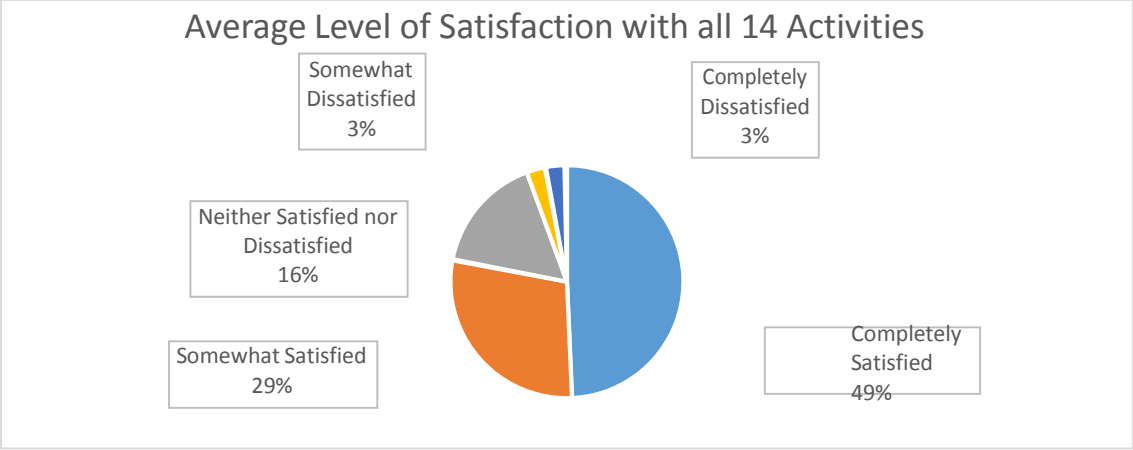


- **How do they rate the water quality of Big Chetac:** 77% consider the water quality of the lake to be fair to very poor, 22% considering it good and 1% as excellent.

- **What indicator of poor water quality concerns them the most:**

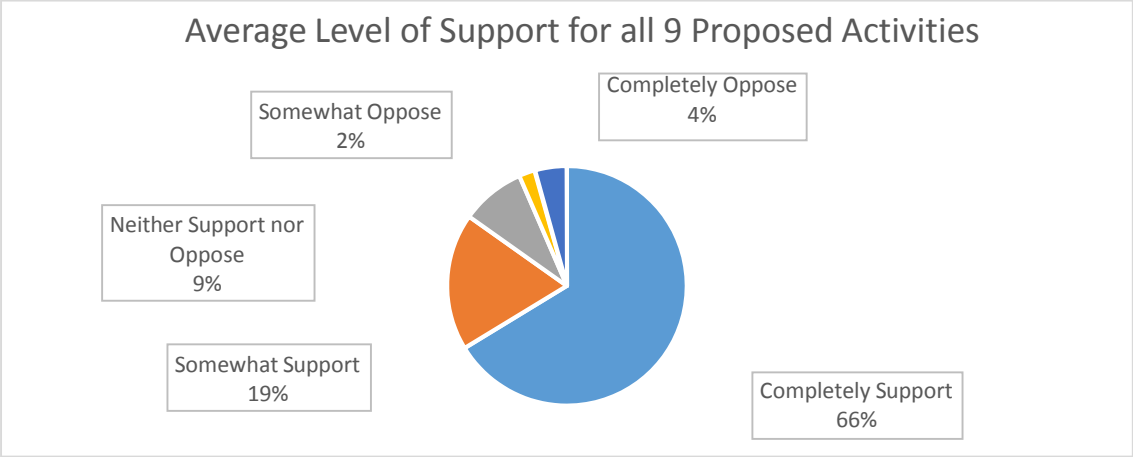


Part 3: What Big Chetac Lakeshore owners think about the work that the Lake Association has done to date in trying to improve water quality: 14 questions were asked in this section of the survey regarding 14 specific activities.



See full survey report for the detail by question, as the responses by question vary. The facts are really positive overall, with significant levels satisfaction reported with all of activities to date.

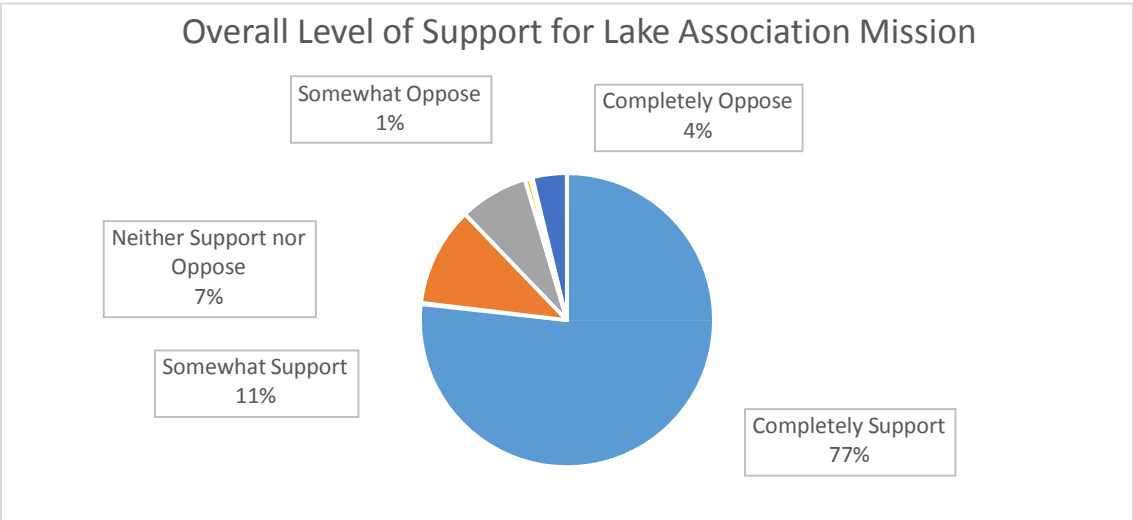
Part 4: What activities do Big Chetac lakeshore owners want the Lake Association to pursue in the future to improve water quality on Big Chetac?: 9 individual questions about water quality activities and 3 individual questions about funding those activities were asked in this section. Extremely significant support reported.



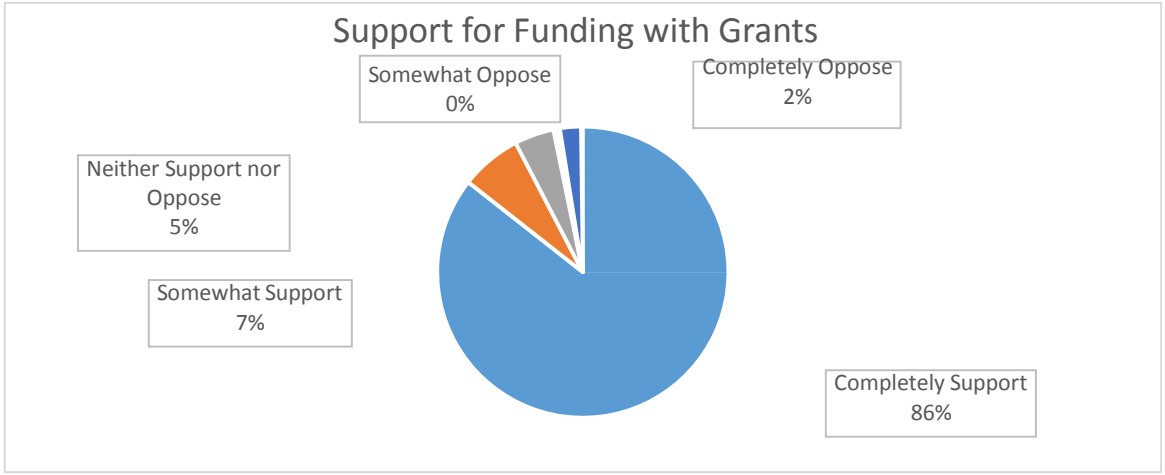
See full survey report for the detail by question, as the responses by question vary. The above indicates extremely significant support for all 9 of the proposed water quality activities, and very few individuals being neutral to the suggested activities. The support for these activities exceeds the level of satisfaction shown for what the lake association has already completed.

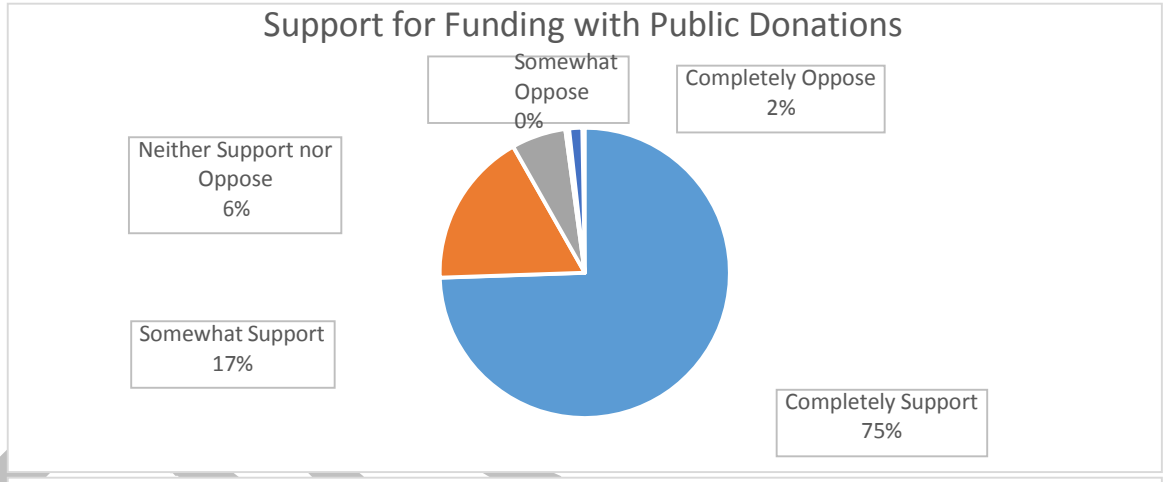
For the detail regarding the 3 funding questions see the full report. There was significant support indicated for using grants, and public donations. Of the three proposed activities, only support for the formation of a lake district appears to be more divided, but still indicating more support for forming one than not.

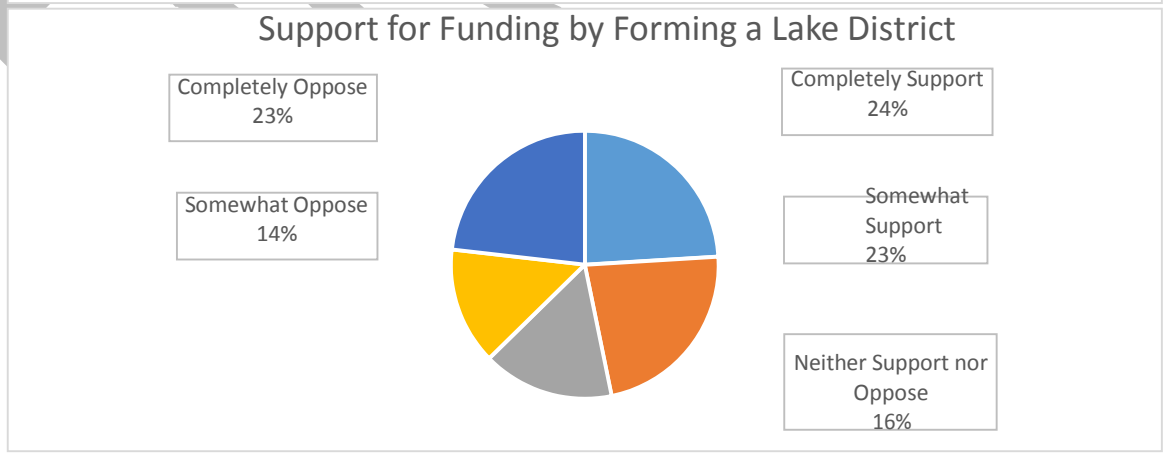
What level of support to Big Chetac Lakeshore owners have for the Lake Association's mission to improve water quality? : There is extremely significant support for continuing the mission.



Part 5: How do Big Chetac Lakeshore owners want the Lake Association to Fund the actual activities undertaken: Grants, Public donations and/ or the formation of a lake district.

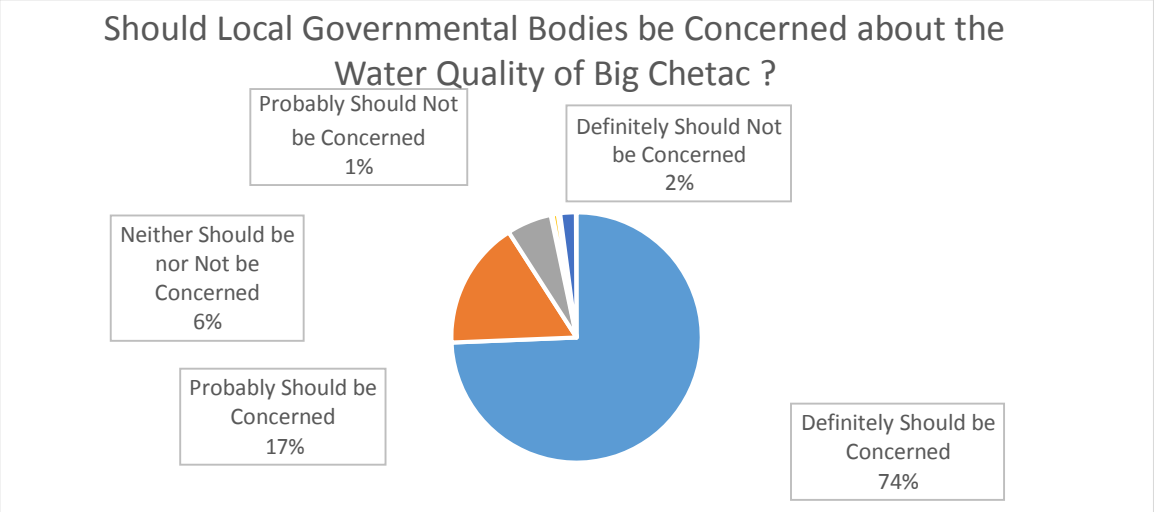


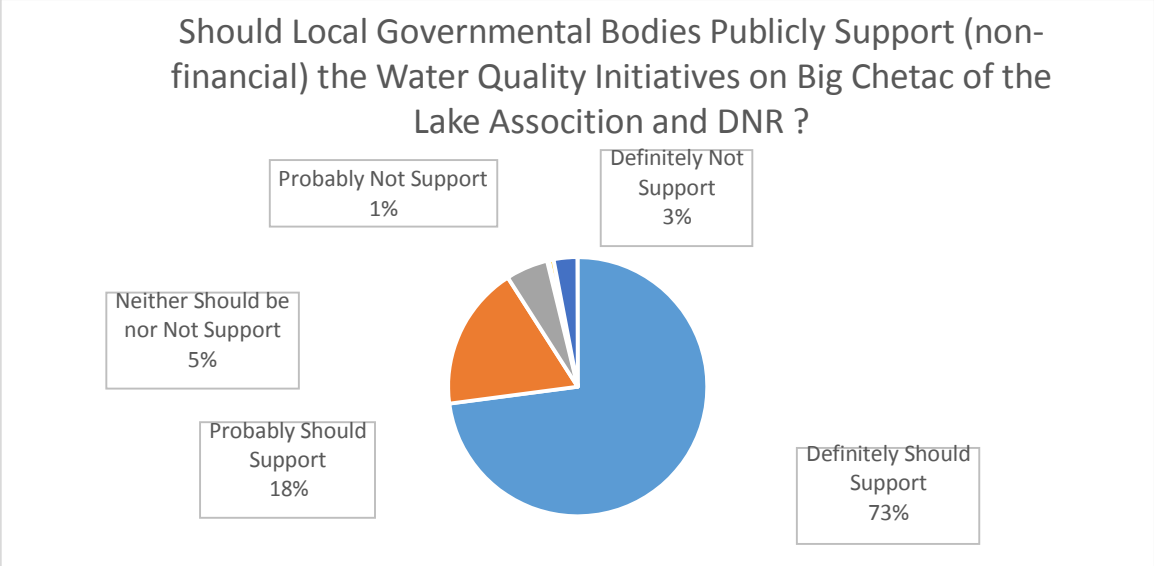


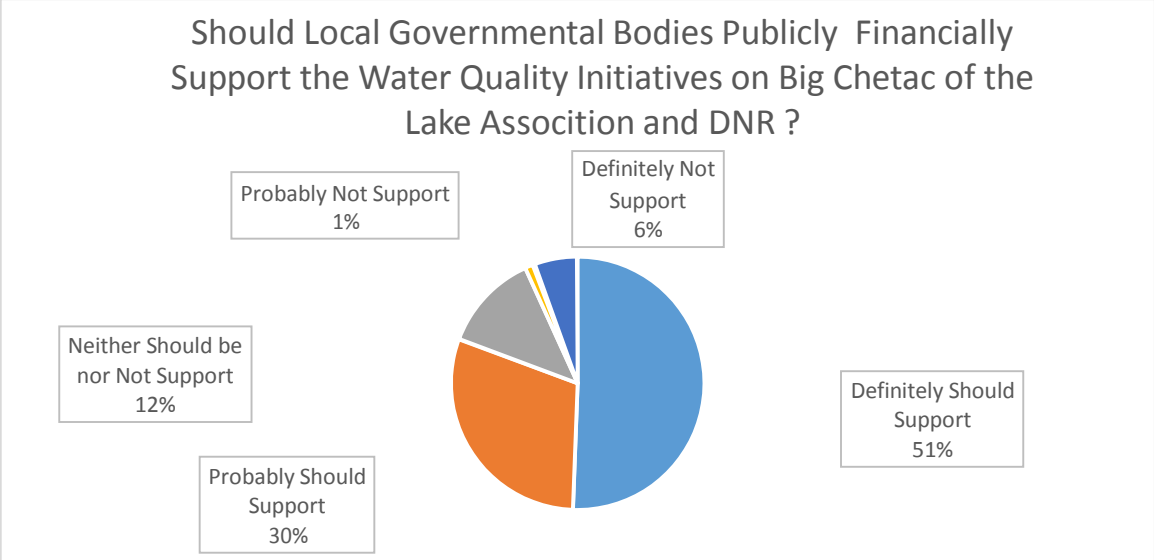


If they were required to, how much money would the lakeshore owners be willing to contribute annually to pay for water quality initiatives on Big Chetac?: 202 responded, with 14.4% saying $0; 20.8% less than $100; 33.2% from $100 to $149; 14.4% from $150 to $299; 2.9% from $300 to $499; and, 14.3% stating $500 or more. The average reported dollars was $190.74 per year.

Part 6: Should the local governmental bodies (Edgewater Township, Village of Birchwood and Town of Birchwood) be concerned about the water quality in Big Chetac, and publicly support the activities of the Lake Association and DNR to improve water quality of Big Chetac (both non financially and financially)?: Yes to all three questions.







On all three of the above questions, the findings were higher for Edgewater Township, than the other two entities. This makes sense, given Big Chetac is under the jurisdiction of Edgewater Township. Please see the full report for the breakdown of these questions by entity.

Appendix IV

AQUATIC PLANT MANAGEMENT STRATEGY

Northern Region WDNR Summer, 2007

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

ISSUES

- Protect desirable native aquatic plants.
- Reduce the risk that invasive species replace desirable native aquatic plants.
- Promote "whole lake" management plans
- Limit the number of permits to control native aquatic plants.

BACKGROUND

As a general rule, the Northern Region has historically taken a protective approach to allow removal of native aquatic plants by harvesting or by chemical herbicide treatment. This approach has prevented lakes in the Northern Wisconsin from large-scale loss of native aquatic plants that represent naturally occurring high quality vegetation. Naturally occurring native plants provide a *diversity of habitat* that *helps maintain water quality*, helps *sustain the fishing* quality known for Northern Wisconsin, supports common lakeshore wildlife from loons to frogs, and helps to provide the *aesthetics* that collectively create the "up-north" appeal of the northwoods lake resources.

In Northern Wisconsin lakes, an inventory of aquatic plants may often find 30 different species or more, whereas a similar survey of a Southern Wisconsin lake may often discover less than half that many species. Historically, similar species diversity was present in Southern Wisconsin, but has been lost gradually over time from stresses brought on by cultural land use changes (such as increased development, and intensive agriculture). Another point to note is that while there may be a greater variety of aquatic vegetation in Northern Wisconsin lakes, the vegetation itself is often *less dense*. This is because northern lakes have not suffered as greatly from nutrients and runoff as have many waters in Southern Wisconsin.

The newest threat to native plants in Northern Wisconsin is from invasive species of aquatic plants. The most common include Eurasian Water Milfoil (EWM) and CurlyLeaf Pondweed (CLP). These species are described as *opportunistic invaders*. This means that these "invaders" benefit where an opening occurs from removal of plants, and without competition from other plants may successfully become established in a lake. Removal of native vegetation not only diminishes the natural qualities of a lake, it *may increase the risk that an invasive species can successfully invade onto the site where native plants have been removed*. There it may more easily establish itself without the native plants to compete against. This concept is easily observed on land where bared soil is quickly taken over by replacement species (often weeds) that crowd in and establish themselves as new occupants of the site. While not a providing a
certain guarantee against invasive plants, protecting and allowing the native plants to remain may reduce the success of an invasive species becoming established on a lake. Once established, the invasive species cause far more inconvenience for all lake users, riparian and others included; can change many of the

natural features of a lake; and often lead to *expensive annual control plans*. Native vegetation may cause localized concerns to some users, but as a natural feature of lakes, they generally do not cause harm.

To the extent we can maintain the normal growth of native vegetation, Northern Wisconsin lakes can continue to offer the water resource appeal and benefits they've historically provided. A regional position on removal of aquatic plants that carefully recognizes how native aquatic plants benefit lakes in Northern Region can help prevent a gradual decline in the overall quality and recreational benefits that make these lakes attractive to people and still provide abundant fish, wildlife, and northwoods appeal.

GOALS OF STRATEGY:

1. Preserve native species diversity which, in turn, fosters natural habitat for fish and other aquatic species, from frogs to birds.
2. Prevent openings for invasive species to become established in the absence of the native species.
3. Concentrate on a" whole-lake approach" for control of aquatic plants, thereby fostering systematic documentation of conditions and specific targeting of invasive species as they exist.
4. Prohibit removal of wild rice. WDNR – Northern Region will not issue permits to remove wild rice unless a request is subjected to the full consultation process via the Voigt Tribal Task Force. We intend to discourage applications for removal of this ecologically and culturally important native plant.
5. To be consistent with our WDNR Water Division Goals (work reduction/disinvestment), established in 2005, to "not issue permits for chemical or large scale mechanical control of native aquatic plants – develop general permits as appropriate or inform applicants of exempted activities." This process is similar to work done in other WDNR Regions, although not formalized as such.

BASIS OF STRATEGY IN STATE STATUTE AND ADMINISTRATIVE CODE

State Statute 23.24 (2)(c) states:
"The requirements promulgated under par. (a) 4. may specify any of the following:
1. The **quantity** of aquatic plants that may be managed under an aquatic plant management permit.
2. The **species** of aquatic plants that may be managed under an aquatic plant management permit.
3. The **areas** in which aquatic plants may be managed under an aquatic plant management permit.
4. The **methods** that may be used to manage aquatic plants under an aquatic plant management permit.
5. The **times** during which aquatic plants may be managed under an aquatic plant management permit.
6. The **allowable methods** for disposing or using aquatic plants that are removed or controlled under an aquatic plant management permit.
7. The requirements for plans that the department may require under sub. (3) (b). "

State Statute 23.24(3)(b) states:
"The department may require that an application for an aquatic plant management permit contain a plan for the department's approval as to how the aquatic plants will be introduced, removed, or controlled."

Wisconsin Administrative Code NR 109.04(3)(a) states:

"The department may require that an application for an aquatic plant management permit contain an aquatic plant management plan that describes how the aquatic plants will be introduced, controlled, removed or disposed. Requirements for an aquatic plant management plan shall be made in writing stating the reason for the plan requirement. In deciding whether to require a plan, the department shall consider the potential for effects on protection and development of diverse and stable communities of native aquatic plants, for conflict with goals of other written ecological or lake management plans, for cumulative impacts and effect on the ecological values in the body of water, and the long- term sustainability of beneficial water use activities."

APPROACH

1. After January 1, 2009* no individual permits for control of native aquatic plants will be issued. Treatment of native species may be allowed under the auspices of an approved lake management plan, and only if the plan clearly documents "impairment of navigation" and/or "nuisance conditions". Until January 1, 2009, individual permits will be issued to previous permit holders, only with adequate documentation of "impairment of navigation" and/or "nuisance conditions". No new individual permits will be issued during the interim.

2. Control of aquatic plants (if allowed) in documented sensitive areas will follow the conditions specified in the report.

3. Invasive species must be controlled under an approved lake management plan, with two exceptions (these exceptions are designed to allow sufficient time for lake associations to form and subsequently submit an approved lake management plan): a. Newly-discovered infestations. If found on a lake with an approved lake management plan, the invasive species can be controlled via an amendment to the approved plan. If found on a lake without an approved management plan, the invasive species can be controlled under the WDNR's Rapid Response protocol (see definition), and the lake owners will be encouraged to form a lake association and subsequently submit a lake management plan for WNDR review and approval.
b. Individuals holding past permits for control of *invasive* aquatic plants and/or "mixed stands" of native and invasive species will be allowed to treat via individual permit until January 1, 2009 if "impairment of navigation" and/or "nuisance conditions" is adequately documented, unless there is an approved lake management plan for the lake in question.

4. Control of invasive species or "mixed stands" of invasive and native plants will follow current best management practices approved by the Department and contain an explanation of the strategy to be used. Established stands of invasive plants will generally use a control strategy based on Spring treatment. (typically, a water temperature of less than 60 degrees Fahrenheit, or approximately May 31st, annually).

5. Manual removal (see attached definition) is allowed (Admin. Code NR 109.06).

DOCUMENTATION OF IMPAIRED NAVIGATION AND/OR NUISANCE CONDITIONS

Navigation channels can be of two types:

- Common use navigation channel. This is a common navigation route for the general lake user. It often is off shore and connects areas that boaters commonly would navigate to or across, and should be

of public benefit.

- Individual riparian access lane. This is an access lane to shore that normally is used by an individual riparian shore owner.

Severe impairment or nuisance will generally mean vegetation grows thickly and forms mats on the water surface. Before issuance of a permit to use a regulated control method, a riparian will be asked to document the problem and show what efforts or adaptations have been made to use the site. (This is currently required in NR 107 and on the application form, but the following helps provide a specific description of what impairments exist from native plants).

Documentation of *impairment of navigation* by native plants must include:

a. Specific locations of navigation routes (preferably with GPS coordinates)
b. Specific dimensions in length, width, and depth
c. Specific times when plants cause the problem and how long the problem persists
d. Adaptations or alternatives that have been considered by the lake shore user to avoid or lessen the problem
e. The species of plant or plants creating the nuisance (documented with samples or a from a Site inspection)

Documentation of the *nuisance* must include:

a. Specific periods of time when plants cause the problem, e.g. when does the problem start and when does it go away.
b. Photos of the nuisance are encouraged to help show what uses are limited and to show the severity of the problem.
c. Examples of specific activities that would normally be done where native plants occur naturally on a site but can not occur because native plants have become a nuisance.

DEFINITIONS

Manual removal: Removal by hand or hand-held devices without the use or aid of external or auxiliary power. Manual removal cannot exceed 30 ft. in width and can only be done where the shore is being used for a dock or swim raft. The 30 ft. wide removal zone cannot be moved, relocated, or expanded with the intent to gradually increase the area of plants removed. Wild rice may not be removed under this waiver.

Native aquatic plants: Aquatic plants that are indigenous to the waters of this state.

Invasive aquatic plants: Non-indigenous species whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Sensitive area: Defined under s. NR 107.05(3)(i) (sensitive areas are areas of aquatic vegetation identified by the department as offering critical or unique fish and wildlife habitat, including seasonal or lifestage requirements, or offering water quality or erosion control benefits to the body of water).

Rapid Response protocol: This is an internal WDNR document designed to provide guidance for grants awarded under NR 198.30 (Early Detection and Rapid Response Projects). These projects are intended to control pioneer infestations of aquatic invasive species before they become established.

Appendix V
DNR 2010 Technical Review Teams Recommendations

WISCONSIN
DEPT. OF NATURAL RESOURCES

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor
Matthew J. Frank, Secretary
John Gozdzialski, Regional Director

Northern Region Headquarters
107 Sutliff Ave.
Rhinelander, Wisconsin 54501-3349
Telephone 715-365-8900
FAX 715-365-8932
TTY Access via relay - 711

September 10, 2010

Sandy Raby
2651 N East Shore Drive
Birchwood, WI 54817

Subject: Lake Chetac Plan Implementation (Technical Team Review)

Dear Sandy:

I had a chance to discuss the Lake Chetac project with the Lakes Technical Team this week. We reviewed the recommended management actions listed in Appendix K of your management plan. There was positive feedback on the listed recommendations and that you are on track but need to prioritize (it's a big complex problem). Many of the management actions listed are grant eligible under our grant programs, but we need to select the ones that are most feasible. We are opposed to the fluridone treatment recommendation.

The Technical Team agreed that the size and complexity of this project makes it difficult to attempt large scale management recommendations without further information. The groups recommendation was to initially implement management actions on a smaller scale to see what works (curly leaf pondweed (CLP) control), and also look into the feasibility of conducting an alum treatment in the North Basin.

The following are some recommendations/implementation options to start with:

1. Consider applying for a lake planning grant (or AIS established control grant if the cost is not too high) to complete the Bathtub Model that would provide information on the in-lake response (improvement) you would expect to achieve implementing different nutrient reduction options. For example how would the lake respond (Total Phosphorus/Chlorophyll A) if you controlled a certain amount of the CLP, or conducted an alum treatment in the North Basin? Would we achieve a desired in-lake benefit that would justify the cost?
2. We recommend early season chemical treatments (one to two sites/plots for treatment and one as a control) of CLP over a 3-5 year period. These would be smaller in scale and provide information on ability to control CLP, and evaluate native plant response. It would also require a pre/post monitoring evaluation as a component. These items along with other activities (Clean Boats/Clean Waters, Citizen Lake Monitoring, Shoreline Restoration and near shore runoff control) would be eligible under an AIS Established Control Grant.
3. We might consider harvesting as a control technique on a smaller scale. The problem is that there is a short window and that harvesting needs to be done early before turion production. We are currently evaluating a couple of other projects that conducted harvesting to see if they were successful.
4. Start conducting a feasibility analysis of an alum treatment in the North Basin.
5. Promote and implement watershed and near shore best management practices (BMP's).

I wish there were simple solutions, but this is a very large project and one that is difficult to recommend a large scale feasible solution. Please call me if you have any questions.

Sincerely

Jim Kreitlow
Lakes Biologist

Cc. Dave Blumer
Kristy Maki
Craig Roesler
Carroll Schaal
Tim Asplund

Appendix VI
DNR 2016 Technical Review Teams Recommendations

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

Scott Walker, Governor
Cathy Stepp, Secretary
Telephone 608-266-2621
Toll Free 1-888-936-7463
TTY Access via relay - 711

January 7, 2016

William Miller
Big Chetac and Birch Lakes Association
1668N Sunset Beach Dr.
Birchwood, WI 54817

Subject: DNR Lakes Technical Team Review of Lake Chetac Management Plan Activities

Dear Mr. Miller,

The Wisconsin DNR Lakes Technical Team (Tech Team) met on Wednesday, November 4, 2015 to review the technical merits of the draft Lake Chetac Management Plan. The Tech Team also reviewed the herbicide and aquatic plant monitoring data from the North Bay Curly Leaf Pondweed (CLP) control project since the Tech Team recommended that project in 2010. The September 10, 2010 Tech Team letter recommended that the CLP herbicide control project be on a smaller scale to provide information on the ability to control CLP and evaluate native plant responses. The key points of our evaluation and discussion are below.

Lake Management Plan

- Goal 1 of the Lake Management Plan currently states "Reduce the number of days the lake experiences severe algae blooms (days with P of >30 ug/L)." Consider re-wording this goal to "Reduce annual summer mean TP concentration to XX ug/L" or "Increase summer mean secchi depths to X feet." Annual means are easier to quantify than daily concentrations.
- Consider promoting and implementing shoreline Best Management Practices like buffers, rain gardens, and fish sticks to reduce nutrient runoff and increase shoreline habitat. DNR Lake Protection Grants are available to help fund many of these projects and DNR staff are willing to provide technical support for these projects.
- Many of the activities in the Plan will require detailed monitoring programs to assess the projects. Please work with DNR staff to develop specific monitoring strategies for each of the projects.

Herbicide Treatment

- The herbicide treatments have been effective at reducing CLP within the North Bay.
- While the 2013 herbicide treatment in the North Bay effectively controlled CLP, the higher herbicide concentration of the 2013 treatment also caused a reduction of two native plants Coontail (*Ceratophyllum demersum*) and Small Pondweed (*Potamogeton pusillus*). The plant monitoring data show that those two native plants have not yet recovered as of 2015, even with reduced herbicide concentrations for the 2014 and 2015 treatments.
- Poor water clarity is likely a bigger barrier for native plant growth than competition from CLP. The native plant data from Fred Thomas Bay accentuates this point. Following the 2013 herbicide treatment, Small Pondweed was present at 33% and Flat-stem pondweed was present 26% of the monitoring points in Fred Thomas Bay; both species increased post-treatment compared to 2013 pre-treatment data. However, both of the plants species were absent during the pre and post treatment plant surveys in 2014. It is likely that the deep snow during the 2013-2014 winter, shaded and killed these plants. Late ice out that spring may have been a factor as well. In 2015, Flat-stem pondweed was still absent, and Small pondweed was present at 2 points pre-treatment and 1 point post-treatment. The Tech Team suspects that

poor water clarity in the lake prevents native plants from recovering from a disturbance. Therefore, the Tech Team does not support herbicide treatments in new areas of the lake until native plants increase significantly within the North Bay treatment area or the lake water clarity improves significantly.

- At this time, the Tech Team does not support an herbicide treatment of Bed 4 as described in the draft Lake Management Plan. Consider working with the Department to develop a dye study for Bed 4 prior to applying for a permit to treat Bed 4 with herbicide. The study would use dye as a surrogate for herbicide to determine if a treatment would provide adequate herbicide contact time for effective CLP control, if the dye moves into the wild rice beds, and if the dye leaves the lake via the outlet.
- Individual riparian treatments are not an effective way to manage CLP. The manufacturer of Aquathol K does not recommend treating areas less than 5 acres in size as the herbicide is likely to dissipate off site quickly and have reduced efficacy. Please remove individual treatments from the plan as an option and incorporate smaller navigation issues into larger, comprehensive CLP management zones.

Alum Treatment

- The Tech Team supports the Alum treatment proposal for the North basin as written in William James' Alum Dosage Report. Modeling results show that an Alum treatment can dramatically decrease in-lake phosphorus concentrations and increase water clarity. This would mean a decrease in the frequency of toxic blue-green algae blooms and promote native aquatic plant growth.
    - It is important to note that chlorophyll a concentrations (measure of algae in the water) in Lake Chetac exceed 50 ug/L each summer. According to the World Health Organization, waters with chlorophyll a concentrations that exceed 50 ug/L exhibit a High probability of adverse human health effects due to blue-green algae toxins.
- Future CLP management may be necessary within the North Basin to control CLP populations and the phosphorus they contribute to the lake in order to prolong the results of an Alum treatment.

Alternative CLP control options

- The Tech Team supports the Lake Association's decision to not pursue CLP harvesting at this time for long-term CLP control. While harvesting can be effective at removing CLP biomass and associated nutrients, herbicides are more effective and efficient than harvesters at reducing turions for long-term CLP control. Further, in lakes where harvesting is a successful management tool, Lake Districts or local units of government have established monetary and human resources specifically dedicated to harvesting.
- The Department cannot permit individual aerators for CLP control. Please remove aerators from the Plan.

Thanks to you and the Big Chetac and Birch Lakes Association for your efforts to protect and improve Lake Chetac. We look forward to working with the Lake Association and local community to protect and improve this valuable resource. If you have questions or concerns, please feel free to setup a meeting with us to discuss these issues in more detail.

Sincerely,

Alex Smith

CC: Cherie Hagen, Scott Van Egeren, Scott Provost, Carroll Schaal, John Gozdzialski – WDNR
Lisa David – GLIFWC
Dan Tyrolt – LCO Conservation Department
Dale Olson – Sawyer County Zoning and Conservation Department
Vicki Busick, Linda Zillmer – Village of Birchwood
Natalie Clemens – Town of Edgewater
Nicole Minnick – Town of Birchwood