Prepared by: EOR

For the: **Muskellunge Lake Association**

2023 Muskellunge Lake EWM Control Grant

Cover Images

Muskellunge Lake Association Volunteers, Joe Pallardy (EOR) - September 2023 Aquatic Plant Survey

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1. BACKGROUND

Eurasian Watermilfoil (EWM) was first discovered in Muskellunge Lake in 2016. Despite volunteer and professional hand-harvesting efforts in 2017 and 2018, and Diver Assisted Suction Harvesting (DASH) efforts in 2019, the total area of the lake with established EWM populations continued to expand. No treatments were enacted in 2020 as the extent of the EWM infestation exceeded the capacity for physical removal techniques to provide a viable solution. In 2021, the Muskellunge Lake Association (MLA) was awarded a Eurasian Watermilfoil Control Grant for $49,920.

The MLA worked collaboratively with EOR and the WDNR to secure a WDNR Surface Water (AIS control) Grant that focused on the use of ProcellaCOR to target the densest stands of EWM (Tier 1, Tier 2) in June of 2021. A portion of the funding procured from this WDNR grant was spent on treating the 19.8-acre area identified in Figure 1. EWM has not been found in Muskellunge Lake since the 2021 treatment.

2021 Muskellunge Lake EWM Treatment Site/Herbicide Rate Data				ProcellaCOR EC Liquid florpyrauxifen-benzyl		
EWM Site	Surface Acres	Mean Depth	Volume	Rate	PDU Per Acre	Total PDU
A-21	1.1	6.0	6.6	4.0	24.0	26.4
B-21	11.6	4.6	53.4	3.0	13.8	160.2
C-21	7.1	4.2	29.8	3.0	12.6	89.4
Totals	**19.8**		**89.8**			**276.0**

Figure 1. 2021 Muskellunge Lake Eurasian Watermilfoil Treatment Area.

2. PURPOSE

The purpose of this document is to review data collected during aquatic plant surveys conducted in 2023 and to use this information to support future management decisions. This report will be shared with DNR biologists to assess efficacy and determine adaptations to management strategy if need be. Specific goal statements are provided below.

3. GOAL STATEMENTS

Having measurable goals is important to maintain accountability and to assess the effectiveness of implemented treatment options. It is important to recognize that progress towards improving the quality of an aquatic plant community through the reduction of invasive species like EWM is often slow. The following goal statements were identified in the 2020 Muskellunge Lake Management Plan.

1) Management activities will maintain or increase native aquatic plants and water quality.
2) Management activities will leverage available funds to the maximum extent possible by implementing controls that provide the best return (reduction of EWM coverage) on investment (dollars spent).
3) Reduce Tier 1/Tier 2 Eurasian Watermilfoil (EWM) by 50% (e.g., from 12.0 acres to 6 acres by the end of 2021).
4) Reduce Tier 1/Tier 2 Eurasian Watermilfoil (EWM) growth by 50% (e.g., from 6 acres to less than 3 acres by the end of 2022).
5) The MLA will continuously update management strategies by incorporating lessons learned from area lakes including Upper and Lower Buckatabon Lakes.
6) The MLA will work with the DNR and its consultant to continuously monitor and graph the total surface area of EWM present in Muskellunge Lake.

Management activities will be refined annually based on data collected from continued professional and volunteer AIS monitoring and continued coordination with the WDNR. Proposed EWM management actions are subject to adaptive management-an iterative approach of implementation, evaluation, and course correction.

4. AQUATIC PLANT MONITORING

The following sections describe the protocol used to evaluate the aquatic plant community in 2023. It should be noted that EWM has not been found in Muskellunge Lake since the June 2021 ProcellaCOR treatment. All methods and protocols are in accordance with the WDNR Aquatic Plant Treatment Evaluation Guidance Document. No treatment (physical, biological, or chemical) was performed in 2022 or 2023, thereby negating the need for a pre vs. post treatment survey.

4.1. Sub-Sample Point Intercept

EOR worked collaboratively with MLA volunteers to conduct a sub-sample point intercept survey on September 8, 2023. All volunteers from the MLA were previously trained on aquatic plant identification, having attended multiple WDNR aquatic plant identification workshops. The survey included a site visit of the 132 sample points that were surveyed in 2021, each spaced 25 meters (approximately 75 feet). The sampling grid was strategically placed on top of the 19.8 acre-area identified in Figure 1. This area was not treated in 2022 or 2023.

The entire treatment area was surveyed from the boat; visual observations were supplemented with rake sampling at each sampling location. The distribution and density for all aquatic plant species at each sampling point was ranked on a scale from 0-3, where a density ranking of one (1) indicates only a few individual plants at a sample site while a ranking of 3 indicates an abundance of plants (Table 1).

Eurasian Water Milfoil (EWM) was not observed within the treatment area. Some aquatic plants may have begun to senesce prior to the survey date (9/3/2023).

Results from the 2023 Sub-P.I. are available here: Muskellunge 2023 Sub PI Final.xlsx.

Table 1. Aquatic Plant Growth Characteristics.

Aquatic Plant Presence (Growth Condition)	Description	Rake Density Equivalent	Stem Density/ Biomass	Example Image
Rare (Light)	Plants rarely reach the surface. Navigation and recreational activities generally are not hindered.	1, 2	**Stem density:** 0 - 40 stems/m2 **Biomass:** 0-51g-dry wt/m2	
Common (Moderate)	Broken surface canopy conditions. However, stems are usually unbranched. Navigation and recreational activities may be hindered. **Lake users may opt for control.**	2, 3	**Stem density:** 35 - 100 stems/m2 **Biomass:** 30-90g-dry wt/m2	
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4.2. Lake-wide Point Intercept Survey

EOR worked collaboratively with the MLA to conduct a lake-wide point intercept survey on September 8, 2023. The purpose of the lake-wide survey was to document the relative frequencies of all submergent and emergent species, and to calculate floristic quality index, and Simpson's diversity index. Results from the 2023 calculations were compared with results from previous lake-wide point intercept surveys conducted in 2009, 2017, 2020, 2021, and 2022. Results from the 2023 lake-wide point intercept survey are available here: Muskellunge PI 2023 Master Final.xlsx. Results from the 2023 surveys can be compared to the 2022 survey (Appendix A). Images of aquatic plants found in Muskellunge Lake are included in Appendix B.

5. WATER QUALITY RESULTS

Water quality results for Muskellunge Lake are available from the Wisconsin DNR's Water Explorer tool. No significant trends in water quality have been observed.

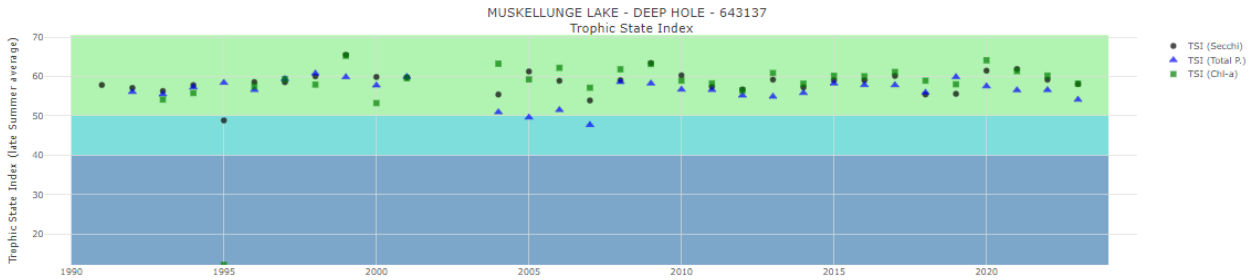


Figure 2. Trophic State

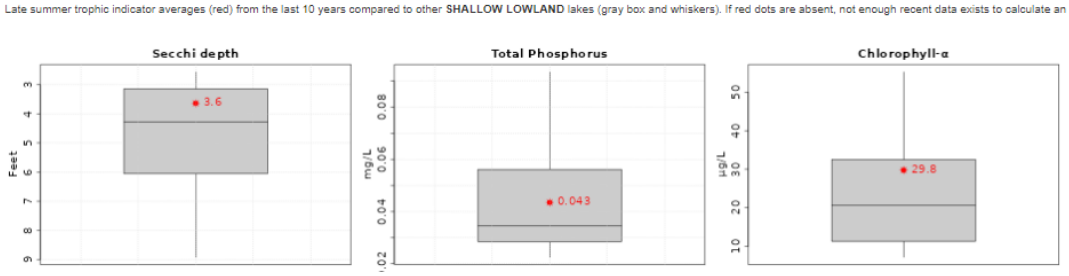
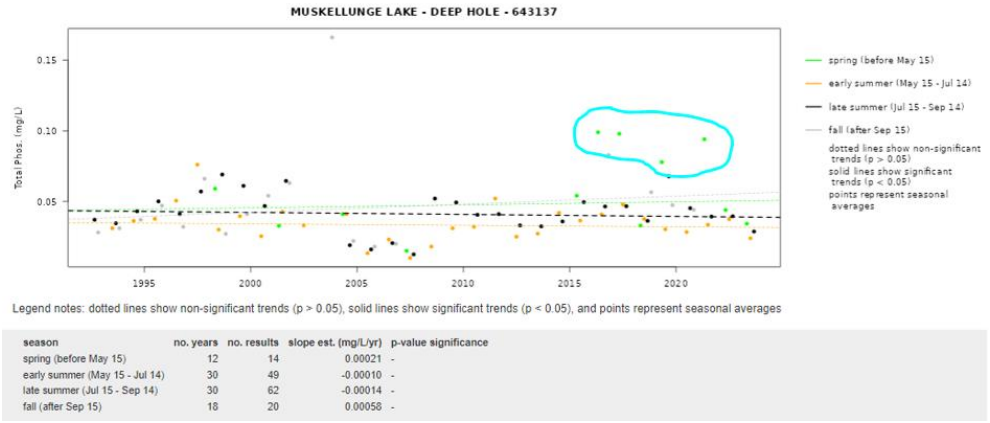


Figure 3. Trophic State Compared to Reference Lakes



season	no. years	no. results	slope est. (mg/L/yr)	p-value significance
spring (before May 15)	12	14	0.00021	-
early summer (May 15 - Jul 14)	30	49	-0.00010	-
late summer (Jul 15 - Sep 14)	30	62	-0.00014	-
fall (after Sep 15)	18	20	0.00058	-

Figure 4. Trends in Total Phosphorus (TP). TP concentrations are highest during spring turnover, immediately after ice-off.

6. DISCUSSION

6.1. Goal Statement Evaluation

The following paragraphs provide an evaluation of progress. A green check mark next to each goal statement indicates the goal has been achieved. An orange check mark indicates additional data is needed to properly evaluate if the goal statement has been achieved.

- ✓ **Management activities will maintain or increase native aquatic plants and water quality.**
    a. The aquatic plant community on Muskellunge Lake appears to be stable. Large-leaf pondweed has recolonized the shallow, center bar located in the middle of Muskellunge Lake.
    b. Water quality data collected pre/post treatment suggested in-lake Total Phosphorus concentrations remained at or below the state standard of 40 µg/L. Total Phosphorus concentrations observed during spring turnover provide additional validation that a portion of the lake is going hypoxic during the winter, leading to the release of phosphorus from the sediment-water interface.
- ✓ **Management activities will leverage available funds to the maximum extent possible by implementing controls that provide the best return (reduction of EWM coverage) on investment (dollars spent).**
    a. The 2021 treatment targeted a 19.8-acre treatment area at a total cost of 16,978.00 for an average treatment cost of $857.5/acre. By comparison, DASH efforts conducted on Muskellunge Lake in 2019 treated a total area of 0.30 acres at a cost of $5,200, resulting in an average treatment cost of $17,300/acre.
    b. No treatments occurred in 2022 or 2023. Given the Muskellunge Lake Association operates on a small budget, derived solely from volunteer contributions from lakeshore residents, it is imperative that future treatments strive to maximize return on investment.
- ✓ **Reduce Tier 1/Tier 2 Eurasian Watermilfoil (EWM) by 50% (e.g., from 12.0 acres to 6 acres by the end of 2021).**
    a. Achieved, EWM was not found in Muskellunge Lake in 2022 or 2023 post treatment surveys.
- ✓ **Reduce Tier 1/Tier 2 Eurasian Watermilfoil (EWM) growth by 50% (e.g., from 6 acres to less than 3 acres by the end of 2022).**
    a. Achieved, EWM was not found in Muskellunge Lake in 2022 or 2023 post treatment surveys.
- ✓ **The MLA will continuously update management strategies by incorporating lessons learned from area lakes including Upper and Lower Buckatabon Lakes.**
    a. N/A. EWM is not found in Muskellunge Lake. Strategies incorporated on Upper and Lower Buckatabon are not currently applicable to Muskellunge Lake.
    b. Jeff Rappold (MLA) has remained active in his efforts to convey lessons learned on Muskellunge Lake to nearby lake associations.
- ✓ **The MLA will work with the DNR and its consultant to continuously monitor and graph the total surface area of EWM present in Muskellunge Lake.**
    a. The MLA will continue to work with the DNR and its consultant to continuously monitor and graph the total surface area of EWM present in Muskellunge Lake.

7. RECOMMENDATIONS

The MLA has shifted its current and future management efforts towards prevention techniques. On 10/15/2023, the MLA secured approval from Vilas County to add new signage at the public landing along with tools to help prevent the introduction of all aquatic invasive species, to include EWM (Figure 5).

Further, The MLA is exploring an I-LIDS camera system as well. Securing on-going volunteers to do CBCW will remain a challenge for the foreseeable future.

Figure 5. Muskellunge Lake Boat Landing

APPENDIX A. 2022 MUSKELLUNGE LAKE AQUATIC PLANT MANAGEMENT REPORT

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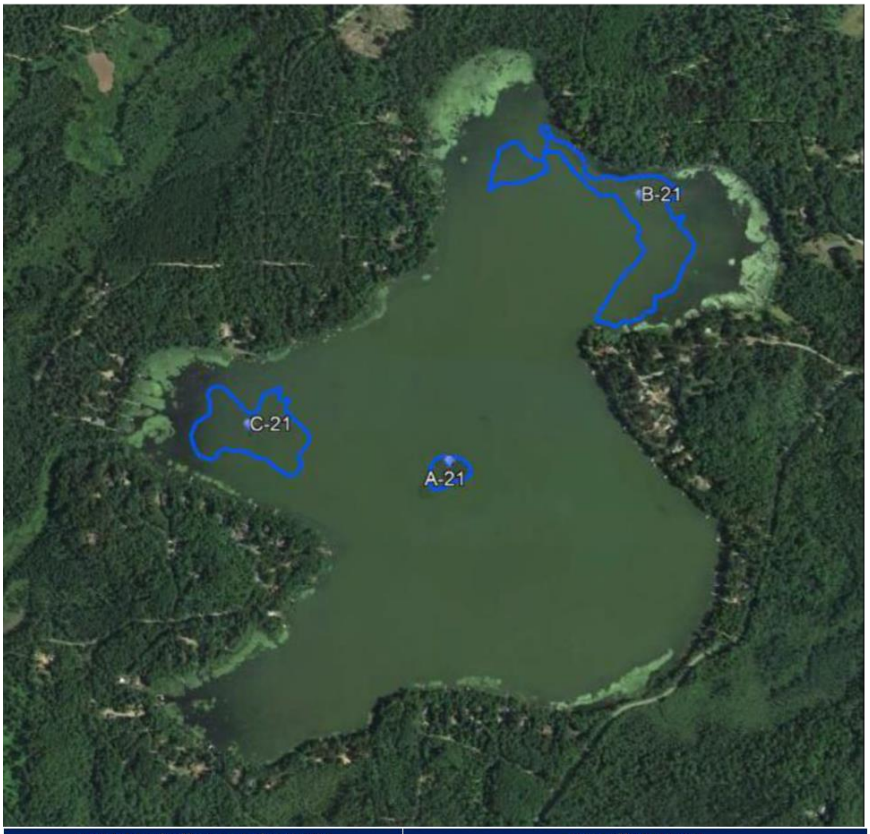

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Eurasian Water Milfoil (EWM) was not observed within the treatment area. MLA volunteers provided anecdotal evidence to suggest that overall aquatic plant density and diversity during the survey seemed lower in 2021 than in the past. One potential explanation for this was that the 2022 survey was conducted two weeks later than the 2021 survey. Some aquatic plants may have begun to senesce prior to the survey date (9/3/2022).

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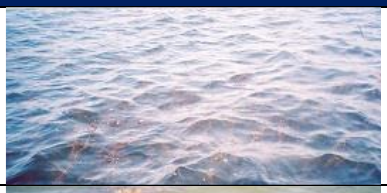
Rare (Light)	Plants rarely reach the surface. Navigation and recreational activities generally are not hindered.	1, 2	**Stem density:** 0 - 40 stems/m2 **Biomass:** 0-51g-dry wt/m2	
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5. AQUATIC PLANT SURVEY RESULTS

Results from the 2021 and 2022 sub-sample point intercept surveys have been uploaded to Muskellunge Lake's Interactive Arc GIS Online Map.

5.1. Sub-Sample P.I. Chi-Square Analysis

Common Name	Scientific Name	2021 – Pre-Treatment present	2021– Post Treatment present	2022 – No Treatment present	p	Significant change 2021*	Increase/ Decrease	Significant change 2022**
Eurasian water-milfoil	*Myriophyllum spicatum*	95	0	**0**	**0.0000**	***	-	***
Watershield	*Brasenia schreberi*	4	7	19	0.5202	No	+	**
Coontail	*Ceratophyllum demersum*	32	54	57	0.0794	No	+	**
Muskgrasses	*Chara sp.*	3	10	3	0.0945	No	+	No
Common waterweed	*Elodea canadensis*	25	41	32	0.1639	No	+	No
Slender naiad	*Najas flexilis*	10	14	12	0.6684	No	+	No
Spatterdock	*Nuphar variegata*	2	8	5	0.0970	No	+	No
White water lily	*Nymphaea odorata*	2	7	3	0.1503	No	+	No
Large-leaf pondweed	*Potamogeton amplifolius*	10	19	22	0.2046	No	+	*
Leafy pondweed	*Potamogeton foliosus*	8	7	6	0.5605	No	-	No
White-stem pondweed	*Potamogeton praelongus*	38	45	27	0.9758	No	+	No
Small pondweed	*Potamogeton pusillus*	6	17	3	0.0514	No	+	No
Fern pondweed	*Potamogeton robbinsii*	25	45	41	0.0679	No	+	*
Flat-stem pondweed	*Potamogeton zosteriformis*	8	26	2	0.0070	**	+	No
Wild celery	*Vallisneria americana*	8	25	36	0.0101	*	+	***
Softstem bulrush	*Schoenoplectus tabernaemontani*	1	1	0	0.9081	No	-	No

* Compares 2021 pre-treatment to 2021 post-treatment

** Compares 2021 pre-treatment to 2022 (no-treatment)

5.2. Lake-wide Point Intercept Comparison

Scientific Name	Common Name	C- Value	2009	2017	2020	2021	2022
Bidens beckii	Water marigold	8	✓	✓	✓	✓	
Brasenia schreberi	Watershield	6		✓	✓	✓	✓
Calla palustris	Water arum	9	✓		✓		
Carex comosa	Bristly sedge	5	✓				
Ceratophyllum demersum	Coontail	3	✓	✓	✓	✓	✓
Chara	Muskgrasses	7	✓	✓	✓	✓	✓
Eleocharis palustris	Creeping spikerush	6	✓	✓	✓	✓	✓
Elodea canadensis	Common waterweed	3	✓	✓	✓	✓	✓
Equisetum fluviatile	Water horsetail	7	✓	✓	✓	✓	
Heteranthera dubia	Water stargrass	6	✓				
Lemna minor	Lesser duckweed	5	✓				
Myriophyllum sibiricum	Northern water milfoil	7	✓		✓	✓	
Najas flexilis	Slender naiad	6	✓	✓	✓	✓	✓
Nitella spp.	Stoneworts	7	✓				
Nuphar variegata	Spatterdock	6	✓	✓	✓	✓	✓
Nymphaea odorata	White water lily	6	✓	✓	✓	✓	✓
Potamogeton amplifolius	Large-leaf pondweed	7	✓	✓	✓	✓	✓
Potamogeton foliosus	Leafy pondweed	6	✓	✓	✓	✓	✓
Potamogeton gramineus	Variable pondweed	7	✓	✓			
Potamogeton praelongus	White-stem pondweed	8	✓	✓	✓	✓	✓
Potamogeton pusillus	Small pondweed	7	✓	✓	✓	✓	✓
Potamogeton richardsonii	Clasping-leaf pondweed	5	✓				
Potamogeton robbinsii	Fern pondweed	8	✓	✓	✓	✓	✓
Potamogeton zosteriformis	Flat-stem pondweed	6	✓	✓	✓	✓	✓
Sagittaria latifolia	Common arrowhead	3	✓				
Schoenoplectus acutus	Hardstem bulrush	6		✓	✓	✓	✓
Schoenoplectus tabernaemontani	Softstem bulrush	4	✓			✓	✓
Sparganium angustifolium	Narrow-leaf bur-reed	9	✓				
Sparganium eurycarpum	Common bur-reed	5	✓	✓	✓	✓	✓
Sparganium fluctuans	Floating-leaf bur-reed	10		✓	✓		
Typha latifolia	Broad-leaved cattail	1	✓	✓	✓	✓	✓
Utricularia vulgaris	Common bladderwort	7	✓		✓	✓	
Vallisneria americana	Wild celery	6	✓	✓	✓	✓	✓
Floristic Quality Index (FQI) FQI = C*√S C= Mean C- value S= Number of species in sample	**Average C-Value**		6.2	6.4	6.3	6.1	**5.7**
	Number of species		25	21	21	23	**19**
	FQI		31.2	29.2	29.0	29.2	**25.0**
Simpson's Diversity Index (1-D): D= ∑(n / N)^2 n = # of instances of a particular species N = the total # of instances of all species D = Value between 1 and 0	**Simpson's Diversity Index**		0.86	0.82	0.91	0.91	**0.87**

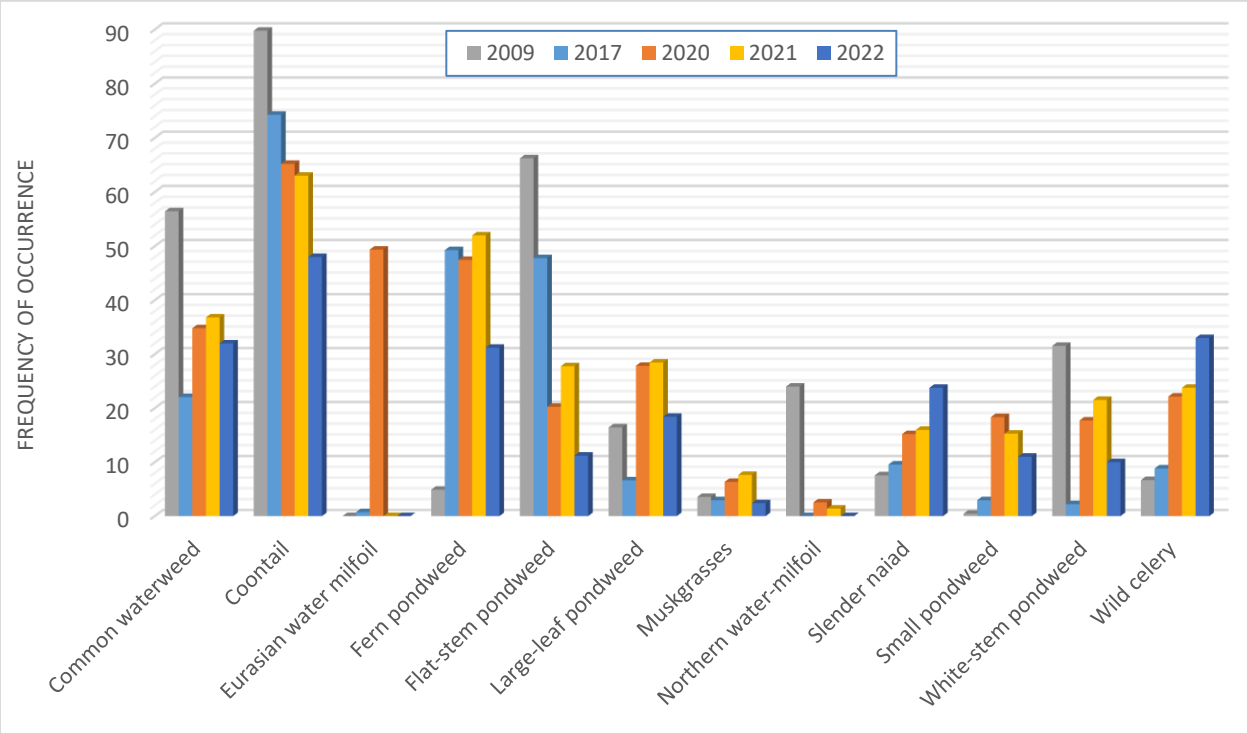


Figure 2. Frequency of Occurrence of aquatic plants from 2009, 2017, 2020, 2021, and 2022 Lake-wide Point Intercept Surveys.

5.3. Lake-Wide Volunteer Meander Surveys

The MLA volunteers conducted periodic meander surveys of the Muskellunge Lake littoral zone throughout the 2022 growing season. EWM was not observed in 2022. Some native vegetation has returned to the center bar, this area used to support a larger diversity of aquatic plant species prior to the arrival of EWM.

6. WATER QUALITY RESULTS

Figure 3, derived from the 2020 Muskellunge Lake Management Plan, shows that the average monthly Total Phosphorus concentration is highest during the month of April, a month that often coincides with spring turnover. In 2021, this pattern continued, a water quality sample collected on April 5, 2021, resulted in an observed in-lake Total Phosphorus concentration of 94 µg/L, the highest observation recorded in 2021. The first water quality sample collected in 2022 was on May 4, 2022. No samples were collected in April due to a later than normal ice-out. Like previous years, the first sample collected in 2022 had a slightly higher Total Phosphorus concentration at 43.9 µg/L. Observed Total Phosphorus concentrations in samples collected from June-August ranged from 36.3 to 42.7 µg/L. A review of water quality data and dissolved oxygen profile data continues to provide evidence to suggest that there are periods of time in which the Muskellunge Lake hypolimnion goes anoxic during the winter. As spring arrives, the lake experiences a spring turnover. Phosphorus rich water, contained in the bottom portions of the lake that are going anoxic mixes with surface waters, resulting in elevated in-lake phosphorus concentrations shortly after ice-off. Overall, water quality in Muskellunge Lake remains stable with no significant trend (Figure 4).

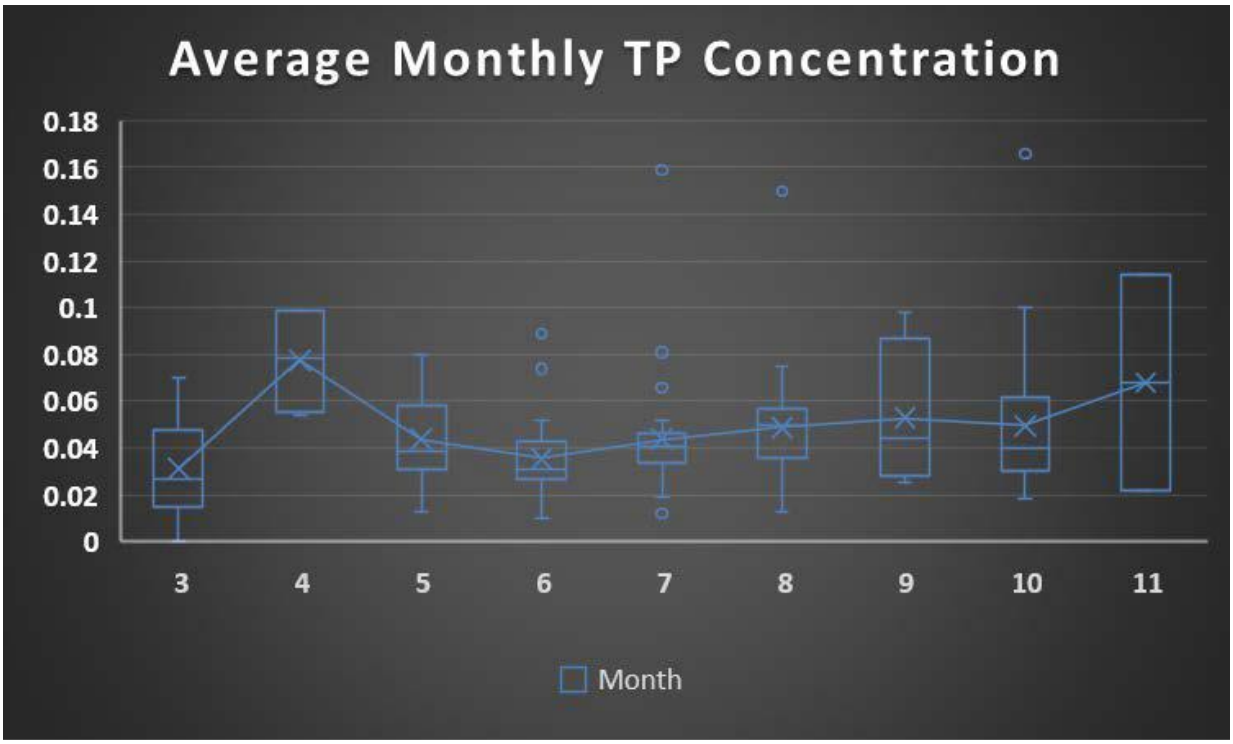


Figure 3. Average Monthly Total Phosphorus (TP) Concentrations

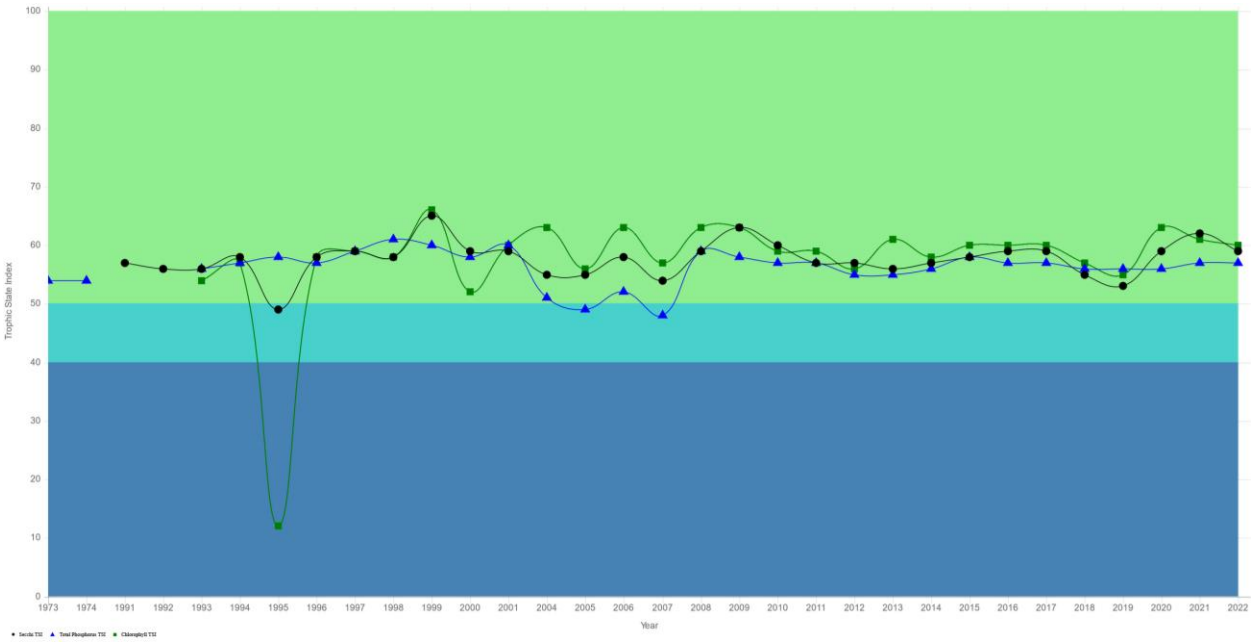


Figure 4. Trophic State Index Graph: Muskellunge Lake - Deep Hole - Vilas County

7. DISCUSSION

Chi-square analysis of the sub-sample point-intercept survey completed **prior to** the ProcellaCOR treatment in June 2021 with the 2022 sub-sample point intercept survey found statistically significant increases (a = 0.05) in the abundance of watershield, coontail, large-leaf pondweed, fern pondweed, and wild celery and statistically significant decreases in the abundance of EWM within the treatment area.

A comparison of Frequency of Occurrence (FOO) by species, average Coefficient of Conservatism (C-Value), and Floristic Quality Index (FQI), suggests a slight decline in the total number of and average quality (C-value) of the species observed. The most probable explanation for this decline was the survey was conducted two weeks later than the August 2021 survey. MLA volunteers provided anecdotal evidence to suggest that some aquatic plants had begun to senesce prior to the 9/3/2022 sampling date. Simpson's Diversity Index score have remained similar since 2009.

7.1.1. Case Studies

The MLA and EOR are committed to advancing the science of invasive aquatic plant management through continued communication with lake associations, lake districts, Wisconsin DNR staff, Vilas County Lakes and Rivers Association, and Vilas County Land and Water Conservation Department. On October 28, 2022, Jeff Rappold attended the Vilas County Lakes Conservation Partner Meeting to **1)** provide an update on Muskellunge Lake and **2)** learn what other Vilas County lakes are doing to combat aquatic invasive species. Notes from that meeting are included in Appendix A.

Upper and Lower Buckatabon

EOR and MLA have remained in contact with Cathy Higley - Vilas County Land & Water Conservation Lake Conservation Specialist to learn more about her efforts to rear and stock weevils on Upper Buckatabon Lake. According to most research, weevils must be stocked for at least 3 years to see any noticeable impacts (Golden Sands 2016). EOR and MLA will continue to communicate with Cathy to evaluate if a similar program could be initiated in Muskellunge Lake should it be found in future surveys. Initial data collected by Cathy provides evidence to suggest that weevil counts appear to be increasing in 2022. Cathy noted that weevils tend to be denser in a "bed" of EWM. So far, Cathy and Buckatabon Lake Association volunteers have been finding weevils here and there on isolated patches, but anecdotally, they seem to be found more so in larger patches of EWM.

The weevil stocking project will be considered a success if any are met by Aug 2023:

- EWM rake average fullness shows a maintenance trend compared to 2020 levels (2020 EWM rake fullness average was 1.0).
- % Acreage of EWM "dense" polygons from EWM Mid/Late Season surveys show a maintenance or decreasing trend from 2020 to 2023 (= or < 3.5% of polygons).

7.2. Goal Statement Evaluation

The following paragraphs provide an evaluation of progress. A green check mark next to each goal statement indicates the goal has been achieved. An orange check mark indicates additional data is needed to properly evaluate if the goal statement has been achieved.

- ✓ **Management activities will maintain or increase native aquatic plants and water quality.**
    a. Several species, including watershield, coontail, large-leaf pondweed, fern pondweed, and wild celery appear to be increasing in abundance. However, the number of species observed, average coefficient of conservatism value, and floristic quality index decreased slightly in 2022. This may have been a result of the 2022 survey being conducted slightly later in the growing season.
    b. Water quality data collected pre/post treatment suggested in-lake Total Phosphorus concentrations remained at or below the state standard of 40 µg/L. Total Phosphorus concentrations observed during spring turnover provide additional validation that a portion of the lake is going hypoxic during the winter, leading to the release of phosphorus from the sediment-water interface.
- ✓ **Management activities will leverage available funds to the maximum extent possible by implementing controls that provide the best return (reduction of EWM coverage) on investment (dollars spent).**
    a. The 2021 treatment targeted a 19.8-acre treatment area at a total cost of 16,978.00 for an average treatment cost of $857.5/acre. By comparison, DASH efforts conducted on Muskellunge Lake in 2019 treated a total area of 0.30 acres at a cost of $5,200, resulting in an average treatment cost of $17,300/acre.
    b. No treatments occurred in 2022. This allowed the MLA to re-allocate funds to control EWM should it be found in 2023 or beyond. Given the Muskellunge Lake Association operates on a small budget, derived solely from volunteer contributions from lakeshore residents, it is imperative that future treatments strive to maximize return on investment.
- ✓ **Reduce Tier 1/Tier 2 Eurasian Watermilfoil (EWM) by 50% (e.g., from 12.0 acres to 6 acres by the end of 2021).**
    a. Achieved, EWM was not found in Muskellunge Lake in 2022.
- ✓ **Reduce Tier 1/Tier 2 Eurasian Watermilfoil (EWM) growth by 50% (e.g., from 6 acres to less than 3 acres by the end of 2022).**
    a. Achieved, EWM was not found in Muskellunge Lake in 2022.
- ✓ **The MLA will continuously update management strategies by incorporating lessons learned from area lakes including Upper and Lower Buckatabon Lakes.**
    a. To be determined. The MLA will continue to work with Vilas County to evaluate the progress made on Upper Buckatabon and to determine if the program is suitable for implementation on Muskellunge Lake.
- ✓ **The MLA will work with the DNR and its consultant to continuously monitor and graph the total surface area of EWM present in Muskellunge Lake.**
    a. The MLA will continue to work with the DNR and its consultant to continuously monitor and graph the total surface area of EWM present in Muskellunge Lake in 2022.

8. RECOMMENDATIONS

With an estimated extent of EWM in Muskellunge Lake of less than 1 acre, it is recommended that 2023 management efforts focus herbicide treatments (if needed) on areas of concentrated EWM growth that exceed 0.50 acres. Areas less than 0.5 acres in size will be delineated. All recommendations are subject to change pending results from aquatic plant surveys conducted in 2023 and continued communication with WDNR staff. EOR and MLA will re-evaluate lessons learned on Buckatabon Lake in August of 2023 to determine if a similar program would be well-suited for Muskellunge Lake.

Furthermore, EOR recommends conducting a native plant transport at the center bar to enhance native species resiliency to future EWM infestations. The targeted species for transplant is *Chara* species (Muskgrass), but EOR has also had success with transplanting *Potamogeton spp.* Prior to the arrival of EWM, the center bar contained dense stands of large-leaf pondweed.

Recent research conducted in the UK, has shown that charophytes can prevent phytoplankton dominance and maintain clear-water conditions via recycling of sediment-bound nutrients, and inducing coprecipitation in the water column. Additional research, has shown that charophytes are able to deliver oxygen to the sediment, thus potentially prohibiting the release of iron-bound phosphorus. Last, research has shown that dense *Chara* meadows that help to reduce the resuspension of sediment which is an important source of phosphorus in Muskellunge Lake, which experiences frequent sediment resuspension due to wind induced wave action as well as from recreational boating activity. Perhaps most importantly, *Chara* species can obtain nutrients directly from the water column and appear to decompose slower than vascular (true aquatic plants) species, thereby promoting a longer cycle of nutrient storage. If successful, establishing *Chara* meadows in Muskellunge Lake will help to 1) provide resiliency against a re-establishment of EWM and 2) provide a low-cost means of reducing internal phosphorus loading. EOR will be assisting native aquatic plant transplants on several lakes in 2023 and will continue to incorporate lessons learned into future recommendations for Muskellunge Lake.

APPENDIX A. VILAS COUNTY LAKES CONSERVATION PARTNER 2022 MEETING

Vilas County Lakes Conservation Partner Meeting
October 28, 2022
Open Forum Notes

Acronyms List
AIS = Aquatic invasive species
CBCW = Clean Boats Clean Waters
CLMN = Citizen Lake Monitoring Network
EWM = Eurasian watermilfoil
DASH = Diver Assisted Suction Harvesting
VCLRA = Vilas County Lakes & Rivers Association

Arrowhead Lake, John Mastoras – Arrowhead Lake has been struggling with their EWM management. They had started with chemical treatments, but are no longer able to get DNR grants for management. They used divers at approximately $30/hour. Now they use snorkelers, but they have concerns about spreading the EWM this way. The lake association is hoping to build a DASH boat. They are primarily working to keep the EWM below the lake surface.

Gresham Lakes, Brad Subler – Upper Gresham had a ProcellaCOR treatment in 2022. In previous chemical treatments, 2,4-D was used. The lake association is so far pleased with the results from the ProcellaCOR treatment.

WI Cisco Chain Lake District & Invasive Species Control Coalition of Watersmeet, Gene Clark – Gene reported that each of these organizations spend $70-$80 thousand annually on the lakes in the Cisco Chain. The funding sources are 2 districts for the Cisco Chain (one in WI, one in MI), the Cisco Chain Riparian Owners Association, grants from several sources, Watersmeet Township, and donations.

Cisco Chain Riparian Owners Association, Steve Kessler – Steve mentioned he is also the treasurer of the WI Cisco Chain Lake District.

Lakeland Times, Beckie Gaskill - Beckie requested that lake organizations send her news-worthy info as it occurs.

Mann Lake, Dick Jenks – Dick reported that Mann Lake is working on 2 aeration systems and a dam. He is also the one that coordinates the CBCW program for Boulder Junction lakes. He offered 20 copies of the new book *Ripple Effect* by Ted Rulseh to interested attendees.

Boulder Lake, Anne Brouwer – Ann is with the Boulder Lake Advancement Association. The lake has had a Directed Lakes study with DNR, and now they are reaching out to riparian owners for installing Healthy Lakes projects. She reported Boulder Lake being shallow, and currently wakeboats are one of the biggest concerns for the lake.

Muskellunge Lake, Jeff Rappold – Muskellunge Lake had EWM found in 2016. It went from a 400 sq. ft. to a 1 acre patch in 1 year. By 2020 it totaled over 10 acres, and the lake association felt they couldn't get ahead of it with handpulling. They wrote a lake management plan and treated 22 acres of EWM with ProcellCOR in 2021. Jeff reported the EWM was gone in 1 week. In 2022, there was a full aquatic plant

point intercept study, and EWM was not found. Native northern watermilfoil was also not found; however it was also not found during a lake-wide point-intercept surveys conducted in 2017 (prior to treatment) and is generally a very rare plant in Muskellunge Lake.

Aquatic Plant Management, Nick Johnson – Nick reported he is from Aquatic Plant Management. They offer DASH and hand harvesting for invasive species plant management.

Last Wilderness Alliance, Jeff Meessmann – Jeff reported he is a CBCW volunteer as well as a CLMN monitor. 78%-94% of voters supported his Citizen Resolutions for regulation of wakeboats at the WI Conservation Congress in April 2022. He is suggesting wakeboats operate 700 ft from shore; in water at least 20 ft deep; and lakes at least 1,500 acres. He was able to present concerns about wakeboats to the Natural Resources Board on September 28, 2022. Natural Resources Board YouTube video is here (at 1 hour 11 min) https://youtu.be/V-Pp-skgBVk.

Wildcat Lake, Richard Phillips – Richard reported that wakesurfing is the greatest current threat.

Wildcat Lake, Carol Phillips – Carol shared a wakeboat concerns handout she had made.

Manitowish Waters Lakes Association, Vilas County Lakes & Rivers Association, & North Lakeland Discovery Center, Karen Dixon – Karen reported that VCLRA is working to increase memberships, improving their website, and engaging new owners and realtors. The tourist boom has been a concern. She also reported that VCLRA has the Blue Heron award for natural shorelines. They also offer 2 scholarships per year to local high schoolers.

Manitowish Waters Lakes Association, Greg Holt – Greg complimented Beckie Gaskill on her coverage in the Lakeland Times on wakeboats. Greg also reported that a property owner on the Manitowish Chain had specified in his will that his property be preserved in perpetuity. Through Northwoods Land Trust, the property was transferred to the Manitowish Waters Lakes Association.

Fence Lake, Mike Bolger – Mike reported that Fence Lake Association had found they were incorporated "wrong" when the association was set up. Now they are working to move Fence Lake Association to a 501(c)3. They continue the CBCW program. They also work closely with the Lac du Flambeau Tribe.

Northwoods Land Trust, Kari Kirschbaum – Kari reported that Northwoods Land Trust works with lakeshore property owners to create conservation easements. They typically prefer to work with owners that have 500 ft or more of shoreline or 40 acres of land. They are partnering the VCLRA on their new outreach project. Northwoods Land Trust also owns and manages 25 nature preserves, mostly in Vilas County. All of the work they do with landowners is voluntary.

Black Oak Lake, Keith Montgomery - Keith reported that 40% of the boats coming to Black Oak Lake are transient; and that of those, 80% involve invaded lakes. He also reported that Black Oak Lake does not have any priority AIS, but they do have invasive mystery snails and rusty crayfish. They work with a $32,000 annual budget.

Eagle River Silver Lake, Lon Fisk - Lon reported that Silver Lake has had EWM chemical treatments in the past.

Eagle River Silver Lake, Louis Gallo – Louis reported that he is originally from California, and is interested in lake conservation.

Anabelle Lake, Dave Vogt – Dave reported he is also on the Presque Isle Town Lakes Committee. There was native large purple bladderwort that went "crazy" on the lake this past summer. There is also invasive European marsh thistle on Anabelle Shores.

Alma-Moon Lakes, Len Larson – Len reported that Alma-Moon Lakes are working on shoreland improvements in 2022. They are working on proactively creating awareness for riparian owners on what is permissible above the ordinary high water mark. They also want to do personalized shoreline assessments on each property. Owners would be encouraged to restore shorelines where appropriate.

North Lakeland Discovery Center, John Heusinkveld – John introduced himself.

Eagle River Chain of Lakes Association, Marc Groth – Marc introduced himself as part of the Eagle River Chain of Lakes Association.

Eagle River Chain of Lakes Association, Dave Mueller – Dave is part of both the Eagle River Chain of Lakes Association (ERCLA) and the United Lower Eagle River Chain of Lakes Commission (ULERCLC). He serves on ERCLA at the AIS Coordinator. At one point there was 285 acres of treatable EWM. Their last 2,4-D treatment was in 2015, and now EWM management is primarily DASH and hand removals. Now the EWM acreage on the Chain varies between about 15-30 acres each year.

Buckatabon Lakes Association, Carla Hibbard – Carla has been working on the Buckatabon Lakes Association since it started in 2015. She worked on the petition for the lake districting on Buckatabon, which will be formed soon. She reported she knows of 1 wakeboat on the Buckatabon Lakes.

Buckatabon Lakes Association, Dan Benson – Dan worked to form the Buckatabon Lakes Association in 2015 when EWM was found. They are working on building their own DASH boat, volunteer recruitment, rearing weevils to control EWM, and fish stocking. He also serves on the Conover Town Lakes Committee.

Boot Lake, Craig Butler – Craig is a new association board member, and is working on getting the association more active.

Snipe Lake Association, Dan Osterberg – Dan reported that Snipe Lake is free from invasive plants.

Eagle River Chain of Lakes Association, Carole Linn - Carole reported that ERCLA is made up of 10 waterbodies which cover 4 municipalities. Because of this, the ULERCLC had to be created for a joint powers agreement to receive grant funds from DNR. This model is now used statewide. The amount each municipality pays is based on shoreline miles within the municipality.

Little Spider Lake, Phil Bozak, Steve Nottleson, and Bob Young - These men reported they are working a lake management plan and their website for the lake association.

Winchester Town Lakes Committee, Rolf Ethun – Rolf reported there is low population density in Winchester, so having lake business at the town level makes a lot of sense for them.

Birch Lake, Glen Wildenberg – Glen reported he has been with the Winchester Town Lakes Committee for 10 years, and he does the lake monitoring on Birch Lake.

Fence Lake Association, Scott Herret - Scott reported that he is from Fence Lake Association.

Lakes Committee for the Town of Plum Lake, Bob Jackson - Bob reported they have 7 I-Lids cameras at landings in the town. Of the 3,500 launches captured, they found 2 violations. They have an active CBCW program logging over 2,000 hours each year. They are working on getting aquatic plant point intercept surveys done on 4 of their smaller lakes in 2022. They are also managing the EWM on Little Star Lake.

Winchester Town Lakes Committee, Gary Engstrom – Gary reported there is yellow iris on 133 sites on the Turtle Chain. Of these, 57 were removed equating to 1 ton of yellow iris. There are 23 CBCW inspectors. They also have a fishing line collection station so they can send the line to Berkley, CA for recycling.

Citizen Lake Monitoring Network, Sandy Wickman – Sandy introduced herself.

Little Crooked Lake, Ron Eckstein - Ron introduced himself.

Town of Lincoln, Bill Marshall – Bill introduced himself.

Catfish Lake, Carol Marshall – Carol reported that there is yellow iris on Catfish Lake.

Wisconsin Headwaters Invasives Partnership, Rosie Page – Rosie reported she will work on wetland species such as yellow iris, European marsh thistle, and purple loosestrife.

Sunset Lake, Joe Spitz - Joe introduced himself.

Vilas County Lakes & Rivers Association, Susan Knight – Susan reported she works for UW-Madison's Center for Limnology Trout Lake Station but is also on the VCLRA board.

Town of Boulder Junction, Jim Galloway – Jim introduced himself as a supervisor for the town of Boulder Junction.

Vilas County Public Health Department, Amy Springer & Graydon Skok – Amy and Graydon introduced themselves.

Little Crawling Stone Lake, Mary Rodman – Mary is a CBCW inspector for Little Crawling Stone Lake.

APPENDIX B. AQUATIC PLANTS COMMONLY FOUND IN MUSKELLUNGE LAKE

Muskellunge Lake Aquatic Plants

Surface / Floating

Spatterdock
Heart Shaped Pad

White Water Lily
Round shaped pad

Watershield
Small pad

Bullrush
Hard Stem

Cattail

Common Burr Reed

Floating Burr Reed

Muskellunge Lake Aquatic Plants

Whorled / Waterweeds

Whorled Water-Milfoil

Common Water Weed
Elodea

Coontail

Slender Waterweed

Leafy Pondweeds

Large Leaf Pondweed

White Stem Pondweed

Milfoils

Northern Water Milfoil

Eurasian Water Milfoil

Muskellunge Lake Aquatic Plants

Slim and Slender Pondweeds

Fern Leaf Pondweed

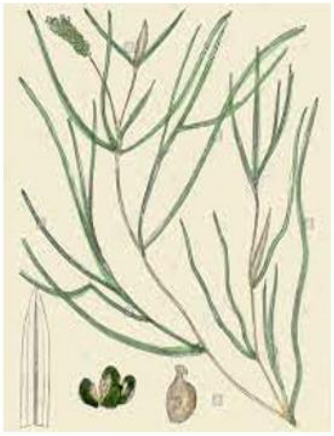
Flat-Stem Pondweed

Leafy Pondweed

Muskgrass / Chara

Fen Pondweed

Wild Celery



Small Pondweed

Slender Niad