Protecting your environment today for tomorrow

Bear Lake, Muskegon County Lake Management Plan Update

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PLM Lake & Land Management Corp.

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- Degree from Michigan State University
- West MI Regional Manager, over 20 years at PLM

- Jason Broekstra, Biologist
- Degree from Grand Valley State University
- Vice President of MI Operations, over 25 years at PLM

MICHIGAN LOCATIONS

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PLM Lake & Land Management Corp.

- 4 offices (soon to be 5 with a Northern MI area office) to better serve our clients
- Largest Aquatic Management Company in the State of Michigan.
- Full service firm with many services to meet your needs:
  - Vegetation Assessment/Mapping
  - Water Quality Monitoring
  - Aquatic Invasive Plant and Algae Control
  - Fisheries Evaluation
  - Lake Depth and volume mapping
  - Fountain Installation and Maintenance
  - Phosphorus Mitigation
  - Aquatic Plant Harvesting
  - Aeration
  - Shoreline Restoration

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Management Goals for Bear Lake

Primary Goals:

- Manage exotic plants to maximum extent to protect native species, allow for recreational use of the lake, promote a healthy fishery and protect property values.
- Control noxious planktonic algae blooms.
- Preserve native plant diversity and densities to provide habitat for fish and other aquatic organisms, stabilize sediments, provide oxygen.

Secondary Goals:

- Implementation of natural shorelines, converting seawalls shorelines back to natural vegetation.
- Education/Outreach, provide residents with important information about lake activities, new invasive plants and management goals.
- Practice “lake friendly” lawn/shoreline techniques to reduce external loading of nutrients.

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Exotic Plants in Bear Lake

- Eurasian watermilfoil
- Curlyleaf pondweed
- Starry stonewort
- Phragmites
- Purple loosestrife

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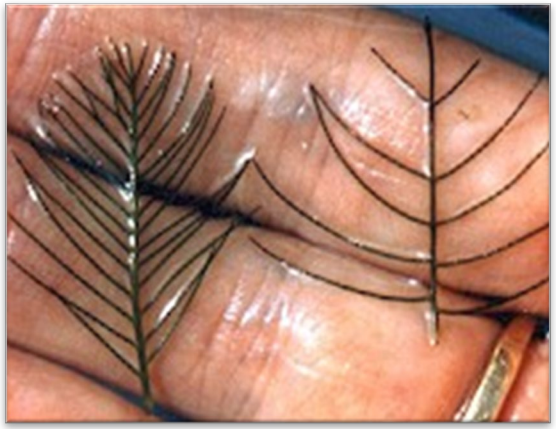
Eurasian Watermilfoil/Hybrids (H/EWM)

- Highly invasive, forms a canopy & monoculture
- Spreads from root system, seed, and **fragmentation** (cutting, raking increases spread)
- Over winters (lives under the ice).
- Outcompetes other native plants



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Curlyleaf pondweed

- Early spring aquatic plant
- Forms dense stands/canopies
- Reproduction is mainly through the production of buds called turions.
- Turions can remain dormant in sediment for up to 5 years.


Credit: Montana State Univ.

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Starry stonewort

- Macro algae
  - Takes all nutrients from water column, not roots
- Can grow in 20’ of water
- Forms a dense mat
- Rated as one of the more detrimental species to infest our waterways

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Phragmites & Purple loosestrife

- Terrestrial/Wetland Plants
- Outcompete native vegetation
- Phragmites spreads by fragmentation and an extensive root system
- Purple loosestrife spreads primarily by seeds

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Lake Management Activities 2022

- Exotic Plant Management
  - Four spot treatments for the control of EWM, CLPW, SSW
    - June: EWM, CLPW - 15 acres using ProcellaCOR (systemic) & Diquat (contact)
    - July: EWM, CLPW – 8 acres using ProcellaCOR (systemic) & Diquat (contact)
    - August: SSW – 5 acres using SeClear (G), EWM – 4 acres using ProcellaCOR (systemic) & Flumioxazin (contact)
  - One treatment for Phragmites & PLS
    - September: Phragmites(primarily) & PLS - .75 acres using Glyphosate

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Lake Management Activities 2022

- Algae Management
  - Two spot treatment for nuisance filamentous/planktonic algae
    - June: 4 acres using Chelated copper
    - August: 6 acres using Copper sulfate & SeClear (L)

- Phosphorus Mitigation – Phoslock Treatment
  - Two Phoslock treatments in Fenner's Ditch, July & August
    - Bentonite clay product containing lanthanum (naturally occurring element)
    - Permanently & rapidly removes "strips" phosphorus from the water column and sediment layer.
    - Goal was to reduce phosphorus in ditch, in turn reduce algal production.

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Phoslock – Phosphorus Mitigation

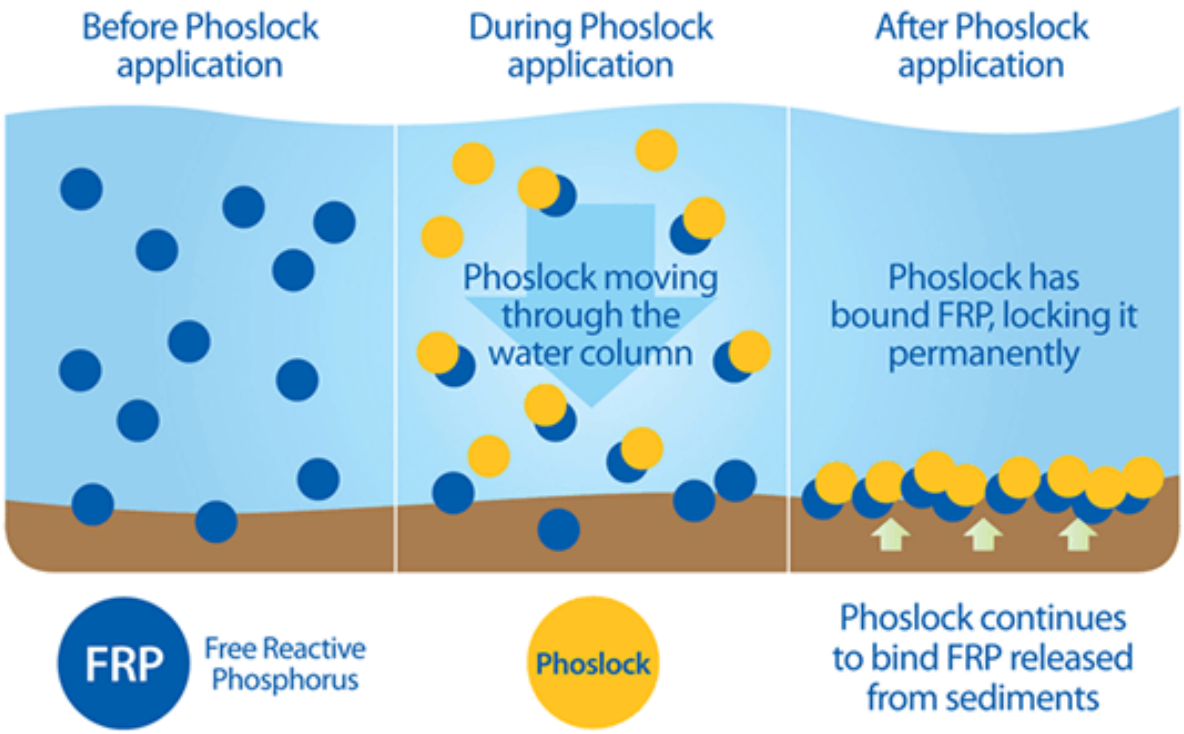
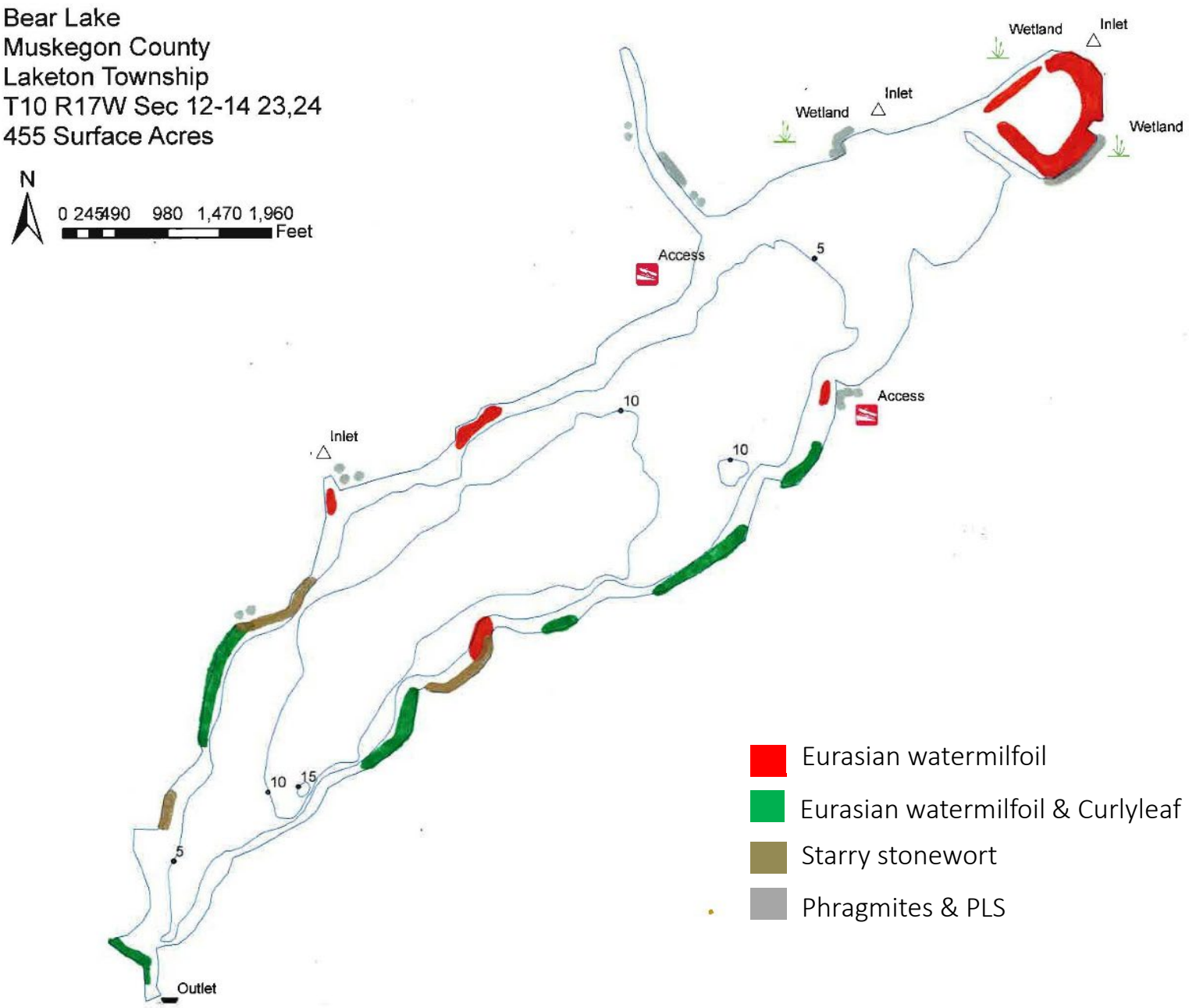


Illustration Courtesy of SePRO Corporation


Bear Lake
Muskegon County
Laketon Township
T10 R17W Sec 12-14 23,24
455 Surface Acres
N
0 245 490 980 1,470 1,960
Feet
Wetland
Inlet
Inlet
Wetland
Wetland
Access
5
Access
10
10
Inlet
10
15
5
Outlet
Eurasian watermilfoil
Eurasian watermilfoil & Curlyleaf
Starry stonewort
Phragmites & PLS

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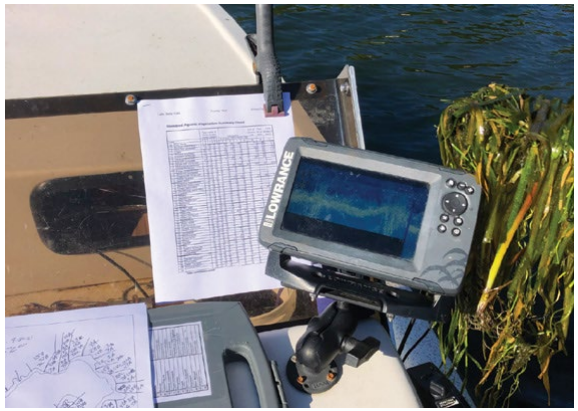

Lake Management Activities 2022

- Aquatic Vegetation Surveys - AVAS
  - SOM survey method: Aquatic Vegetation Assessment Site Survey
    - Divides littoral zone into subareas, records the cover of each aquatic plant found in each site.
    - This method considers the type of plants (diversity) as well as the cover (density)
  - Two AVAS Surveys were conducted in 2022
    - June 1, 2022: Significantly less plant growth due to cool spring.
    - September 19, 2022: 21 Native plants found, 5 exotic plants
      - Very good native plant diversity
      - Rooted plant growth was moderate along a majority of the shoreline

AVAS Code	Common Name	Scientific Name	% Cumulative Cover September 2022
	Submerged- Exotic		
1	Eurasian watermilfoil	Myriophyllum spicatum	6.89
2	Curlyleaf pondweed	Potamogeton crispus	1.46
29	Starry stonewort	Nitellopsis obtusa	1.33
	Submerged- Native		
3	Muskgrass	Chara	13.52
4	Thinleaf pondweed	Potamogeton spp.	0.95
5	Flatstem pondweed	Potamogeton zosteriformis	5.16
8	White stem pondweed	Potamogeton praelongus	0.02
9	Richardsons pondweed	Potamogeton richardsonii	16.92
13	Floating leaf pondweed	Potamogeton natans	0.02
14	Water stargrass	Zosterlia dubia	2.89
15	Wild Celery	Vallisneria Americana	52.60
20	Coontail	Ceratophyllum demersum	13.83
21	Elodea	Elodea Canadensis	0.32
22	Bladderwort	Utricularia valgaris	0.33
25	Naiad	Najas flexilis	14.13
26	Brittle naiad	Najas minor	0.56
27	Sago pondweed	Potamogeton pectinatus	5.73
	Emergent- Native		
30	Water lily	Nymphaea odorata	2.62
31	Spatterdock	Nuphar variegate	0.54
36	Arrowhead	Sagittaria latifolia	0.02
37	Pickerelweed	Pontederia cordata	0.19
39	Cattail	Typha spp.	11.75
40	Bulrush	Scirpus spp.	1.86
42	Swamp loosestrife	Dianthera americana	0.16
	Emergent - Exotic		
43	Purple loosestrife	Lythrum salicaria	2.19
44	Common reed	Phragmites	0.59
	Total		**156.56**

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Common Native Plants Found in Bear Lake

Coontail

Eel grass (Wild Celery)

Richardson's Pondweed

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Summary 2022

- Successful year controlling exotic plants and nuisance algae
- Native plants flourished
- Lake did not experience a lake-wide planktonic algae
- Initiated Phosphorus mitigation plan – Fenner's Ditch
- Great communication with BLLB & residents

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Recommended Management Plan for 2023

- Continue successful treatment strategy for exotic plant management.
  - ProcellaCOR & Diquat Combination for EWM & CLPW Control
  - SeClear G for SSW Control
- Algae control when required.
- AVAS Surveys (Spring & Late Summer) to evaluate conditions and direct management efforts.
- Phragmites & PLS treatment in fall, if needed
- Phoslock treatment of Fenner’s Ditch, could be expanded to additional areas of the lake.

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Recommended Management Plan for 2023

- Work together with industry experts to investigate the petroleum pollution in Bear Lake to develop potential remediation efforts.
- Work in partnership with Grand Valley State University to encourage a comprehensive management approach for Bear Lake and the surrounding watershed.
- *Optional*, Sonar mapping of the lake bottom to determine plant biovolume, bottom hardness.

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What can Residents do to protect Bear Lake?

- **Do not rake leaves into the lake. Decomposing leaves produce more muck.**
- **Do not feed waterfowl.**
- **Remove dog, geese and duck droppings from lawns, docks, etc. Excess feces will increase nutrients within the lake.**
- **Perforate lawn periodically and seed and mulch exposed soil (to prevent erosion).**
- **Remove aquatic plants, leaves/branches and other debris that washes up along the lakeshore so less decomposition occurs in or near the lake.**
- **Always use silt fences when building a new home or doing any yard-work that would cause erosion.**
- **Keep all burn piles and debris piles away from lake. Do not burn near the water. The ash is concentrated nutrients!**
- **Encourage the use of stone, brick and similar porous materials when building a landscape to minimize urban water collection.**
- **Create a natural buffer close to the water's edge.**
  - **A natural setting will filter excess nutrients from entering the water**
  - **Decreases erosion**
  - **Deters geese from making a stop on your beach front. Geese do not like areas where they cannot see the predators coming towards them.**

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THANK YOU, QUESTIONS!