Loon Lake

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PLM Lake & Land Management Corp.

- North Regional Manager - Gaylord, with PLM 10 years
- Bachelors of Science- Natural Resource Management and Biology
- PLM is a full service Lake Management Company serving Michigan for over 40 years
  - Consulting, Lake Management Planning, Education, Implementation, Special Assessment Districts
  - Surveying, Mapping, Water Quality, Fishery Assessments
  - Herbicide Applications, Harvesting, Fountains/Aeration, Biological Control etc.

Review of Aquatic Plant Management

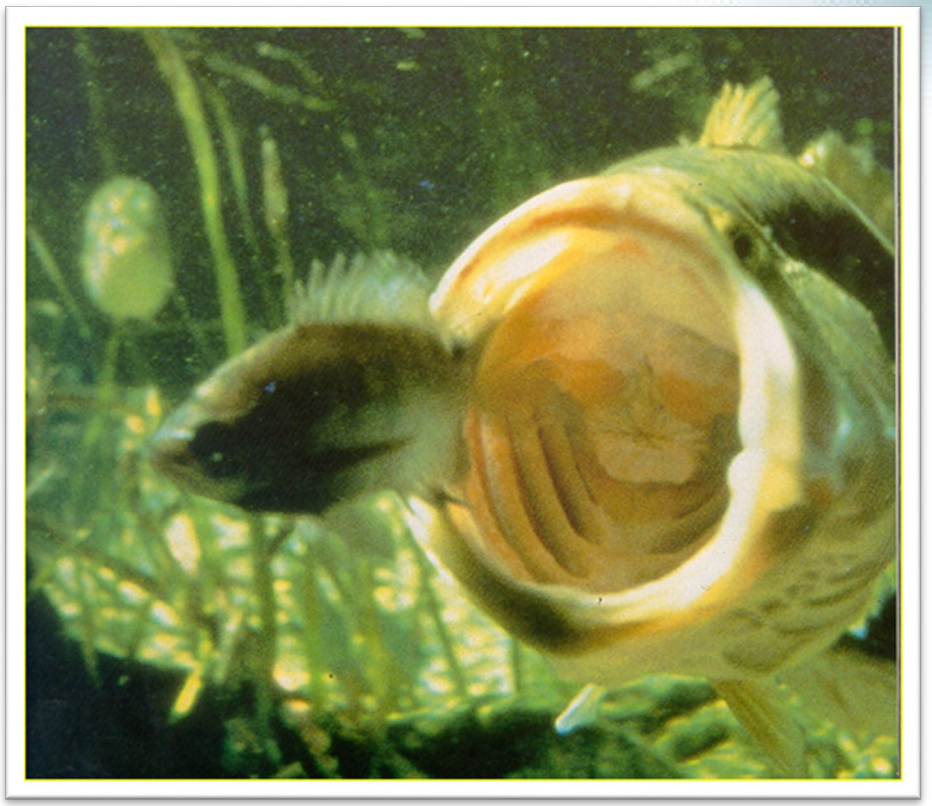
- Goals of APM
- Benefits of Native Plant Diversity
- Impacts of Exotic, Invasive Aquatic Plants
  - Eurasian watermilfoil, Curlyleaf pondweed, Starry stonewort, Variable leaf milfoil
- Loon Lake Management Plan
  - Survey, Mapping, Treatments
- Lake Management Tools
- Prevention

Goals of Aquatic Plant Management

- Control Exotic, Invasive Species!
- Promote a Balanced and Diverse Native Plant Community
  - Improve Fisheries
  - Maintain Property and Recreational Values

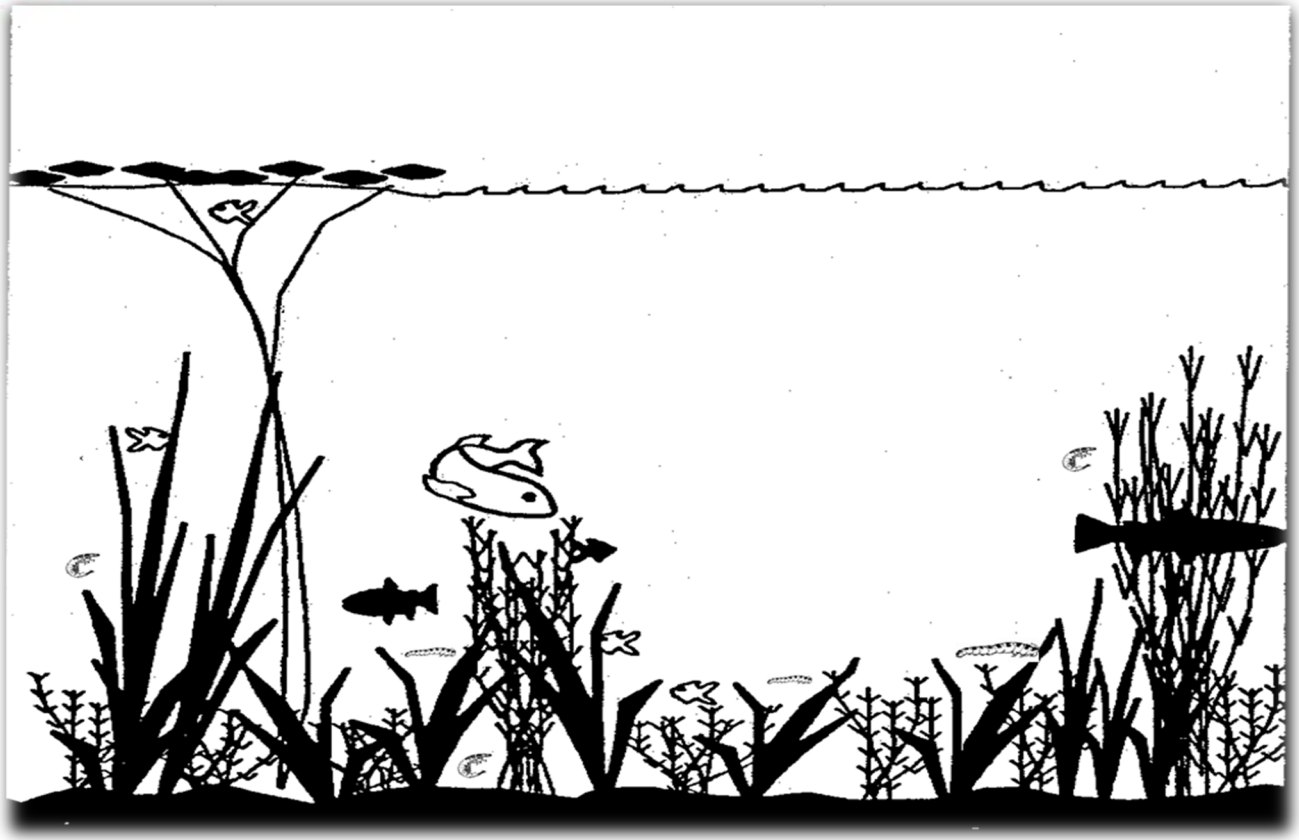
Native Plants

- **"Typically"** do not cause recreational problems
- Fundamental component of aquatic ecosystems
- Perform important functions
  - Stabilizing sediments
  - Support aquatic insects
  - Maintaining Oxygen
  - Provide forage and refuge areas for fish



- When control is needed, harvesting or use of contact herbicides are best management options. EGLE Permits restrict treatment of native plants to developed shorelines.

Diverse, Native Plant Community



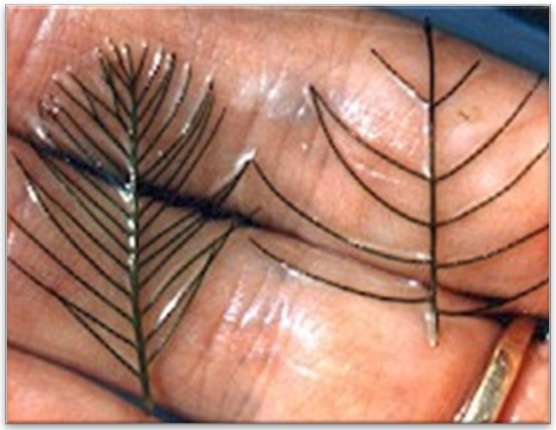
The goal of Aquatic Plant Control: A healthy & diverse plant community.

This is NOT the goal!

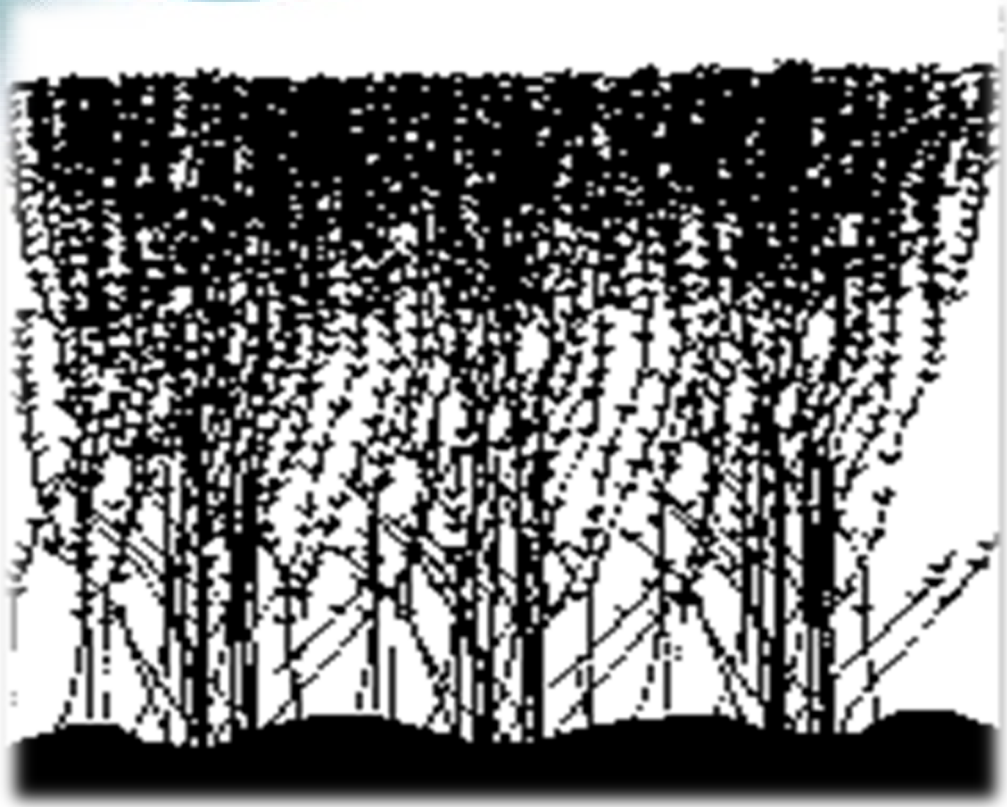
Impacts of Exotic Species

Eurasian Watermilfoil (EWM)

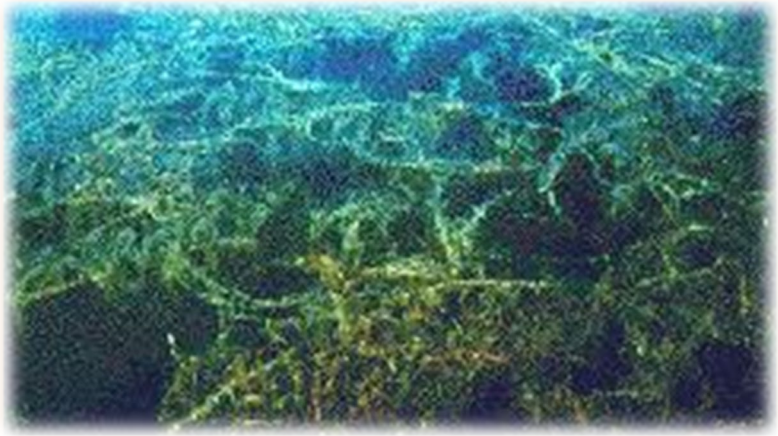
- Not native to North America
- Highly invasive, forms a canopy & monoculture
- Spreads from root system, seed, and **fragmentation** (cutting, raking increases spread)
- Over winters (lives under the ice).
- Outcompetes other native plants
- Negatively impacts fisheries
- A single plant can produce millions new plants in a single year!



EWM

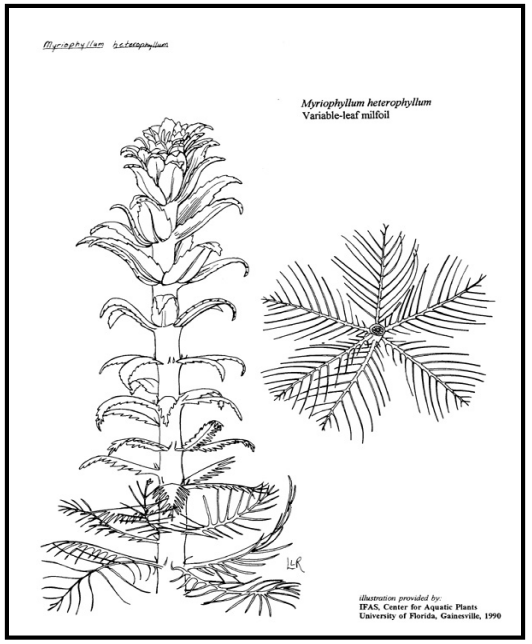


CANOPY



Variable Leaf Milfoil

- Seven species of milfoil in this region that have similar characteristics
- Most of the “native” milfoils looks very similar and often referred to as “Northern” or “Native Milfoil”
- Spreads by fragmentation, similar to that of Eurasian watermilfoil
- Native to North America, not necessarily Michigan waters. Therefore, management approval from EGLE is VERY different than EWM.
- Considered invasive in most MI lakes. Found in other local lakes and across Northern Michigan, including Loon Lake.



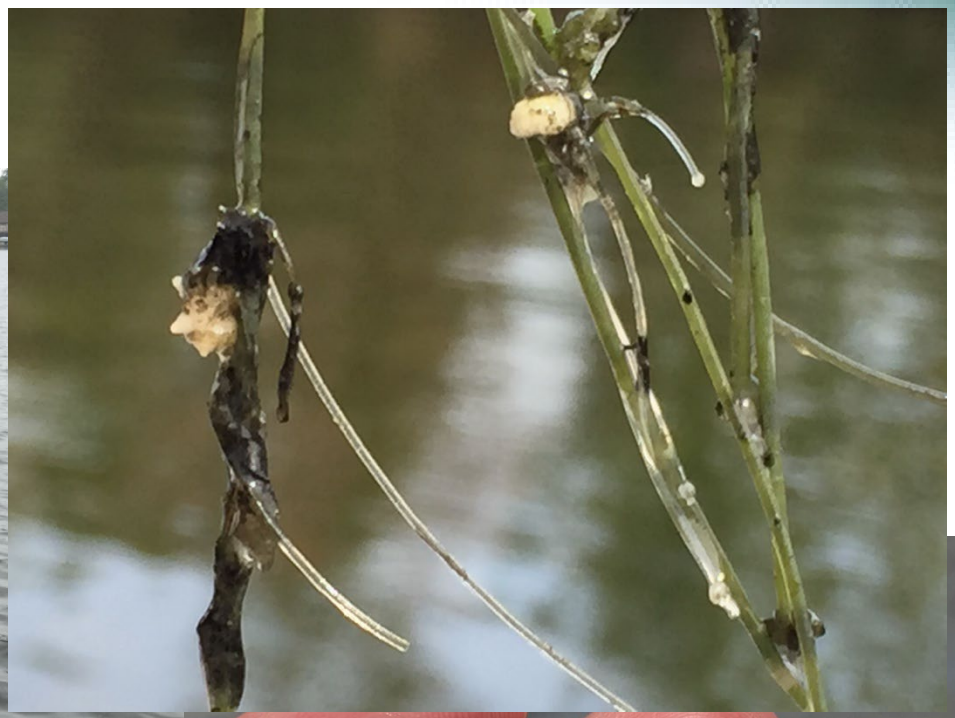
Curly leaf pondweed

- Introduced to North America in 19th century
- Emerges early each spring, flowers and sets seed in the late spring and early summer, and then collapses by the first week in July.
  - There are, however, exceptions to this pattern regarding juvenile plants, part of this re-growth community can occasionally be found in the late summer or early autumn.
- Capable of over-wintering below ice cover
- Curly Leaf can be a severe nuisance during the early part of the peak recreational use season
- Early control of this species is recommended so that the plant is not allowed to produce large quantities of biomass that die naturally and decompose in early July when water temperatures and the potential for oxygen stress are high
- Serrated edge

Starry stonewort

- Rooted macro algae
  - Takes all nutrients from water column, not roots
- Originated in Europe
- First found in St. Clair River/ Detroit Area
- Can grow in 20’ of water
- Preferred by Zebra Mussels
- Forms a dense mat
- Rated as one of the more detrimental species to infest our waterways

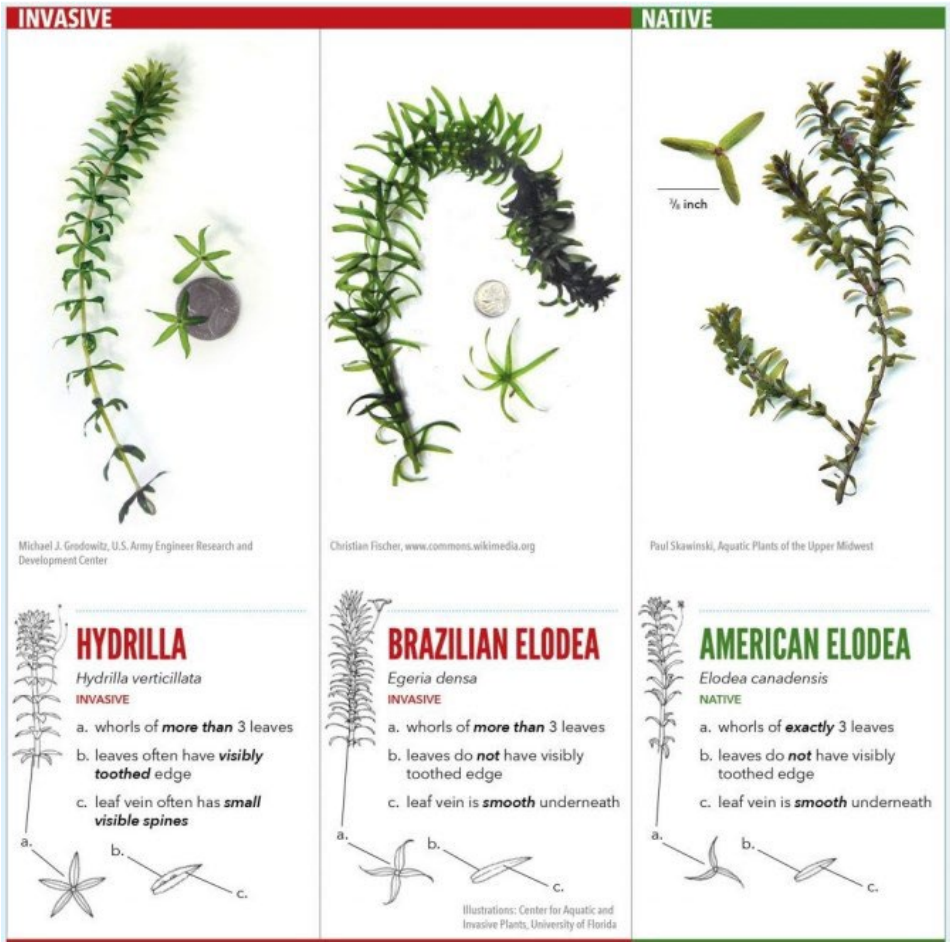
Starry stonewort



- Photo credit: Bre Grabill, PLM

Hydrilla

- PLM was contacted by EGLE, as part of their Rapid Response Plan for new exotic plants
- Ability to reproduce through fragmentation, stolons or rhizomes and tubers
- Quickly out-competes native plants and EWM
- Leaves of 3-native, Leaves of 4+ invasive



Phragmites

- Phragmites (common reed) is a wetland grass that ranges in height from 6 to 15 feet tall
- “Phrag” quickly becomes the dominant feature in aquatic ecosystems, aggressively invading shorelines, wetlands, and ditches.
- This plant creates dense “strands” - walls of weeds crowding out beneficial native wetland vegetation and indigenous waterfowl habitats.
- Spreading by fragmentation and an extensive root system, Phragmites ultimately out-competes native plant life for sun, water and nutrients.
- Phragmites demands extensive control and is currently only controlled with chemical herbicide. Quick action can keep densities from taking over

Clean, Drain, Dry, Dispose

Virkon™ AQUATIC

Prevent The Spread!

STOP AQUATIC HITCHHIKERS!™

Prevent the transport of nuisance species.
Clean all recreational equipment.
www.ProtectYourWaters.net

HELP STOP AQUATIC HITCHHIKERS!

To avoid spreading aquatic invasive species

BEFORE launching ... BEFORE leaving:

- Remove aquatic plants and aquatic animals
- Drain lake or river water away from landing
- Dispose of unwanted live bait in the trash

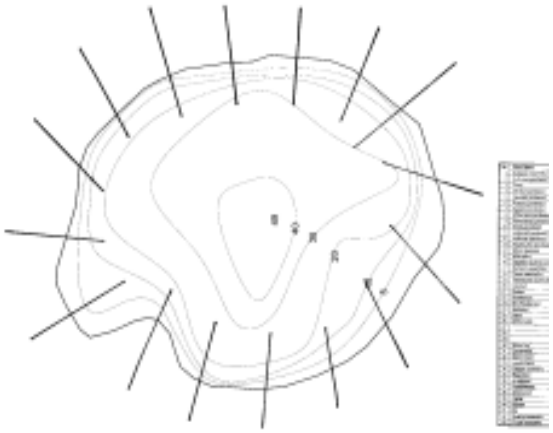
It's the Law... Do not:

- Transport aquatic plants, zebra mussels, or other prohibited species on public roads
- Launch a watercraft or place a trailer in the water if it has aquatic plants, zebra mussels or other prohibited species attached
- Transport water from infested waters

Michigan Department of Natural Resources

Surveys

- AVAS Survey
  - EGLE approved survey technique, Document growth within every 300’ shoreline
- Pre/post treatment surveys



Cover Code	Approximate Cover Range
a	1-2%
b	3-20%
c	21-60%
d	61-100%

No	Plant Name
1	Eurasian watermilfoil
2	Curly leaf pondweed
3	Chara
4	Thinleaf pondweed
5	Flatstem pondweed
6	Robbins pondweed
7	Variable pondweed
8	White stem pondweed
9	Richardsons pondweed
10	Illinois pondweed
11	Large leaf pondweed
12	American pondweed
13	Floating leaf pondweed
14	Water stargrass
15	Wild celery
16	Sagittaria (submersed)
17	Northern watermilfoil
18	Green watermilfoil
19	Two-leaved watermilfoil
20	Coontail
21	Elodea
22	Bladderwort
23	Mini Bladderwort
24	Buttercup
25	Naiad
26	Brittle naiad
27	Sago Pondweed
30	Water Lily
31	Spatterdock
32	Water shield
33	Lemna minor
34	Greater duckweed
35	Watermeal
36	Arrowhead
37	Pickerelweed
38	Arrow arum
39	Cattail
40	Bulrush
41	Iris
42	Swamp loosestrife

AVAS

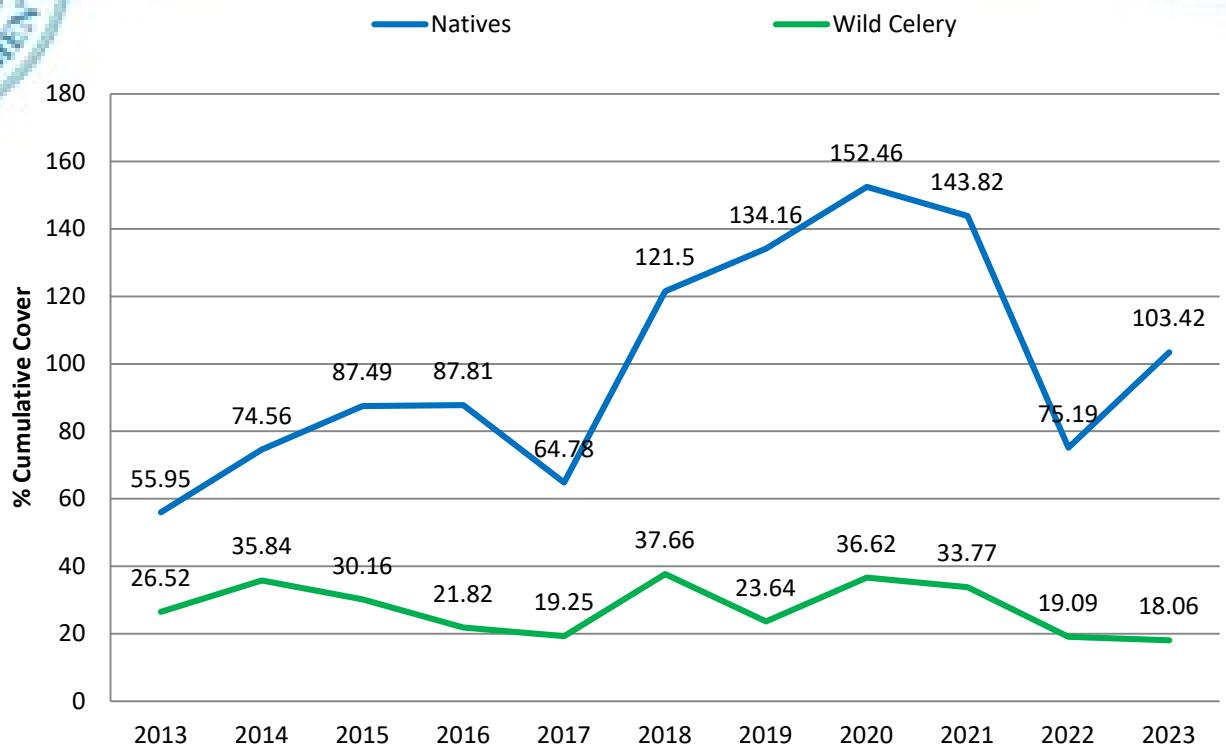
- Changes based on year, surveyor, timing
- Important for tracking trends over time
- Approved survey method by EGLE
- AVAS surveys required as part of certain permits
- Data can be used to track species diversity, % cover by exotics, and changes in total cumulative plant coverage over time

Lake: Loon Lake County: Iosco Survey Date :8/14/2023

Standard Aquatic Vegetation Summary Sheet

		Total number of AVAS's for each Density Category				Calculations				Sum of Columns 5-8	Total No. of AVAS	Col 9 divided by Col 10
Code		A	B	C	D	A x 1	B x 10	C x 40	D x 80			
No	Plant Name	1	2	3	4	5	6	7	8	9	10	11
1	Eurasian watermilfoil	0	0	0	0	0	0	0	0		71	
2	Curly leaf pondweed	0	0	0	0	0	0	0	0			
3	Chara	2	14	54	2	2	140	2160	160	2462	71	34.68
4	Thinleaf pondweed	2	4	4	0	2	40	160	0	202	71	2.85
5	Flatstem pondweed	1	16	3	0	1	160	120	0	281	71	3.96
6	Robbins pondweed	0	0	0	0	0	0	0	0			
7	Variable pondweed	0	35	8	0	0	350	320	0	670	71	9.44
8	White stem pondweed	0	18	14	0	0	180	560	0	740	71	10.42
9	Richardsons pondweed	0	1	0	0	0	10	0	0	10	71	0.14
10	Illinois pondweed	0	0	0	0	0	0	0	0			
11	Large leaf pondweed	0	34	8	0	0	340	320	0	660	71	9.30
12	American pondweed	0	0	0	0	0	0	0	0			
13	Floating leaf pondweed	0	0	0	0	0	0	0	0			
14	Water stargrass	0	0	0	0	0	0	0	0			
15	Wild celery	2	28	23	1	2	280	920	80	1282	71	18.06
16	Sagittaria (submersed)	0	0	0	0	0	0	0	0			
17	Northern watermilfoil	9	13	1	0	9	130	40	0	179	71	2.52
18	Rush	0	0	0	0	0	0	0	0			
19	Variable leaf watermilfoil	0	0	0	0	0	0	0	0			
20	Coontail	0	0	0	0	0	0	0	0			
21	Elodea	0	0	0	0	0	0	0	0			
22	Bladderwort	0	0	0	0	0	0	0	0			
23	Mini Bladderwort	0	0	0	0	0	0	0	0			
24	Buttercup	0	0	0	0	0	0	0	0			
25	Naiad	0	1	0	0	0	10	0	0	10	71	0.14
26	Brittle naiad	0	0	0	0	0	0	0	0			
27	Sago Pondweed	0	0	0	0	0	0	0	0			
28	Starry Stonewort	1	2	0	0	1	20	0	0	21	71	0.30
29	Cabomba	0	0	0	0	0	0	0	0			
30	Water Lily	6	14	12	1	6	140	480	80	706	71	9.94
31	Spatterdock	0	0	1	0	0	0	40	0	40	71	0.56
32	Water shield	0	0	0	0	0	0	0	0			
33	Common Duckweed	0	0	0	0	0	0	0	0			
34	Greater duckweed	0	0	0	0	0	0	0	0			
35	Watermeal	0	0	0	0	0	0	0	0			
36	Arrowhead	0	0	2	0	0	0	80	0	80	71	1.13
37	Pickerelweed	0	0	0	0	0	0	0	0			
38	Arrow arum	0	0	0	0	0	0	0	0			
39	Cattail	0	2	5	0	0	20	200	0	220	71	3.10
40	Bulrush	2	13	13	3	2	130	520	240	892	71	12.56
41	Iris	0	0	0	0	0	0	0	0			
42	Swamp loosestrife	0	0	0	0	0	0	0	0			
43	Purple loosestrife	8	5	1	0	8	50	40	0	98	71	1.38
44	Phragmites	0	0	0	0	0	0	0	0			
45	Frogbit	0	0	0	0	0	0	0	0			
46	Slender spikerush	0	0	0	0	0	0	0	0			
47	Smartweed	0	0	0	0	0	0	0	0			
48	Water marigold	0	0	0	0	0	0	0	0			
49	American lotus	0	0	0	0	0	0	0	0			
50		0	0	0	0		0	0	0			
	Total cumulative cover											**120.46**

Lake Plant Coverage



This graph represents the cumulative percent of coverage of all submerged aquatic plants. Overall, plant coverage on Loon Lake is good. It is normal to see variation from year to year and tracking these plant trends can assist in short and long term management decisions and evaluation.

Utilizing GPS in Aquatics

The use of GPS can greatly improve communication and accuracy of treatments

- Pre-treatment surveys downloaded directly to applicator hand held/boat GPS unit.
- Applicator tracking of application.
- Post-treatment surveys to ensuring treatment target area has been controlled.

Loon Lake

- PA 451 Lake Improvement Board (LIB)
  - Set up at the county level to support lake management efforts allowing two main goals: financial support from entire district(lake). Lake wide program/district support
  - If your board wasn't in place, your lake would not be managed as one entity, so it is VERY important that we all work together to maintain protection of Loon Lake!
  - Lakes should be managed as one entity, with the entire waterbody being the focus.
  - LIB's are comprised of County Drain Commissioner, County Commissioner, Township Reps, and Lakefront Reps.

Permitting

Standard Permits

- Permit applications submitted to EGLE
- DNR fisheries has a period for input prior to issuance
- Only residential areas are permitted for Algae or Native weed control
- Littoral zone permitted for invasive treatment
- Copper Sulfate not allowed in May/June
- 25% of littoral zone max for algae treatments
- Off-shore invasive species treatments are only approved prior to June 15th

Special Conditions

- DNR fisheries has a period for input prior to issuance
- Cisco Lake – No algae treatments from November 1-June 1
- can limit type of treatment available if threatened/endangered species are present or historically present

Herbicide FAQ

“The aquatic pesticides that are permitted by the ANC Program are registered by the USEPA and MDARD. They also undergo toxicological review by EGLE. If the pesticides are applied according to label instructions and permit requirements, these chemicals should pose no danger to public health. Most products permitted by ANC also pose no danger to the environment when correctly used and while a small subset may have an impact on water quality, these products have additional permit restrictions to minimize their risk to the environment.
General product safety information is included on the federal product label. In addition, you may review human and environmental health and safety information on the Safety Data Sheet. This information is usually posted on the manufacturer’s website.

EGLE institutes a 24-hour swimming restriction only in the treatment area. This restriction is in place primarily to keep swimmers out of the way of the applicator boat, to minimize disturbance within the treatment area, and to maximize plant uptake of the active ingredient. The only product with a swim restriction on the federal label is 2,4 D ester (Navigate and Aquacide, 24-hour swim restriction). Currently, there are no fish consumption restrictions required by the aquatic pesticide labels of products permitted in Michigan”.

RELATIVE TOXICITY OF CHEMICAL SUBSTANCES
Acute Oral-Rates
LDC/50-mg/kg

Less Toxic

Fluridone	10,000
Glyphosate	5,600
Table Salt	3,000
Renovate	2.574
Aspirin	1,000
2,4-D(DMA)	300-1,000
Copper Sulfate	300
Reward	230
Caffeine	192
Nicotine	53
Sodium Cyanide	6.5

Most Toxic

LD C/50 (lethal dosage/50%) is the amount of active ingredient required to cause the death of one-half of the test population

Herbicide Cont.

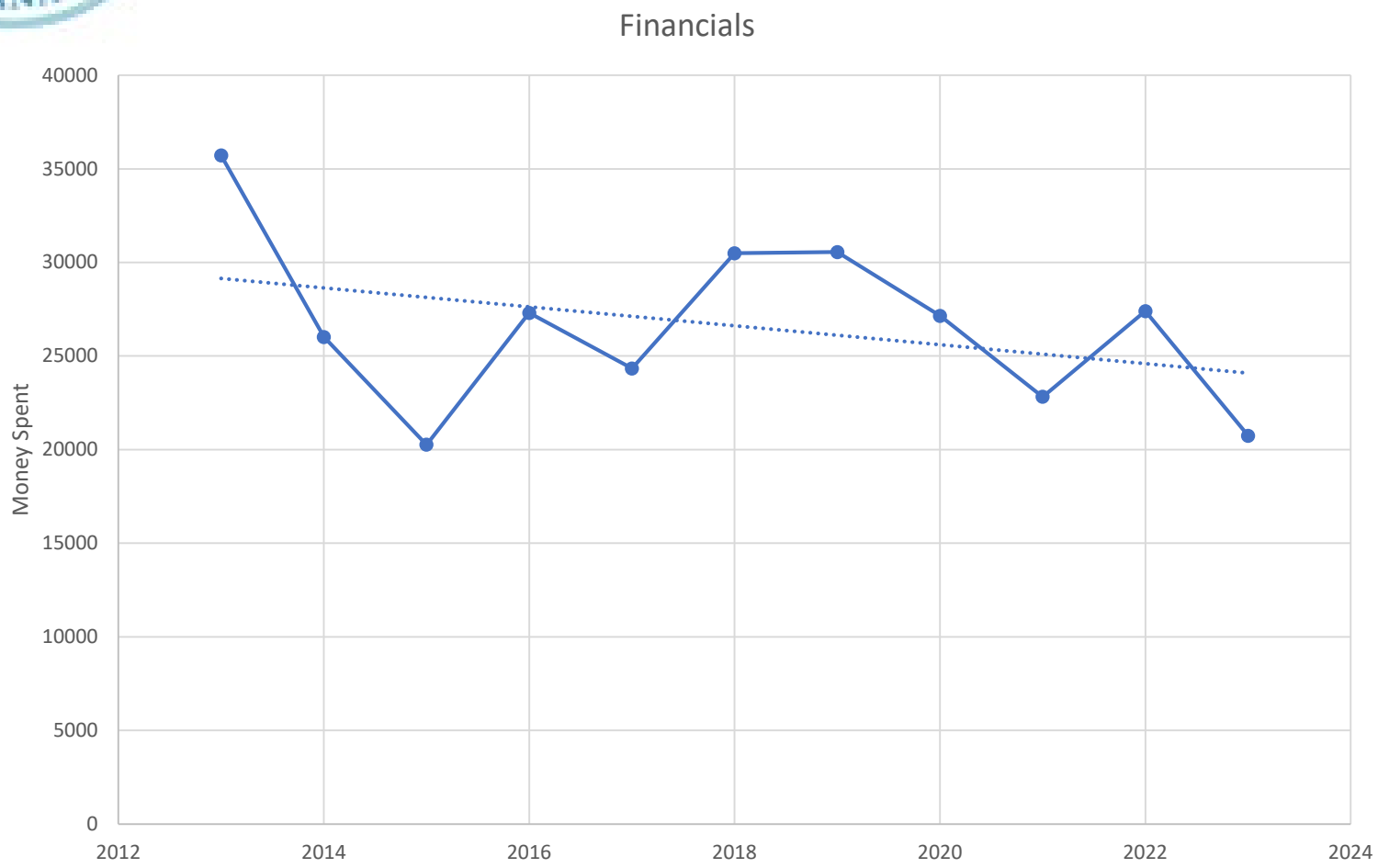
- Takes 6-10 years to conduct testing to get approval from EPA
- Re-Review cycle for currently approved products based on recent data
- After EPA certification takes years of toxicology review and testing by EGLE before approval in MI
- Testing includes degradation time in environment, and method of degradation
- Test effects on fish and non-target aquatic organisms
- Inert ingredients tested in addition to active ingredient
- 100-1000x buffer given to potential exposure level for swimming
- Only one product approved for use in MI has swimming restriction on label (Navigate – Systemic used for EWM, not used in Loon Lake)

[3.8 A Discussion to Address Your Concerns Will Herbicides Hurt Me.pdf (aquatics.org)]

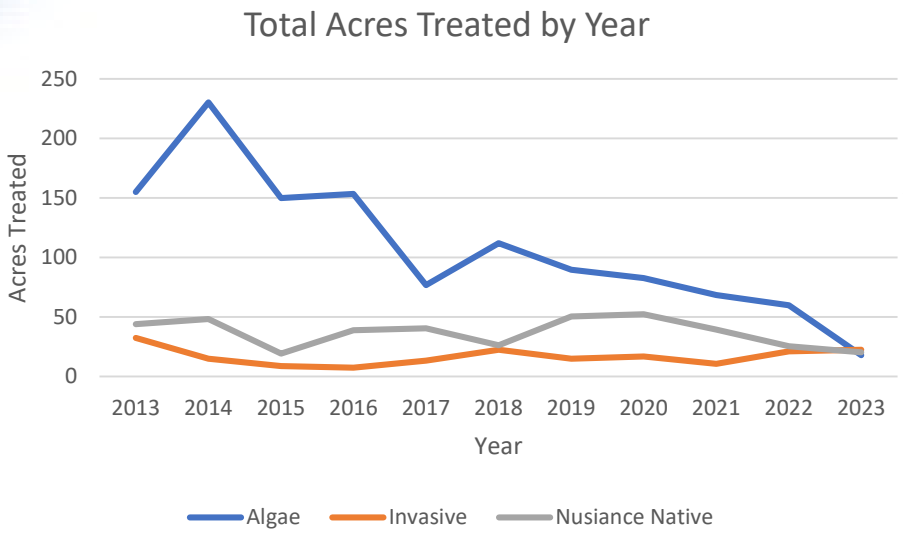
History of Loon Lake

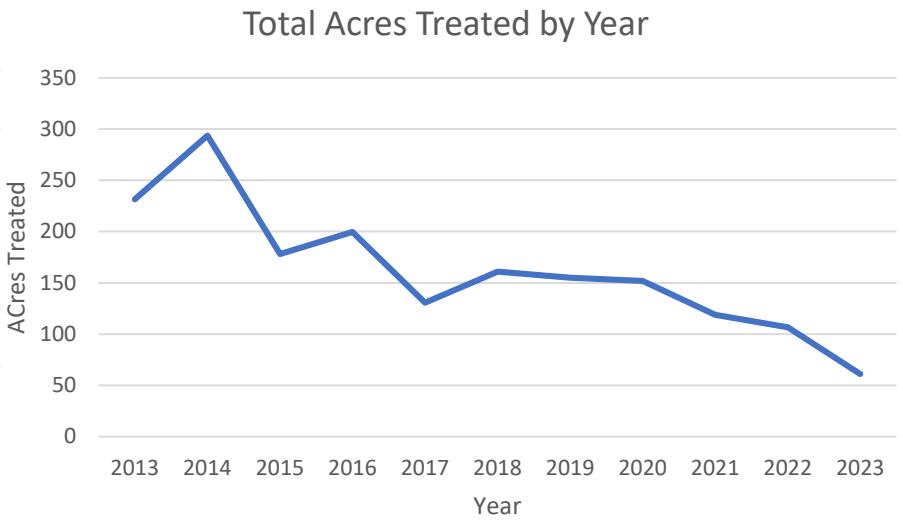
- PLM took over management in 2013.
- Original surveys documented CLP, and Native Species
- Overall annual budget was reduced during our management of the lake.
- Extensive water quality testing was performed for years, before reducing the program in 2023 as previous years of data has shown no negative trends
- In 2017 Starry Stonewort was found around the loons nest and was treated.
- Starry continues to come back around the loons nest annually, and has not spread beyond the area of initial introduction.
- Full lake surveys are performed multiple times during the summer to check for new infestations of invasive plants as well as evaluate the native plant community.
- Annual AVAS survey is performed each August to quantify the number and density of plants present around the lake
- Varying products/New product on the market
  - Alternating Active ingredients
  - ProcellarCOR
- Native pondweeds/plant species have been promoted

Loon Lake Budget

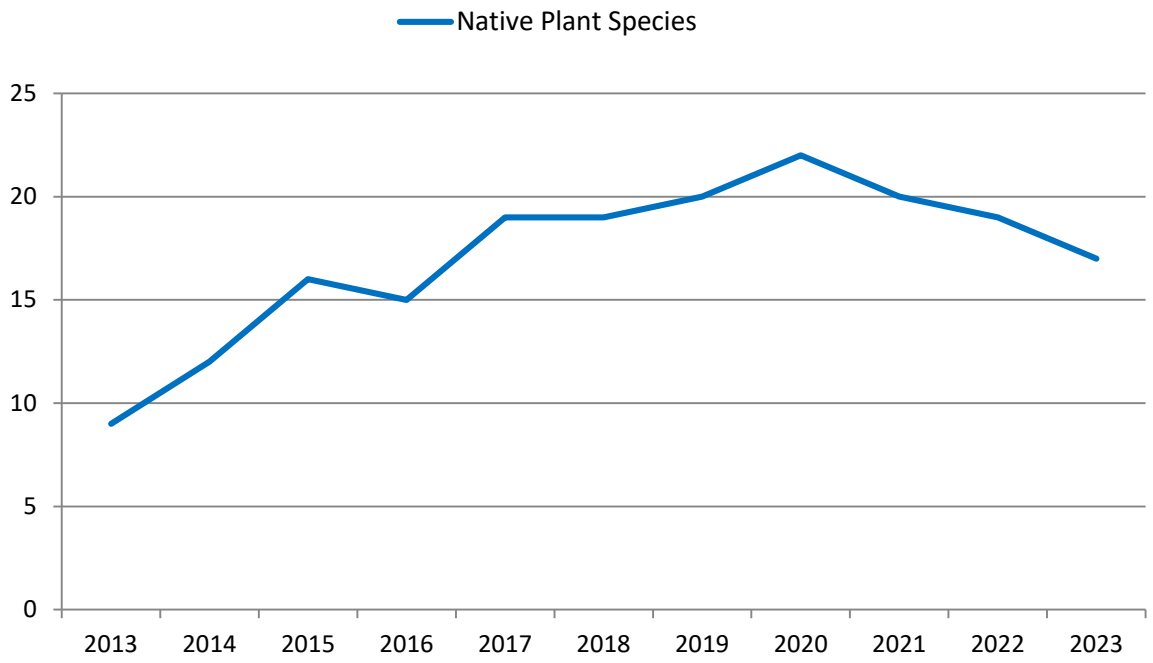


Management Through the Years





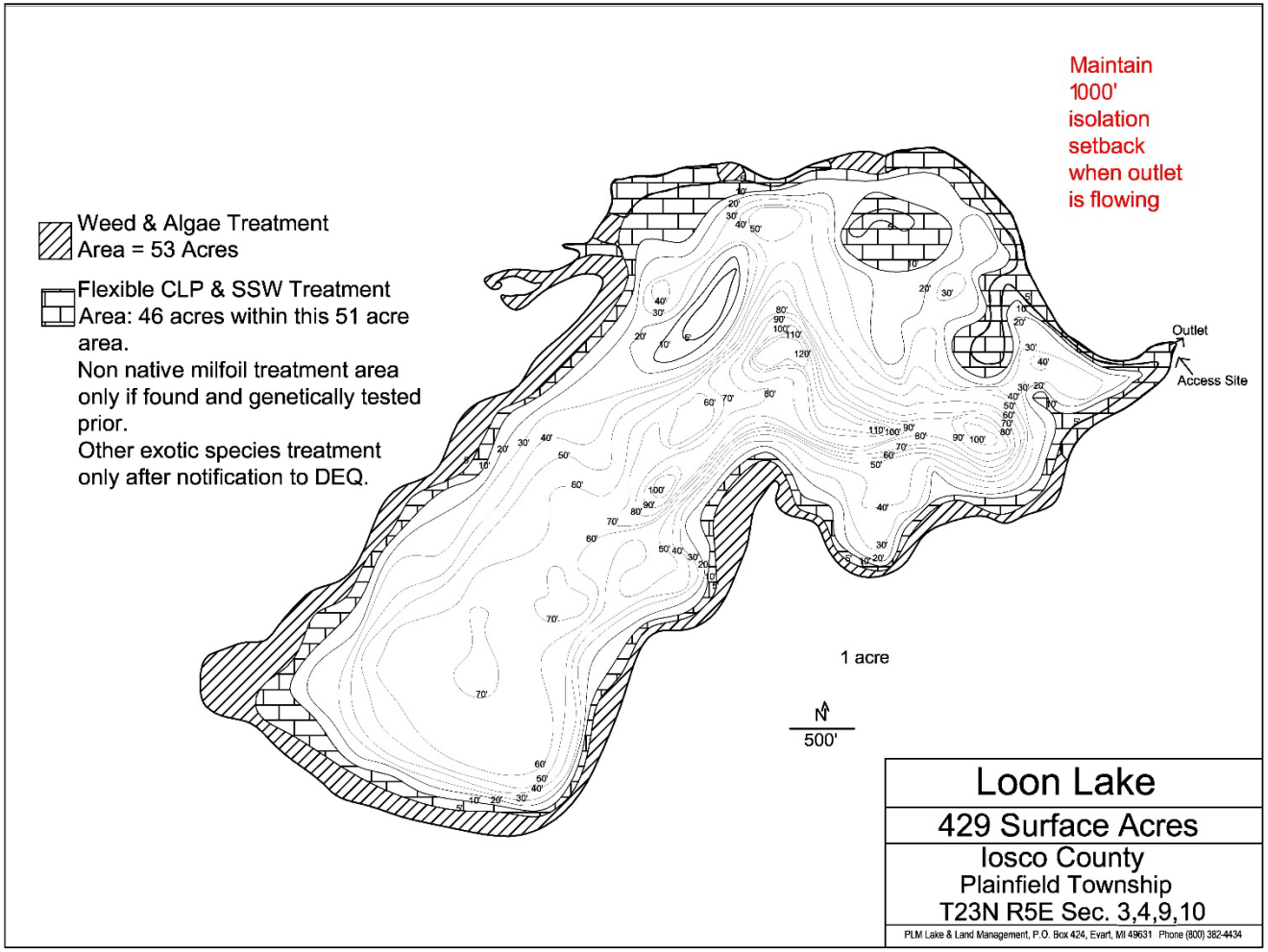
Native Plant Species



This graph illustrates the Native plant diversity throughout Loon Lake. Plant diversity can vary between years as represented in this graph. Variations can be from weather, surveyor techniques and plant biology (cycles between years). Overall, diversity is good on Loon Lake.

Treatment Maps

- Map until 2019
- Permit price based on # acres allowed for treatment



Treatment Maps

- 2019-Current Treatment map
- Decrease in W/A area
- Native species restricted to 34

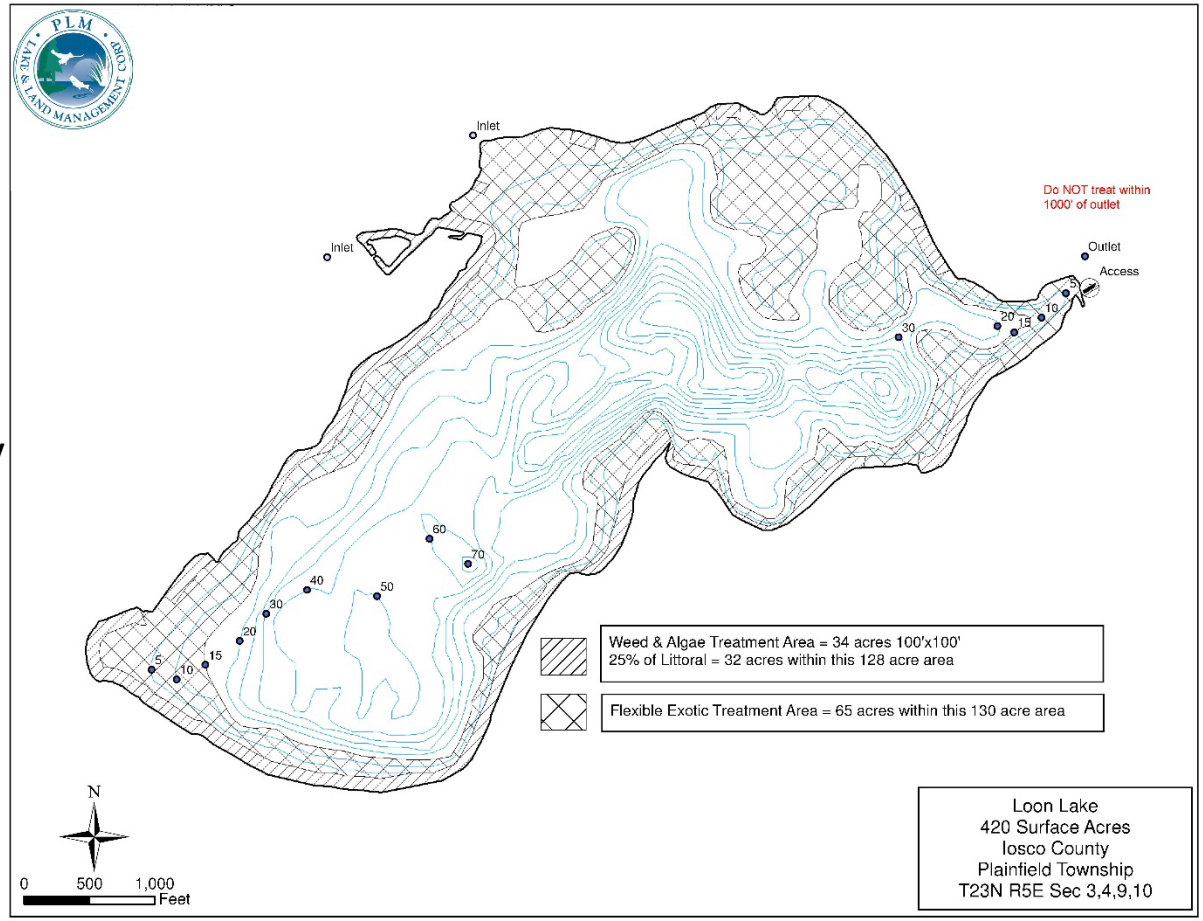
Acres-not flexible, residential only

- Exotic species area is flexible
- Exotic area generally not

Utilized unless exotic beds found

- Permit price $875 from

19.9-99.9 acres permitted



Littoral Zone-The margin of a freshwater body, extending out from the shore to the limit of attached or rooted plants, where light can penetrate to the bottom.

Water Quality Program

- Lake is tested 3 times a summer
- Spring
  - Nutrients (surface), DO, Temp, ALK, pH, TDS, Clarity, Conductivity
- Summer
  - Ecoli
- Late summer/Fall
  - Nutrients (surface), DO, Temp, ALK, pH, TDS, Clarity, Conductivity
- Important in making management decisions and understanding the impacts of human interaction on the lake (watershed) and why and how the lake is changing.

Lake 2023 WQ Results

Analytical Results

Parameter	Result	Units	Interpretation
Fecal Bacteria (E. coli		CFU/100 mL	N/A
Conductivity	190	uS/cm	Low concentration of dissolved salts
Total Dissolved Solids	170	mg/L	
pH	8.4	S.U.	Water is slightly alkaline
Alkalinity	127	mg CaCO3/L	Water is hard
Total Phosphorus	29	ug/L	Moderately phosphorus enriched
Nitrates	230	ug/L	Not nitrogen enriched

Eutrophication

- Lakes naturally progress from oligotrophic to eutrophic, a process called eutrophication.
- Human activities dramatically speed this process by increasing input of nutrients (phosphorus and nitrogen) and sediment
- Prevention is far easier and less expensive than restoring lakes already damaged
  - Monitor phosphorus and nitrogen concentrations
  - Encourage BMP – Phosphorus free fertilizer, buffers, soil erosion, leaves, debris out of lake
  - Evaluate sources entering lake (Watershed study)

Minimizing Nutrient Input

- Do not feed the ducks and geese. Remove dog, geese and duck droppings from lawns, docks, etc. Excess feces will increase nutrients within the lake. Please, do not sweep it into the lake!
- Create a natural buffer close to the water's edge and remove grass/turf touching the water's edge. A natural setting will filter excess nutrients from entering the water and help decrease erosion. The greenbelt should consist of native plant varieties of shrubs, flowers or trees that do not shed their foliage into the water. Natural buffers are also an excellent way to deter geese from making a stop on your beach front. Geese do not like areas where they cannot see the predators coming towards them.
- If you do fertilize make sure you are using. **Phosphorus free fertilizer!** Talk with your neighbors and develop a Phosphorus Free program which uses no phosphates and slow release nitrogen. One pound of phosphorous may produce over 775 pounds of algae-"The slimy green stuff". If you must fertilize, apply nitrogen fertilizer when the grass is actively growing to minimize loss of nutrients to nearby waters. Begin fertilizing in the spring when temperatures are warm and discontinue before the grass ceases to grow in the fall. Avoid application of fertilizer prior to rainy days.
- 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.

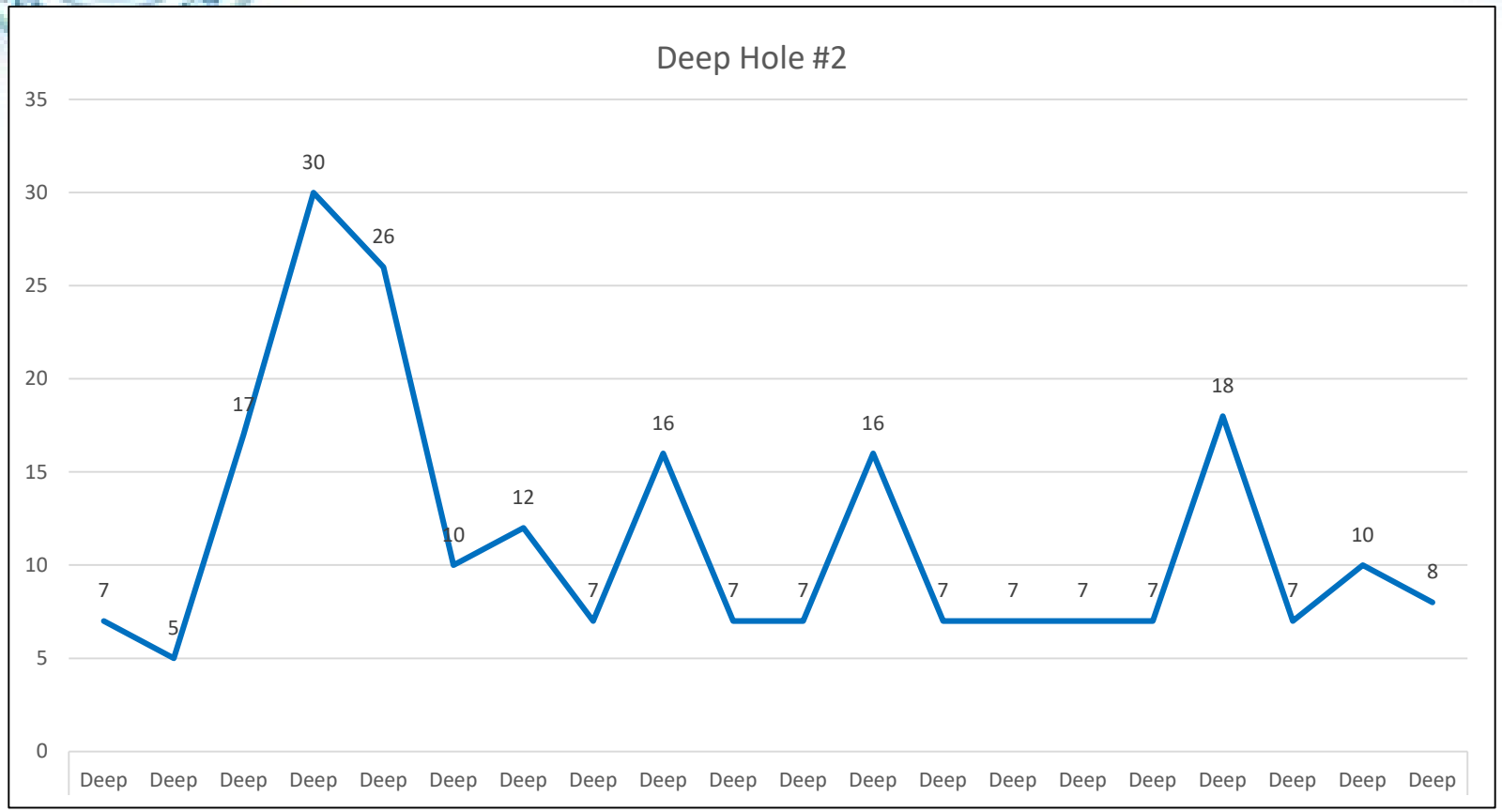
Trophic Status

- Trophic status is a measure of nutrient richness and productivity. Lakes with different trophic categories also differ n a variety of characteristics important to lake users. Common categories include: Oligotrophic, Mesotrophic, Eutrophic and Hypereurotrophic
- Loon Lake is Oligotrophic/Mesotrphoic

Characteristics Typical of Different Trophic States

	Oligotrophic	Mesotrophic	Eutrophic	Hypereutrophic
Water Clarity	excellent	Good	fair-poor	very poor
Nutrients	low	Moderate	high	very high
Algae	few	Moderate	blooms likely	severe blooms probable
Plants	few	Moderate	abundant	few, in shallows
Fishery	cold water possible	cold water possible	warm water only	rough fish often dominate

Total Phosphorus



This graph shows how Total Phosphorus can fluctuate depending on year. Low nutrient levels is an excellent sign in the overall health of the lake ecosystem. Lake levels were elevated from previous years in 2022. One test is not cause for concern, but is something to keep an eye on for 2024 and beyond.

Loon Lake Management 2024

- Routine Pre/Post surveys of the lake
- Treatment of non native species
- Annual AVAS Survey
- Water Quality monitoring
- All management efforts are evaluated and considered in both a short and long term strategy for managing your waterbody.

Tentative schedule (2024 Plan of Action)

The tentative schedule is provided to give an idea of what MAY happen on the lake throughout the season. It is NOT a confirmation of all services, specific times, or activities. Many factors can impact the schedule from permitting to weather, from equipment to weed growth.

April: Water Quality
June 3: Survey, Weed & Algae Treatment
June 24: Survey, Weed & Algae Treatment, WQ
July 15: Survey, Weed & Algae Treatment
August 12: Survey, Weed & Algae Treatment
September 9: AVAS Survey, Water Quality

If you live on a lake, you must own a rake!

- Regardless of management efforts it is the riparian's responsibility to clean shoreline of floating leaves and debris!
  - Reduces muck and improves the quality of your shoreline.
- Knowing the species is important.
  - Fragmentation!
  - New introductions!

STOP AQUATIC HITCHHIKERS!

Prevent the transport of nuisance species.
Clean all recreational equipment.
www.ProtectYourWaters.net

THANK YOU, QUESTIONS!!!

- Know your environment, what is around you
- Ask questions
- Communicate
- Prevention is key
- Early detection, rapid response
- We can all do our part!
- Let's work together to protect your Lake!

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