



Protecting your
environment today
for tomorrow.

Chippewa Lake

May 3, 2024

BreAnne Grabill, Environmental Scientist

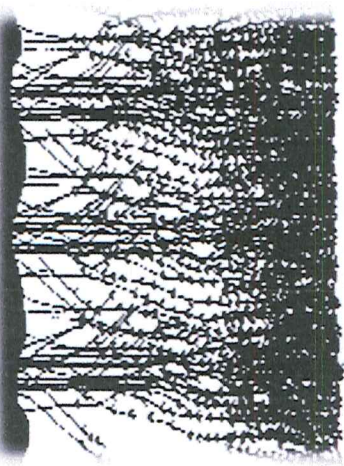
Senior Regional Manager

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- Integrated Pest Management (IPM) Approach
 - Emphasize spending more effort evaluating the problem, so that exactly the right control can be applied at just the right time to control the pest.
 - Minimize management costs and minimizes the use of chemicals.
 - Essential for long term success.
 - Multi-faceted approach to review numerous control avenues.
 - Allows for cost-benefit analysis as well as checks and balances over program.
- Plant Management
 - Submersed nonnative plant management
 - Eurasian watermilfoil (EWM), Curlyleaf pondweed (CLP), Starry stonewort (SSW)
 - Emergent nonnative plant management
 - Purple Loosestrife (PL)
- Algae management
 - Advanced monitoring in place, reports of growing visual impacts.
 - Water Clarity, Harmful Algal Blooms (HABs)



Aquatic plants are part of a healthy lake. They produce oxygen, provide food and habitat for fish, and help to stabilize shoreline and bottom sediments.

Insects and other invertebrates live on or near aquatic plants, and become food for fish, birds, amphibians and other wildlife.

Plants and algae are the base of the food chain. Lakes with a healthy fishery have a moderate density of aquatic plants.

Aquatic plants provide habitat for fish and other aquatic life.

Aquatic plants help to hold sediments in place and improve water clarity.

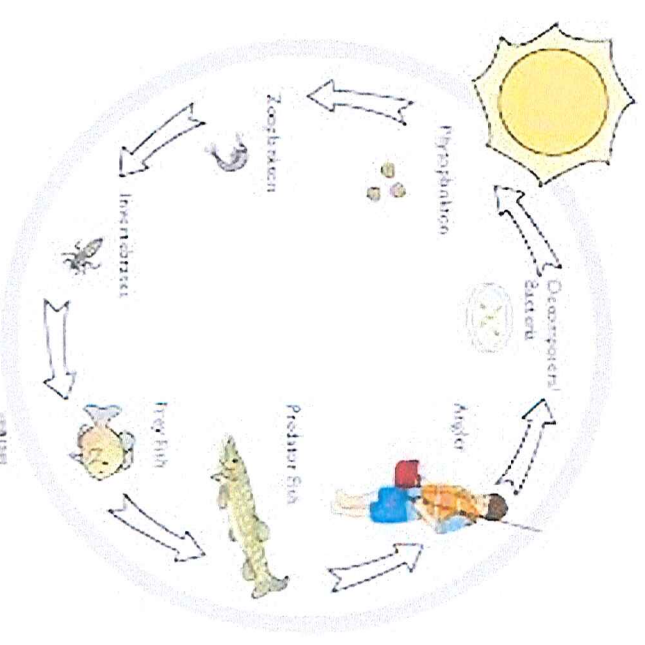
Roots and stones absorb wave energy and reduce scouring of the lake bottom.

Trees and shrubs prevent erosion and provide habitat.

Predator-fish such as pike hide among plants, rocks, and tree roots to sneak up on their prey. Prey-fish such as minnows and small sunfish use aquatic plants to hide from predators.

Algae Management

- Algae or Phytoplankton are the base of the food chain.
- An over abundance of algae is an indicator
 - An excess amount of nutrients within the water column/lake, causing the waterbody to become overly productive.
- If algae reaches the point of hindering the use of the lake, control measures are available:
 - Actions should be taken within the watershed to promote a healthy lake ecosystem and decrease nutrient loading, etc. However, no immediate change will be seen with these actions but play a critical role in protecting the lake for future generations.
- Phosphorus Mitigation Options
- Direct control options – treatments, etc.
- 3 types of algae to be familiar with:
 - **Filamentous, Planktonic, Macroalgae**





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Algae

Macroalgae

- Chara
 - Grows like a plant on the bottom (carpet), is a natural water filter and is excellent for fish bedding
 - This is a #1 species in Chippewa Lake and should continue to be protected!
 - Chara is one most dominate “plant” in Chippewa Lake
- Starry stonewort
 - Starry stonewort- the enemy of Chara and Chippewa Lake
 - Cause severe recreational and ecological damage
 - Top watch list species and a top priority of surveys to help prevent and stop the spread of it.



Filamentous algae

- Form raft-like masses over the water surface.
- Vulnerable to winds and currents
- Can grow attached to the lake bottom, weeds and docks.
- Frequently detach from the lake bottom and form floating mats.



Algae

Planktonic algae

- Microscopic, often referred to as "water bloom".
- Typically Blue-green algae species
- Many different species but most problems with planktonic algae come from "Cyanobacteria"
- In large number, the algae can cause water to appear green, brown, yellow, or even red.
- Dealing with the source is often preferred over treatment.
- Cyanobacteria
 - Often referred to as blue green algae blooms
 - Different forms and appearances
 - Can produce toxins (not always)- these are referred to as a HAB
 - Microcystis (common)
 - Rivularia (less common)





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Rivularia



- Colonial, benthic (bottom) cyanobacteria
- Jelly like (gelatinous) and very squishy
- Grows on stones or plants but can be found free floating
- More common in mid-summer through late fall, when temperatures rise
- Small changes in ecosystem can present conditions for different species to grow
 - Rain events, temperature fluctuations, climate change, watershed development
- August 2023
 - Tested for micro toxins, none found
 - Less common species, so less is known about it
 - Water quality testing for nutrients (no spikes found)
 - But doesn't rule out an input of Phosphorus that wasn't captured
 - Zebra mussels don't filter Cyanos (prefer green algae)
 - Brought in algae specialist, Dr. West Bishop
 - Video available on website
- 2024- monitor and respond based on what grows.



Goals of Aquatic Plant Management

Control Exotic Species

Promote a Balanced and Diverse Native Plant Community

Improve Fisheries

Maintain Property and Recreational Values

Native Plant Species

Fundamental component of aquatic ecosystems

Perform important functions:

Stabilizing sediments; support aquatic insects; maintaining oxygen; provide forage and refuge areas for fish

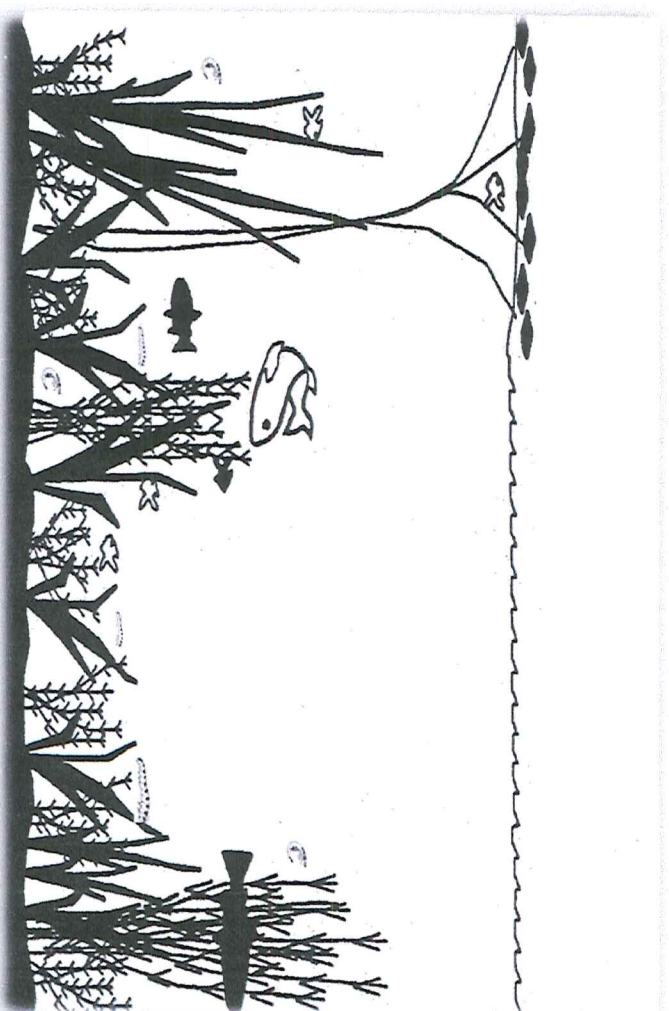
Diverse fishery including both cool and warm water species.

Overall health of the lake's fishery is directly tied to many factors including:

Plant coverage; Water quality; Algae densities

Managing nonnative plants, while maintaining native plants will promote a healthy fish community.

Through proper management, a fishery can be maintained and restored.



Chippewa Lake Survey Program

- Numerous surveys each summer including:
 - Annual AVAS Surveys
 - Map with 71 segments
 - Pre/post treatment surveys
 - Includes GPS mapped areas for applicator
- Water Quality Testing
- Treatment Recap

2023 Service Timeline:

<u>Service</u>	<u>Date</u>
Survey, Water Quality	4/10
Survey, Algae Treatment	5/18
Survey, Weed/Algae Treatment	5/30
Survey	6/22
Survey, Weed/Algae Treatment	6/26
Survey, Water Quality	7/5
Survey, Algae Treatment	8/3
Survey	8/16
Survey, Algae Treatment	8/31
Bathymetric mapping, WQ	9/7
AVAS Survey	9/22



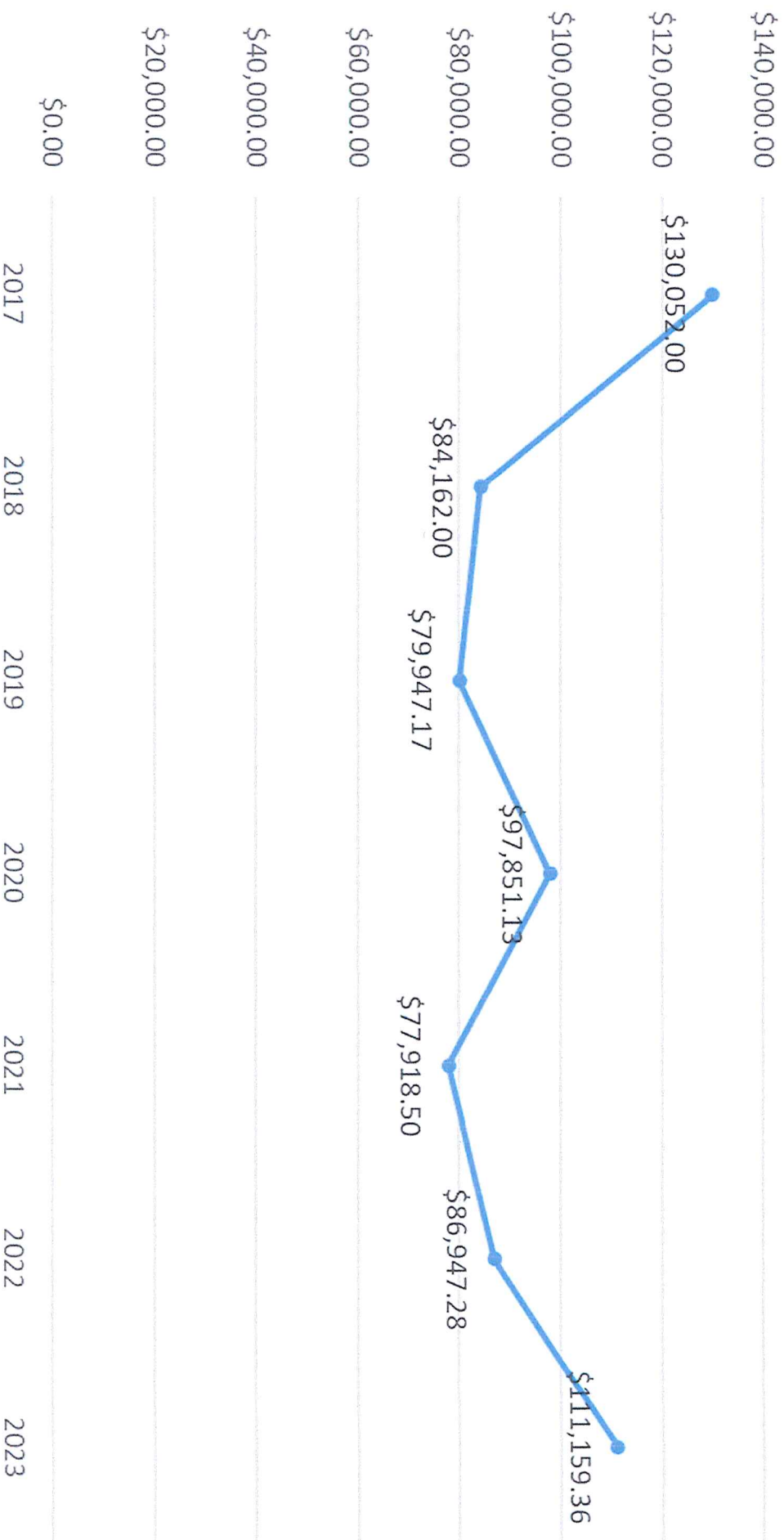


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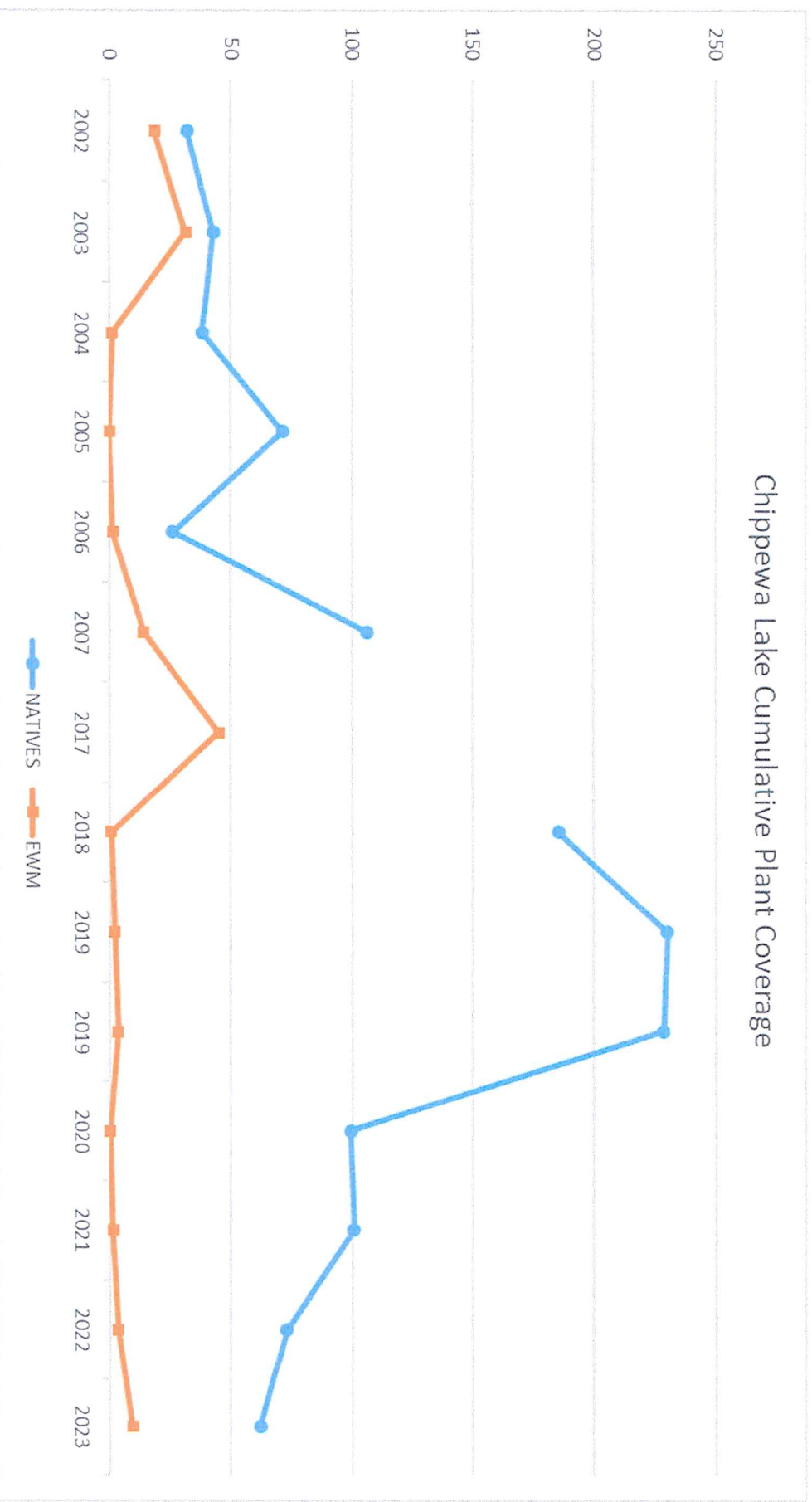
Chippewa Lake

A look back at the cost of treatment annually

Cost of Management Program



Chippewa Lake Cumulative Plant Coverage



This graph shows the cumulative coverage of EWM and Native plants from 2002-2023. An overall decline in the presence of EWM from the start of the management program shows the success and in 2023, a resurgence was found. This is no unexpected based on an established seed bank.

Documentation does show that after EWM control has taken place, the natives in the lake rebounded! But, in recent years have tapered off some, likely a reflection of natural competition, seasonal weather patterns, lake activity among other factors. Continuing to monitor these trends are important to understand the overall health lake.



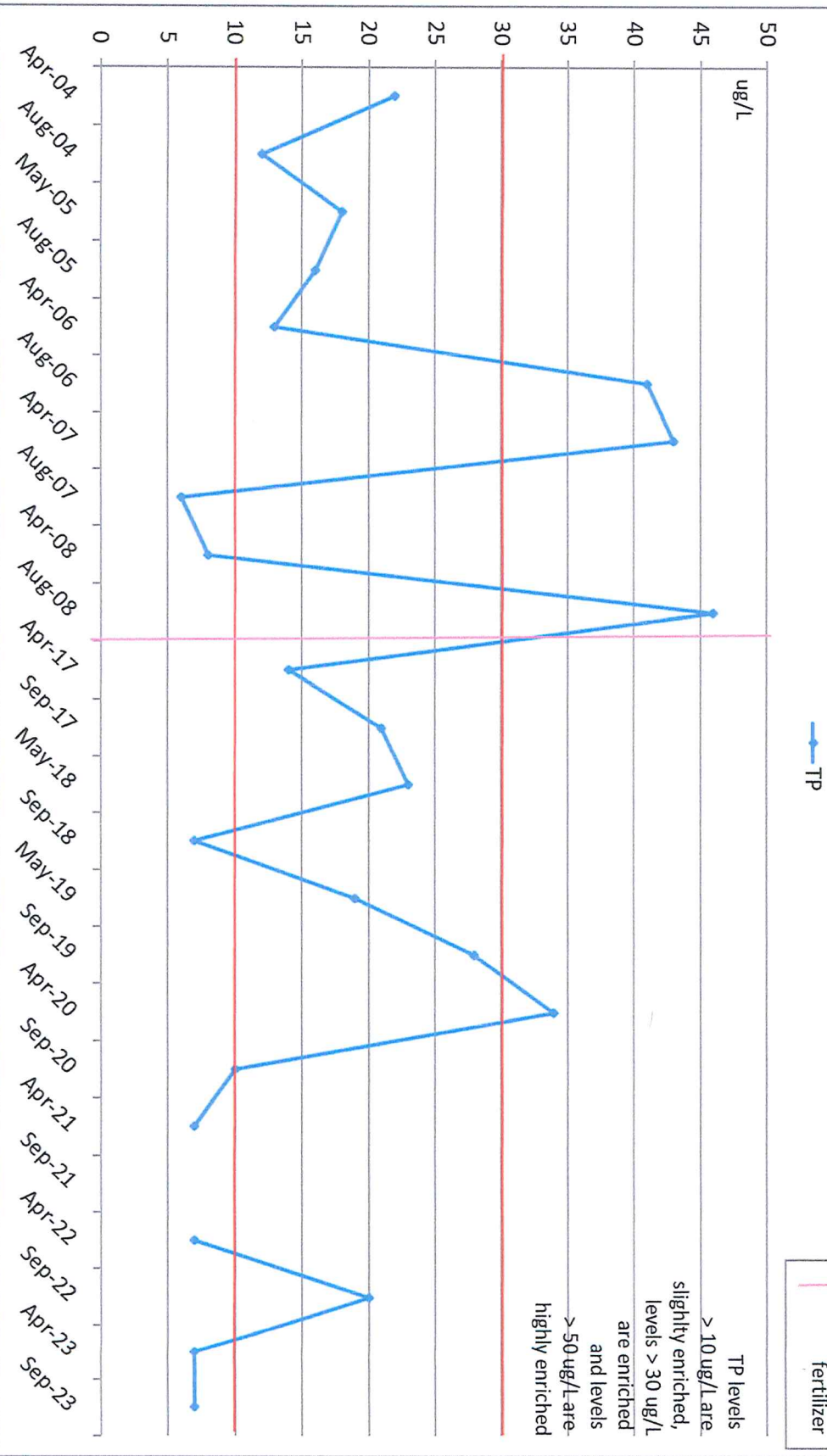
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Chippewa Lake Water Quality

- Chippewa Lake participates in PLM's water quality program
 - Test spring and end of summer for various parameters
 - Phosphorus, Nitrates, Alkalinity
 - Spring is surface (before lake is stratified)
 - End of summer is deep water sample – checks for internal loading
 - Temperature, Dissolved Oxygen, pH, Conductivity
 - Summer Ecoli testing

Total phosphorus measures the total amount of phosphorus in the water. Phosphorus is an important plant nutrient (i.e., fertilizer) and the nutrient most likely to limit algal growth. Phosphorus levels are not only related to internal loading of nutrients but also from external sources. Elevated phosphorus inputs to lakes caused by human activities are a major cause of cultural eutrophication. Readings above 10 µg/L are considered slightly enriched while readings over 30 µg/L are considered enriched.

Total Phosphorus



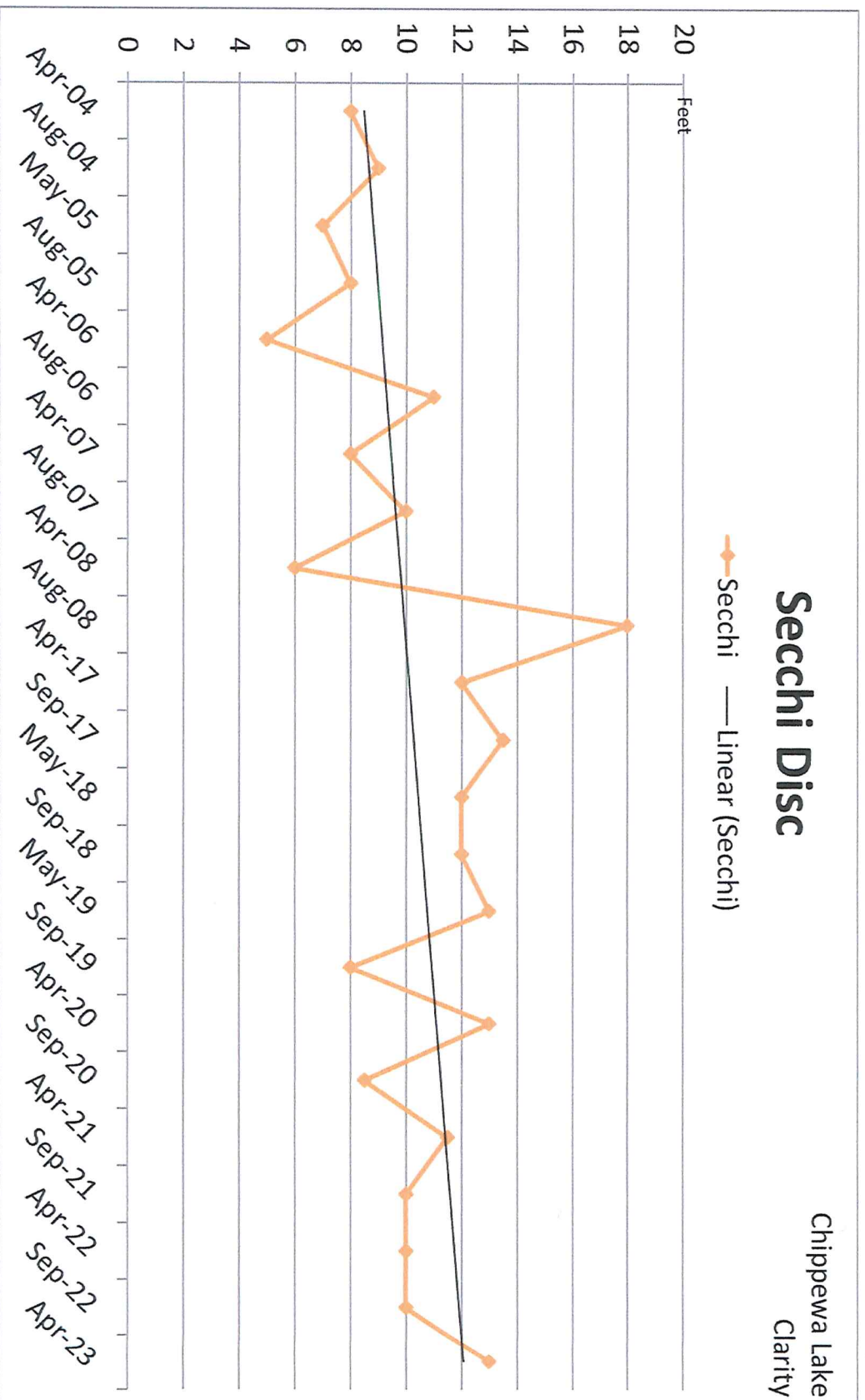
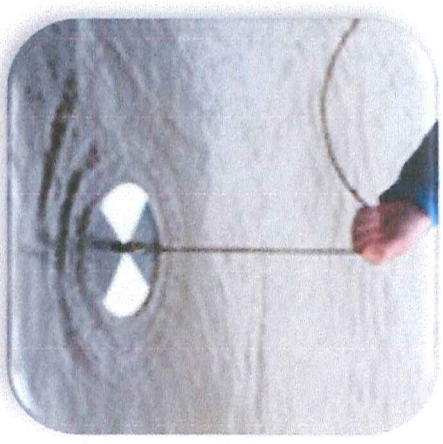
Historical data shows spikes but not a massive concern.



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Secchi Disc

- Numbers can vary daily/weekly
- Variance since 2004, trendline shows historical increase





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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)

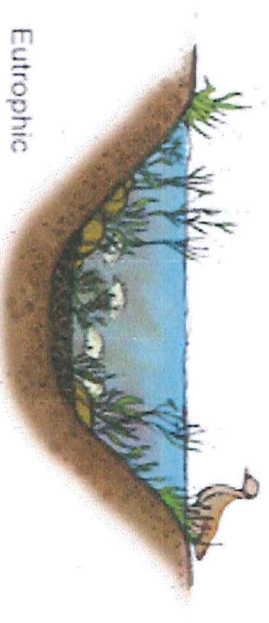
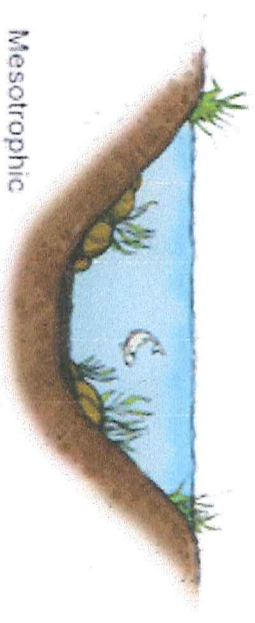


Photo curiosity Progressive AE

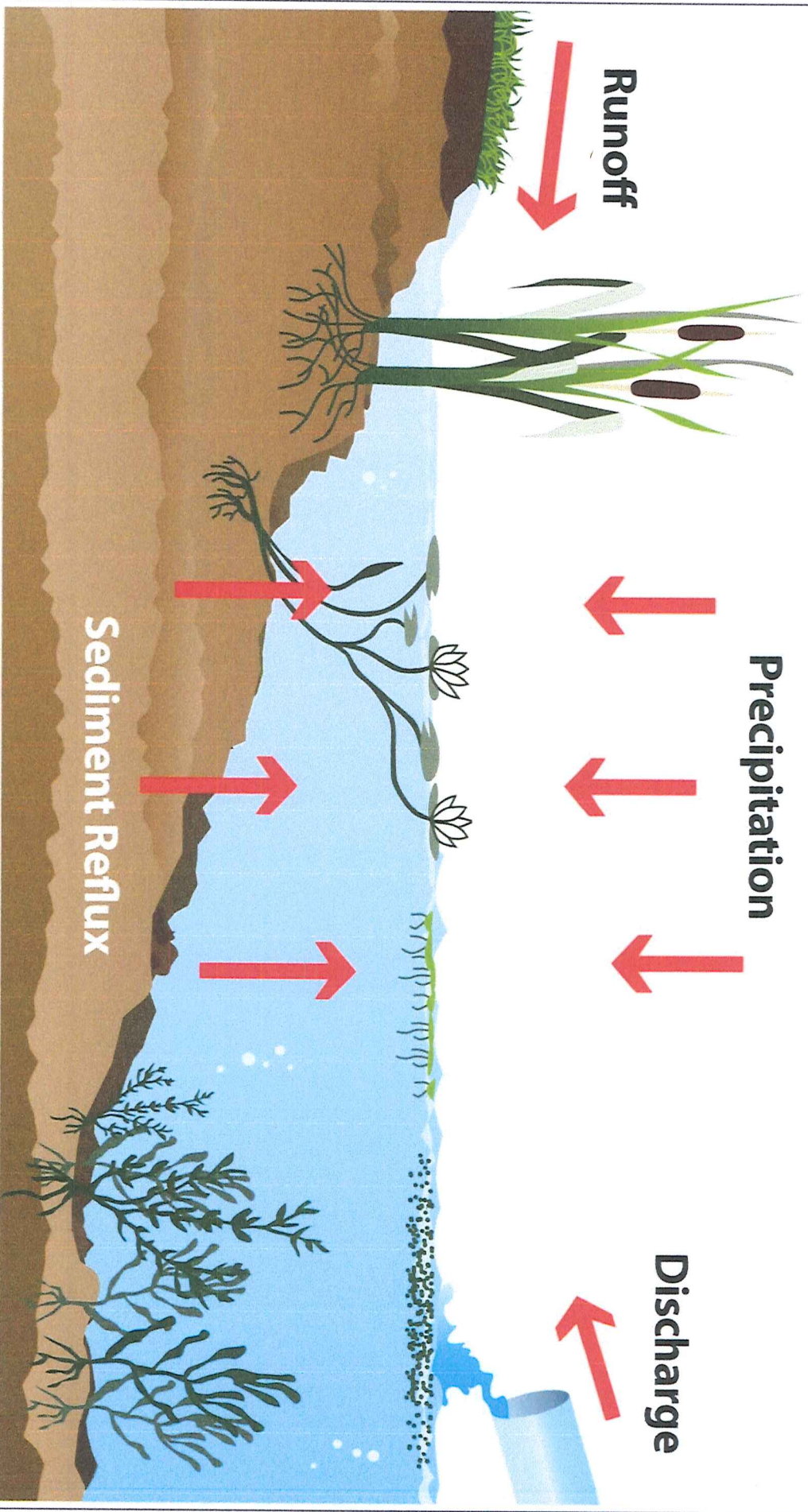
Trophic status

	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

Phosphorous Mitigation

- 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)
 - Products available to remove Phosphorous

Sources of Phosphorus Loading

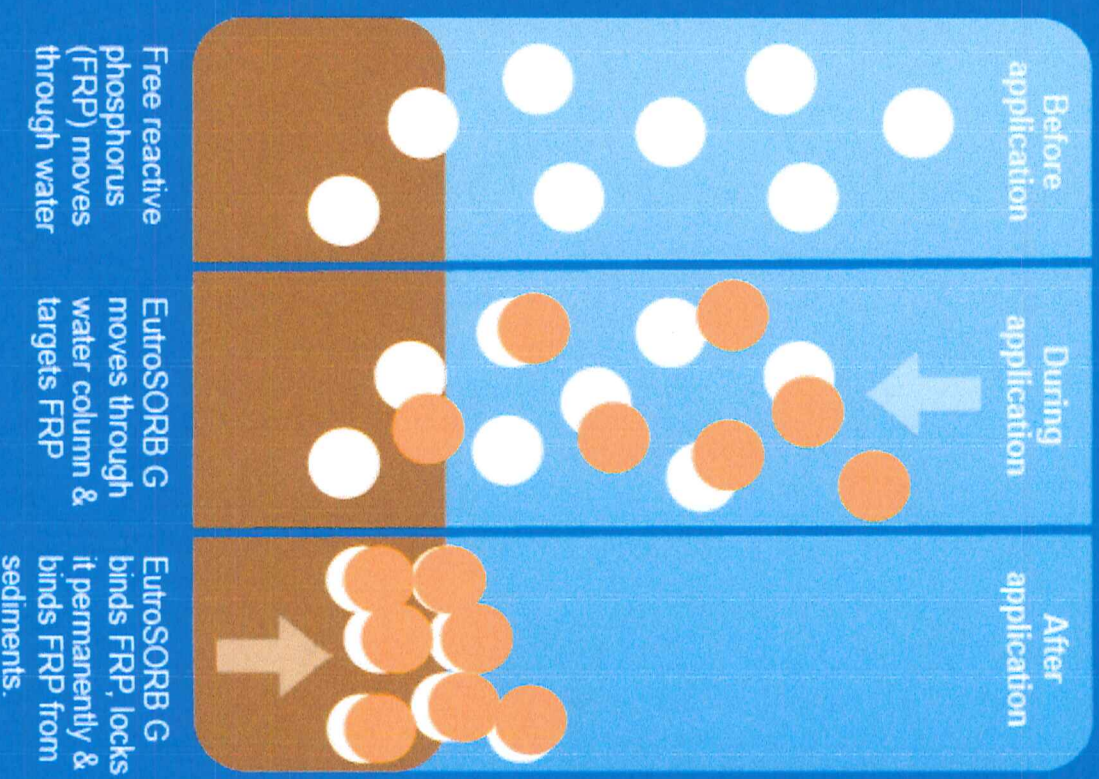


Phosphorus Mitigation

- 1lb. Of Phosphorus can support 500lbs of algae
- 90% Bentonite Clay
- 10% Lanthanum “Element #57”
- 50 lbs. of EutroSORB G will bind 1 lb. of P
- Chippewa Lake Treatment 2024
 - 19 acres of Channels/East Bay
 - 39 acres of shoreline

EutroSORB® G

Phosphorus Locking Technology



Chippewa Lake
800 Surface Acres
Mecosta County
Chippewa Township
T16N R8W Sec 20,21,29,30



Phosphorus Management Areas Priority A = 19 acres



Phosphorus Management Areas Priority B = 39 acres



Wake Boats!

HB5532- bi partisan sponsorship to regulate use of Wake Boats in Michigan
Take a ways provided by MLSA.

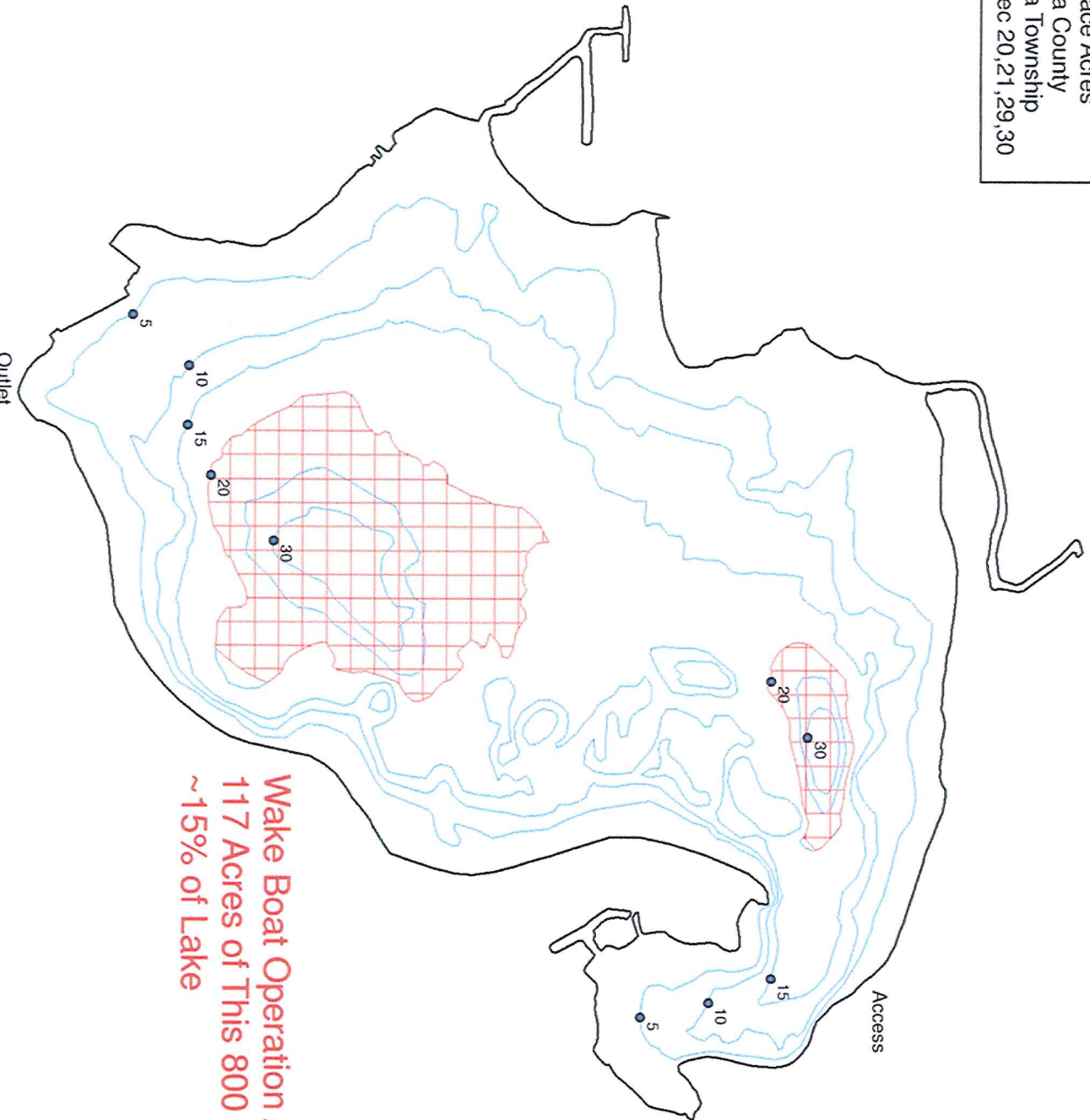
- Intends to limit wake augmentation to depths of 20' and a 500' distance from shore or other stationary objects.
- Analyzing all of the scientific studies available on the topic, MI DNR made the recommendation to restrict activity based on the water quality concerns (i.e. damage to shorelines, bottomlands, and fish habitat) which greatly backs up the legislation as it is currently drafted.
- Concerns about the fishery's, birds and ecological impacts
- Concern that the increase in wave action causes safety issues for other boaters and recreational activities on lakes.
- Similar legislation already exists and/or is being researched in other states (OR, ID, VT, NH, ME, WI, MN) and Canada.
- Lakes vary considerably.
 - There are many examples of narrow, shallow, and low acreage lakes where wake activity is particularly problematic.
- The design of a wake boat is unlike any other vessel used on inland lakes when the original boating laws were adopted.
- There was no way to predict the need for changes, much like when personal watercraft (PWCs) became popular and needed specific regulation.





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Chippewa Lake
800 Surface Acres
Mecosta County
Chippewa Township
T16N R8W Sec 20,21,29,30



Wake Boat Operation Area
117 Acres of This 800 Acre Lake
~15% of Lake



Water skiing doesn't destroy pristine lakes, but...



WAKESURFING? That's a whole new story!

The bow comes up and the stern goes down to increase the wake, so it's hard to see ahead.

3 to 4 foot high wakes are created so people can wakesurf, without a rope, like surfing in the ocean.

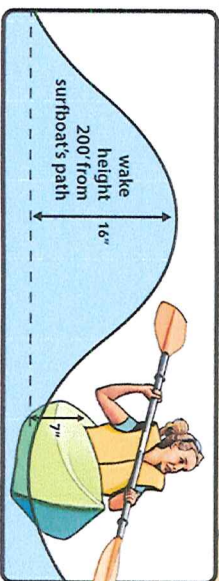
Algae blooms are fueled by nutrients freed from disturbed sediment. Some can kill fish and pets, and make people sick.

Fishermen have been knocked over, pontoons drenched, and small craft capsized by the massive wakes.

If fishermen, pleasure boaters, paddlers, and others can't enjoy our lakes, then tourism, property values and business income will plummet.

Loon nests are just inches above water in calm areas. Big wakes can destroy eggs.

Is the boating industry's 200 feet from shore rule enough?



Sediment is stirred up and plants are damaged 20 feet deep by the powerful motor and deep downward angled propeller.

Little fish live among the plants. Fewer plants means fewer little fish for big game fish to eat.

Loons, otter and many fish can't see prey in murky water.

Ballast tanks don't drain completely and can bring invasives from other lakes.

Invasive plants spread easily in damaged areas.

Spiny waterfleas can upset the entire ecosystem, resulting in fewer game fish and murky water.

As the wake enters shallow water, plants are damaged, sediment is churned, and fish eggs can be destroyed.

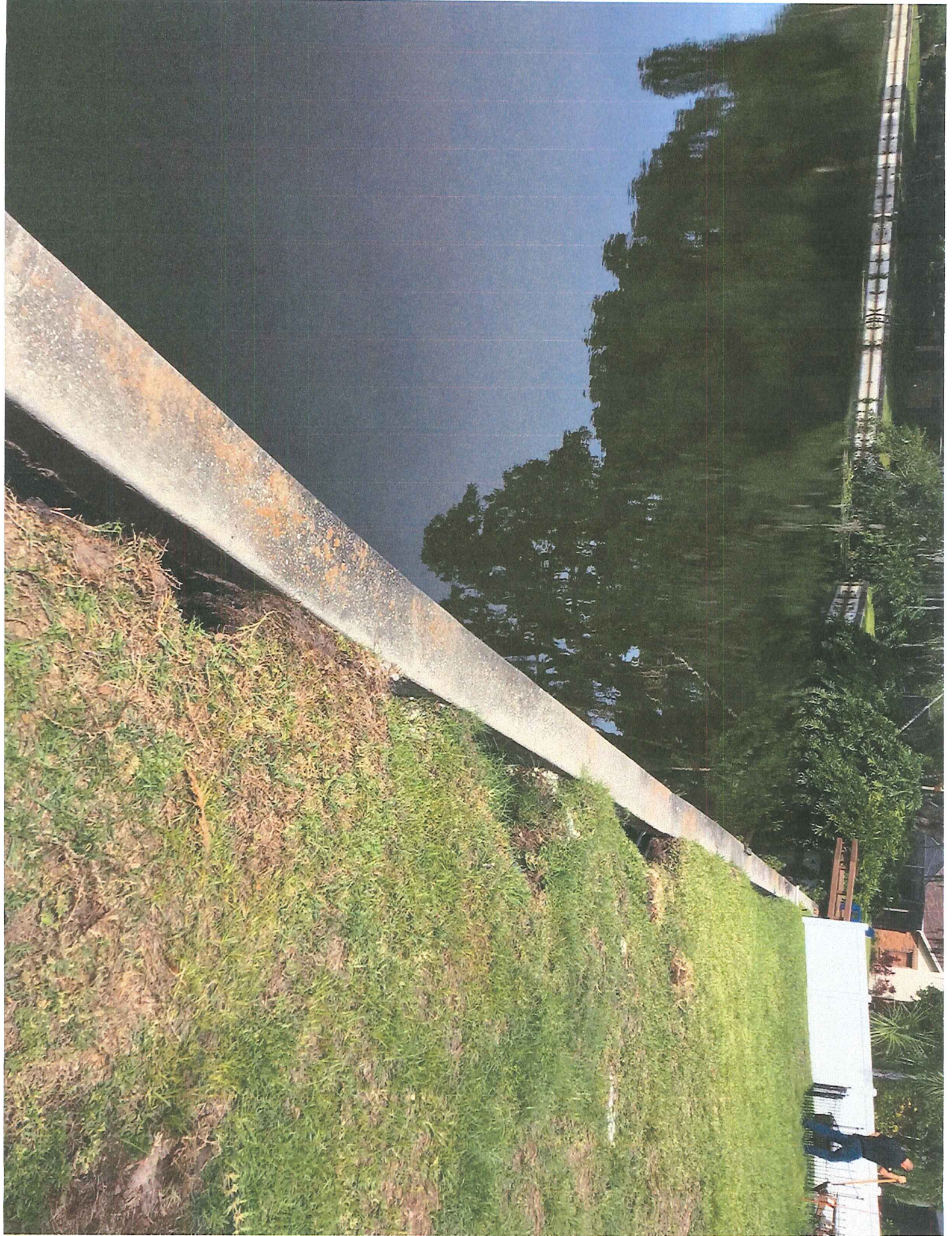
When the big wake crashes on shore it can cause erosion and damage docks and moored boats.

How do they make those huge wakes?

- Add ballast water, up to 5000 pounds (600 gallons)
- Operate at speeds that bring the bow up and stern down
- Use wake enhancing fins
- The wake is 6 to 12 times more powerful than ski boat wakes!

- 16'** = Height of wake 200' from wakesurf boat's path (per industry)
- 7"** = Typical kayak freeboard
- 10"** = Typical canoe freeboard
- 12"** = Typical small fishing boat freeboard
- 9"** = Height of waves, 25 mph wind, 30 minutes, 1 mile wide lake

For More Information See: LastWildernessAlliance.org
Report dangerous boating at DNR's anonymous 24/7 hotline: 1-800-TIP-WDNR



Newsletter Produced by PLM Lake & Land Management Corp. Spring 2024



The property owners in this area are planning to have the waters chemically

The property owners in this area are planning to have the waters chemically treated to control lake weeds and/or algae. This notice is being circulated in accordance with Department of Environment, Great Lakes & Energy (EGLE) procedures. Due to the uncertainty of weather, the treatment schedule is approximate. Please watch your shoreline for the posting of the 8.5 x 11 inch, yellow or green signs. The signs will indicate the date of the treatment, the products used, and any restrictions on the use of treated water for swimming, watering lawns, etc. One or more treatments involving water-restrictive products may be applied. Please be aware that only products approved by the State of Michigan and the Federal government are being used. We have experienced no adverse effects on people, fish, wildlife or domestic pets since applying these products. We anticipate using one or more of the products listed. Please read the restrictions. Again, the restrictions that apply to the products actually used in a particular treatment will be found on the signs posted on the day of treatment.

Treatments will be occurring throughout the summer months. Please watch

you will see PLT on your lake many times this summer. We will not always be treating the lake, but performing many surveys, water quality testing, etc. Thank you for your understanding as we work to preserve and protect Clippewa Lake. The following weeks of have been tentatively set but (floods, weather, etc.) Always watch for posting signs.

Property Owners, please check Township website for most current treatment dates! <https://www.chippewacwp.org/>

April 15: Water Quality May 13: Spring Survey, Spot Algae Treatment
May 17: Potential Weed & Algae Treatment June 17: Survey
June 24: Weed & Algae Treatment July 22: Survey
August 26: AVAS, WQ & Optional Algae
September 2: Optional Weed Treatment

The popularity of wake sports has been on the rise over the past decade and with it

The number or more boats operating on Lake Erie These boats are designed to produce large waves. Hull shape, ballast tanks, adjustable plates, and thrust power are some of the technologies used. Wave boaters tend to push thrust at a downward angle and therefore have a greater potential to disrupt bottom sediments in addition to their wake erosion. Several recent scientific findings provide unequivocal evidence that wave-dependent water sports are having an adverse impact on frequently exposed aquatic ecosystems. Shoreline degradation, shallow water herbicide disturbance, safety related incidents, and damage to waterfront property occur. On February 26th a bill was introduced in hopes to minimize adverse impacts of wave boaters. "It will require a person in a wave sport mode to go 500 feet or more from a shore or dock and as a depth of 10 feet or more." For more information visit:

<http://www.lake-erie.com/water-sports/legislation/index.html>

Sonar A.S. fluoride: Swimming or bathing 1 day. Irrigation re-

[illegible][illegible][illegible]

The chemicals used for Aquatic Nuisance Control are registered by the U.S. Environmental Protection Agency and the Department of Environment, Great Lakes and Energy. The potential for damage to fish and other non-target organisms is minimal provided that the product is used as directed on the product label and the permits. To minimize the potential effects on health and the environment, the treated water is restricted for the above purposes.

Method of Application: Chemical application will be made via boat back pack and/or hand vehicle applying liquid surface products by surface spray and/or injection. Granular product application will be surface broadcast.

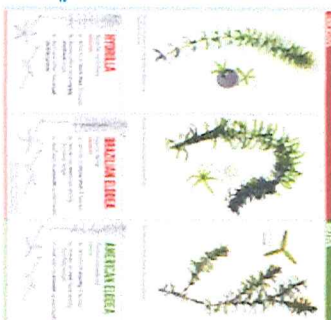
PLH Ltd. Land Management Corp. Certified Affiliated Company
 Estate Planners: David, Robert, Bruce, John, Pauline, William, Cecilia, Joseph
 Correll, James, Davidson, Neilson, Fraser, Wilson, Duden, Holder, Evers, Jeff
 Fisher, Brando, Crabb, Dean, Crabb, Mark, Nelson, Kate, Margaret, Sue, Peter
 And, Paul, Elizabeth, Johnson, Peter, Joseph, Elizabeth, Paul, Elizabeth, Paul, Peter
 Margaret, Kim, Kristen, Eric, Alfred, Catherine, Peter, Susan, Robert, John, John
 Cori, Robert, James, David, David, Margaret, Susan, Susan, Gary, David
 John, John, Peter, Jennifer, Jeff, Tom, Alan, Tomaszewski, David, Virginia
 Andrew, William

100

In the decade news we tracked for over a decade was met with reality in September when *Hydrilla* was positively identified by the Water Resource Division of EGLE in two small waterbodies in Berrien Springs, Michigan. *Hydrilla*, widespread in southern states, has been a top "Watch List" species in Michigan for decades.

FLN was contacted by EGLE as part of their Rapid Response Plan for new exotic plants to get these plants tested as quickly as possible. FLN responded immediately with an herbicide treatment to experimentally treat the infestation in hopes to prevent it from spreading regionally or state wide. Hydrilla, a federally regulated plant, in which it is illegal to house and/or sell, has plagued southern US waters for decades. It's ability to reproduce through fragmentation, stolons or rhizomes and tubers makes this plant extremely difficult to control. It quickly outcompetes native and most other noninvasive plants (including Eurasian watermilfoil), forming a dense monoculture (single plant) and is considered one of the world's most invasive aquatic plants.

An early detection rapid response plan is vital to any management plan in order to protect it from new invaders that threaten our lakes. FLIM works closely with our clients to ensure that proper protocols are in place to protect our lakes. With *Hydrilla* positively identified in Michigan, it is important that everyone is on the look out for this plant and know the key identifiers. *Hydrilla* looks very similar to Michigan's native species, *Eloidea* as well as another nonnative invader, Brazilian *elodea*. *Hydrilla* has a whorl of more than 3 leaves, has dry serrated edges, and is the ONLY submerged plant to produce submers.



more and more developed, the impacts combin-

use to be damaging to the lake ecosystem. From mowed grass and sandy beaches, to seaxalms and riprap to wake boat waves and erosion, the cumulative effects of these human alterations have reduced the natural ability of the lake to reduce the human footprints around the lake. The health of the lake will be improved when shoreline restoration is helpful from reducing nutrient loading and runoff to providing habitat for birds and fish to naturally defend against *C. parvum* and other pathogens. In addition, against Canadain geneses converging in you, it is important that action is taken to minimize development impact and restore natural features.



2024

Recommended Management Schedule for 2024:

- A spring and fall vegetation survey (to evaluate conditions in the lake).
- Exotic plant management/treatment, as required
- Algae management as needed
- Phosphorous mitigation
- Pre and post implementation surveys as required, in addition to a mid-summer survey
- Water quality monitoring throughout season
- Community Education/outreach activities
- Early Detection Rapid Response to any new infestation

2024 Tentative Treatment Schedule

April 15: Water Quality

May 13: Survey, Spot algae treatment

May 27: Potential Weed/Algae Treatment

May/June: Phosphorous mitigation treatment

June 17: Survey

June 24: Spot Weed/Algae Treatment

July 22: Survey

July 29: Spot Weed/Algae Treatment

August 26: Survey, Water Quality, Optional Treatment

PLM's Rapid Response on First Hydrilla Infestation Found in Michigan

- September, 2023 Hydrilla was positively identified by EGLE in two small waterbodies in Berrien Springs, Michigan.
- Widespread in southern states, has been a top "Watch List" species in Michigan for decades.
- PLM was contacted by EGLE, as part of their Rapid Response Plan for new exotic plants, to get these waterbodies treated as quickly as possible.
- PLM responded immediately with an herbicide treatment to systemically treat the infestation in hopes to prevent it from spreading regionally or state wide.



Hydrilla

Commonly found in the Southern United States.

- Spreads by fragmentation
 - but can also spread by seeds, tubers and turions (overwintering buds), making this species extremely prolific and capable of quickly taking over any waterbody.

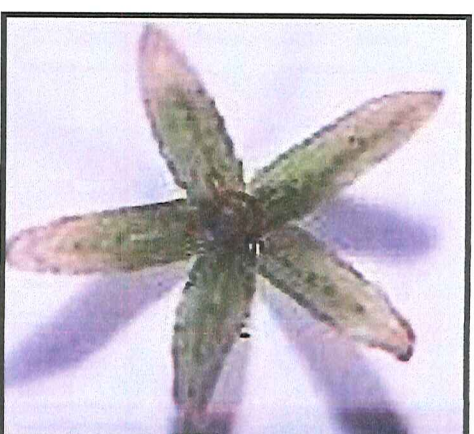
Until September 2023, most Northern infestation has been in a Northern Indiana lake, Lake Manitou.

- Lake Manitou is a public lake located 50 miles from the Michigan border.

Identification

- Whorls of 5 leaves around stem
- Elodea (good plant) has 3 leaves and looks very similar
- Monoecious and dioecious plants, making it much more complicated for management

An early detection rapid response plan is vital to any management plan in order to protect it from new invaders that threaten our lakes.



Leslie J. Mehrhoff, University of Connecticut,
Bugwood.org





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INVASIVE

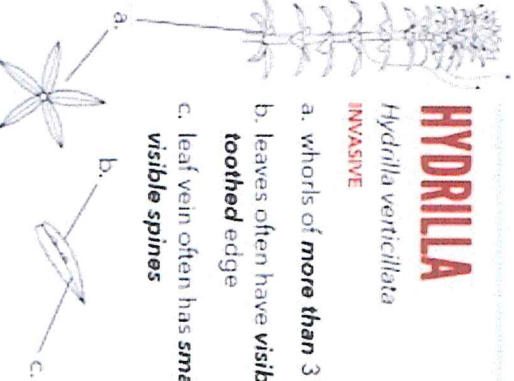


Michael J. Egedanz, U.S. Army Engineer Research and Development Center

HYDRILLA

Hydrilla verticillata
INVASIVE

- a. whorls of **more than 3** leaves
- b. leaves often have **visibly toothed** edge
- c. leaf vein often has **small visible spines**



NATIVE

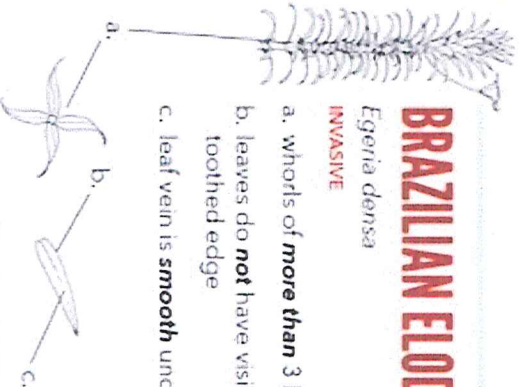


Christian Fischer, www.commonswiki.net/wiki/eia.org

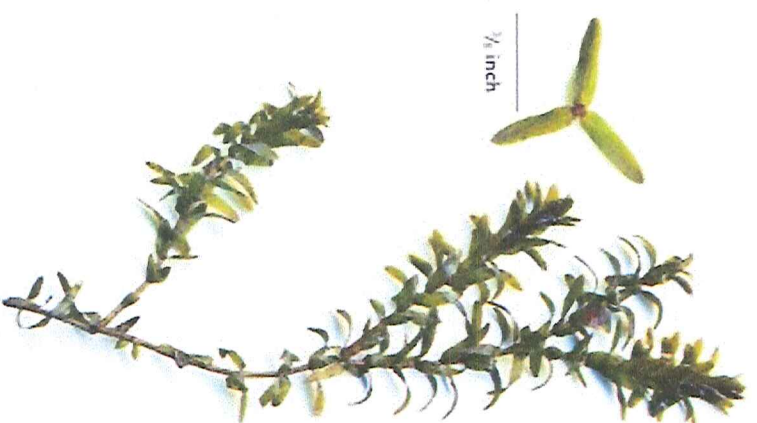
BRAZILIAN ELODEA

Egeria densa
INVASIVE

- a. whorls of **more than 3** leaves
- b. leaves do **not** have visibly toothed edge
- c. leaf vein is **smooth** underneath



Illustrations: Center for Aquatic and Invasive Plants, University of Florida

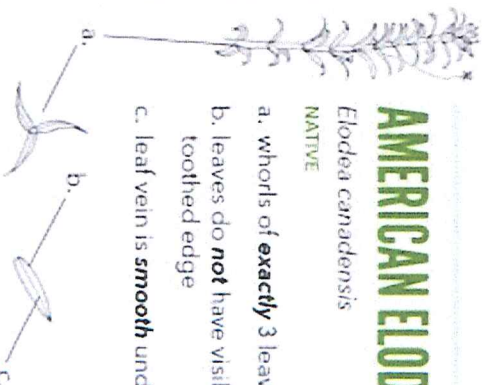


Paul Shanley, Aquatic Plants of the Upper Midwest

AMERICAN ELODEA

Elodea canadensis
NATIVE

- a. whorls of **exactly 3** leaves
- b. leaves do **not** have visibly toothed edge
- c. leaf vein is **smooth** underneath





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Do Your Part to Protect the Water Quality of Your Lake

- Use of a greenbelt!
 - Natural vegetation between your lawn and lake to filter run off.
- No lawn fertilization or a program that uses slow or time released nitrogen.
- If you fertilize, apply when grass is actively growing to minimize loss of nutrients to nearby waters.
- Remove aquatic weeds & other debris that washes up on your shoreline.
- Remove fall leaves & branches near shoreline
- Never burn yard waste along shoreline
 - ash contains phosphorous
- Use Silt fences when building
- Remove dog and geese droppings into trash (not the lake)
- Encourage use of stone, brick & similar porous materials when building a landscape to minimize urban water collection
- Have septic tank pumped regularly



STOP AQUATIC HITCHHIKERS!

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

THANK YOU, QUESTIONS!

Reminders for as you leave today:

- Know your environment, what is around you, we can all be citizen scientists
- Ask questions, communicate
- Prevention is key! Early detection, rapid response
- Remember your healthy lakefront living practices, whether you are lake front or within the watershed-We can all do our part
- Let's work together to protect your Lake!



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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