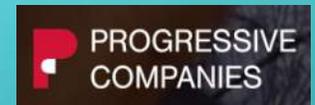




# Paw Paw Lake, Berrien County Public Hearings 10:00 am June 8, 2024

Paul Hausler, Water Resources Practice Leader  
Joel Spriegel, Design Engineer II



# Topics for Today's Public Hearing



What variables affect plant growth and water quality on Paw Paw Lake?



How can the cumulative cultural effects on water quality and nuisance conditions be managed?

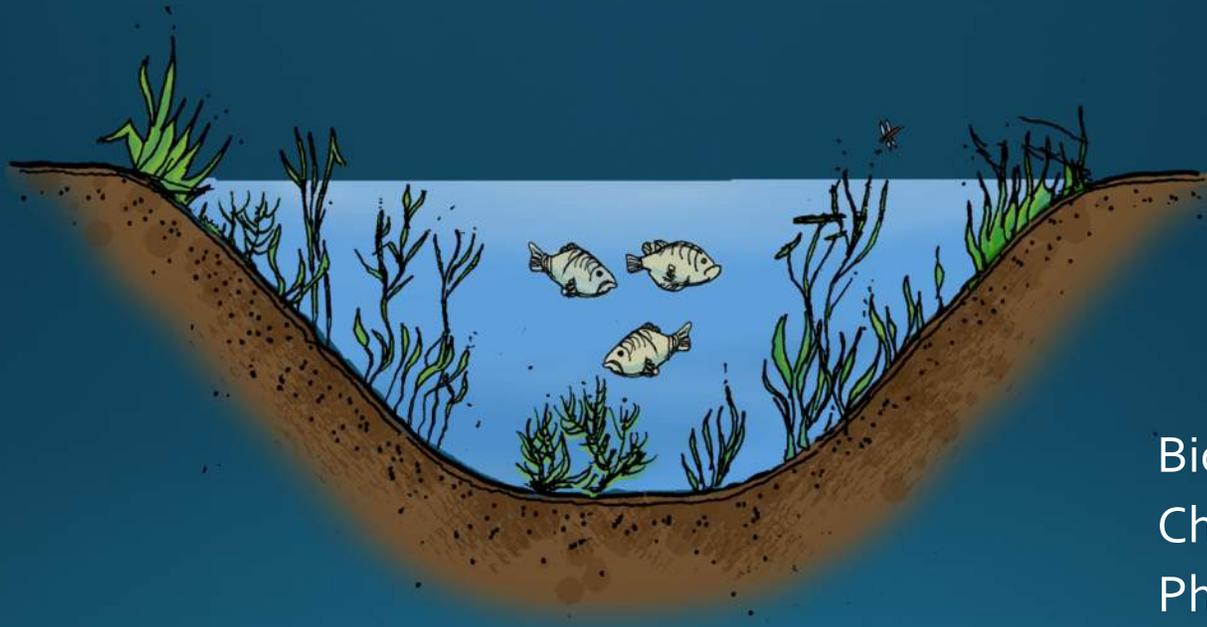


What are the goals of the management program?



What are the most cost-effective means of achieving these goals?

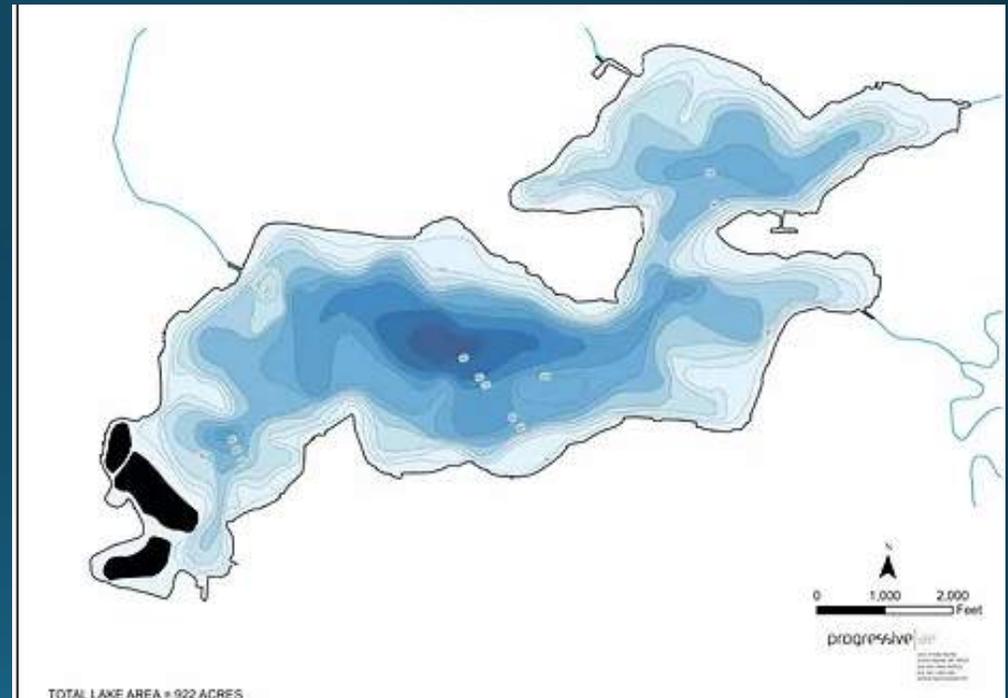
# Limnology



Biological  
Chemical  
Physical

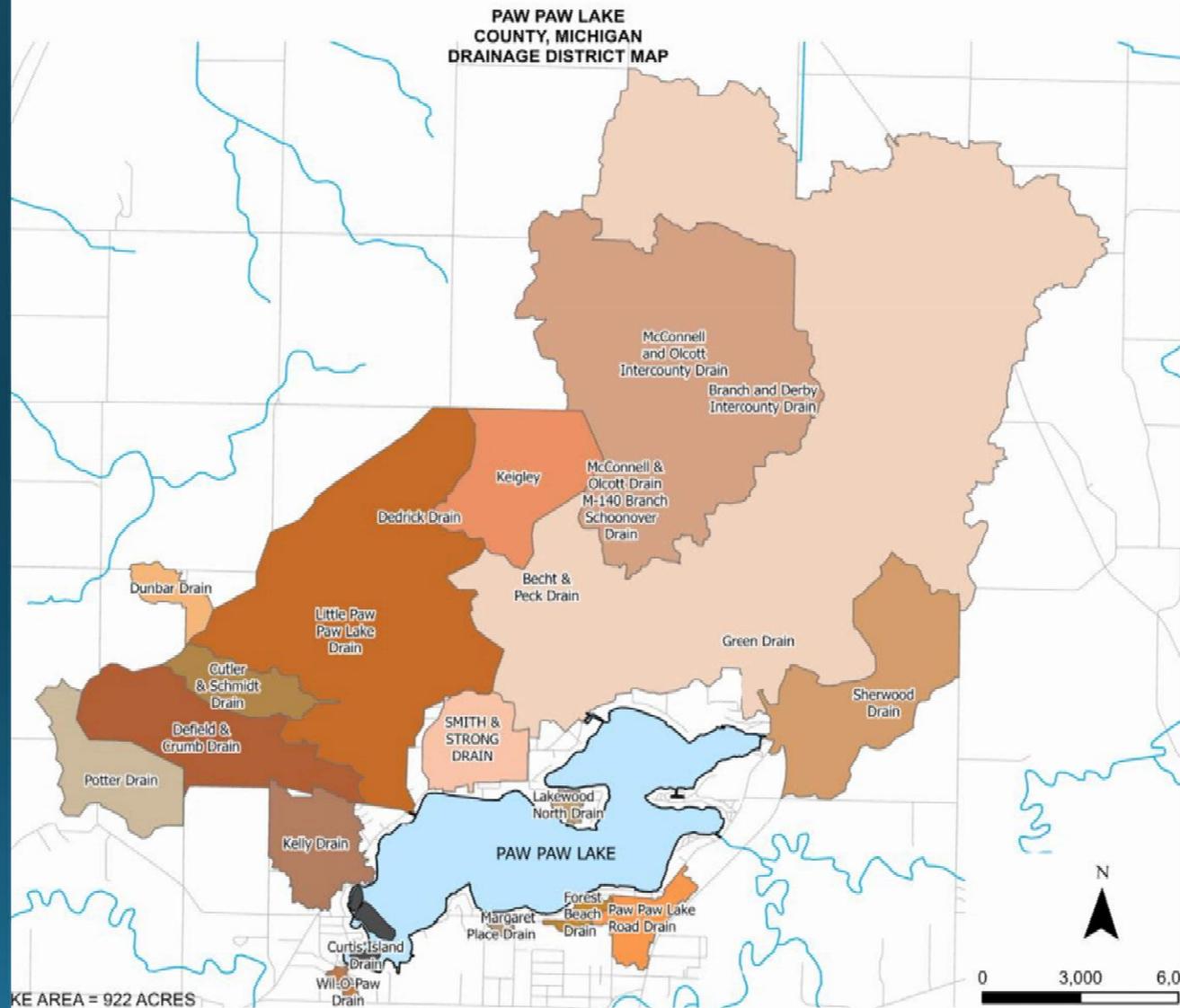
# Physical Characteristics

- Lake surface area 922 acres
- Maximum depth 90 feet
- Mean depth 32.2 feet
- Lake volume 29,645 acre-feet
- Shoreline length 12.1 miles
- Shoreline development factor 2.8
- Watershed area 9,200 acres
- Ratio of lake to watershed area 1:9.8
- Residence time 2.13 years

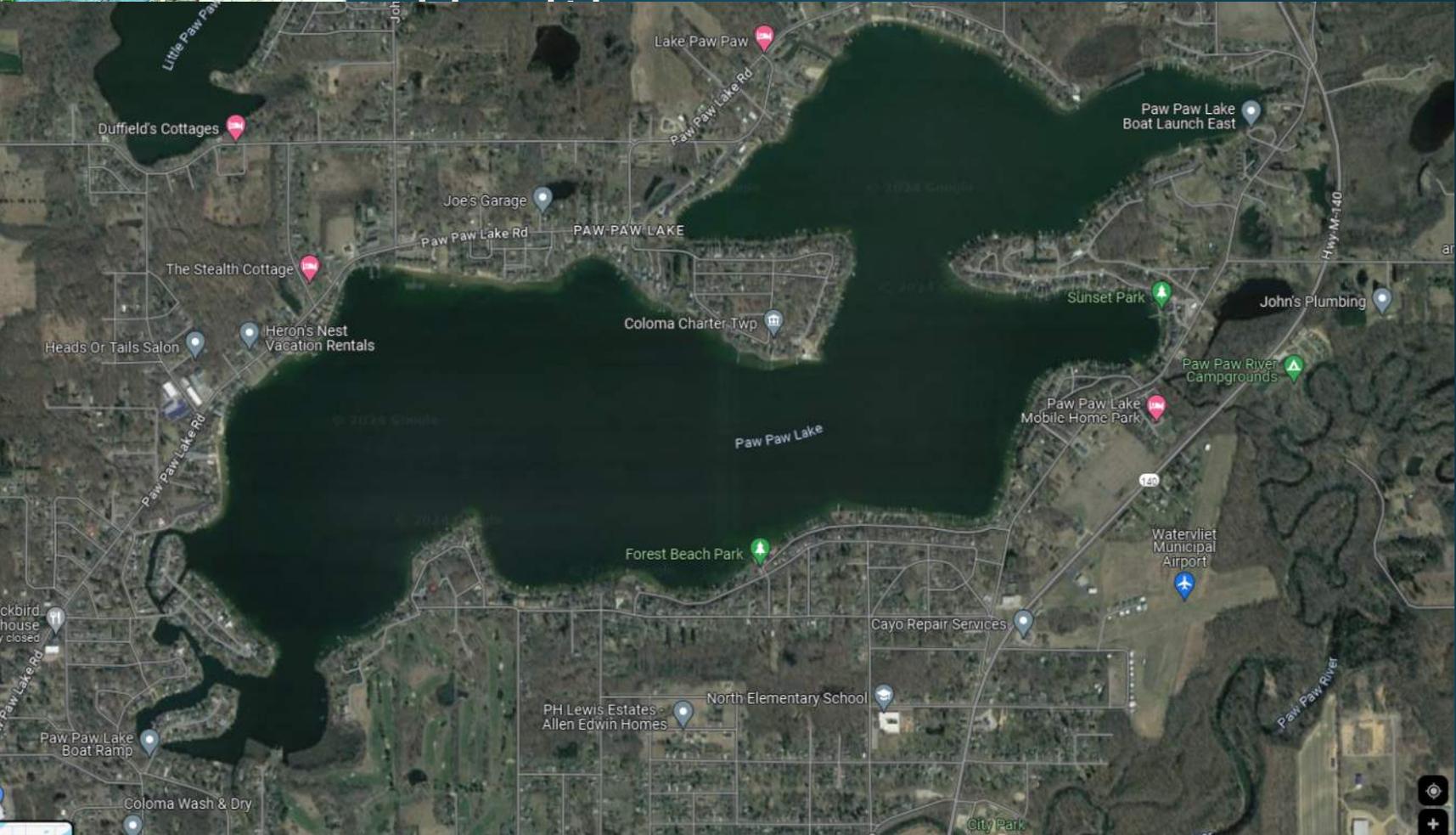
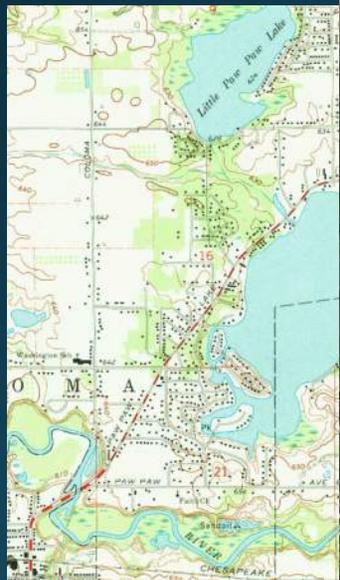


## Paw Paw Lake Watershed Drainage Districts

- Branch & Derby County Drain is largest contributor of nutrients and sediment to Paw Paw Lake – very flashy
- Shoreland areas and stormwater systems also contribute significantly due to their proximity to the lake



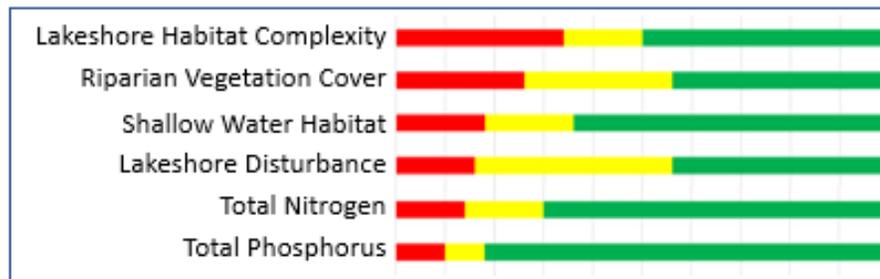
# Cultural Effects on Lake



9/18/2024

# Historical Perspective

## 2017 Extent of Stressors in Michigan Lakes



■ Poor    ■ Fair    ■ Good

EPA's National Lakes Assessment occurs every 5 years. Based on 50 Michigan lakes in each study, the number one stressor was due to reduced lakeshore habitat complexity followed by reduced vegetation cover. The Michigan Natural Shoreline Partnership is working to increase natural shorelines through its Contractors training program and shoreline Stewards program.



Figure 2. Statewide distribution of Michigan inland lakes greater than five acres. Source: Michigan GIS Open Data.

➤ Over 10,000 inland lakes in Michigan (>5 acres)\*

➤ Over 60 percent of Michigan's lakes have impaired shoreline vegetative cover and over 50 percent have degraded lake habitat complexity and lakeshore habitat\*\*

\* Michigan GIS open database

\*\* US EPA National Lakes Assessment 2022

**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.*

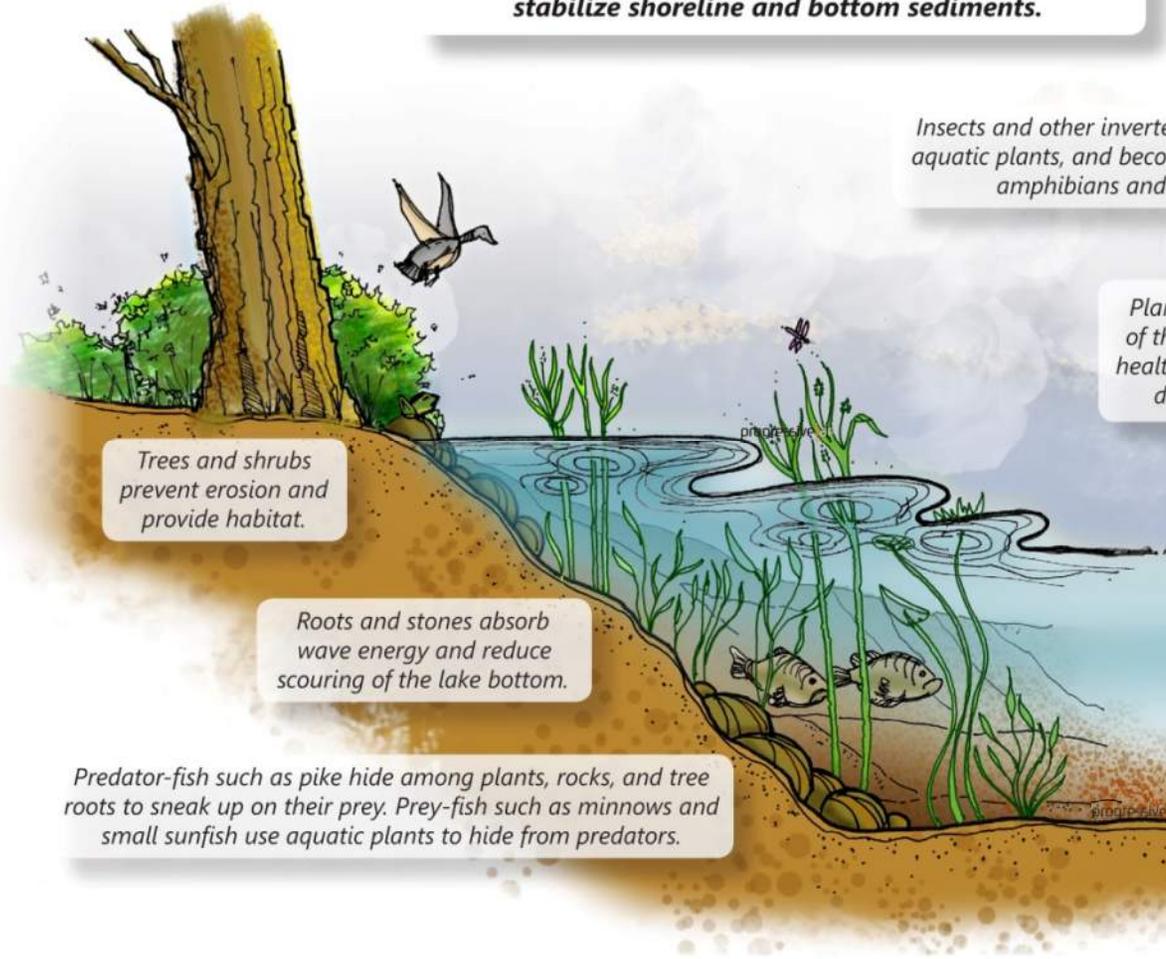
*Trees and shrubs prevent erosion and provide habitat.*

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

*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.*

*Aquatic plants provide habitat for fish and other aquatic life.*

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



# Aquatic Plant Control

## Plants of Primary Concern

Invasive exotic species:

Eurasian (hybrid) milfoil



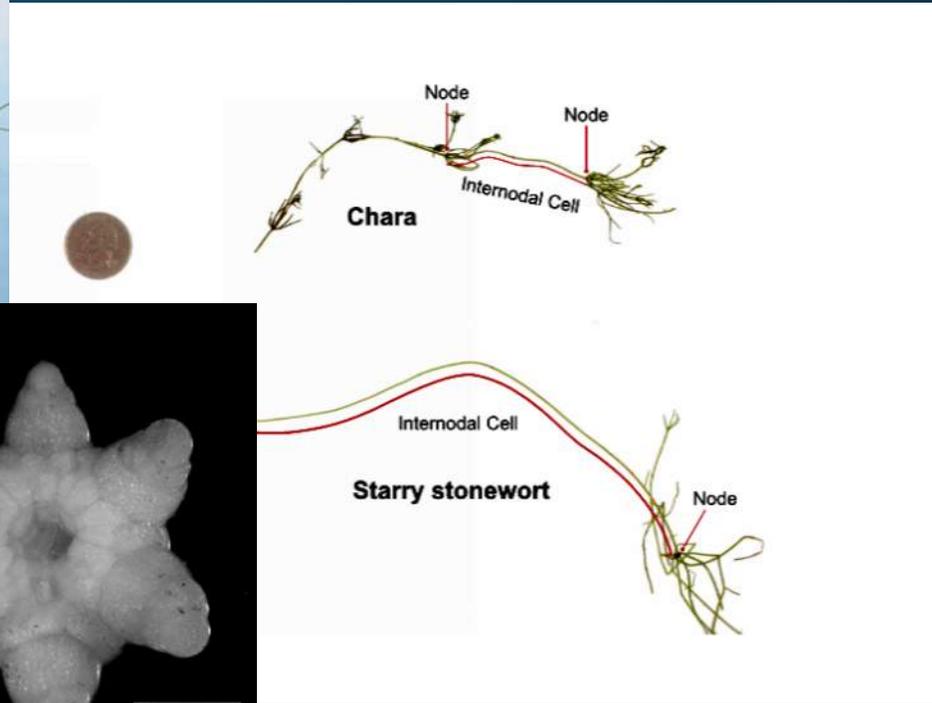
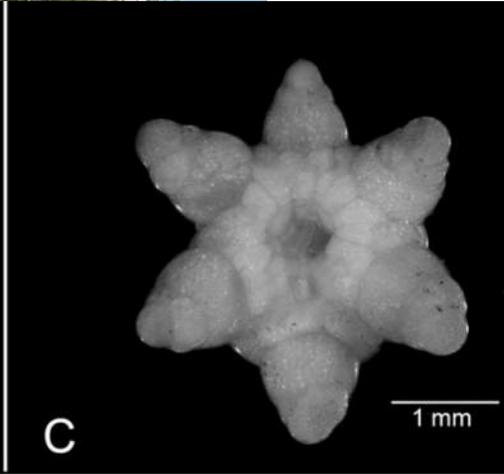
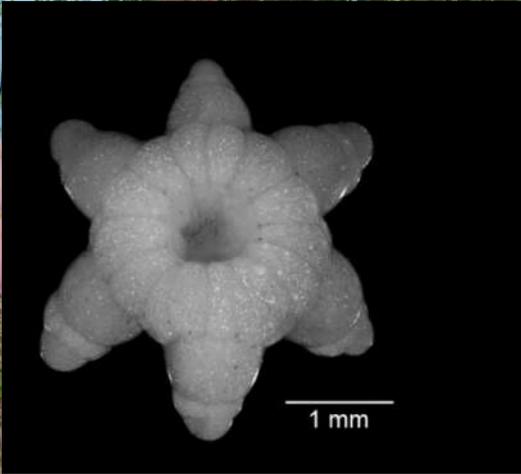
Curly-leaf pondweed



Starry stonewort



# Starry Stonewort vs. *Chara* sp.



Bulbil photos from Sleith et al. 2015

# Aquatic Plant Control

## Plants of Primary Concern

Native plant species:

Chara



Slender naiad



Coontail



# Aquatic Plant Control



## SPECIMEN LABEL

### **ProcellaCOR EC**

A selective systemic herbicide for management of freshwater aquatic vegetation in slow-moving/quiescent waters with little or no continuous outflow: ponds, lakes, reservoirs, freshwater marshes, wetlands, bays, drainage ditches, and non-irrigation canals.

#### User Safety Recommendations

##### Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

FIRST AID

**\*\*This notice is required for each Lake/Pond resident, to be distributed between 7 - 45 days prior to first treatment (per EGLE rules)\*\***

## **TREATMENT NOTICE**

**LAKE RESIDENTS ARE ENCOURAGED TO CHECK THE LAKE BOARD WEBSITE (WWW.DIXIELAKEBOARD.ORG) FOR THIS NOTICE, FUTURE TREATMENT DATES, AND TREATMENT MAPS.**

**RESIDENTS IN THIS AREA ARE PLANNING TO HAVE THE WATERS IN THIS AREA TREATED WITH HERBICIDES AND ALGAEICIDES FOR CONTROL OF AQUATIC WEEDS AND/OR ALGAE.**

This notice is being circulated as required by the Environment, Great Lakes & Energy (EGLE) rules. A permit for the treatment has either been secured or will be secured from EGLE before the work is begun. In some cases, a permit is not required.

You are receiving this notice if you are in the proposed treatment area, or if you are within 100 feet of the proposed treatment area. In some cases, we also provide this notice to persons in adjacent subdivisions as an informational courtesy to advise persons who may have beach rights but are not lakefront residents.

We usually work with groups of homeowners or their elected representatives through homeowners' associations, or with the owners of apartment or condominium units. Please try to contact any of these in your situation if you have any questions about the proposed treatment plan.

**Aqua-Weed Control, Inc. typically performs two types of treatments: algae control and weed control.**

**Algae Control** - If we are doing only an algae control treatment using only copper-based products then no water use restrictions apply. We will post the shoreline with yellow signs informing you of this work as required by EGLE.

- Lakes - Typically lake shorelines are treated twice during the summer.
- Ponds - Expect several algae control treatments during the summer beginning in late April thru September.

# Aquatic Plant Control

## Algae concerns and what you can do:

Common algae  
Filamentous algae



michiganlakeinfo

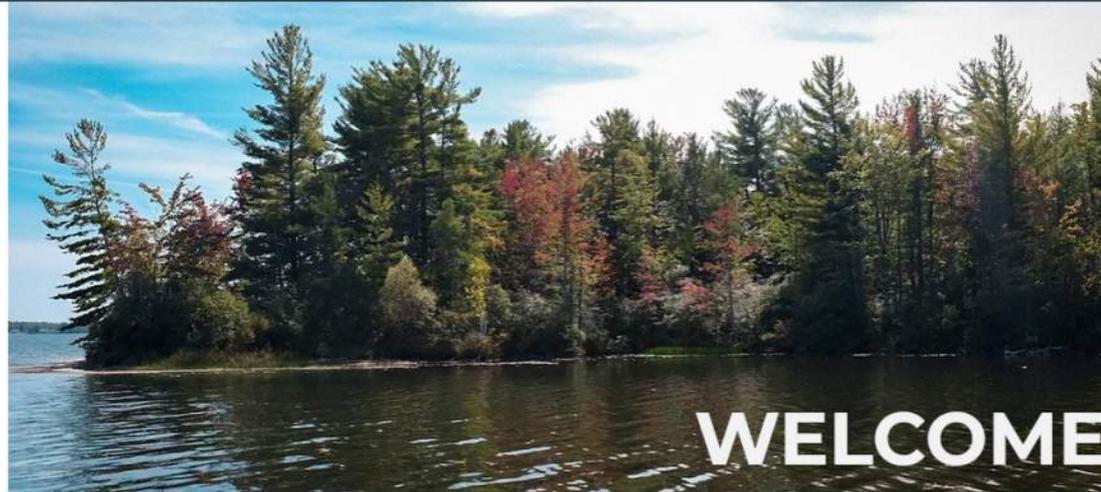
Home

Info

Links

Associations

MNSP



# WELCOME

The Michigan Shoreland Stewards Program provides recognition for lakefront

Your shoreland can be maintained to provide beach and boat access for you while maintaining habitat for fish and wildlife.

Don't dump into storm drains; pollutants may be piped directly to the lake



Most lakeside soils have more than enough phosphorus to grow lawns, trees, and shrubs. Adding phosphorus fertilizer is usually not necessary, and can cause excessive growth of aquatic plants.



Maintain a greenbelt of trees, shrubs, and ground cover—it's good for fish and wildlife, and protects water quality too.



Less turf means less maintenance—and less mowing! It's more time and easier on you.



E



# Lake Management

- Aquatic plant surveys
- Contractor oversight
- Record keeping
- Meeting atten



Pre

PROGRESSIVE COMPANIES



Paw Paw

JOURNAL

2024

Type	Date
Permit	1/17/2024
	1/29/2024

9/18/2024

PAW PAW LAKE  
 BERRIEN COUNTY, MICHIGAN  
 TREATMENT MAP  
 SURVEY DATE: MAY 15 2024

☐ = ONE ACRE

Treatment

Florpyrauxifen-Benzyl @ 19.2 oz./acre + Diquat



8.5 acres 103 104 107 11.5 acres

TOTAL LAKE AREA = 922 ACRES

The applicator shall make adjustments, if needed, to comply with EGLE permit requirements.

progressive|ae

2024 W. WARRIOR RD. #100  
 GRAND RAPIDS, MI 49508  
 616.361.2000  
 www.progressive.com

# AQUATIC PLANT MANAGEMENT PLAN GOALS

Greatly reduce distribution and abundance of invasive exotic plants

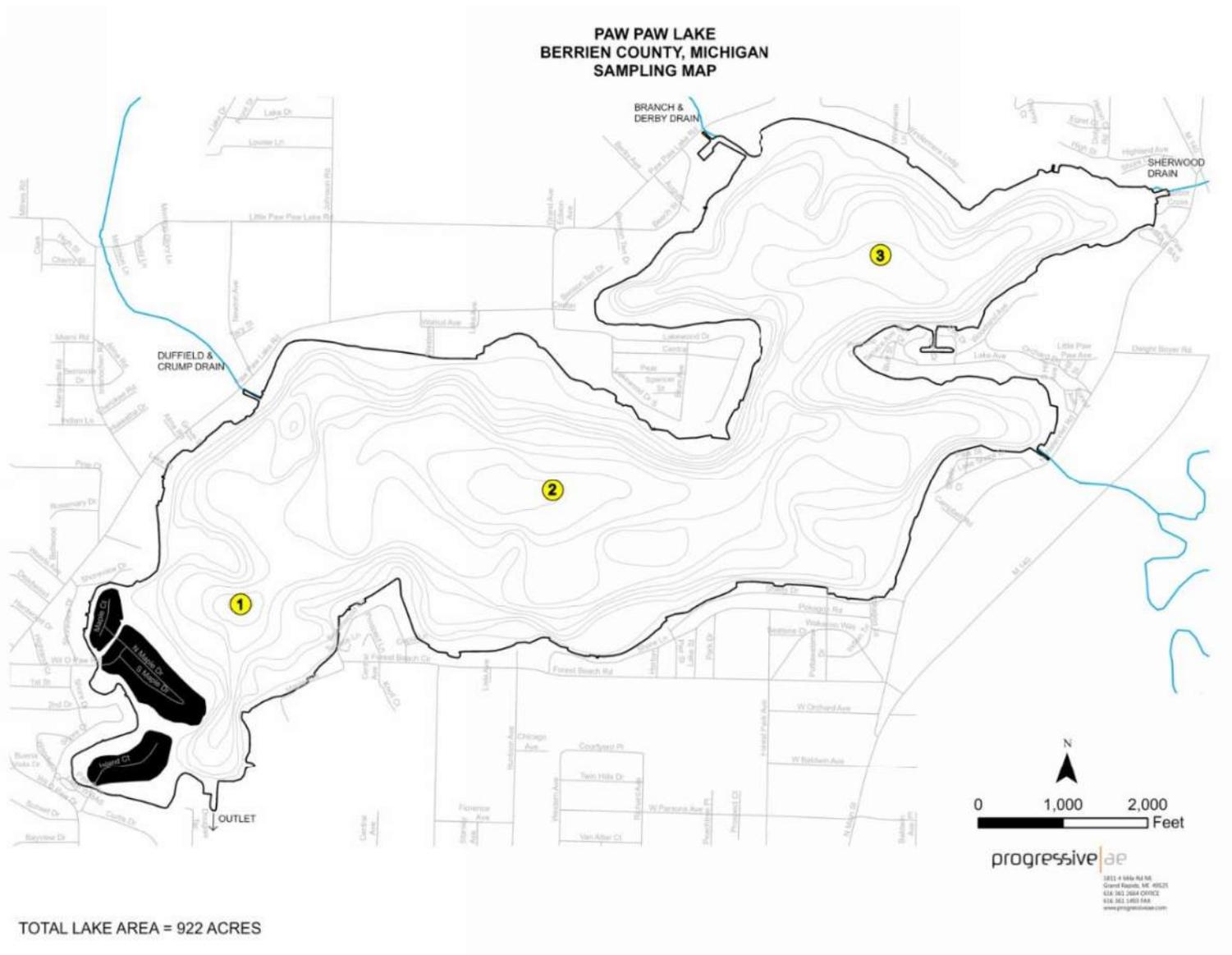
Promote a diverse and balanced aquatic plant community, thus, improving the overall health of the Paw Paw Lake ecosystem, it's fishery, and protecting property values

Provide where possible, through the use of environmentally-sound and proven management methods, multi-use recreational opportunities to the residents of Paw Paw Lake – this does NOT include the removal or near-removal of all aquatic vegetation which could damage the lake's fragile balance and tip it toward a turbid state and away from its current clear-water state.



# Water

- Temperature
- Dissolved Oxygen
- Phosphorus
- Chlorophyll a
- Secchi Transparency
- pH & Total Alkalinity
- Total Suspended Solids
- Chloride
- QA/QC
- Discrepancies

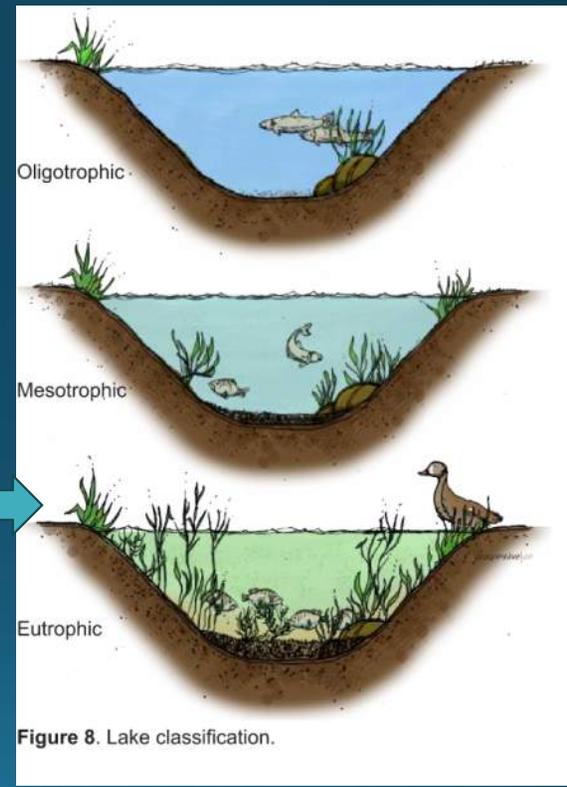


9/18/2024

# Lake Classification (by Trophic State)



Paw Paw Lake appears to be meso-eutrophic (the lake has characteristics of both a mesotrophic and a eutrophic lake)





# Watershed Management/Projects

- See Spicer Group slides



The diagram shows a cross-section of a ditch labeled "Stephey Ditch" leading into a larger body of water labeled "Lake of the Woods". A series of blue rectangular filters, representing EutroSORB F, are installed across the ditch. An arrow labeled "Water Flow" points from the ditch towards the lake. The EutroSORB F logo, with the tagline "Phosphorus Filtration Technology", is positioned above the filters.



The photograph shows a close-up view of the EutroSORB F filters installed in a ditch. The filters are blue and rectangular, and are surrounded by rocks and vegetation. The water is clear and flowing through the filters.

EutroSORB F filters strategically deployed in Stephey Ditch to intercept flow and treat the water before it continues downstream.

In the photo, EutroSORB F filters are placed in Stephey Ditch providing an unobtrusive yet effective approach to enhancing water quality and combating increased phosphorus loading in the lake.



  **EutroPHIX**  
Accelerating Water Resource Restoration

When you are ready to get started or want to learn more about the restoration process, contact us at:

# Dredging & Alum Feasibility Study

(this study will also explore the feasibility of other in-lake alternatives)



# Alum Treatment Considerations

- Alum (Aluminum sulfate + sodium aluminate) = aluminum phosphate + colloidal aluminum hydroxide in treated lake water
- Alum has been used in water treatment for over 200 years and is probably the most widely used drinking water treatment in the world (Odegaard, et al., 1990)
- Lake managers prefer aluminum hydroxide due to its apparent low or zero toxicity to lake biota (fauna & flora), its ability to adsorb large amounts of particulate and soluble phosphorus (P), and the binding of P to floc (colloidal suspension) (Cooke, et al., *Restoration & Management of Lakes and Reservoirs*, third edition 2005)

# Information and Education

- Website [pawpawlakemanagement.org](http://pawpawlakemanagement.org)
- Reports
- Meetings
- ≡ Treatment schedule and maps



## Links & Information

This page provides pertinent studies and reports about Paw Paw Lake along with several informative links.

- [2008 Paw Paw Lake Watershed Study \(Spicer Group\)](#)
- [Big Paw Paw Lake 2004 - 2010 Water Quality Studies Report](#)
- [2010 Paw Paw Lake Restoration Plan Report](#)
- [2020 Paw Paw Lake Improvement Plan \(Spicer Group & GEI Consultants of Michigan, Inc.\)](#)
- [2022 Summary of Water Quality Results Paw Paw Lake \(Spicer Group\)](#)
- [2022 Branch & Derby Intercounty Drain Water Quality Report \(Spicer Group\)](#)

## Informative Links

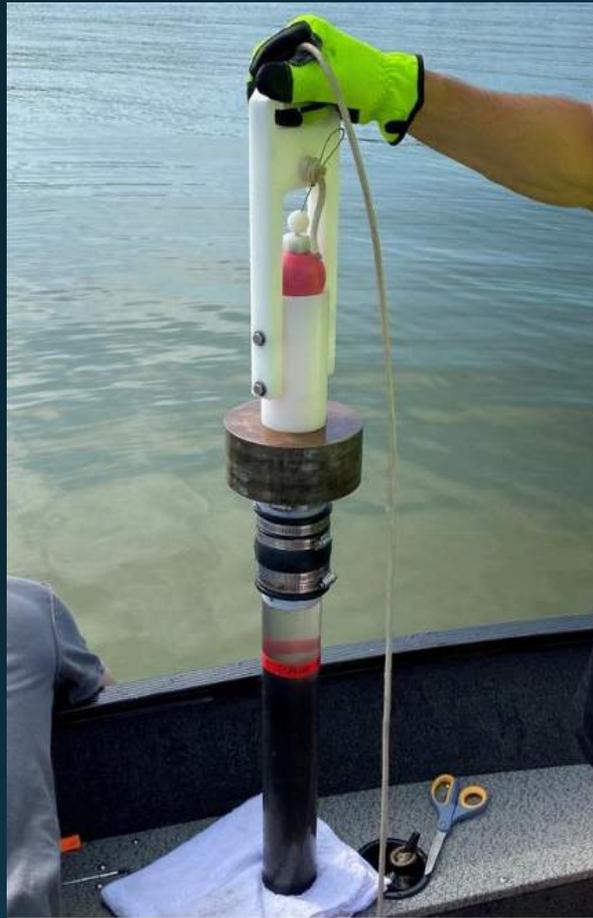




watershed sub-basin map (Data Source: Spicer Group)







Sediment core sample

# Alum Sediment Study

- Sediment core sampling
- Fractionation analysis to determine migration potential
- Measure P-release under differing scenarios and concentrations
- Proper dosing determined
- Develop a targeted application and dosing plan
- This study is also applicable to aeration/hypolimnetic oxygenation

# Administration & Contingency Funds

- Public hearing related costs (mailings, advertisements, etc....)
- Administrative costs incurred by the townships in relation to the project
- Additional herbicide treatments and/or other work element cost overruns

# 2025-2028 Budget

	<b>Annual Cost</b>
• <b>Improvement</b>	
• Aquatic Plant Control (Treatments & Harvesting)	\$45,000
• Lake Management Consulting	
• Plant Control Oversight & Coordination	\$12,000
• Project Administration & Coordination	\$9,000
• Water Quality Monitoring (Three Deep Basins)	\$7,500
• Watershed Engineering & Coordination	\$25,000
• Watershed Improvement Projects	\$95,000
• Dredging/Alum Feasibility Study	\$27,000
• Information & Education	\$2,500
• Alum Sediment Study (Independent Lab Analyses)	\$20,000
• Administration & Contingency	<u>\$32,000</u>
• <b>TOTAL</b>	<b>\$228,000</b>

# 2025 – 2028 Annual Assessment Breakdown

Direct Access	\$204.65
Indirect Access	\$20.46
Marinas (per 8 slips)	\$204.65

Thank you!

