



9353 Hill Road • Swartz Creek, MI 48473
(810) 635-4400 • Fax (810) 635-4404

www.lakeproinc.com

Meadow Lake 2024 Service Review

Introduction

This year's testing protocols were focused on BioBase survey, plant identification, density monitoring, and location tracking. LakePro collected 3 substrate samples from the lake. The testing protocols were comprehensive and aimed at gathering a wide range of data to better understand and manage the health and quality of the waterbody in question. We can also find troubled areas regarding vegetation and can help you see how effective your treatments have been. This information can be valuable for environmental monitoring and decision making related to the waterbody's management and conservation.

Discussion

BioBase surveys are aimed at identifying problematic aquatic plant and algal species within a waterbody as well as identifying the areas in which they inhabit. Our recording and analysis this year have shown that the amount of species in the lake increased from last year. In 2023, we observed 3 species, this year it grew to 6 species. Although off the cuff this may seem like an issue, however your lake is diversifying and showing the system can sustain multiple species at once. Biodiversity is one of the main indicators of lake health and we did not see an issue there, on the contrary we were quite happy to see this. We identified Lyngbya Algae, Chara macroalgae, Sago Pondweed, Horned Pondweed, Curly Leaf Pondweed, and Phragmites (*Australis*). Chara, Horned Pondweed and Sago pondweed are natural species and most of the time, unproblematic.

At the time of the observations, these species thrived at robust levels, signifying an ecologically balanced ecosystem capable of effective nutrient cycling. This equilibrium also supported a thriving fishery by furnishing protective and breeding habitats. In much more expansive regions compared to last year, Chara exhibited relatively dense growth. We noticed this species has now covered the majority of the lake. If treatment continues, management efforts to reduce Chara should be implemented. Effective control measures for this macroalgae include straightforward algal treatments, which help mitigate its abundance, enhancing the lake's visual appeal by reducing its overall presence.

We did notice emergence of two invasive species, Curly Leaf Pondweed and Phragmites (*Australis*). We recommend post emergence treatment throughout the season for Phragmites to control their growth and limit their spread around the lake. For controlling Curly Leaf Pondweed, regularly scheduled herbicide applications will reduce and essentially remove Curly Leaf Pondweed allowing native species to retake control of the area in which they were displaced.

Lyngbya however, could pose an issue in the future as it is a type of filamentous cyanobacteria. There are many forms of cyanobacteria and the majority of them are not toxic. This being said, there is no way to know if this sighting is toxic as samples need to be lab tested for their toxicity to be known. The good news is there were only two observations made on the lake, like last year. These sightings were so miniscule, they did not raise any concern for health of the environment or organism health as well. To address these issues, it's essential to monitor water bodies for the presence of Lyngbya algae, especially when conditions are conducive to their growth (e.g., warm temperatures, excess nutrients). Implementing strategies to reduce nutrient pollution, manage water flow, and control other factors that promote algal growth can help mitigate the problems associated with Lyngbya algae blooms.

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Map Descriptions

- **Bathymetric Contour Map:** This map shows the depth of the entirety of the lake. It also shows the topography of the lakebed such as hills or valleys. Both lakes have deep wells mostly centered around the middle of the lakebed. Other than that, majority of both lakes are relatively shallow and could influence future plant growth next Spring/Summer.
- **Vegetation Biovolume Heat Map:** This map shows a thermal image of the biovolume found in the lake. “Hotter colors” such as yellows and reds represent higher amounts of biovolume while “cooler colors” such as blue and green represent little to no biovolume. From the information gathered on the fourth of October, plant grow is limited in both lakes. This being said, there are certain areas of concern potentially for next year. This can be seen by the green coloration in both lakes and the couple yellow/red spots on the south side of Wormer.
- **Composition Map:** This map shows the density of the lakebed. Red coloration represents a hard lake bottom whereas lighter colors such as yellow or white show a soft or mucky lake bottom. From the information we gathered, the lakebeds of both Mohawk and Wormer Lake show a good balance between density.
- **BioBase Track:** This map shows are track we recorded while gathering the BioBase information.

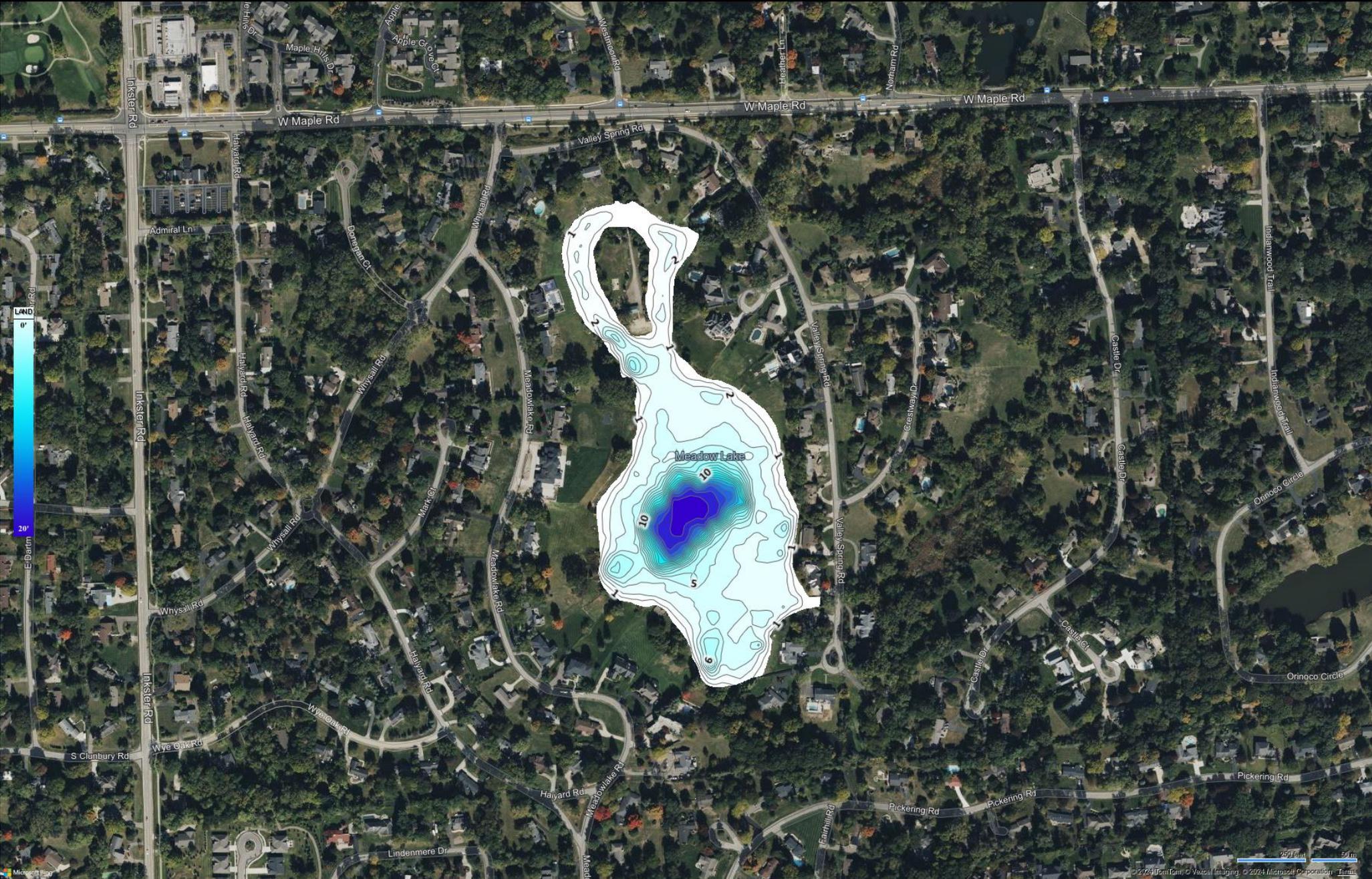


Meadow Lake 2024 – Bathymetric Contour Map

BIOBASE

Meadow Lake
6/24/2024

www.biobasemaps.com

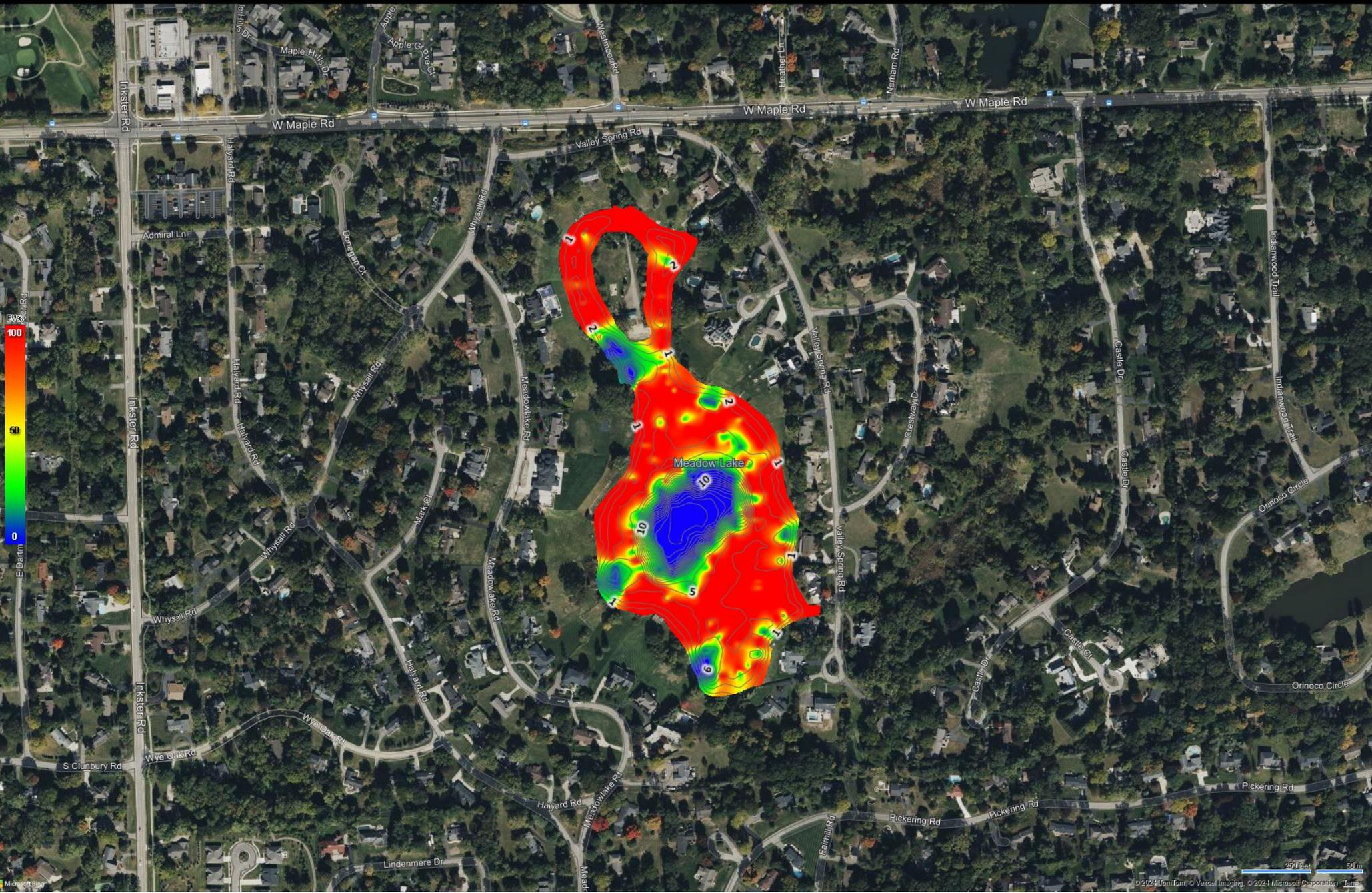


Meadow Lake 2024 – Vegetation Biovolume Heat Map

BIOBASE

Meadow Lake
6/24/2024

www.biobasemaps.com

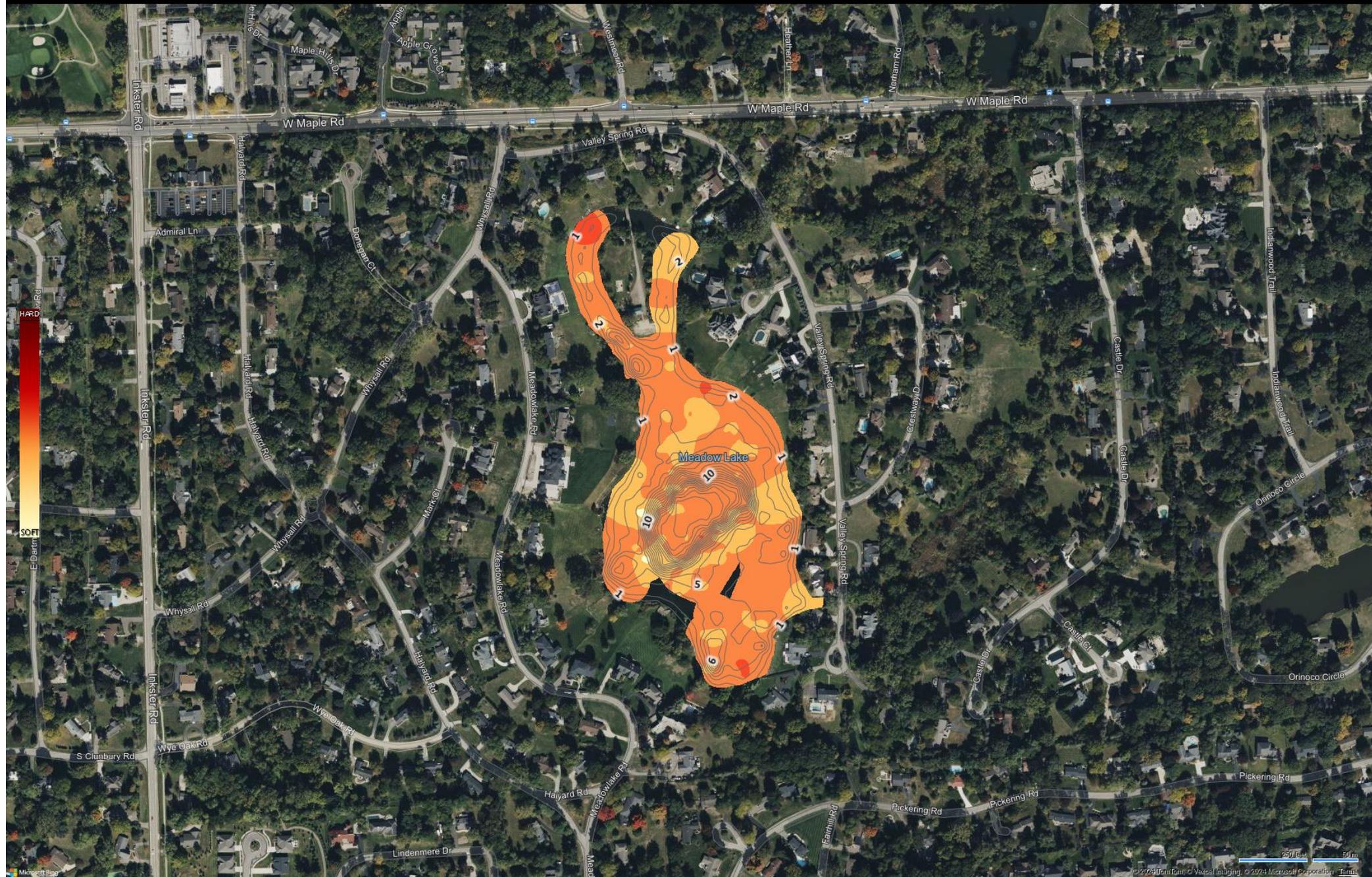


Meadow Lake 2024 – Composition Map

BIOBASE

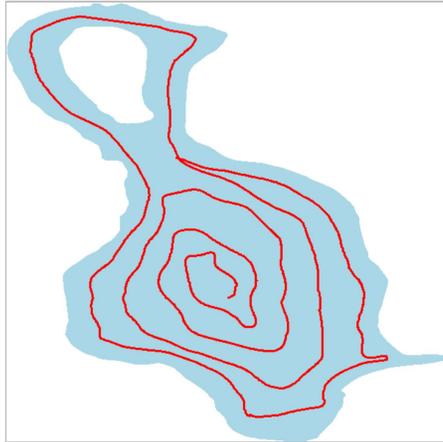
Meadow Lake
6/24/2024

www.biobasemaps.com



Meadow Lake, Oakland Michigan

Report Time Stamp: 2024 July 08 - 15:45 (UTC) ... [REPORT LINK \(https://s3-bb-prd-po-snr-rpt-use1.s3.amazonaws.com/1aaeb986-ba7a-461d-93ea-a8f3866c7c14/Report.html\)](https://s3-bb-prd-po-snr-rpt-use1.s3.amazonaws.com/1aaeb986-ba7a-461d-93ea-a8f3866c7c14/Report.html)



Survey Metadata

Data Collector: Paul Dominick
 Survey Time: 2024 June 24
 Stamp (UTC): - 14:52
 Starting Location: 42.541367, -83.313887
 Ending Location: 42.539741, -83.313428
 Distance: 1.585 miles

Survey Settings

Includes Edited Data: No
 Track Buffer: 25 m
 BV Grid Cell Size: 5 m
 BV Minimum: 10.0%
 Detection - Percent: 1.000 ft
 Detection - Depth: 20.000 ft
 BV Maximum: 20.000 ft
 Detection - Depth: ft
 BV Sonar Channel: Primary

Survey Statistics

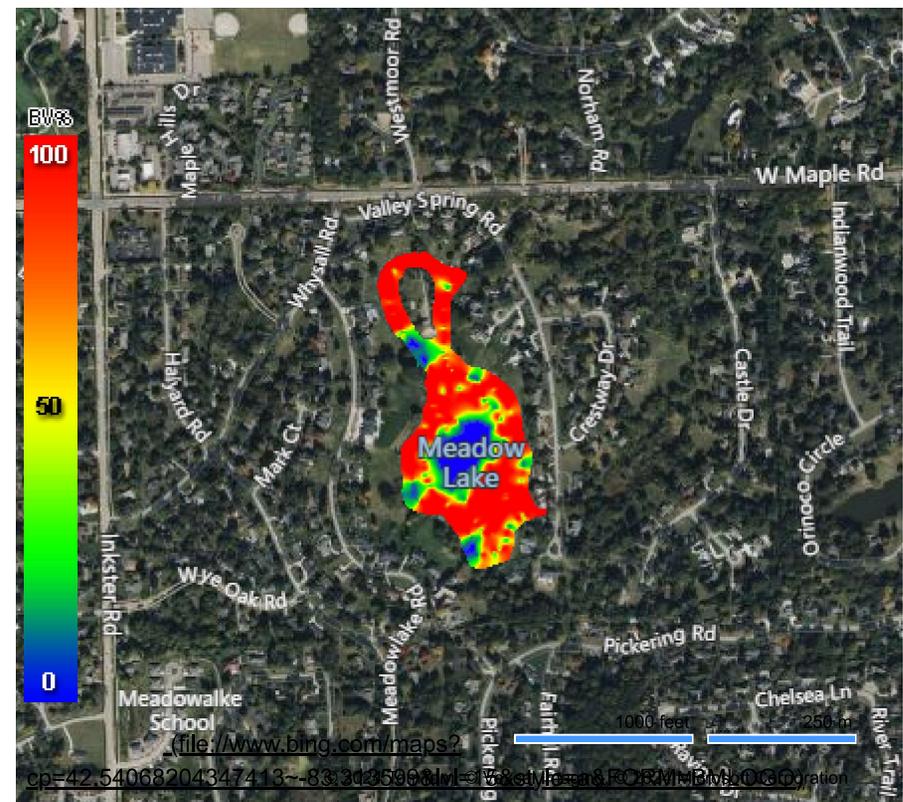
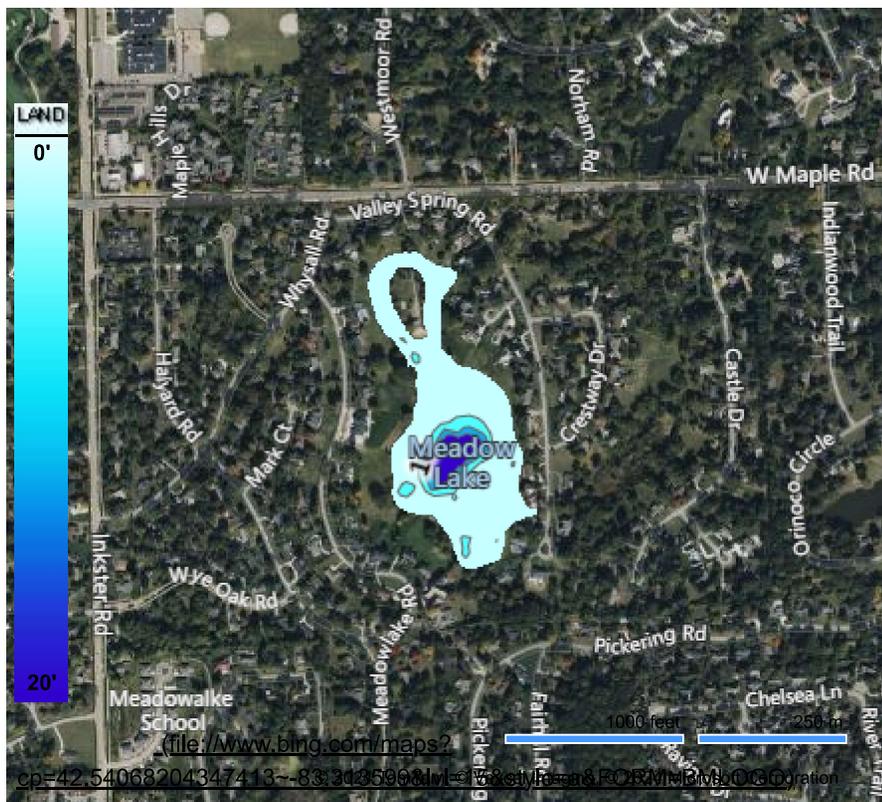
Average Water Temperature:
 Survey Area: 18.869 acres
 Survey Volume: 78.495 acre ft
 Percent of Waterbody Surveyed: 99.1%
 Waterbody Area: 19.034 acres
 Estimated Waterbody Volume: 79.182 acre ft

Survey Summary

Type	PAC	Avg BVp	SD BVp	Avg BVw	SD BVw	Depth Range	Depth Avg	No. Depth Records
Point	63.3%	92.7%	± 59.1%	58.7%	± 48.3%	1.76 - 19.82 ft	5.725 ft	1735
Grid	86.2%	77.6%	± 26.0%	66.9%	± 36.1%	0.18 - 19.66 ft	4.160 ft	5592

Bathymetric Contour Map

Vegetation Biovolume Heat Map



Manual Data

None

Biovolume Analysis by Quintiles

Type	0 - 20%	20 - 40%	40 - 60%	60 - 80%	80 - 100%
Point	40.1%	2.4%	0%	0%	57.5%
Grid	17.9%	7.4%	8.7%	12.7%	53.3%

Biovolume Analysis by Depth

Type	Depth	Count	PAC	Avg BVp	SD BVp	Avg BVw	SD BVw
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Point	0 - 1 m	853	91.9%	98.2%	± 30.2%	90.3%	± 29.1%
	1 - 2 m	231	52.9%	72.3%	± 56.9%	38.2%	± 45.6%
	2 - 3 m	0	0%	0%	± 0%	0%	± 0%
	3 - 4 m	0	0%	0%	± 0%	0%	± 0%
	4 - 5 m	0	0%	0%	± 0%	0%	± 0%
	5 - 6 m	0	0%	0%	± 0%	0%	± 0%
	6 - 7 m	0	0%	0%	± 0%	0%	± 0%
	7 - 8 m	0	0%	0%	± 0%	0%	± 0%
	8 - 9 m	0	0%	0%	± 0%	0%	± 0%
	9 m +	0	0%	0%	± 0%	0%	± 0%
Grid	0 - 1 m	3617	98.4%	85.6%	± 20.0%	84.2%	± 22.5%
	1 - 2 m	1184	89.0%	59.8%	± 27.1%	53.2%	± 31.7%
	2 - 3 m	200	58.7%	35.3%	± 17.3%	20.8%	± 21.9%
	3 - 4 m	143	42.5%	26.3%	± 13.0%	11.2%	± 15.5%
	4 - 5 m	145	18.5%	18.5%	± 8.0%	3.4%	± 7.9%
	5 - 6 m	303	0.1%	10.3%	± 0.2%	0.0%	± 0.3%
	6 - 7 m	0	0%	0%	± 0%	0%	± 0%
	7 - 8 m	0	0%	0%	± 0%	0%	± 0%
	8 - 9 m	0	0%	0%	± 0%	0%	± 0%
	9 m +	0	0%	0%	± 0%	0%	± 0%

Glossary

AOI

Area of Interest: Defines the individual transects or contiguous data samples as depicted by the color coding of each trip line. Separate areas of interest can be generated through merging of multiple trips, appending data to a single sonar log or lapses in time (greater than five minutes) within a sonar log.

BVp

Biovolume (Plant): Refers to the percentage of the water column taken up by vegetation when vegetation exists. Areas that do not have any vegetation are not taken into consideration for this calculation.

BVw

Biovolume (All water): Refers to the average percentage of the water column taken up by vegetation regardless of whether vegetation exists. In areas where no vegetation exists, a zero value is entered into the calculation, thus reducing the overall biovolume of the entire area covered by the survey.

PAC

Percent Area Covered: Refers to the overall surface area that has vegetation growing.

Grid

Geostatistical Interpolated Grid: Interpolated and evenly spaced values representing kriged (smoothed) output of aggregated data points. The gridded data is most accurate summary of individual survey areas.

Point

Individual Coordinate Point: A single point represents a summary of sonar pings and the derived bottom and canopy depths. Individual point data create an irregularly spaced dataset that may have overlaps and/or gaps in the data resulting in a increased potential for error.

Offsets

Trip Name	Trip Date (UTC)	Manual Offset (ft)	Tide Station Name	Avg Tide (ft)	Min Tide (ft)	Max Tide (ft)	Start Tide (ft)	End Tide (ft)
Sonar_2024-06-24_1 ...	2024 June 24 - 14:52	0.000	NA	NA	NA	NA	NA	NA

Report URL: <https://s3-bb-prd-po-snr-rpt-use1.s3.amazonaws.com/1aaeb986-ba7a-461d-93ea-a8f3866c7c14/Report.html> (<https://s3-bb-prd-po-snr-rpt-use1.s3.amazonaws.com/1aaeb986-ba7a-461d-93ea-a8f3866c7c14/Report.html>)

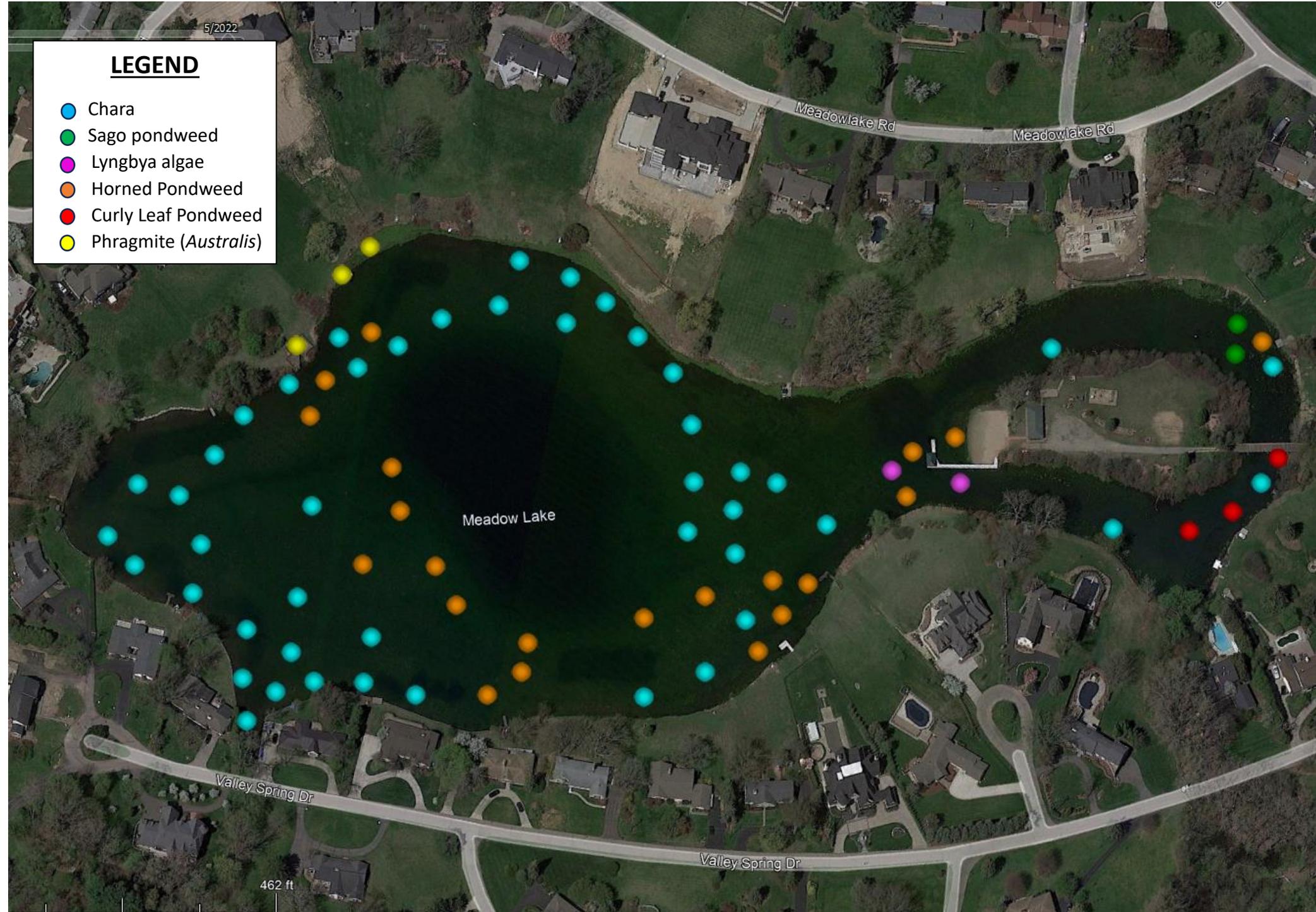
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Meadow Lake – Location Vegetation Map 2024

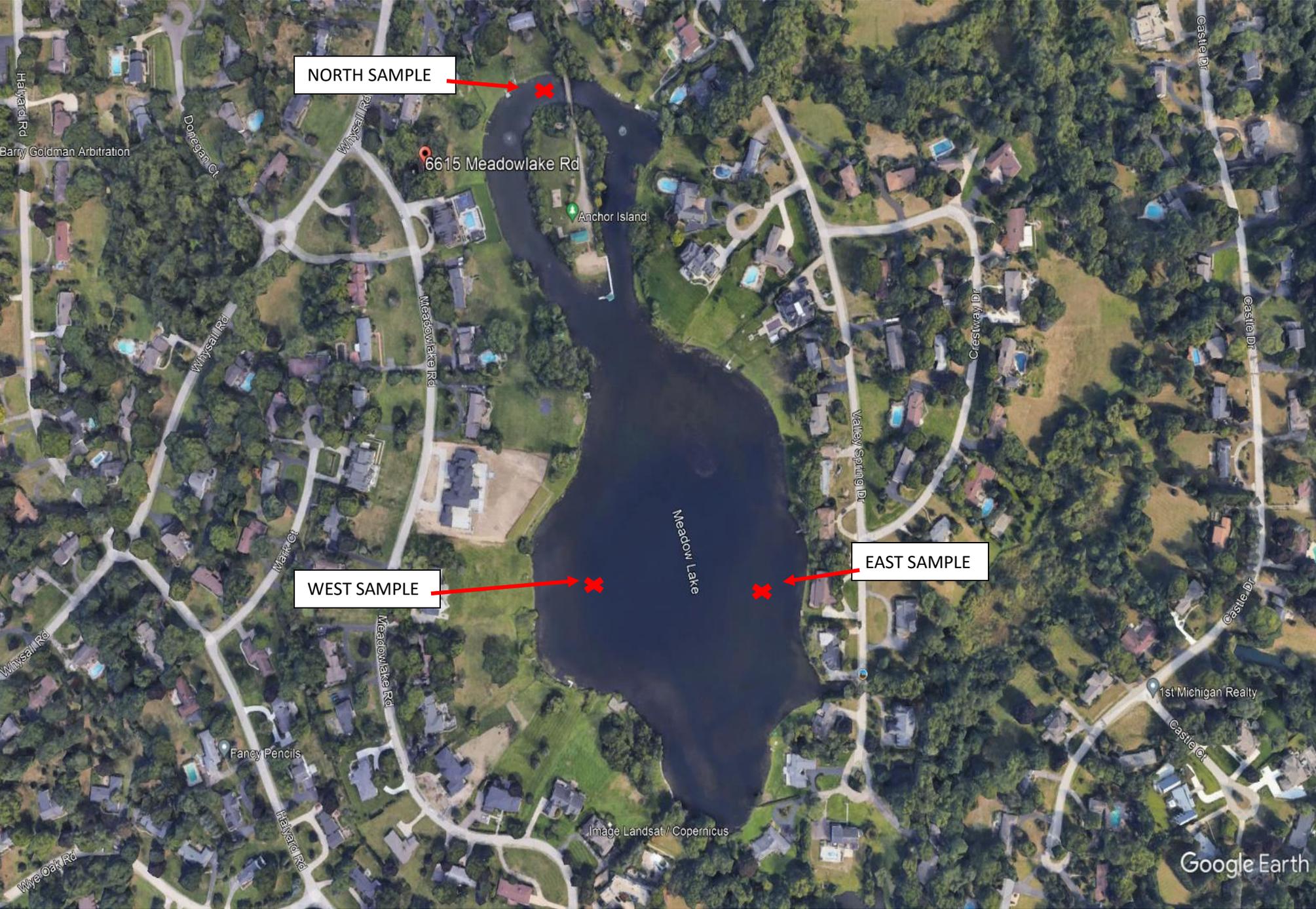
5/2022

LEGEND

- Chara
- Sago pondweed
- Lyngbya algae
- Horned Pondweed
- Curly Leaf Pondweed
- Phragmite (*Australis*)



MEADOW LAKE MUCK SAMPLE LOCATIONS



NORTH SAMPLE

WEST SAMPLE

EAST SAMPLE

6615 Meadowlake Rd

Anchor Island

To: Lake Pro

Contact:

Project:

Sample(s): East, West, & Canal

Received: 07/01/2024

Analyzed: 07/01/2024—07/15/2024

Problem(s): Muck Analysis

	East	West	Canal
Total Solids (%)	18	21	14
Total Volatile Solids (%)	11	12	26

Summary:

All of the muck samples appeared to have high levels of total volatile solids. These solids are composed of organic material that can be degraded through microbial metabolism. The Canal sample had almost twice the amount of volatile solids compared to the other two samples.

Recommendation(s):

- Applications of MuckBiotics to areas of built up muck will help to prevent release of internal nutrients from the muck into the water column. If applied to the Canal, it would be best to perform the applications where there is no rain in the forecast for the next few days.



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RECIPIENT:

+MEADOW LAKE (1S/1 MUCK SEDIMENT TESTING- 3 SITES)

4200 Telegraph Road
 Bloomfield Hills, MI 48302
 Phone: 2484337702

SERVICE ADDRESS:

6615 Meadowlake Road
 Bloomfield Hills, Mi 48301

Quote #1351	
Sent on	Jan 15, 2024
Total	\$1,237.60

Product/Service	Description	Qty.	Unit Price	Total
Lake Management Services				
Agreement for 2024 (1 Year Annual Agreement) for services listed.	1 year service agreement. Price is good for 90 days from date sent.			
Lake service acreage for services provided	1 Lake- 18.5 acres			
No State of Michigan EGLE Permit Required	No EGLE (Environment, Great Lakes and Energy) Permit Fee is required to treat this waterbody			
Aquatic Vegetation BioBase Survey	Customer supplied with Maps, Notes and summaries. Detailed GIS maps of depth, aquatic vegetation abundance, and bottom hardness are created automatically.	1	\$500.00	\$500.00
Muck and Sediment Testing	Pull 3 bottom muck/organic samples and ship to Aqua-Fix for testing. Locations per map attached. \$230.00 per sample includes labor and shipping.	3	\$230.00	\$690.00
Water Quality E.Coli Summer Monitoring Service	Summer E.Coli monitoring. 2 sites, 3 testing events (May, July and Sept). LakePro offers E. coli testing to ensure the safety of your beach and swim areas.	6	\$40.00	\$240.00
Water Quality Mid Summer Testing Service	Parameters Include: Temperature, pH, Dissolved Oxygen, Specific Conductivity, Salinity, Total Dissolved Solids, Chlorophyll-a, Transparency, Total Phosphorus, and Total Nitrogen - \$250.00 per sample site. 2 testing events, 2 sites.	2	\$250.00	\$500.00
Nutrient Testing	Testing for Nitrate-Nitrogen and Total Phosphorus. Spring and Fall 2 sites on each visit.	4	\$50.00	\$200.00



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Product/Service	Description	Qty.	Unit Price	Total
				Not included
Water Quality- Cynotoxin Testing	Use Semi-quantitative field screening ELISA testing kits. Send to Lab for Testing.	1	\$250.00	\$250.00
Management Services	<p>Lake Management Services are designed to improve the recreational, functional, and aesthetic values of your waterbody(s), by assisting with Target Algae and Plant Control (defined below) and with improvement of the overall water quality through best management practices. This Agreement provides the Customer with treatments annually which includes all labor, materials, and service equipment necessary to execute. Pending issuance of the EGLE permit and unless weather prohibits, these treatments shall be scheduled between the months of April and September. Additional services shall be available upon request by the Customer and approval by LakePro.</p>			
Aquatic Nuisance Control Permit Compliance	<p>Customer understands that treatments and services cannot begin until the proper permit is received from the appropriate governing authority and that submittal of application for such permit must be accompanied by payment for the application and permit fees. Accordingly, Customer shall pay these fees annually or upon request by LakePro, whichever is earlier. The fee amount is reviewed annually by the EGLE and other governing authorities and is subject to change. LakePro shall perform all treatments in compliance with the EGLE permit and all treatment products used by LakePro in the performance of such treatments are registered for aquatic use with the EPA and approved by the EGLE permit. For permit compliance, LakePro shall post treatment notification signs prior to each treatment. The Customer is and remains responsible for removing such signs after the expiration of the longest restriction period. For permit compliance, the Customer must distribute treatment notices to all riparians within and 100 feet beyond the treatment area. Customer must deliver notices between 7 and 45 days prior to the first treatment.</p>			



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Product/Service	Description	Qty.	Unit Price	Total
Program Implementation	<p>Customer shall provide all gate keys, codes, permissions, and other access privileges required by LakePro to reach all possible treatment sites. Additionally, Customer shall provide a site to launch a 12-16 foot boat with a light or medium duty truck. If no launch site is provided, LakePro may implement the treatments from shore and Customer hereby grants shore access to LakePro. Additionally, LakePro may utilize the following equipment to complete the management services as necessary: UTV, ATV, Utility Tractor, or other additional equipment. All work shall be performed between 7am and 9pm, Monday through Friday, unless otherwise specified by LakePro or Customer.</p>			
Program Risks	<p>LakePro utilizes best management practices for all treatments to protect the water quality and ecology of your waterbody(s). If LakePro becomes aware of any risks of oxygen depletion in your waterbody(s), LakePro may change the treatment products, dosages, frequency, methods, or other factors to reduce those risks to non-target organisms. Customer understands that the risk of oxygen depletion always exists.</p>			
Invoicing	<p>The annual Management Services total shall be invoiced in halves. The first half shall be invoiced before service starts each year. The second half shall be invoiced mid season of each year. Additional options or requested treatments approved or authorized by customer will be invoiced upon completion. All payments are due within 30 days of date of invoice. A service charge of 2% per month will be applied to past due balances. A \$30.00 return check fee will be charged for insufficient funds.</p>			
Cancellation	<p>At any time, either Customer or LakePro —at its sole discretion—can cancel this Agreement without penalty. If LakePro is the canceling party, then LakePro shall notify Customer by giving written notice of cancellation at least 10 days in advance. If Customer is the canceling party, then Customer shall notify LakePro by giving written notice of cancellation at least 10 days in advance. Upon cancellation, Customer must pay in full for all services rendered prior to the date of cancellation.</p>			



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Product/Service	Description	Qty.	Unit Price	Total
Hold Harmless	LakePro endeavors to prevent damage to any property of the Customer. Nevertheless, and only to the extent permitted by law Customer shall hold harmless LakePro and its employees, agents, and any other officers, directors, or controlling persons from and against any and all damages, claims, cost, and expenses whenever and however incurred, except in the event of LakePro's negligence or tortious act. Examples of such damaged property include but are not limited to: lawns, driveway, sprinkler caps, landscaping, fountain cables, and irrigation intakes.			
Arbitration	If the parties agree and only after any dispute arises, such dispute between the parties may be resolved by binding arbitration in accordance with Michigan's Uniform Arbitration Act, MCL 691.168 et seq. in the Oakland County Michigan - or another location mutually agreed to by both parties. Both parties agree to be bound by the decisions and awards of such arbitration. An award of arbitration may be confirmed in a court of competent jurisdiction.			
Miscellaneous	LakePro is considered at all times to be an independent contractor. Customer acknowledges that LakePro controls its own schedule, methods, and workers, that LakePro provides its own treatment products, equipment, and vehicles, and that this Agreement is strictly for the period of time described above and may only be extended by mutual execution of the Extension Agreement attached hereto as "Schedule A or so". Customer understands that LakePro cannot guarantee treatment results due to permit restrictions, weather, flow, and the amount of aquatic vegetation. Customer also understands that the length of growing season, sunlight, temperatures, and nutrient concentrations affect the rate of vegetation re-growth. This Agreement is the sole and exclusive understanding between LakePro and Customer of the subject matter and, where a separate agreement exists of any nature between LakePro and Customer and the terms therein conflict with the terms of this Agreement, the terms of this Agreement shall control. Invalidation or waiver of a provision of this Agreement shall not constitute invalidation or waiver of any other provision, and all remaining provisions shall continue in full force and effect.			



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This Agreement contains the full and exclusive scope of the terms, conditions, and understandings to which both parties agree. This agreement shall commence on the date of signature below until December 31st of year stated above. Understood and Agreed.

Subtotal	\$1,190.00
STRIPE PROCESSING FEE- ONLY IF PAID ONLINE (4.0%)	\$47.60
Total	\$1,237.60

Signature: _____ Date: _____