

**ONEKAMA TOWNSHIP BOARD REGULAR MEETING  
WEDNESDAY, April 10, 2024, 4 P.M.  
AGENDA**

**CALL TO ORDER**

**PLEDGE OF ALLEGIANCE**

**ATTENDANCE**

**MINUTES**

Minutes of Special Board Meeting of March 20, 2024

**AMEND AGENDA**

**PUBLIC COMMENT**

**FINANCIAL REPORTS**

Revenue & Expense Report, Trial Balance

**CLERK'S REPORT**

Clerk's Report

**TREASURER'S REPORT**

Treasurer's Report

**COUNTY COMMISSIONERS**

Jeff Dontz

Janice McCraner

**NEW BUSINESS**

Update Camera System

CPA Services

Parks Committee credit card

Survey\Mark Midway Road -End

Food Trucks

**UNFINISHED BUSINESS**

ORV Ordinance

Cost Recovery Ordinance

Board & Committee emails

**REPORTS OF BOARDS AND COMMITTEES:**

**FIRE**

**ASSESSOR**

**ROADS**

**HARBOR COMMISSION**

**PARKS & RECREATION**

Project Goals

Trail feasibility quote

Complete Streets Resolution

Langland Sand Management

Carden Park Upgrade

Larson's Landscaping

Anthony's Outdoor Services

Langland Fire Rings

Summer Events

Onekama History Association- Funding Request

**PLANNING COMMISSION – OFF UNTIL APRIL**

**BOR**

**RECYCLE**

**PLA**

**INVASIVE SPECIES**

Portage Lake's 2023 LMP Report

Fishery Report conducted in 2023

DNR Memo of Fishery Report

**PUBLIC COMMENT**

**CORRESPONDENCE**

**BILLS TO BE PAID**

**ADJOURN**

**ONEKAMA TOWNSHIP**  
**REGULAR BOARD MEETING**  
**WEDNESDAY, MARCH 20, 2024 at 4:00 PM**

Meeting called to order by Supervisor David Meister at 4:06 PM

Pledge of Allegiance

**ATTENDANCE:**

Present: Bob Blackmore, Al Taylor (Remote), Ed Bradford, David Meister.

Absent: Amber Sedelmaier.

**MINUTES:**

Board Meeting of February 14, 2024. **Motion** by Bradford, Second by Taylor to approve the minutes as presented. Motion carried unanimously.

Special Board Meeting of February 21, 2024. **Motion** by Blackmore, Second by Bradford to approve the minutes as presented. Motion carried unanimously.

Special Board Meeting of March 4, 2024. **Motion** by Blackmore, Second by Bradford to approve the minutes as presented. Motion carried unanimously.

**AMEND AGENDA:**

Move the report from Katie Mehl on Land Bank, Chief Johnson\Fire report, and report from Jim Simons\Harbor Commission after Public Comment. Add Lake Management Report under Invasive Species.

**PUBLIC COMMENT:**

Comment received from Dan N. about when the Board was going to appoint the Deputy Clerk. Supervisor Meister explained that this is a Clerk appointment. Comments received from Libby S. about fire rescue deputy wages, requested a copy of the treasurer memo for March, asked a question about the Village Parks project, and asked for more details about the proposed cost recovery ordinance.

**REPORT FROM KATIE MEHL ON LAND BANK:**

County Planning Director Katie Mehl discussed the County Land Bank and handed out some information. Discussed the new Land Bank Fast Track Act. Discussed recent Land Bank grants. Emphasized that the Land Bank can only acquire property through a designated process. Explained the 5/50% tax rule for land bank parcels. Discussed County ARPA funding for the land bank.

**FIRE:**

Chief Johnson discussed the activities of the fire department for February. The new rescue vehicle is in service. Calls for mutual aid are declining. There was ice rescue training in Feb.

when the ice was good. The department is down to 10 members, and they are looking to recruit more people.

Chief Johnson introduced Derek Smith from Almira Township to talk about their cost recovery ordinance and how it can recoup expenses from insurance companies. Smith explained how their ordinance worked and that they collect \$5,000-\$10,000 annually. Smith explained they have a billing policy that accompanies their ordinance.

Chief Johnson expressed a desire to get the ordinance passed soon. The attorney hasn't finished their review and edits. Until that is done, and the Board has had a chance to review and discuss a more finished product, no action on approval. Meister said he would contact the attorney.

#### **COUNTY COMMISSIONER:**

Jeff Dontz reported on activities at the County including tax allocation board action, County software upgrade, Centra Wellness statistics, various appointments, Regional Summit, Land bank grants, Coast Guard consolidation at Station Manistee, maple Street bridge re-opening, and status of EAS at the airport, and various other items.

#### **HARBOR COMMISSION:**

Jim Simons requested that Ted Bromley and Kevin Hughes be reappointed to the commission for terms ending 3/31/2027. Consensus of Board to do so. Simons reported that the dock at the DNR launch had been installed but that water depths 10' to 15' out from shore were only 1' deep. The water depth is only 3' to 3.5' deep out 300' from shore. The DNR is hoping to dredge out 300' but no timeframe for action. This will be put on the website. Channel dredging is on hold until 2025 because more sediment samples are needed.

#### **ROADS:**

Outgoing Road Commission manager Mark Sohlden updated the Board on the transition to the new manager Brad Kluczynski. Discussed road projects including Milarch Rd. which will be a crush and shape and resurface to be completed by August 23. This is a 70% road commission 30% township project with Bear Lake Twp and Onekama Twp each paying 15%. Eleven Mile Rd. won't happen until spring 2025. They need to get some grading easements and some utilities need to be relocated. The project is a 22' travel lane and two 5' shoulders for 32' edge to edge. The board expressed concern about the mature trees and requested to review plans when complete. Bayview and Seymour will be getting an overlay this summer 100% road commission. Discussed Wic-A-Te-Wah roads. They have a 40' ROW and were re-graveled in 2016. Will discuss options with new manager, but paving is not wanted by most of the residents.

#### **CLERK'S REPORT:**

Information in the packet.

#### **TREASURER'S REPORT:**

Bradford reported that he had settled with the County treasurer for 2023 taxes. The process went smoothly.

**NEW BUSINESS:**

Reviewed a proposal from Larsen's Landscaping for the Township Hall. **Motion** by Blackmore, Second by Bradford to accept. Motion carried unanimously.

ARPA grant has been closed. No need to do anything else unless contacted by the State.

Reviewed a proposal from the Manistee, Mason and Lake Conservation Districts for the annual Household Hazardous Waste collection to be held August 17, 2024 at the Manistee County Road Commission building. **Motion** by Bradford, Second by Blackmore to approve the agreement. Motion carried unanimously.

**UNFINISHED BUSINESS:**

Discussed the changes to the ORV ordinance. Have not heard back from the attorney. **Motion** by Bradford, Second by Blackmore to **TABLE** the ordinance changes until the April meeting. Meister to contact attorney.

Consensus that the fire department cost recovery ordinance needed attorney review and more discussion.

Meister discussed the old Shirley's restaurant property across from the Township Hall. The owner is willing to donate half the price of the property if the Township wants to acquire it. The property is big enough to accommodate recycling and pickleball, and the building could be used for storage and other purposes, and it is conveniently located. Some concerns about taking up prime downtown real estate were expressed. Meister said the other parcel is still working through the title issues. Meister will gather more information to bring to the next board meeting.

Meister said the DeVoe court agreement had been signed. Some boats had been moved. Meister will review the settlement to make sure things are progressing by the deadlines.

**BUDGET RESOLUTIONS:**

Budget Resolution 2024-01 Wages / Salary / Charges. **Motion** by Blackmore, Second by Taylor to approve the resolution. Roll call vote. Bradford – Recused\Abstained, Blackmore – Yes, Taylor – Yes, Meister – Yes. Motion carried.

Budget Resolution 2024-02 Supervisor's Salary. **Motion** by Bradford, Second by Blackmore to approve the resolution. Roll call vote. Bradford – Yes, Blackmore – Yes, Taylor – Yes, Meister – Yes. Motion carried.

Budget Resolution 2024-03 Treasurer's Salary. **Motion** by Blackmore, Second by Taylor to approve the resolution. Roll call vote. Bradford – Yes, Blackmore – Yes, Taylor – Yes, Meister – Yes. Motion carried.

Budget Resolution 2024-04 Trustee's Salary. **Motion** by Blackmore, Second by Bradford to approve the resolution. Roll call vote. Bradford – Yes, Blackmore – Yes, Taylor – Yes, Meister – Yes. Motion carried.

Budget Resolution 2024-05 Clerk's Salary. **Motion** by Bradford, Second by Blackmore to approve the resolution. Roll call vote. Bradford – Yes, Blackmore – Yes, Taylor – Yes, Meister – Yes. Motion carried.

Budget Resolution 2024-06 General Fund Budget. **Motion** by Blackmore, Second by Taylor to approve the resolution. Roll call vote. Bradford – Yes, Blackmore – Yes, Taylor – Yes, Meister – Yes. Motion carried.

Budget Resolution 2024-07 Road Fund Budget. **Motion** by Blackmore, Second by Bradford to approve the resolution. Roll call vote. Bradford – Yes, Blackmore – Yes, Taylor – Yes, Meister – Yes. Motion carried.

Budget Resolution 2024-08 Fire Fund Budget. **Motion** by Bradford, Second by Blackmore to approve the resolution. Roll call vote. Bradford – Yes, Blackmore – Yes, Taylor – Yes, Meister – Yes. Motion carried.

Budget Resolution 2024-09 Lake Improvement Fund Budget. **Motion** by Bradford, Second by Blackmore to approve the resolution. Roll call vote. Bradford – Yes, Blackmore – Yes, Taylor – Yes, Meister – Yes. Motion carried.

**PARKS:**

Bik Pratt informed the Board the ridged walkway was being installed in early April. Picnic tables are being delivered to North Point Park on April 1. Confirmed that the parks budget had not changed since the last meeting. Pratt requested a meeting with Bradford to discuss website capabilities. Swidorski will be putting in the kayak launch soon.

**ASSESSOR/BOR:**

Meister reported there were around 17 appeals at the March Board of Review.

**INVASIVE SPECIES:**

Taylor stated the 2023 Lake Management report is complete. The Fish Study is also complete. These will both be presented at the April 10 meeting. Tyler Dula from the Manistee Conservation District has been working to identify invasive species on Township parks and properties.

**RECYCLING:**

No report. Meister stated he had an upcoming meeting with the County on this and will discuss location.

**PLA:**

The PLA is working on Onekama days events and schedule. Making good progress. The Concerts in the Park lineup is almost finalized.

**PUBLIC COMMENT:**

Libby S. would like to see the DeVoe agreement posted on the website.

**BILLS TO BE PAID:**

**Motion** by Blackmore, Second by Taylor to pay the incoming regular bills. Motion carried unanimously.

ADJOURNED AT 6:25 pm

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Edward Bradford, Treasurer

DRAFT

Fund 101 GENERAL FUND

GL Number	Description	Balance
*** Assets ***		
101-000-001.000	CASH	334,225.51
101-000-001.001	CASH - ESCROW	19,124.53
101-000-005.000	CASH - MICHIGAN CLASS	823,734.69
101-000-020.000	PROPERTY TAXES RECEIVABLE	10,331.37
101-000-078.000	DUE FROM STATE	23,219.00
101-000-084.206	DUE FROM FIRE FUND	9,774.16
101-000-123.000	PREPAID EXPENDITURES	4,904.82
<b>Total Assets</b>		<b>1,225,314.08</b>
*** Liabilities ***		
101-000-200.000	FUNDS HELD IN ESCROW	19,124.53
101-000-202.000	ACCOUNTS PAYABLE	27,330.42
101-000-214.000	DUE TO OTHER FUNDS	14,828.01
101-000-228.001	DUE TO STATE - INCOME TAX WITHHELD	2,039.70
101-000-229.001	DUE TO FEDERAL - INCOME TAX WITHHELD	(988.39)
101-000-229.002	DUE TO FEDERAL - FICA	3,715.04
101-000-231.000	DUE TO STATE - SUTA	(1.04)
101-000-257.000	ACCRUED WAGES PAYABLE	1,634.65
<b>Total Liabilities</b>		<b>67,682.92</b>
*** Fund Balance ***		
101-000-390.000	FUND BALANCE	1,026,376.51
<b>Total Fund Balance</b>		<b>1,026,376.51</b>
<b>Beginning Fund Balance</b>		<b>1,026,376.51</b>
<b>Net of Revenues VS Expenditures</b>		<b>131,254.65</b>
<b>Fund Balance Adjustments</b>		<b>0.00</b>
<b>Ending Fund Balance</b>		<b>1,157,631.16</b>
<b>Total Liabilities And Fund Balance</b>		<b>1,225,314.08</b>



Fund 204 ROAD FUND

GL Number	Description	Balance
*** Assets ***		
204-000-001.000	CASH	216,140.20
204-000-005.000	CASH - MICHIGAN CLASS	653,928.74
204-000-020.000	PROPERTY TAXES RECEIVABLE	5,856.40
<b>Total Assets</b>		<b>875,925.34</b>
*** Liabilities ***		
<b>Total Liabilities</b>		<b>0.00</b>
*** Fund Balance ***		
204-000-390.000	FUND BALANCE	679,747.83
<b>Total Fund Balance</b>		<b>679,747.83</b>
<b>Beginning Fund Balance</b>		<b>679,747.83</b>
<b>Net of Revenues VS Expenditures</b>		<b>196,177.51</b>
<b>Ending Fund Balance</b>		<b>875,925.34</b>
<b>Total Liabilities And Fund Balance</b>		<b>875,925.34</b>

Fund 206 FIRE FUND

GL Number	Description	Balance
*** Assets ***		
206-000-001.000	CASH	250,085.63
206-000-005.000	CASH - MICHIGAN CLASS	295,556.53
206-000-020.000	PROPERTY TAXES RECEIVABLE	5,825.05
206-000-123.000	PREPAID EXPENDITURES	9,593.98
<b>Total Assets</b>		<b>561,061.19</b>
*** Liabilities ***		
206-000-202.000	ACCOUNTS PAYABLE	2,026.88
206-000-214.101	DUE TO GENERAL FUND	9,774.16
<b>Total Liabilities</b>		<b>11,801.04</b>
*** Fund Balance ***		
206-000-390.000	FUND BALANCE	558,372.70
<b>Total Fund Balance</b>		<b>558,372.70</b>
<b>Beginning Fund Balance</b>		<b>558,372.70</b>
<b>Net of Revenues VS Expenditures</b>		<b>(9,112.55)</b>
<b>Ending Fund Balance</b>		<b>549,260.15</b>
<b>Total Liabilities And Fund Balance</b>		<b>561,061.19</b>

Fund 220 LAKE IMPROVEMENT FUND (INVASIVE SPECIES)

GL Number	Description	Balance
*** Assets ***		
220-000-001.005	CASH	76,056.15
220-000-020.000	PROPERTY TAXES RECEIVABLE	3,146.56
<b>Total Assets</b>		<b>79,202.71</b>
*** Liabilities ***		
<b>Total Liabilities</b>		<b>0.00</b>
*** Fund Balance ***		
220-000-390.000	FUND BALANCE	49,496.01
<b>Total Fund Balance</b>		<b>49,496.01</b>
<b>Beginning Fund Balance</b>		<b>49,496.01</b>
<b>Net of Revenues VS Expenditures</b>		<b>29,706.70</b>
<b>Ending Fund Balance</b>		<b>79,202.71</b>
<b>Total Liabilities And Fund Balance</b>		<b>79,202.71</b>

GL Number	Inv. Line Desc	Vendor	Invoice Desc.	Invoice	Due Date	Amount	check #
Fund 101 GENERAL FUND							
Dept 101 TOWNSHIP BOARD							
101-101-727.000	SUPPLIES	EMERGENCY MEDICAL PROD	AED AND PADS	2619655	03/22/24	447.99	6241
101-101-727.000	SUPPLIES	ELAN CARDMEMBER SERVIC	CREDIT CARD PAYMENT	ELANMAR2024	03/24/24	170.97	6247
101-101-727.000	SUPPLIES	JACKPINE BUSINESS CENT	COPY PAPER/ ENVELOPES	INV5438	03/29/24	142.45	6249
101-101-900.000	PUBLISHING	THE PIONEER GROUP	NEWSPAPER PUBLISHING- SYNOPSIS	PIONEERFEB2024	03/06/24	90.30	6255
101-101-900.000	PUBLISHING	THE PIONEER GROUP	NEWSPAPER PUBLISHING	PIONEERMARCH2024	03/31/24	844.75	6274
101-101-921.000	LIGHTING	CONSUMERS ENERGY	CONSUMERS ENERGY- 2ND ST	CON2NDSTMAR2024	03/18/24	30.58	6239
101-101-921.000	LIGHTING	CONSUMERS ENERGY	CONSUMERS ENERGY LED LIGHTS	CONLED2024 M	03/23/24	242.50	6239
101-101-921.000	LIGHTING	CONSUMERS ENERGY	CONSUMERS ENERGY - STREET LIGHTS	CONSTREETMAR2024	03/04/24	88.82	6239
101-101-921.000	LIGHTING	CONSUMERS ENERGY	CONSUMERS ENERGY- MAIN ST	CONMAINSTMAR2024	03/19/24	168.46	6239
101-101-921.000	LIGHTING	CONSUMERS ENERGY	CONSUMERS ENERGY LED LIGHTS	CONLEDMARCH24	03/25/24	488.75	6265
101-101-921.000	LIGHTING	CONSUMERS ENERGY	CONSUMERS LIGHTS MARCH	CONLIGHTSMARCH20:	03/25/24	178.79	6265
101-101-921.000	LIGHTING	CONSUMERS ENERGY	CONSUMERS LED LIGHT MARCH	CONLEDMARCH2024	03/01/24	253.50	6265
Total For Dept 101 TOWNSHIP BOARD						3,147.86	
Dept 215 CLERK							
101-215-727.000	SUPPLIES	JACKPINE BUSINESS CENT	BUSINESS CARDS	INV6120	03/31/24	49.00	6268
Total For Dept 215 CLERK						49.00	
Dept 257 ASSESSOR							
101-257-802.000	CONTRACTUAL SERVICES	GREAT LAKES ASSESSING	ASSESSING CONTRACT- MARCH	MAR2024	03/31/24	3,859.00	6267
Total For Dept 257 ASSESSOR						3,859.00	
Dept 262 ELECTIONS							
101-262-702.000	WAGES	DIANA MCLEOD	ELECTION INSPECTOR - FEB 2024	FEB2024-2	03/29/24	220.50	6256
101-262-702.000	WAGES	JUDITH SPOHN	ELECTION INSPECTOR FEB 2024	FEB2024-6	03/29/24	78.75	6257
101-262-702.000	WAGES	JUSTIN SEDELMAIER	ELECTION INSPECTOR FEB 2024	FEB2024-5	03/29/24	234.50	6258
101-262-702.000	WAGES	MINDY SEDELMAIER	ELECTION INSPECTOR FEB 2024	FEB2024-4	03/29/24	220.50	6259
101-262-702.000	WAGES	PAUL CUNNINGHAM	ELECTION INSPECTOR - FEB 2024	FEB2024-3	03/29/24	220.50	6260
101-262-702.000	WAGES	PEGGY GREEN	ELECTION INSPECTOR- FEB 2024	FEB2024-1	03/29/24	220.50	6261
Total For Dept 262 ELECTIONS						1,195.25	
Dept 265 BUILDING & GROUNDS							
101-265-727.000	SUPPLIES	GALLOUP	ELKAY EZ H2O FILTER	S113965868.001	03/26/24	323.94	6248
101-265-727.000	SUPPLIES	ONEKAMA BUILDING SUPPL	PAPER TOWEL CASE	2402-271446	03/28/24	49.99	6250
101-265-727.000	SUPPLIES	GALLOUP	CARBON FILTER CARTRIDGE	S114054059.001	03/31/24	597.10	6266
101-265-802.000	CONTRACTUAL SERVICES	PITNEY BOWES GLOBAL FI	POSTAGE MACHINE LEASE	3318775198	03/21/24	615.15	6251
101-265-802.000	CONTRACTUAL SERVICES	RING CENTRAL INC	TELEPHONE BILL	CD_000768953	03/31/24	349.97	6252
101-265-802.000	CONTRACTUAL SERVICES	LARSEN'S LANDSCAPING &	SNOW REMOVAL	84214	04/01/24	267.00	6269
101-265-920.000	UTILITIES	SUPERIOR ENERGY COMPAN	NATURAL GAS BILL	SUPMAR2024	03/28/24	171.56	6254
101-265-920.000	UTILITIES	SUPERIOR ENERGY COMPAN	NATURAL GAS BILL MARCH	MARCH 2024	03/31/24	277.12	6273
101-265-920.000	UTILITIES	VILLAGE OF ONEKAMA	SEWER MARCH 2024	MARCH 2024	03/31/24	145.00	6275
Total For Dept 265 BUILDING & GROUNDS						2,796.83	
Dept 266 ATTORNEY							
101-266-803.000	ATTORNEY	RUNNING, WISE & FORD,	ATTORNEY FEES- GENERAL MATTERS	45166	03/06/24	1,232.00	6253
101-266-803.000	ATTORNEY	RUNNING, WISE & FORD,	ATTORNEY FEES - MIKE DEVOE ZONING V	45163	03/06/24	2,681.00	6253
101-266-803.000	ATTORNEY	RUNNING, WISE & FORD,	GENERAL MATTERS	45313	03/31/24	1,519.00	6272
101-266-803.000	ATTORNEY	RUNNING, WISE & FORD,	MIKE DEVOE ZONING VIOLATION	45292	03/31/24	1,162.30	6272
101-266-803.000	ATTORNEY	RUNNING, WISE & FORD,	STOKES/VANECEK ZBA	45293	03/31/24	105.00	6272
101-266-803.000	ATTORNEY	RUNNING, WISE & FORD,	PORTAGE POINT INN SUP	45318	03/31/24	595.00	6272
Total For Dept 266 ATTORNEY						7,294.30	
Dept 751 PARKS & RECREATION							

INVOICE GL DISTRIBUTION REPORT FOR ONEKAMA TOWNSHIP  
EXP CHECK RUN DATES 03/01/2024 - 03/31/2024  
BOTH JOURNALIZED AND UNJOURNALIZED  
BOTH OPEN AND PAID

GL Number	Inv. Line Desc	Vendor	Invoice Desc.	Invoice	Due Date	Amount	check #
Fund 101 GENERAL FUND							
Dept 751 PARKS & RECREATION							
101-751-802.000	CONTRACTUAL SERVICES	MANISTEE RECREATION AS MRA CONTRACT 2024		MRAMAR2024	03/31/24	3,060.00	6243
101-751-802.000	CONTRACTUAL SERVICES	C & W PORTABLE TOILETS	PORTABLE RESTROOM SEYMOUR	I24342	03/31/24	155.00	6264
101-751-921.000	LIGHTING	CONSUMERS ENERGY	CONSUMERS ENERGY - FAIRWAY ST	CONFAIRWAYSTMAR21	03/20/24	28.77	6239
101-751-921.000	LIGHTING	CONSUMERS ENERGY	CONSUMERS ENERGY - GREENWAY ST	CONGREENMAR2024	03/20/24	28.77	6239
Total For Dept 751 PARKS & RECREATION						3,272.54	
Total For Fund 101 GENERAL FUND						21,614.78	
Fund 206 FIRE FUND							
Dept 000							
206-000-727.000	SUPPLIES	CLIA LABORATORY PROGRA	CLIA LAB USER FEES	CLIAMAR2024	03/08/24	180.00	3242
206-000-728.000	SUPPLIES - MEDICAL & SAFETY	EMERGENCY MEDICAL PROD	CYNCH-LOKS	2618526	03/31/24	44.19	3246
206-000-920.000	UTILITIES	CONSUMERS ENERGY	CONSUMERS ENERGY MAIN ST FF	CONMAINSTMAR2024	03/19/24	168.46	3239
206-000-920.000	UTILITIES	SUPERIOR ENERGY COMPAN	NATURAL GAS BILL	SUPMAR2024FF	03/28/24	171.55	3243
206-000-920.000	UTILITIES	SUPERIOR ENERGY COMPAN	NATURAL GAS MARCH FF	MARCH2024FF	03/31/24	277.13	3248
206-000-920.000	UTILITIES	VILLAGE OF ONEKAMA	SEWER MARCH 2024	MARCH 2024FF	03/31/24	145.00	3249
206-000-931.000	REPAIRS AND MAINT - AUTO &	ALLIED FIRE SALES & SE	T-102 LABOR REPAIRS	50815	03/31/24	844.31	3244
206-000-931.000	REPAIRS AND MAINT - AUTO &	FIRESERVICE MANAGEMENT	WORK ORDER 25642 REPAIRS	28956	02/18/24	65.52	3247
206-000-971.000	CAPITAL OUTLAY	ALLIED FIRE SALES & SE	UPFIT ON 2023 FORD EXPEDITION	50963	03/31/24	26,037.40	3241
Total For Dept 000						27,933.56	
Total For Fund 206 FIRE FUND						27,933.56	
Fund 703 TAX FUND							
Dept 000							
703-000-214.101	DUE TO GENERAL FUND	ONEKAMA GENERAL FUND	ONEKAMA TOWNSHIP WINTER TAXES GENER.	WIN 2023-5	03/15/24	7,540.30	2341
703-000-214.101	DUE TO GENERAL FUND	ONEKAMA GENERAL FUND	ADMIN FEE SUMMER TAXES	SUM 2023-12	03/15/24	311.20	2341
703-000-214.204	DUE TO ROAD FUND	ONEKAMA ROAD FUND	ONEKAMA TOWNSHIP WINTER TAXES ROADS	WIN 2023-5	03/15/24	4,834.45	2343
703-000-214.206	DUE TO FIRE FUND	ONEKAMA FIRE FUND	ONEKAMA TOWNSHIP WINTER TAXES FIRE	WIN 2023-5	03/15/24	4,972.26	2340
703-000-214.220	DUE TO LAKE IMPROVEMENT FUND	ONEKAMA INVASIVE SPECI	ONEKAMA TOWNSHIP WINTER INVASIVE SP	WIN 2023-5	03/15/24	2,847.18	2342
703-000-222.001	DUE TO COUNTY - OPERATING	MANISTEE COUNTY TREASU	MANISTEE COUNTY SUMMER TAXES	SUM 2023-12	03/15/24	2,364.42	2337
703-000-222.002	DUE TO COUNTY - 911	MANISTEE COUNTY TREASU	MANISTEE COUNTY WINTER TAXES	WIN 2023-5	03/15/24	4,900.04	2337
703-000-222.003	DUE TO COUNTY - RECYCLING	MANISTEE COUNTY TREASU	MANISTEE COUNTY WINTER TAXES	WIN 2023-5	03/15/24	828.00	2337
703-000-222.005	DUE TO COUNTY - CONSERVATION	MANISTEE COUNTY TREASU	MANISTEE COUNTY WINTER TAXES	WIN 2023-5	03/15/24	1,110.40	2337
703-000-222.006	DUE TO COUNTY - COUNCIL ON	MANISTEE COUNTY TREASU	MANISTEE COUNTY WINTER TAXES	WIN 2023-5	03/15/24	2,326.74	2337
703-000-222.007	DUE TO COUNTY - DIAL A RI	MANISTEE COUNTY TREASU	MANISTEE COUNTY WINTER TAXES	WIN 2023-5	03/15/24	2,449.57	2337
703-000-222.008	DUE TO COUNTY - MEDICAL C	MANISTEE COUNTY TREASU	MANISTEE COUNTY WINTER TAXES	WIN 2023-5	03/15/24	2,449.57	2337
703-000-223.000	DUE TO COUNTY - LIBRARY	MANISTEE COUNTY TREASU	MANISTEE COUNTY WINTER TAXES	WIN 2023-5	03/15/24	4,900.02	2337
703-000-225.001	DUE TO SCHOOL - DEBT	ONEKAMA CONSOLIDATED S	ONEKAMA SCHOOL SUMMER TAXES	SUM 2023-12	03/15/24	1,504.61	2339
703-000-225.002	DUE TO SCHOOL - OPERATING	ONEKAMA CONSOLIDATED S	ONEKAMA SCHOOL SUMMER TAXES	SUM 2023-12	03/15/24	22,390.92	2339
703-000-225.003	DUE TO SCHOOL - SINKING F	ONEKAMA CONSOLIDATED S	ONEKAMA SCHOOL SUMMER TAXES	SUM 2023-12	03/15/24	421.69	2339
703-000-228.002	DUE TO STATE - SET	MANISTEE COUNTY TREASU	MANISTEE COUNTY SUMMER TAXES	SUM 2023-12	03/15/24	2,579.37	2337
703-000-234.000	DUE TO MANISTEE INTERMEDI	MANISTEE INTERMEDIATE	MANISTEE ISD SUMMER TAXES	SUM 2023-12	03/15/24	976.38	2338
703-000-235.000	DUE TO WEST SHORE COLLEGE	WEST SHORE COMMUNITY C	WSCC OPERATING SUMMER TAXES	SUM 2023-12	03/15/24	1,324.32	2345
703-000-275.000	DUE TO TAXPAYERS	THE NORTHERN TRUST CO	2023 Win Tax Refund 11-004-009-10	03/13/2024	03/20/24	58.42	2344
Total For Dept 000						71,089.86	
Total For Fund 703 TAX FUND						71,089.86	

INVOICE GL DISTRIBUTION REPORT FOR ONEKAMA TOWNSHIP  
EXP CHECK RUN DATES 03/01/2024 - 03/31/2024  
BOTH JOURNALIZED AND UNJOURNALIZED  
BOTH OPEN AND PAID

GL Number	Inv. Line Desc	Vendor	Invoice Desc.	Invoice	Due Date	Amount	check #
Fund Totals:							
			Fund 101 GENERAL FUND			21,614.78	
			Fund 206 FIRE FUND			27,933.56	
			Fund 703 TAX FUND			71,089.86	
			Total For All Funds:			<u>120,638.20</u>	

User: AMBER

DB: Onekama Twp

PERIOD ENDING 03/31/2024

GL NUMBER	DESCRIPTION	2023-24	YTD BALANCE	ACTIVITY FOR	AVAILABLE	% BGD USED
		AMENDED BUDGET	03/31/2024 NORMAL (ABNORMAL)	MONTH 03/31/2024 INCREASE (DECREASE)	BALANCE NORMAL (ABNORMAL)	
Fund 101 - GENERAL FUND						
Revenues						
Dept 000						
101-000-402.000	CURRENT PROPERTY TAXES	279,900.00	284,989.84	7,185.40	(5,089.84)	101.82
101-000-411.000	DELINQUENT PROPERTY TAXES	7,200.00	8,840.51	0.00	(1,640.51)	122.78
101-000-445.000	PENALTIES AND INTEREST ON TAXES	0.00	0.00	0.00	0.00	0.00
101-000-447.000	PROPERTY TAX ADMINISTRATION FEE	77,700.00	78,162.38	666.10	(462.38)	100.60
101-000-448.000	SUMMER TAX COLLECTION FEE	8,000.00	7,987.00	0.00	13.00	99.84
101-000-451.000	SPECIAL ASSESSMENTS	0.00	0.00	0.00	0.00	0.00
101-000-476.000	BUSINESS LICENSE AND PERMITS	5,000.00	8,800.00	600.00	(3,800.00)	176.00
101-000-478.000	LAND AND SPECIAL USE PERMITS	15,000.00	17,690.00	0.00	(2,690.00)	117.93
101-000-479.000	VARIANCE AND APPEALS	3,000.00	1,500.00	0.00	1,500.00	50.00
101-000-480.000	CEMETERY FEES	500.00	0.00	0.00	500.00	0.00
101-000-502.000	FEDERAL GRANTS	0.00	0.00	0.00	0.00	0.00
101-000-528.000	FEDERAL GRANTS - OTHER	0.00	0.00	0.00	0.00	0.00
101-000-540.000	STATE GRANTS	75,900.00	68,310.00	0.00	7,590.00	90.00
101-000-541.000	LIQUOR LICENSE REVENUE	1,200.00	892.65	0.00	307.35	74.39
101-000-542.000	METRO ACT REVENUE	5,000.00	5,664.28	0.00	(664.28)	113.29
101-000-573.000	LOCAL COMMUNITY STABILIZATION AUTHORITY	800.00	856.84	0.00	(56.84)	107.11
101-000-574.000	STATE REVENUE SHARING	105,000.00	101,419.00	16,738.00	3,581.00	96.59
101-000-626.000	CHARGE FOR SERVICES	100.00	580.80	0.00	(480.80)	580.80
101-000-642.000	SALES	0.00	0.00	0.00	0.00	0.00
101-000-665.000	INTEREST INCOME	20,000.00	41,638.63	0.00	(21,638.63)	208.19
101-000-667.000	RENTAL INCOME	0.00	0.00	0.00	0.00	0.00
101-000-668.000	ROYALTIES	1,800.00	1,256.82	0.00	543.18	69.82
101-000-674.000	DONATIONS	1,000.00	500.00	0.00	500.00	50.00
101-000-675.000	LOCAL GRANTS	5,000.00	4,885.00	0.00	115.00	97.70
101-000-676.000	REIMBURSEMENT TO TWP	3,500.00	99.48	0.00	3,400.52	2.84
101-000-684.000	OTHER REVENUE	1,500.00	2,243.90	0.00	(743.90)	149.59
101-000-693.000	SALE OF FIXED ASSETS	70,000.00	14,521.00	0.00	55,479.00	20.74
101-000-699.000	TRANSFERS IN	0.00	0.00	0.00	0.00	0.00
Total Dept 000		687,100.00	650,838.13	25,189.50	36,261.87	94.72
TOTAL REVENUES		687,100.00	650,838.13	25,189.50	36,261.87	94.72
Expenditures						
Dept 101 - TOWNSHIP BOARD						
101-101-702.000	WAGES	24,000.00	18,990.04	1,573.08	5,009.96	79.13
101-101-715.000	SOCIAL SECURITY	1,800.00	1,452.76	120.35	347.24	80.71
101-101-727.000	SUPPLIES	8,000.00	9,010.86	761.41	(1,010.86)	112.64
101-101-801.000	PROFESSIONAL SERVICES	35,000.00	28,210.00	0.00	6,790.00	80.60
101-101-802.000	CONTRACTUAL SERVICES	11,500.00	17,549.35	0.00	(6,049.35)	152.60
101-101-860.000	MILEAGE	500.00	33.13	16.75	466.87	6.63
101-101-900.000	PUBLISHING	5,000.00	2,430.25	935.05	2,569.75	48.61
101-101-921.000	LIGHTING	5,500.00	6,643.05	1,451.40	(1,143.05)	120.78
101-101-930.000	REPAIRS AND MAINTENANCE	300.00	524.00	0.00	(224.00)	174.67
101-101-955.000	OTHER EXPENSE	7,000.00	1,398.71	0.00	5,601.29	19.98
101-101-956.000	TRAINING & EDUCATION	2,000.00	18.00	0.00	1,982.00	0.90
101-101-957.000	MEMBERSHIP DUES	3,500.00	3,543.09	0.00	(43.09)	101.23
101-101-958.000	INSURANCE	5,000.00	12,964.00	0.00	(7,964.00)	259.28
101-101-971.000	CAPITAL OUTLAY	5,000.00	5,793.75	0.00	(793.75)	115.88
101-101-995.000	TRANSFERS OUT	0.00	0.00	0.00	0.00	0.00
Total Dept 101 - TOWNSHIP BOARD		114,100.00	108,560.99	4,858.04	5,539.01	95.15

PERIOD ENDING 03/31/2024

GL NUMBER	DESCRIPTION	2023-24	YTD BALANCE	ACTIVITY FOR	AVAILABLE	% BDGT USED
		AMENDED BUDGET	03/31/2024	MONTH 03/31/2024	BALANCE	
			NORMAL (ABNORMAL)	INCREASE (DECREASE)	NORMAL (ABNORMAL)	
Fund 101 - GENERAL FUND						
Expenditures						
Dept 171 - SUPERVISOR						
101-171-702.000	WAGES	23,900.00	18,899.92	1,453.84	5,000.08	79.08
101-171-715.000	SOCIAL SECURITY	1,850.00	1,445.84	111.21	404.16	78.15
101-171-727.000	SUPPLIES	1,000.00	35.00	0.00	965.00	3.50
101-171-860.000	MILEAGE	500.00	0.00	0.00	500.00	0.00
101-171-955.000	OTHER EXPENSE	0.00	0.00	0.00	0.00	0.00
101-171-956.000	TRAINING & EDUCATION	500.00	0.00	0.00	500.00	0.00
Total Dept 171 - SUPERVISOR		27,750.00	20,380.76	1,565.05	7,369.24	73.44
Dept 215 - CLERK						
101-215-702.000	WAGES	42,175.00	40,210.24	2,984.16	1,964.76	95.34
101-215-715.000	SOCIAL SECURITY	3,650.00	3,061.64	228.29	588.36	83.88
101-215-727.000	SUPPLIES	4,000.00	908.63	49.00	3,091.37	22.72
101-215-801.000	PROFESSIONAL SERVICES	0.00	0.00	0.00	0.00	0.00
101-215-860.000	MILEAGE	500.00	113.13	50.25	386.87	22.63
101-215-955.000	OTHER EXPENSE	0.00	0.00	0.00	0.00	0.00
101-215-956.000	TRAINING & EDUCATION	500.00	25.00	0.00	475.00	5.00
101-215-957.000	MEMBERSHIP DUES	150.00	0.00	0.00	150.00	0.00
101-215-971.000	CAPITAL OUTLAY	0.00	0.00	0.00	0.00	0.00
Total Dept 215 - CLERK		50,975.00	44,318.64	3,311.70	6,656.36	86.94
Dept 247 - BOARD OF REVIEW						
101-247-702.000	WAGES	2,500.00	1,170.00	540.00	1,330.00	46.80
101-247-715.000	SOCIAL SECURITY	200.00	89.52	41.32	110.48	44.76
101-247-727.000	SUPPLIES	0.00	0.00	0.00	0.00	0.00
101-247-860.000	MILEAGE	100.00	22.93	0.00	77.07	22.93
101-247-900.000	PUBLISHING	500.00	0.00	0.00	500.00	0.00
101-247-955.000	OTHER EXPENSE	0.00	0.00	0.00	0.00	0.00
101-247-956.000	TRAINING & EDUCATION	500.00	0.00	0.00	500.00	0.00
Total Dept 247 - BOARD OF REVIEW		3,800.00	1,282.45	581.32	2,517.55	33.75
Dept 253 - TREASURER						
101-253-702.000	WAGES	40,000.00	39,465.56	3,191.73	534.44	98.66
101-253-715.000	SOCIAL SECURITY	3,000.00	3,019.11	244.16	(19.11)	100.64
101-253-727.000	SUPPLIES	1,200.00	1,309.23	0.00	(109.23)	109.10
101-253-801.000	PROFESSIONAL SERVICES	0.00	0.00	0.00	0.00	0.00
101-253-802.000	CONTRACTUAL SERVICES	12,000.00	12,046.15	0.00	(46.15)	100.38
101-253-860.000	MILEAGE	200.00	0.00	0.00	200.00	0.00
101-253-900.000	PUBLISHING	0.00	0.00	0.00	0.00	0.00
101-253-955.000	OTHER EXPENSE	500.00	0.00	0.00	500.00	0.00
101-253-956.000	TRAINING & EDUCATION	0.00	0.00	0.00	0.00	0.00
101-253-957.000	MEMBERSHIP DUES	150.00	0.00	0.00	150.00	0.00
101-253-971.000	CAPITAL OUTLAY	0.00	0.00	0.00	0.00	0.00
Total Dept 253 - TREASURER		57,050.00	55,840.05	3,435.89	1,209.95	97.88
Dept 257 - ASSESSOR						
101-257-702.000	WAGES	0.00	0.00	0.00	0.00	0.00
101-257-715.000	SOCIAL SECURITY	0.00	0.00	0.00	0.00	0.00



User: AMBER

PERIOD ENDING 03/31/2024

DB: Onekama Twp

GL NUMBER	DESCRIPTION	2023-24	YTD BALANCE	ACTIVITY FOR	AVAILABLE	% BGDG USED
		AMENDED BUDGET	03/31/2024 NORMAL (ABNORMAL)	MONTH 03/31/2024 INCREASE (DECREASE)	BALANCE NORMAL (ABNORMAL)	
Fund 101 - GENERAL FUND						
Expenditures						
101-257-727.000	SUPPLIES	1,000.00	1,677.72	0.00	(677.72)	167.77
101-257-802.000	CONTRACTUAL SERVICES	48,500.00	48,606.20	3,859.00	(106.20)	100.22
101-257-860.000	MILEAGE	0.00	0.00	0.00	0.00	0.00
101-257-900.000	PUBLISHING	0.00	0.00	0.00	0.00	0.00
101-257-955.000	OTHER EXPENSE	0.00	0.00	0.00	0.00	0.00
101-257-956.000	TRAINING & EDUCATION	0.00	0.00	0.00	0.00	0.00
101-257-971.000	CAPITAL OUTLAY	0.00	0.00	0.00	0.00	0.00
Total Dept 257 - ASSESSOR		49,500.00	50,283.92	3,859.00	(783.92)	101.58
Dept 262 - ELECTIONS						
101-262-702.000	WAGES	20,000.00	1,384.25	1,195.25	18,615.75	6.92
101-262-715.000	SOCIAL SECURITY	0.00	0.00	0.00	0.00	0.00
101-262-727.000	SUPPLIES	10,000.00	940.21	0.00	9,059.79	9.40
101-262-802.000	CONTRACTUAL SERVICES	2,500.00	1,531.81	0.00	968.19	61.27
101-262-860.000	MILEAGE	100.00	0.00	0.00	100.00	0.00
101-262-900.000	PUBLISHING	300.00	0.00	0.00	300.00	0.00
101-262-955.000	OTHER EXPENSE	0.00	0.00	0.00	0.00	0.00
101-262-956.000	TRAINING & EDUCATION	1,000.00	0.00	0.00	1,000.00	0.00
Total Dept 262 - ELECTIONS		33,900.00	3,856.27	1,195.25	30,043.73	11.38
Dept 265 - BUILDING & GROUNDS						
101-265-702.000	WAGES	6,000.00	4,267.20	336.00	1,732.80	71.12
101-265-715.000	SOCIAL SECURITY	460.00	326.43	25.70	133.57	70.96
101-265-727.000	SUPPLIES	13,000.00	1,566.58	971.03	11,433.42	12.05
101-265-802.000	CONTRACTUAL SERVICES	20,000.00	15,824.83	1,232.12	4,175.17	79.12
101-265-920.000	UTILITIES	9,000.00	7,376.47	593.68	1,623.53	81.96
101-265-930.000	REPAIRS AND MAINTENANCE	23,000.00	2,962.66	0.00	20,037.34	12.88
101-265-955.000	OTHER EXPENSE	500.00	0.00	0.00	500.00	0.00
101-265-958.000	INSURANCE	12,000.00	0.00	0.00	12,000.00	0.00
101-265-971.000	CAPITAL OUTLAY	0.00	56,666.00	0.00	(56,666.00)	100.00
Total Dept 265 - BUILDING & GROUNDS		83,960.00	88,990.17	3,158.53	(5,030.17)	105.99
Dept 266 - ATTORNEY						
101-266-803.000	ATTORNEY	35,000.00	18,656.35	7,294.30	16,343.65	53.30
Total Dept 266 - ATTORNEY		35,000.00	18,656.35	7,294.30	16,343.65	53.30
Dept 330 - LIQUOR LAW ENFORCEMENT						
101-330-702.000	WAGES	1,200.00	1,199.90	92.30	0.10	99.99
101-330-715.000	SOCIAL SECURITY	90.00	91.78	7.06	(1.78)	101.98
101-330-727.000	SUPPLIES	0.00	0.00	0.00	0.00	0.00
101-330-955.000	OTHER EXPENSE	0.00	0.00	0.00	0.00	0.00
Total Dept 330 - LIQUOR LAW ENFORCEMENT		1,290.00	1,291.68	99.36	(1.68)	100.13
Dept 536 - SANITARY SEWER						
101-536-801.000	PROFESSIONAL SERVICES	2,000.00	0.00	0.00	2,000.00	0.00
101-536-802.000	CONTRACTUAL SERVICES	1,200.00	0.00	0.00	1,200.00	0.00

User: AMBER

DB: Onekama Twp

PERIOD ENDING 03/31/2024

GL NUMBER	DESCRIPTION	2023-24	YTD BALANCE	ACTIVITY FOR	AVAILABLE	% BDGT USED
		AMENDED BUDGET	03/31/2024 NORMAL (ABNORMAL)	MONTH 03/31/2024 INCREASE (DECREASE)	BALANCE NORMAL (ABNORMAL)	
Fund 101 - GENERAL FUND						
Expenditures						
101-536-955.000	OTHER EXPENSE	1,000.00	872.87	0.00	127.13	87.29
Total Dept 536 - SANITARY SEWER		4,200.00	872.87	0.00	3,327.13	20.78
Dept 567 - CEMETERY						
101-567-702.000	WAGES	0.00	0.00	0.00	0.00	0.00
101-567-727.000	SUPPLIES	600.00	310.00	0.00	290.00	51.67
101-567-802.000	CONTRACTUAL SERVICES	15,000.00	2,950.00	0.00	12,050.00	19.67
101-567-860.000	MILEAGE	0.00	0.00	0.00	0.00	0.00
101-567-930.000	REPAIRS AND MAINTENANCE	2,000.00	0.00	0.00	2,000.00	0.00
101-567-955.000	OTHER EXPENSE	0.00	0.00	0.00	0.00	0.00
101-567-956.000	TRAINING & EDUCATION	0.00	0.00	0.00	0.00	0.00
101-567-957.000	MEMBERSHIP DUES	0.00	0.00	0.00	0.00	0.00
101-567-971.000	CAPITAL OUTLAY	0.00	0.00	0.00	0.00	0.00
Total Dept 567 - CEMETERY		17,600.00	3,260.00	0.00	14,340.00	18.52
Dept 701 - PLANNING COMMISSION						
101-701-702.000	WAGES	6,000.00	4,148.76	60.00	1,851.24	69.15
101-701-715.000	SOCIAL SECURITY	460.00	295.32	4.59	164.68	64.20
101-701-727.000	SUPPLIES	2,200.00	71.25	0.00	2,128.75	3.24
101-701-801.000	PROFESSIONAL SERVICES	7,000.00	1,776.49	0.00	5,223.51	25.38
101-701-860.000	MILEAGE	0.00	0.00	0.00	0.00	0.00
101-701-900.000	PUBLISHING	4,000.00	193.50	0.00	3,806.50	4.84
101-701-955.000	OTHER EXPENSE	0.00	0.00	0.00	0.00	0.00
101-701-956.000	TRAINING & EDUCATION	500.00	0.00	0.00	500.00	0.00
101-701-957.000	MEMBERSHIP DUES	700.00	0.00	0.00	700.00	0.00
Total Dept 701 - PLANNING COMMISSION		20,860.00	6,485.32	64.59	14,374.68	31.09
Dept 702 - ZONING						
101-702-702.000	WAGES	1,300.00	780.00	0.00	520.00	60.00
101-702-715.000	SOCIAL SECURITY	0.00	59.67	0.00	(59.67)	100.00
101-702-727.000	SUPPLIES	300.00	0.00	0.00	300.00	0.00
101-702-802.000	CONTRACTUAL SERVICES	38,000.00	19,047.07	0.00	18,952.93	50.12
101-702-860.000	MILEAGE	0.00	0.00	0.00	0.00	0.00
101-702-900.000	PUBLISHING	1,200.00	0.00	0.00	1,200.00	0.00
101-702-955.000	OTHER EXPENSE	0.00	0.00	0.00	0.00	0.00
101-702-956.000	TRAINING & EDUCATION	0.00	0.00	0.00	0.00	0.00
Total Dept 702 - ZONING		40,800.00	19,886.74	0.00	20,913.26	48.74
Dept 751 - PARKS & RECREATION						
101-751-702.000	WAGES	0.00	6,760.00	0.00	(6,760.00)	100.00
101-751-715.000	SOCIAL SECURITY	0.00	517.13	0.00	(517.13)	100.00
101-751-727.000	SUPPLIES	11,085.00	8,290.61	0.00	2,794.39	74.79
101-751-801.000	PROFESSIONAL SERVICES	16,500.00	0.00	0.00	16,500.00	0.00
101-751-802.000	CONTRACTUAL SERVICES	24,000.00	29,339.39	3,215.00	(5,339.39)	122.25
101-751-920.000	UTILITIES	1,000.00	3,153.06	0.00	(2,153.06)	315.31
101-751-921.000	LIGHTING	500.00	500.78	57.54	(0.78)	100.16
101-751-930.000	REPAIRS AND MAINTENANCE	20,500.00	10,858.20	0.00	9,641.80	52.97
101-751-955.000	OTHER EXPENSE	1,000.00	0.00	0.00	1,000.00	0.00

PERIOD ENDING 03/31/2024

GL NUMBER	DESCRIPTION	2023-24	YTD BALANCE	ACTIVITY FOR	AVAILABLE	% BDGT USED
		AMENDED BUDGET	03/31/2024 NORMAL (ABNORMAL)	MONTH 03/31/2024 INCREASE (DECREASE)	BALANCE NORMAL (ABNORMAL)	
Fund 101 - GENERAL FUND						
Expenditures						
101-751-971.000	CAPITAL OUTLAY	76,000.00	36,198.10	0.00	39,801.90	47.63
Total Dept 751 - PARKS & RECREATION		150,585.00	95,617.27	3,272.54	54,967.73	63.50
Dept 880 - INVASIVE SPECIES						
101-880-802.000	CONTRACTUAL SERVICES	0.00	0.00	0.00	0.00	0.00
101-880-955.000	OTHER EXPENSE	0.00	0.00	0.00	0.00	0.00
Total Dept 880 - INVASIVE SPECIES		0.00	0.00	0.00	0.00	0.00
TOTAL EXPENDITURES		691,370.00	519,583.48	32,695.57	171,786.52	75.15
Fund 101 - GENERAL FUND:						
TOTAL REVENUES		687,100.00	650,838.13	25,189.50	36,261.87	94.72
TOTAL EXPENDITURES		691,370.00	519,583.48	32,695.57	171,786.52	75.15
NET OF REVENUES & EXPENDITURES		(4,270.00)	131,254.65	(7,506.07)	(135,524.65)	3,073.88
BEG. FUND BALANCE		1,026,376.51	1,026,376.51			
END FUND BALANCE		1,022,106.51	1,157,631.16			

PERIOD ENDING 03/31/2024

GL NUMBER	DESCRIPTION	2023-24	YTD BALANCE	ACTIVITY FOR	AVAILABLE	% BGD USED
		AMENDED BUDGET	03/31/2024 NORMAL (ABNORMAL)	MONTH 03/31/2024 INCREASE (DECREASE)	BALANCE NORMAL (ABNORMAL)	
Fund 204 - ROAD FUND						
Revenues						
Dept 000						
204-000-402.000	CURRENT PROPERTY TAXES	188,300.00	191,745.16	4,834.45	(3,445.16)	101.83
204-000-411.000	DELINQUENT PROPERTY TAXES	4,800.00	0.00	0.00	4,800.00	0.00
204-000-665.000	INTEREST INCOME	10,000.00	26,733.57	0.00	(16,733.57)	267.34
204-000-676.000	REIMBURSEMENT TO TWP	0.00	0.00	0.00	0.00	0.00
204-000-684.000	OTHER REVENUE	0.00	0.00	0.00	0.00	0.00
Total Dept 000		203,100.00	218,478.73	4,834.45	(15,378.73)	107.57
TOTAL REVENUES		203,100.00	218,478.73	4,834.45	(15,378.73)	107.57
Expenditures						
Dept 000						
204-000-727.000	SUPPLIES	1,000.00	145.00	0.00	855.00	14.50
204-000-801.000	PROFESSIONAL SERVICES	20,000.00	0.00	0.00	20,000.00	0.00
204-000-930.000	REPAIRS AND MAINTENANCE	364,000.00	22,156.22	0.00	341,843.78	6.09
204-000-955.000	OTHER EXPENSE	0.00	0.00	0.00	0.00	0.00
Total Dept 000		385,000.00	22,301.22	0.00	362,698.78	5.79
TOTAL EXPENDITURES		385,000.00	22,301.22	0.00	362,698.78	5.79
Fund 204 - ROAD FUND:						
TOTAL REVENUES		203,100.00	218,478.73	4,834.45	(15,378.73)	107.57
TOTAL EXPENDITURES		385,000.00	22,301.22	0.00	362,698.78	5.79
NET OF REVENUES & EXPENDITURES		(181,900.00)	196,177.51	4,834.45	(378,077.51)	107.85
BEG. FUND BALANCE		679,747.83	679,747.83			
END FUND BALANCE		497,847.83	875,925.34			

User: AMBER

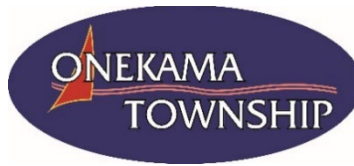
PERIOD ENDING 03/31/2024

DB: Onekama Twp

GL NUMBER	DESCRIPTION	2023-24	YTD BALANCE	ACTIVITY FOR	AVAILABLE	% BDGT USED
		AMENDED BUDGET	03/31/2024	MONTH 03/31/2024	BALANCE	
			NORMAL (ABNORMAL)	INCREASE (DECREASE)	NORMAL (ABNORMAL)	
Fund 206 - FIRE FUND						
Revenues						
Dept 000						
206-000-402.000	CURRENT PROPERTY TAXES	195,700.00	197,211.24	4,972.26	(1,511.24)	100.77
206-000-411.000	DELINQUENT PROPERTY TAXES	5,000.00	0.00	0.00	5,000.00	0.00
206-000-502.000	FEDERAL GRANTS	0.00	0.00	0.00	0.00	0.00
206-000-626.000	CHARGE FOR SERVICES	0.00	0.00	0.00	0.00	0.00
206-000-626.001	FIRE AND RESCUE CHARGES	9,000.00	9,000.00	750.00	0.00	100.00
206-000-642.000	SALES	30,000.00	25,000.00	25,000.00	5,000.00	83.33
206-000-665.000	INTEREST INCOME	9,000.00	17,717.36	0.00	(8,717.36)	196.86
206-000-674.000	DONATIONS	1,500.00	100.00	0.00	1,400.00	6.67
206-000-675.000	LOCAL GRANTS	5,000.00	11,775.71	0.00	(6,775.71)	235.51
206-000-676.000	REIMBURSEMENT TO TWP	0.00	0.00	0.00	0.00	0.00
206-000-684.000	OTHER REVENUE	0.00	0.00	0.00	0.00	0.00
Total Dept 000		255,200.00	260,804.31	30,722.26	(5,604.31)	102.20
TOTAL REVENUES		255,200.00	260,804.31	30,722.26	(5,604.31)	102.20
Expenditures						
Dept 000						
206-000-702.000	WAGES	45,000.00	37,098.46	1,931.34	7,901.54	82.44
206-000-715.000	SOCIAL SECURITY	3,500.00	2,837.97	147.77	662.03	81.08
206-000-718.000	SUTA	0.00	0.00	0.00	0.00	0.00
206-000-727.000	SUPPLIES	10,000.00	25,284.98	180.00	(15,284.98)	252.85
206-000-728.000	SUPPLIES - MEDICAL & SAFETY	12,000.00	8,029.31	44.19	3,970.69	66.91
206-000-801.000	PROFESSIONAL SERVICES	0.00	0.00	0.00	0.00	0.00
206-000-803.000	ATTORNEY	0.00	0.00	0.00	0.00	0.00
206-000-860.000	MILEAGE	0.00	0.00	0.00	0.00	0.00
206-000-880.000	ADVERTISING AND PROMOTION	500.00	0.00	0.00	500.00	0.00
206-000-920.000	UTILITIES	6,600.00	4,771.83	762.14	1,828.17	72.30
206-000-930.000	REPAIRS AND MAINTENANCE	10,000.00	2,884.40	0.00	7,115.60	28.84
206-000-931.000	REPAIRS AND MAINT - AUTO & APPARATUS	30,000.00	8,932.93	909.83	21,067.07	29.78
206-000-940.000	RENT EXPENSE	0.00	0.00	0.00	0.00	0.00
206-000-955.000	OTHER EXPENSE	0.00	30.00	0.00	(30.00)	100.00
206-000-956.000	TRAINING & EDUCATION	2,500.00	793.10	0.00	1,706.90	31.72
206-000-957.000	MEMBERSHIP DUES	3,500.00	75.00	0.00	3,425.00	2.14
206-000-958.000	INSURANCE	21,000.00	23,582.00	0.00	(2,582.00)	112.30
206-000-971.000	CAPITAL OUTLAY	110,000.00	155,596.88	26,037.40	(45,596.88)	141.45
Total Dept 000		254,600.00	269,916.86	30,012.67	(15,316.86)	106.02
TOTAL EXPENDITURES		254,600.00	269,916.86	30,012.67	(15,316.86)	106.02
Fund 206 - FIRE FUND:						
TOTAL REVENUES		255,200.00	260,804.31	30,722.26	(5,604.31)	102.20
TOTAL EXPENDITURES		254,600.00	269,916.86	30,012.67	(15,316.86)	106.02
NET OF REVENUES & EXPENDITURES		600.00	(9,112.55)	709.59	9,712.55	1,518.76
BEG. FUND BALANCE		558,372.70	558,372.70			
END FUND BALANCE		558,972.70	549,260.15			

PERIOD ENDING 03/31/2024

GL NUMBER	DESCRIPTION	2023-24	YTD BALANCE	ACTIVITY FOR	AVAILABLE	% BGD USED
		AMENDED BUDGET	03/31/2024 NORMAL (ABNORMAL)	MONTH 03/31/2024 INCREASE (DECREASE)	BALANCE NORMAL (ABNORMAL)	
Fund 220 - LAKE IMPROVEMENT FUND (INVASIVE SPECIES)						
Revenues						
Dept 000						
220-000-451.000	SPECIAL ASSESSMENTS	75,000.00	70,480.55	2,847.18	4,519.45	93.97
220-000-665.000	INTEREST INCOME	500.00	14.04	0.00	485.96	2.81
220-000-684.000	OTHER REVENUE	0.00	0.00	0.00	0.00	0.00
Total Dept 000		75,500.00	70,494.59	2,847.18	5,005.41	93.37
TOTAL REVENUES		75,500.00	70,494.59	2,847.18	5,005.41	93.37
Expenditures						
Dept 000						
220-000-727.000	SUPPLIES	0.00	80.02	0.00	(80.02)	100.00
220-000-801.000	PROFESSIONAL SERVICES	0.00	0.00	0.00	0.00	0.00
220-000-802.000	CONTRACTUAL SERVICES	74,000.00	40,707.87	0.00	33,292.13	55.01
220-000-955.000	OTHER EXPENSE	1,000.00	0.00	0.00	1,000.00	0.00
Total Dept 000		75,000.00	40,787.89	0.00	34,212.11	54.38
TOTAL EXPENDITURES		75,000.00	40,787.89	0.00	34,212.11	54.38
Fund 220 - LAKE IMPROVEMENT FUND (INVASIVE SPECIES):						
TOTAL REVENUES		75,500.00	70,494.59	2,847.18	5,005.41	93.37
TOTAL EXPENDITURES		75,000.00	40,787.89	0.00	34,212.11	54.38
NET OF REVENUES & EXPENDITURES		500.00	29,706.70	2,847.18	(29,206.70)	5,941.34
BEG. FUND BALANCE		49,496.01	49,496.01			
END FUND BALANCE		49,996.01	79,202.71			
TOTAL REVENUES - ALL FUNDS						
TOTAL REVENUES - ALL FUNDS		1,220,900.00	1,200,615.76	63,593.39	20,284.24	98.34
TOTAL EXPENDITURES - ALL FUNDS		1,405,970.00	852,589.45	62,708.24	553,380.55	60.64
NET OF REVENUES & EXPENDITURES		(185,070.00)	348,026.31	885.15	(533,096.31)	188.05
BEG. FUND BALANCE - ALL FUNDS		2,313,993.05	2,313,993.05			
END FUND BALANCE - ALL FUNDS		2,128,923.05	2,662,019.36			



**Memo to:** Township Board  
**From:** Ed Bradford, Treasurer  
**Subject:** February 2024 Treasurer Report  
**Date:** March 5, 2024

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### **Cash & Investments**

Cash and investments as of month-end total \$2,7407,412.

### **Investments**

investment income for the month was \$7,665. The daily yield on invested funds at month-end was 5.44%.

### **Balance Sheet**

The Balance Sheet report is in the packet for your review and information.

### **Revenues**

Revenues are included in the Revenue & Expense report and are at 91% for the general fund. Almost all tax revenue has been received for the fiscal year.

### **Property Taxes**

The due date for winter taxes was February 14. The last day to pay taxes at the Township was February 29. I am settling with the County. Delinquent taxes must be paid at the County Treasurer's office.

### **BS&A Cloud Upgrade**

Will be discussed as part of the budgeting process.

### **Board & Committee Emails**

Needs further discussion as part of the budget process.



**Memo to:** Township Board  
**From:** Ed Bradford, Treasurer  
**Subject:** March 2024 Treasurer Report  
**Date:** April 6, 2024

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**Cash & Investments**

Cash and investments as of month-end total \$2,680,956.

**Investments**

investment income for the month was \$8,185. The daily yield on invested funds at month-end was 5.40%.

**Balance Sheet**

The Balance Sheet report is in the packet for your review and information.

**Revenues**

Revenues are included in the Revenue & Expense report and are at 95% for the general fund.

**Property Taxes**

Taxes were settled with the County and we are waiting for the final settlement check. Delinquent taxes must be paid at the County Treasurer's office.

**BS&A Cloud Upgrade**

This transition is in process. Next step is completing the questionnaire and scheduling the implementation.

**Board & Committee Emails**

Needs further discussion.



**Progressive Surveillance Tech**

Pobox 12

Arcadia, MI 49613

Sales@prosur.us



Progressive Surveillance Tech

**Estimate**

ADDRESS
Shelli Johnson Onekama TWP 5435 Main st Onekama, MI 49675 USA

SHIP TO
Shelli Johnson Onekama TWP 5435 Main st Onekama, MI 49675 USA

ESTIMATE #	DATE
1134	02/12/2024

DATE	ACTIVITY	QTY
	<b>PSNVR5216-4KS2</b> NVR5216-4KS2 >H.265/H.264/MJPEG/MPEG4 codec decoding >Max 320Mbps incoming bandwidth >Up to 12Mp resolution preview&playback >HDMI/VGA simultaneous video output >3D intelligent positioning with Dahua PTZ camera	1
	<b>pshd8tb</b> WD Purple 8TB Surveillance Hard Disk Drive - 5400 RPM Class SATA 6 Gb/s 128MB Cache 3.5 Inch	1
	<b>PSHDB8T</b> IP Camera 4k - 8MP, 1/2.7" CMOS image sensor, low illuminance, high image definition. Outputs max. 8MP (3840 × 2160) @15 fps, and supports 2688×1520 (2688 × 1520) @25/30 fps 4K Ultra Dome Camera - H.265 codec, high compression rate, ultra-low bit rate. Built-in IR LED, max IR distance: 30 m 8MP IP Camera - ROI, SMART H.264+/H.265+, flexible coding, applic. able to various bandwidth and storage environments. Intelligent detection: Intrusion, tripwire, 12V DC/PoE power supply IP PoE Camera - Rotation mode, WDR, 3D NR, HLC, BLC, digital watermarking, applicable to various monitoring scenes. IP67 protection 4k Outdoor Security Camera - Abnormality detection: Motion detection, video tampering, no SD card, SD card full, SD card error, network disconnection, IP conflict, illegal access, voltage detection. Supports max. 256 GB Micro SD card, built-in MIC	8
	<b>S-Cab</b> 12U Server cabinet wall mount	1
	<b>UPS600</b> APC UPS Battery Backup and Surge Protector, 600VA Backup Battery Power Supply, BE600M1 Back-UPS with USB	1
	<b>Cat 5</b>	400

DATE	ACTIVITY	QTY
	Cat 5 communication cable <b>N-Labor</b> Labor to install NVR, Poe Switch, 8 new cameras in locations we discussed, connect your monitor from old system, install recorder poe switch and UPS in 12u server cabinet mounted above desk in the office.. install all software on phone and tablets and computers as needed setup and training.	26

50% Due at time of order

SUBTOTAL	6,599.00
TAX	0.00
<b>TOTAL</b>	<b>\$6,599.00</b>

Accepted By

Accepted Date

STATE OF MICHIGAN  
COUNTY OF MANISTEE  
TOWNSHIP OF ONEKAMA

November 1, 2010

Amended Dec. 7, 2010

ORDINANCE No. 2010-1

An ordinance to authorize and regulate the operation of Off Road Vehicles (ORVs) on the roads in the Township of Onekama, to provide penalties for the violation thereof, to provide for appropriation of fines and damages resulting from the operation of ORVs and repeal all ordinances in conflict herewith.

THE TOWNSHIP OF ONEKAMA ORDAINS:

Sec. 1 As used in this Ordinance, the following definitions shall apply:

- a) "Township" means the Township of Onekama.
- b) "Drivers License" means an operators or chauffeurs license or permit issued to an individual by the secretary of state under chapter III of the Michigan vehicle code, 1949 PA 300, MCL 257.301 to 257.329, for that individual to operate a vehicle, whether or not conditions are attached to the license or permit.
- c) "Operate" means to ride in or on, and be in actual physical- control of an ORV.
- d) "Operator" means a person who operates or is in actual physical control of an ORV.
- e) "ORV" means a motor-driven recreation vehicle designed for off-road use and capable of cross-country travel without benefit of a road or trail, on or immediately over land, snow, ice, marsh, swampland, or other natural terrain. ORV includes, but is not limited to, a multi-track or multi-wheel drive vehicle, a motorcycle or related 2-wheel, 3-wheel, or 4-wheel vehicle, an amphibious machine, a ground effect air cushion vehicle, an ATV as defined in section 81101 of the natural resources and environmental protection act, 1994 PA 451, MCL 324.81101, or other means of transportation deriving motive power from a source other than muscle or wind. ORV does not include a vehicle described in this definition that is registered for use upon a public highway and has the security required by law.
- f) "Road" means local roads of the Township as the same may be designated from time to time by the Township Board.
- g) "Safety Certificate" means a certificate issued pursuant to 1994 PA 451 as amended, MCL 324.81129, or comparable ORV safety certificate issued under the authority of another state or province of Canada.
- h) "Visual Supervision" means the direct observation of the operator with the unaided or normally corrected eye, where the observer is able to come to the immediate aid of the operator.

Sec. 2 Subject to the regulations of this Ordinance and part 811 of the natural resources and environmental protection act, 1994 PA 324.81101, an ORV may be operated on the far right of the maintained portion of any road within the Township, except Portage Point Drive from M-22 to 2<sup>nd</sup> Street West and any roadway, shoulder right-of-way of any State or Federal highway. (The following sentence was amended and included in Section 2 at the Onekama

*Township Board meeting Tuesday, December 7, 2010).*: "This also includes access on Portage Point Drive from Herkelrath to Bayview."

**Sec. 3** An ORV may be operated from a residence on a road closed by the Township or Manistee County Road Commission solely for the purpose of gaining access to the roads open to ORV's within the Township.

**Sec. 4** An ORV travelling on a road in the Township shall meet all of the following conditions, in addition to any others that may be imposed by law:

- a) Shall travel at a speed of no more than 25 miles per hour or a lower posted speed limit.
- b) Shall be operated by a person not less than 12 years of age. (SEE SECTION 5.)
- c) Shall travel with the flow of traffic.
- d) Shall be operated in a manner that does not interfere with traffic on the road.
- e) Shall travel in single file except when overtaking and passing another ORV.
- f) Shall not travel on a road when visibility is substantially reduced due to weather conditions unless displaying a lighted headlight and lighted taillight.
- g) Shall not operate before ½ hour before sunrise or after ½ hour after sunset unless displaying a lighted headlight and lighted taillight.
- h) Shall at all times display a lighted headlight, lighted tail light.
- i) Shall only be operated while the operator and each passenger is wearing a crash helmet and protective eyewear approved by the United States Department of Transportation unless the vehicle is equipped with a roof that meets or exceeds standards for a crash helmet and the operator and each passenger is wearing a properly adjusted and fastened seat belt.
- j) Shall be equipped with a throttle so designed that when the pressure used to advance the throttle is removed, the engine speed will immediately and automatically return to idle.
- k) Shall be equipped with a spark arrester type, United States Forest Service approved muffler in good working order and in constant operation.
- l) Shall observe all noise emission standards defined by law.

**Sec. 5** A parent or legal guardian of a child less than 16 years of age shall not permit, and a child less than 16 years of age shall not operate an ORV on a road in the Township unless the child is under the direct visual supervision of an adult and the child has in his or her immediate possession a Michigan issued ORV safety certificate or a comparable ORV safety certificate issued under the authority of another state or a province of Canada.

**Sec. 6** Unless a person possesses a valid driver's license, a person shall not operate an ORV on a road in the Township if the ORV is registered as a motor vehicle and is either more than 60 inches wide or has three wheels.

**Sec. 7** Any person who violates this ordinance is guilty of a municipal civil infraction and may be ordered to pay a civil fine of not more than \$500. In addition, a court may order a person who causes damage to the environment, a road or other property as a result of the operation of an ORV to pay full restitution for that damage above and beyond the penalties paid for civil fines.

**Sec. 8** The Township Treasurer shall deposit all fines and damages collected under this Ordinance into a fund to be designated as the "ORV Fund". The Onekama Township Board shall appropriate revenue in the ORV Fund as follows:

- a) Fifty percent to the Manistee County Road Commission for repairing damage to roads and the environment that may have been caused by ORV'S. Signs should be posted indicating whether a road is closed to the operation of ORV's.
- b) Fifty percent to the Manistee County Sheriff for ORV enforcement and training.

**Sec. 9** This ordinance shall take effect thirty (30) days following its publication as required by law, following adoption by the Onekama Township Board.

**Sec.10** The approved ORV Ordinance will be reviewed in one year.

**Sec. 11** All ordinances or part of ordinances in conflict herewith are replaced to the extent of the conflict.

**Motion** by **Beebe**, second by **Clement**, to adopt Onekama Township ORV Ordinance No. **2010-1** with corrections.

Trustees voting "Aye": **Roland Clement, LaVonne Schafer-Beebe, Helen Mathieu, James Wisniski, David Meister.**

Trustees voting "Nay": None.

Trustees absent or abstaining: None.

**RESOLUTION DECLARED PASSED**

**CERTIFICATION**










\_\_\_\_\_  
**Helen Mathieu, Onekama Township Clerk**

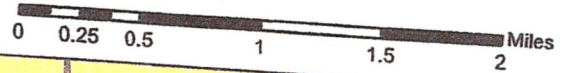
I, **Helen Mathieu**, Clerk of the Township of Onekama, do hereby certify that this is a true and correct copy of the Ordinance duly adopted by the Township Board on November 1, 2010.  
Amended \_\_\_\_\_ Dec. 7, 2010.

\_\_\_\_\_  
**Helen Mathieu, Onekama Township Clerk**

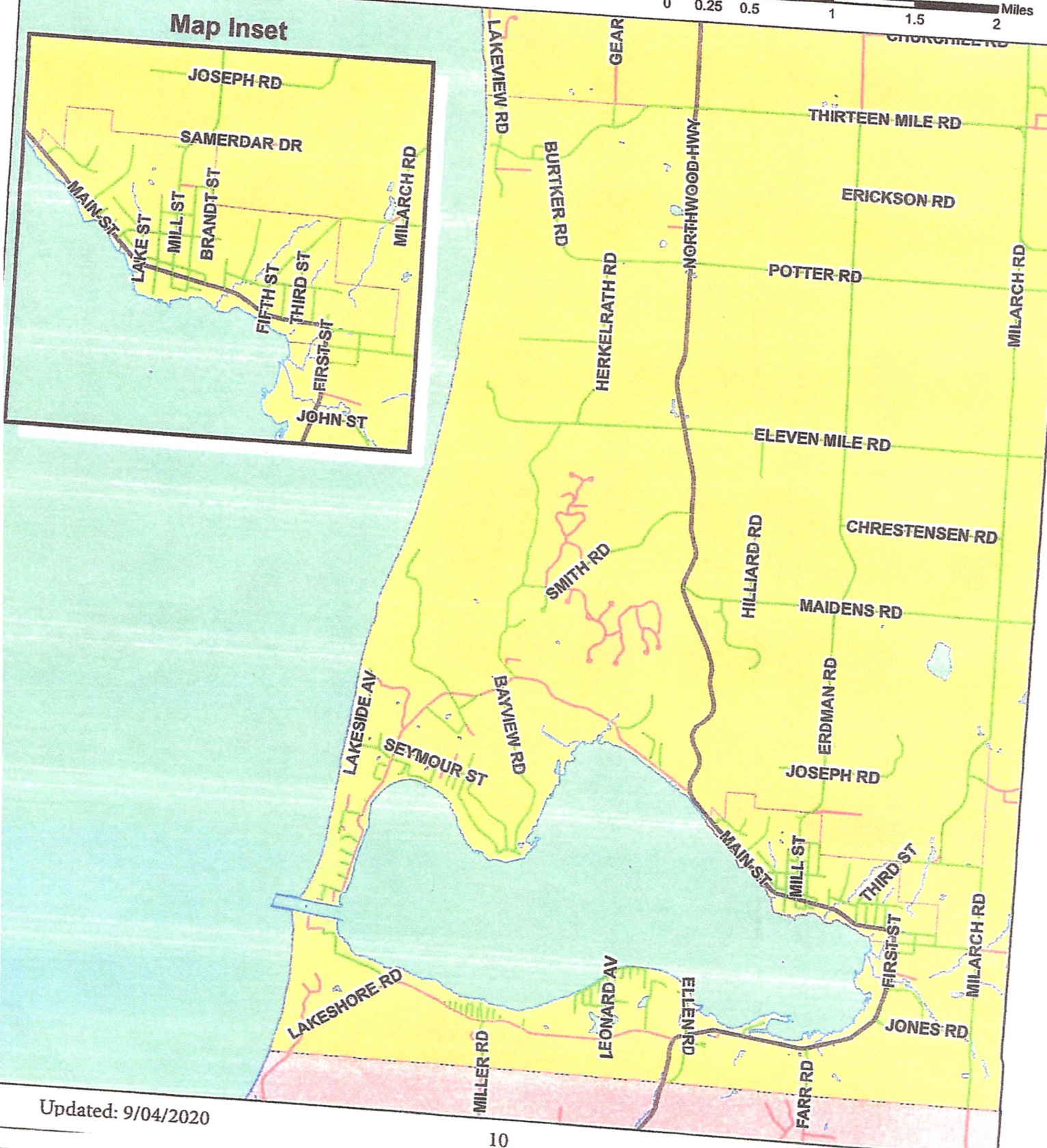
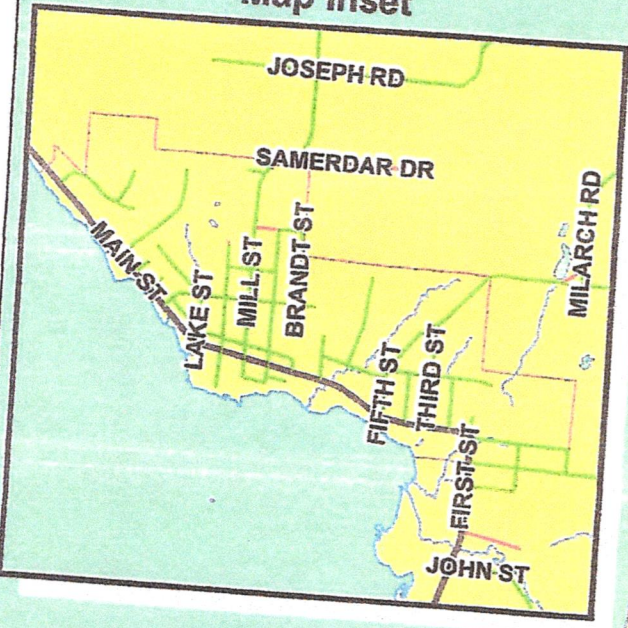
# Chickamauga Twp. & Village ORV Use Allowance Map

## Legend

-  Roads Open to ORV Use
-  Roads Closed to ORV Use
-  Highways Closed to ORV Use
-  Hydrology
-  Water Bodies
-  Units Allowing ORV Use
-  Units Not Allowing ORV Use
-  Local Unit Boundaries
-  Adjacent Counties



## Map Inset



Updated: 9/04/2020

Updated: 9/04/2020

October 11,2023

Amend December 7, 2010

ORDINANCE No 20\_\_\_\_\_

Proposed changes:

Section 2

Delete: "except PPDrive from.....to the end of paragraph on second page "This also includes access on Portage Point Drive from Herkelrath to Bayview."

Section 3

Delete section 3.

Section 10

Delete section 10.

---

# \* SAMPLE \*

## ORDINANCE NO: 17-1 #1

AN ORDINANCE ESTABLISHING AND IMPLEMENTING A PROGRAM TO CHARGE MITIGATION RATES FOR THE DEPLOYMENT OF EMERGENCY AND NON-EMERGENCY SERVICES BY THE FIRE DEPARTMENT FOR SERVICES PROVIDED/RENDERED FOR THE ONEKAMA TOWNSHIP FIRE DEPARTMENT.

WHEREAS, the emergency and non-emergency services response activity to incidents continues to increase each year; Environmental Protection requirements involving equipment and training, and Homeland Security regulations involving equipment and training, creating additional demands on all operational aspects of the fire department services; and

WHEREAS, the fire department has investigated different methods to maintain a high level of quality of emergency and non-emergency service capability throughout times of constantly increasing service demands, where maintaining an effective response by the fire department decreases the costs of incidents to insurance carriers, businesses, and individuals through timely and effective management of emergency situations, saving lives and reducing property and environmental damage; and

WHEREAS, raising real property tax to meet the increase in service demands would not be fair when the responsible party(s) should be held accountable for their actions; and

WHEREAS, the Onekama Township Board of the Onekama Township Fire Department desires to implement a fair and equitable procedure by which to collect said mitigation rates and shall establish a billing system in accordance with applicable laws, regulations and guidelines; Now, Therefore

### **BE IT ORDAINED BY THE ONEKAMA TOWNSHIP BOARD OF THE ONEKAMA TOWNSHIP FIRE DEPARTMENT:**

SECTION 1: The Onekama Township Fire Department shall initiate mitigation rates for the delivery of emergency and non-emergency services by the fire department for personnel, supplies and equipment to the scene of emergency and non-emergency incidents as listed in "EXHIBIT A". The mitigation rates shall be based on actual costs of the services and that which is usual, customary and reasonable (UCR) as shown in "EXHIBIT A", which may include any services, personnel, supplies, and equipment and with baselines established by addendum to this document.

SECTION 2: A claim shall be filed to the responsible party(s) through their insurance carrier. In some circumstances, the responsible party(s) will be billed directly.

SECTION 3: The fire department's Township Board of Trustee's may make rules or regulations and from time to time may amend, revoke, or add rules and regulations, not consistent with this Section, as they may deem necessary or expedient in respect to billing for these mitigation rates or the collection thereof.



SECTION 4: It is found and determined that all formal actions of this Board concerning and relating to the adoption of this Ordinance were adopted in open meetings of this Board, and that all deliberations of this Board and any of its committees that resulted in such formal actions were in accordance with all legal requirements, and the Codified Ordinances of the Onekama Township Board.

SECTION 5: This Ordinance shall take effect thirty days (30) from the date of adoption as permitted by law.

Voting for:

Voting against:

The Township Supervisor declared the ordinance adopted.

\_\_\_\_\_  
David Meister  
Township Supervisor

#### CERTIFICATION

The foregoing is a true copy of Ordinance No. 17-1 #1 which was enacted by the Board of Trustees for the Township of Onekama at a regular meeting held on January 9, 2017.

\_\_\_\_\_  
Michelle Johnson  
Township Clerk

**EXHIBIT A  
MITIGATION RATES  
BASED ON PER HOUR**

The mitigation rates below are average “billing levels”, and are typical for the incident responses listed, however, when a claim is submitted, it will be itemized and based on the actual services provided.

**MOTOR VEHICLE INCIDENTS**

**Level 1 - \$506.00**

Provide hazardous materials assessment and scene stabilization. This will be the most common “billing level”. This occurs almost every time the fire department responds to an accident/incident.

**Level 2 - \$576.00**

Includes Level 1 services as well as clean up and material used (sorbents) for hazardous fluid clean up and disposal. We will bill at this level if the fire department has to clean up any gasoline or other automotive fluids that are spilled as a result of the accident/incident.

**Level 3 – CAR FIRE - \$704.00**

Provide scene safety, fire suppression, breathing air, rescue tools, hand tools, hose, tip use, foam, structure protection, and clean up gasoline or other automotive fluids that are spilled as a result of the accident/incident.

**ADD-ON SERVICES:**

**Extrication - \$1,520.00**

Includes heavy rescue tools, ropes, airbags, cribbing etc. This charge will be added if the fire department has to free/remove anyone from the vehicle(s) using any equipment. We will not bill at this level if the patient is simply unconscious and fire department is able to open the door to access the patient. This level is to be billed only if equipment is deployed.

**Creating a Landing Zone - \$465.00**

Includes Air Care (multi-engine company response, mutual aid, helicopter). We will bill at this level any time a helicopter landing zone is created and/or is utilized to transport the patient(s).

**Itemized Response:** The fire department has the option to bill each incident as an independent event with custom mitigation rates, for each incident using, itemized rates deemed usual, customary and reasonable (UCR). These incidents will be billed, itemized per apparatus, per personnel, plus products and equipment used.

### **ADDITIONAL TIME ON-SCENE**

Engine billed at \$400 per hour.

Truck billed at \$500 per hour.

Miscellaneous equipment billed at \$300.

### **HAZMAT**

#### **Level 1 - \$816.00**

Basic Response: Claim will include engine response, first responder assignment, perimeter establishment, evacuations, set-up and command.

#### **Level 2 - \$2,913.00**

Intermediate Response: Claim will include engine response, first responder assignment, hazmat certified team and appropriate equipment, perimeter establishment, evacuations, set-up and command, Level A or B suit donning, breathing air and detection equipment. Set-up and removal of DECON center.

#### **Level 3 – \$6,875.00**

Advanced Response: Claim will include engine response, first responder assignment, hazmat certified team and appropriate equipment, perimeter establishment, evacuations, first responder set-up and command, Level A or B suit donning, breathing air and detection equipment and robot deployment. Set-up and removal of DECON center, detection equipment, recovery and identification of material. Disposal and environment clean up. Includes above in addition to any disposal rates of material and contaminated equipment and material used at scene. Includes 3 hours of on scene time - **each additional hour @ \$336.00 per HAZMAT team.**

### **ADDITIONAL TIME ON-SCENE (for all levels of service)**

Engine billed at \$400 per hour.

Truck billed at \$500 per hour.

Miscellaneous equipment billed at \$300

### **FIRES**

**Assignment - \$466.00 per hour, per engine / \$582.00 per hour, per truck**

#### **Includes:**

- Scene Safety
- Investigation
- Fire / Hazard Control

This will be the most common “billing level”. This occurs almost every time the fire department responds to an incident.

**OPTIONAL: A fire department has the option to bill each fire as an independent event with custom mitigation rates.**

**Itemized, per person, at various pay levels and for itemized products use.**

## **ILLEGAL FIRES**

**Assignment - \$466.00 per hour, per engine / \$582.00 per hour, per truck**

When a fire is started by any person or persons that requires a fire department response during a time or season when fires are regulated or controlled by local or state rules, provisions or ordinances because of pollution or fire danger concerns, such person or persons will be liable for the fire department response at a cost not to exceed the actual expenses incurred by the fire department to respond and contain the fire. Similarly, if a fire is started where permits are required for such a fire and the permit was not obtained and the fire department is required to respond to contain the fire the responsible party will be liable for the response at a cost not to exceed the actual expenses incurred by the fire department. The actual expenses will include direct labor, equipment costs and any other costs that can be reasonably allocated to the cost of the response.

## **WATER INCIDENTS**

### **Level 1**

**Billed at \$466 plus \$58 per hour, per rescue person.**

Basic Response: Claim will include engine response, first responder assignment, perimeter establishment, evacuations, first responder set-up and command, scene safety and investigation (including possible patient contact, hazard control). This will be the most common "billing level". This occurs almost every time the fire department responds to a water incident.

### **Level 2**

**Billed at \$932 plus \$58 per hour, per rescue person**

Intermediate Response: Includes Level 1 services as well as clean up and material used (sorbents), minor hazardous clean up and disposal. We will bill at this level if the fire department has to clean up small amounts of gasoline or other fluids that are spilled as a result of the incident.

### **Level 3**

**Billed at \$2,304 plus \$58 per hour per rescue person, plus \$117 per hour per HAZMAT team member.**

Advanced Response: Includes Level 1 and Level 2 services as well as D.A.R.T. activation, donning breathing apparatus and detection equipment. Set up and removal of DECON center, detection equipment, recovery and identification of material. Disposal and environment clean up. Includes above in addition to any disposal rates of material and contaminated equipment and material used at scene.

#### **Level 4**

**These incidents will be billed, itemized, per trained rescue person, plus rescue products used.**

Itemized Response: You have the option to bill each incident as an independent event with custom mitigation rates for each incident using itemized rates deemed usual, customary and reasonable (UCR).

#### **BACK COUNTRY OR SPECIAL RESCUE**

**Minimum billed \$466 for the first response vehicle plus \$58 per rescue person. Additional rates of \$466 per hour per response vehicle and \$58 per hour per rescue person.**

Itemized Response: Each incident will be billed with custom mitigation rates deemed usual, customary and reasonable (UCR). These incidents will be billed, itemized per apparatus per hour, per trained rescue person per hour, plus rescue products used.

#### **CHIEF RESPONSE**

**Billed at \$291 per hour.**

This includes the set-up of Command, and providing direction of the incident. This could include operations, safety, and administration of the incident.

#### **MISCELLANEOUS / ADDITIONAL TIME ON-SCENE**

Engine billed at \$466 per hour.

Truck billed at \$582 per hour.

Miscellaneous equipment billed at \$350.

#### **LIFT ASSIST**

**Billed at a rate of \$100 per incident after 5 incidents within a thirty (30) day period.**

This includes but is not limited to responding to the scene, assessing the situation, and assisting the individual. This includes but is not limited to lifting off the floor, from chair to bed, out of chair, or any other lift assist not resulting in any injury or medical evaluation.

#### **MITIGATION RATE NOTES**

The mitigation rates above are average "billing levels", and are typical for the incident responses listed, however, when a claim is submitted, it will be itemized and based on the actual services provided. These average mitigation rates were determined by itemizing costs for a typical run (from the time a fire apparatus leaves the station until it returns to the station) and are based on the actual costs, using amortized schedules for apparatus (including useful life, equipment, repairs, and maintenance) and labor rates (an average department's "actual personnel expense" and not just a firefighters basic wage). The actual personnel expense includes costs such as wages, retirement, benefits, workers comp, insurance, etc.

**LATE FEES**

If the invoice is not paid within 90 days, a Late Charge of 10% of the invoice, as well as 1.5% per month, as well as the actual cost of the collections, will be accessed to the responsible party.

Onekama Township Meeting  
4/10/24  
PTPRC Report

Parks and Rec Action items – [01\\_2024 04 10 Township Meeting asks and notes](#)

#### Trails:

- OTPRC Project Goal: Support Township 5 year plan securing Trails grants by having a qualified grant writer engaged, who will win grants and is ready to act at a moment's notice based on Granting agencies time line.
- Board actions to enable OTPRC
  - o Authorize spend for budget approved Trail Feasibility quote. File name: [02\\_Trail Feasibility Quote Gourdie-Fraser 1.24](#)
  - o Roll call support and Clerk Signature. File name: [03\\_Complete Streets Resolution for Onekama Township \(1\)](#)

#### Langland Sand Management

- Review, discuss and approve proposal
- Larsen, Swidorski call backs
- Anthony's Outdoor Services Bid includes 24 hour turnaround. File name: [04\\_AOS Langland Sand Management](#)

#### Carden Park Upgrade

- Review, discuss, select vendor, approve proposal to start work
  - o Anthony's Outdoor Services
    - Proposal file name: [05\\_AOS Carden Infrastructure](#)
    - Cover & Terms: Discuss accommodation. File name: [06 AOS Carden Cover\\_Terms\\_Conditions](#)
  - o Larsen's Proposal. File name: [07\\_Larsen Carden Proposal](#)

#### Lawn Service: Township Office and Carden Park

- Larson YOY price increase. File name: [08\\_Mowing Bid – Larsen](#)
- Anthony's Outdoor Services.
  - o Carden Proposal File name: [09\\_AOS Lawn Cardin Park](#)
  - o Township Proposal File Name: [10\\_AOS Lawn Onekama Township – Office](#)
  - o Term File name: [11\\_AOS Lawn Terms and Conditions](#)

#### Langland Fire Rings:

- Onekama Building Supply
- Cadillac Culvert. Filename: [12\\_Inv\\_23691\\_from\\_Cadillac\\_Culvert\\_Inc.\\_44940](#)
- Family Home Proposal. Filename: [13 Firerings\\_Langland\\_Family\\_Home](#)
- Family Home Cover. Filename: [14\\_Firerings\\_Langland\\_Family\\_HomeCover Letter](#)

#### New Summer Events Proposal

- Beach Volleyball: \$25 for ball, \$100 for snacks
- Family Fun Day: \$200 for crafts and food
- Onekama 30 Day Challenge: \$500 for awards and prizes

New Events overall request is 1,000. These events are under development and costs have not yet been fully established.

- Beach Volleyball Flyer attached: [15\\_2024 BEACH volleyball & BonFire-2](#)
- Family Fun Day Flyer Attached: [16\\_2024 Family Fun Day in the Parks](#)
- Onekama 30 day Challenge Flyer Attached: [17\\_Onekama 30 Day Challenge-3](#)

Onekama History Association – Funding requests from Onekama 150 balance

- Banner Request: 2x5 Full color banner \$100 (Banner \$30, Setup \$20, Shipping estimate)
- Historical Plaques: 2 this summer. \$1200 max. MacBeth and Thrift Shop. Glenwood will be next

Minutes:

- February Final: [18\\_OTPR meeting minues Feb 23 Final Approved](#)
- March Draft: [19\\_OTPRC Meeting Minutes March 29 DRAFT](#)





January 8, 2024

Mr. Rick Alameddine  
Onekama Township

RE: Proposal for engineering services  
Onekama Village and Township – M22 Trail Feasibility Study

Dear Mr. Tyler:

Thank you for the opportunity to submit this proposal for Civil Engineering services for the Trail Feasibility Study. This letter represents our contract for provision of consultant services. Should you have any questions regarding the information contained herein please do not hesitate to contact me.

### **Project Scope**

The intent of the study is to determine the viability of a non-motorized trail along M22 within the Township and Village around the eastern boundaries of Portage Lake. The scope research of routes and preparation of preliminary costs estimates to construction and identification of funding sources and timelines should the project move forward. This study will provide a great resource and tool in determining viable routes and challenges along with costs to construct and potential funding sources. The trail will be a multi-jurisdictional collaboration between at least two (2) municipalities: Village of Onekama and Onekama Township.

### **Proposed Scope of Work**

This scope of work and subsequent price estimate is based on the specific items outlined below:

#### **Task 1: Research:**

GFA will inventory the existing site conditions and available data (Federal, State and Local) related to soil conditions, topography, ordinances, right-of-way and available easements and create a base map to utilize for identifying viable routes.

An detail of our scope work includes:

- A meeting to clarify/refine project issues, problems, and opportunities. We will answer contract questions, identify contact people, finalize scheduling, and confirm personnel roles.
- Review work session strategies to determine the best approach for timing and meeting locations.
- Review potential route configurations.
- Onsite discussions should include:
  - a. Problem areas from existing use patterns and potential solutions.
  - b. Problem areas from existing natural and/or manmade conditions and potential solutions.
  - c. Potential opportunities/conflicts which may arise from the trail program. How can we accomplish the trail improvements while minimizing the impact upon existing natural features and adjacent landowners?
  - d. Possible trailhead location and configuration.



- e. Road and drive crossings, other safety concerns.
  - Collect and review existing documents and base information available from townships, Villages, County, and the State of Michigan. This information can include: MDOT maps and CAD files, MDNR GIS data, road commission plans, plat maps, HUD floodplain maps, EGLE wetland maps, zoning maps, SCS soils information, aerial photos, topography, land-use information, and trail plans.
  - Prepare base map
  - Review Trail Design Requirements for compliance with:
    - a. Local Zoning Ordinance
    - b. MDOT
  - Develop objectives to implement trail improvements.
  - Conduct an extensive inventory of existing conditions, identifying all conditions which require additional attention during the design development phase.
  - Identify locations where additional soils information may be required.
  - Outline the process for permitting the project.
  - Prepare schematic drawings and cost analyses for the potential routes.

## **Task 2: Evaluate and analyze alternative routes for the trail.**

GFA will identify the most viable trail routes based upon the results of the Stakeholder meetings, and research. We will create base maps illustrating the route along with cross sections and details related to proposed construction.

GFA will prepare an opinion of probable costs for all trail alternatives and scenarios. These preliminary estimates will provide a basis for capital expenditures as well as providing cost comparisons between the different alternatives and scenarios. The estimates will be shown as a total project cost.

A detail of our scope of items includes:

- Analyze natural and built conditions; water, land, and their edge/interface; offsite adjacent conditions such as traffic, utilities, and land use
- Identify existing problem areas, vegetation, views to and from the trail, and areas sensitive to development
- Identify and summarize issues and opportunities, both overall and site-specific, as they pertain to future trail use.
- Document the resource analysis, goals, and objectives, as well as the resulting planning implications.
- Refine the base drawing using information gathered in the field.
- Begin to analyze the budget implications of the trail.
- The design team will meet again with key trail officials for selection of the most desirable route
- Schematic plans and budgets will be presented for each of the potential routes.
- Prepare a preliminary plan of the railway at a scale of approximately 1"=1/2 mile. This plan will include proposed access points, connector trails, railway development concepts, and typical development details.
- Prepare typical railway development details for varying conditions addressing signage, trail width/pavement type, amenities, etc.
- Prepare unit budget estimates for the railway development concepts and typical development details.



**Task 3: Estimate a range of anticipated operational, maintenance and replacement costs for each scenario.**

GFA will provide projected annual operation and maintenance costs for trail options and scenarios. Included will be annual labor for snow removal (as applicable) repairs and maintenance, supplies, and miscellaneous items.

**Task 4: Development of financing options.**

Alternative capital improvement financing methods will be explored and evaluated, and could include: grants, loans, bonds, etc.

Items associated with completed the outlined tasks above:

**1. Meetings**

A key element to the success of a project is communication. In order to promote and maintain this project communication, we have included budget allotments for six (6) project meetings: Our project team will meet with the key stakeholder group and the Village / Township as needed (anticipated to be monthly meetings) to discuss status of each Task and receive feedback as the project progresses.

**2. Deliverables**

The Feasibility Study will incorporate the work task results and will provide a summary of recommendations and cost estimates. We would approach it as follows:

Preliminary Study: A preliminary copy of the study will be prepared and presented to the Stakeholder Committee for review and comment.

Final Feasibility Study: This would be our final deliverable, incorporating the comments generated from the review process, alternatives with cost estimates and funding sources and survey results.

**Clarifications and Assumptions**

The project fee budget is based on the following assumptions, and that specific work items listed in this section will not be included in the scope of services:





- Public Engagement Meetings
- Wetland location, determination, mitigation, and permitting.
- Preparation of easements, rights-of-way, or boundary documents.
- Title Work / Easement or right-of-way acquisition.
- Permit fees.
- Environmental Impact Statements or Reports.
- Design, Permitting, Bidding and Construction Engineering Services. This proposal is for a Feasibility Study Only
- Grant Application / submission

### **Responsibilities of Client/Owner**

The Client/Owner shall furnish the following minimum information as necessary in reference to the Project:

- Property description where the Project lies outside public rights-of-way or similar lands where creation of this information is not part of the Consultants Services as specifically stated herein or previously provided.
- Deed or other land use restriction information where the Project lies outside public rights-of-ways unless the Consultant's services include research and/or preparation of such information as specifically stated herein or previously provided.
- Property boundary, easement, right-of-way or other information associated with the Project and not part of the Consultants Services as specifically stated herein or previously provided.
- All information available for the Project regarding explorations, tests, subsurface conditions, environmental assessments/audits/impact statements, and any interpretations thereof not part of the Consultants Services as specifically stated herein or previously provided.
- All information, as the Client/Owner becomes aware of, with regard to hazardous environmental conditions or materials that might affect the Project or Project site.

### **Additional Services**

Any work desired in addition to the work scope described above, can be completed by GFA on an hourly time and material basis in accordance with our current rates, or as a revision to this proposal.

### **Time Schedule**

GFA can commence services immediately with work to be completed within 90 days upon receipt of an executed contract

### **Fee**

GFA will perform the project design services on a lump sum basis with the following budgets not to be exceeded without prior authorization.



*Final Design/Engineering Services*

Task 1	\$ 2,750.00
Task 2	\$ 7,500.00
Task 3	\$ 1,500.00
Task 4	\$ 1,500.00
<u>Total</u>	<u>\$ 13,250.00</u>

**Contract Terms and Conditions**

Exhibit 1 (attached), "Standard Terms and Conditions is incorporated into this proposal by reference.

**Acceptance**

If this proposal is acceptable to you, your signature on the enclosed copy of this letter and your initials on page 1 of Exhibit 1 "Standard Terms and Conditions" will serve as our authorization to proceed. Thank you for giving us the opportunity to be of service. We look forward to working with you on this project.

**Gourdie-Fraser, Inc.**

CONSULTANT

CLIENT/OWNER

_____	(Signature)	_____
Jennifer Graham, P.E.	(Name)	_____
Project Manager	(Title)	_____
_____	(Date)	_____

Attachments: Exhibit 1 – Standard Terms and Conditions





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**Complete Streets Resolution for Onekama Township, Michigan**  
**Resolution # \_\_\_\_\_**

**WHEREAS**, increasing walking and bicycling offers the potential for greater health of the population, and more livable communities; and

**WHEREAS**, A Complete Street is safe, comfortable, and convenient for travel by automobile, foot, bicycle, and transit regardless of age or ability, and

**WHEREAS**, The Michigan Legislature has passed Complete Streets legislation that requires the Michigan Department of Transportation and local governments to consider all users in transportation related projects; and

**WHEREAS**, the Michigan Planning Enabling Act has been amended, requiring that all transportation improvements identified in a plan are appropriate to the context of the community and considers all legal users of the public right of way; and

**WHEREAS**, Complete Streets support economic growth and community stability by providing accessible and efficient connections between home, school, work, recreation and retail destinations by improving the pedestrian and vehicular environments throughout communities; and

**WHEREAS**, Complete Streets enhance safe walking and bicycling options for school-age children, in recognition of the objectives of the national Safe Routes to School program; and

**WHEREAS**, Onekama Township recognizes the importance of street infrastructure and modifications such as sidewalks, crosswalks, shared use paths, bicycle lanes, signage and accessible curb ramps, that enable safe, convenient, and comfortable travel for all users; therefore

**NOW THEREFOR IT BE RESOLVED**, by the Board of the Onekama Township, Manistee County, Michigan that:

FIRST: to the extent feasible, Onekama Township will include Complete Streets design considerations and practices as a routine part of infrastructure planning and implementation; and

SECOND: Onekama Township supports participation in the future development of local and regional non-motorized transportation plans, to include Park and Recreation Planning and consideration of a Complete Streets ordinance that supports ease of use and safety for all users of transportation systems within the Onekama Township.

PASSED AND APPROVED BY THE Township Board of Onekama Township , Manistee County, MICHIGAN THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 2024.

AYES:

NAYS:

ABSTENTIONS:

ABESENT:

I **Amber Sedelmaier**, Clerk of Onekama Township, having duly sworn the oath of office, do attest to the above resolution offered and approved by the Board of Onekama Township, Manistee County, Michigan.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Print



Main - (231) 794-9150 Fax - (231) 887-4163
Address - 1395 Lakeshore Rd. Manistee, MI 49660
Email - anthonysooutdoorservices@gmail.com
Web - www.anthonysoutdoorservices.com

Date Submitted: 03/22/2024

Onekama Township Parks and Rec
Langland Park Sand Management

PROPOSAL FOR THE FOLLOWING

Job Description: Hourly Rates for Equipment and Labor

Onsite Hourly Rates:

- Truck/Labor and stand on Compact Utility Loader - \$165.00/hr.
Truck/Labor and Compact Track Loader - \$235.00/hr.

Trucking Hourly Rates:

- 12-yard Tri-Axle Dump Truck - \$110.00/hr.
5-yard Single Axle Dump Truck - \$90.00/hr.

Labor Rate:

- Labor for 1 crew member - \$40.00/hr.

Travel Cost:

- Travel Cost consists of travel to and from Anthony's Outdoor Services shop to and from Langland Park - \$85.00/request.

This proposal is for sand management at Langland Park for the 2024 season. The above cost will be billed at a hourly rate for sand management based off equipment needed and a travel rate will be applied for each request. Anthony's Outdoor Services will respond within 24 hours of requests for services.

Respectfully Submitted:

Anthony Ganss

The above prices, specifications and conditions are satisfactory and are hereby accepted. You are authorized to do the work as specified. Payments will be made as outlined above.

Signature

Date





LANDSCAPING - EXCAVATING - TREES - SNOW

Main - (231) 794-9150 Fax - (231) 887-4163
Address - 1395 Lakeshore Rd. Manistee, MI 49660
Email - anthonysootdoorservices@gmail.com
Web - www.anthonysoutdoorservices.com

Proposal #2024-30
Date Submitted: 03/27/2024

Onkama Township -Parks Dept.
5435 Main St.
Onkama, MI 49675

Job Location: Park on Schimke Creek

PROPOSAL FOR THE FOLLOWING

Job Description:

- Level existing 18'x18' area off creek and 44'x 4 1/2' walkway from road.
• Install 4"x 4" treated timbers in an 18'x 18' square.
• Infill timbers with 4" of trap rock gravel. Cover 44'x 4 1/2' walkway with 4" of trap rock gravel. Compact trap rock on walkway and 18'x 18' area.
• Install black plastic edging around 7 trees and install brown hardwood natural mulch around the trees.

TOTAL FOR JOB LISTED ABOVE: 3,200.00

This proposal may be withdrawn by us if not accepted within 30 days from the date on this proposal due to material cost fluctuation, product availability, and fuel concerns. \*\* A fuel surcharge may apply\*\*. We propose herby to furnish material-complete in accordance with the above proposal with 50% down at time of acceptance of proposal and remaining amount due at completion of job. Any alteration or deviation from above specifications involving extra cost will be executed only upon written or verbal order and will become an extra charge over and above the proposed amount.

Respectfully Submitted:

Anthony Ganss

The above prices, specifications and conditions are satisfactory and are hereby accepted. You are authorized to do the work as specified. Payments will be made as outlined above.

Signature

Date



# Proposal

## Larsen's Landscaping, LLC

**Client Name:** Onekama Township  
**Project Name:** Onekama Park Tree Circles and Picnic Area  
**Jobsite Address:** Onekama, MI 49675 **Billing Address:** 5435 Main St. Onekama, MI 49675  
**Estimate ID:** EST4488183  
**Date:** Mar 29, 2024

### Picnic Table Area Definition and 7 - 6 Foot Tree Circles \$3,961.50

	Spray Round Up		\$32.00
	Landscape Crew Leader - Site Preparation - Removals & Prep		\$320.00
	Landscape Laborer - Site Preparation - Removals & Prep		\$260.00
	Haul Away & Disposal		\$75.00
	Landscape Truck & Trailer		\$96.00
	Loader - Track Dingo		\$420.00
2.5 Yard	Mulch - Double Ground Hardwood - For 7 Trees	\$46.00	\$115.00
7 Piece	Edging - Black Vinyl - 20' Length - For 7 Trees	\$40.00	\$280.00
6 Yard	Stone - Limestone 21AA - 18' x 18' Square, 6" Deep, Compacted	\$49.00	\$294.00
	18 x 18 Picnic Table Base, Compacted Limestone, 6x6 treated lumber, 4 foot cut entry for wheelchair access		
	Compactor		\$260.00
	Timber Saw		\$80.00
	Bed Edger		\$130.00
1 1/4 box	Steel Spikes - 12" - 1/4 Box	\$52.14	\$52.14
12 each	Rebar - 2'	\$6.28	\$75.36
6 Piece	Timber - Treated - 6" x 6" x 12'	\$52.00	\$312.00
	Landscape Crew Leader - Installation		\$640.00
	Landscape Laborer - Installation		\$520.00

**Subtotal** \$3,961.50

## Plant Warranty

Larsen's Landscaping guarantees all plants that we supply and install for one full year from the date of installation provided that proper water and care have been practiced. Exceptions to this guarantee are annual plants, plants that are not winter hardy, and perennials.

The guarantee is void if:

- Payment is not made within 30 days of project completion.
- If a customer does not have an irrigation system to guarantee proper watering.
- The customer has not notified Larsen's Landscaping of abnormal or unusual growth conditions.
- Plants dying due to gross negligence.
- Plants that are damaged or killed due to insect damage or acts of nature, such as lightning, drought, tornadoes, abnormal frost, floods, ice storms, salt damage, etc.
- Plants killed by human or wildlife damage.
- Washouts of any stone materials (gravel, crushed stone, etc) are not covered under warranty.

## Hardscape Warranty

Larsen's Landscaping guarantees all hardscaping projects that we supply and install for one full year, from the date of installation. Once the warranty period is over, any requested adjustments or repairs will be performed at an additional charge. Washouts, of any kind, during or after installation are not covered by the warranty. It is recommended that a paver/hardscape surfaced be sand-locked every 3-5 years. Entire surface should be power washed to remove existing sand-lock from joints, then new sand-lock should be installed. A sealer can be applied 60 days after installation of sand-lock and should be reapplied every 2-3 years. This waiting period allows time for the salts left from manufacturing to release from the paver. These recommendations are dependent on weather and site conditions. Upon request, Larsen's Landscaping will perform a site visit to assess the condition of your hardscape area and make any necessary recommendations for follow-up care. \*Warranty is

void if payment has not been made within 30 days of project completion.

## Proposal Acceptance & Payment Agreement

### Customer Name Onekama Twp Parks:

I agree to pay the fee of **\$3,961.50** for the project outlined in the proposal above and authorize Larsen's Landscaping, LLC. to begin work.

I agree the payment will be made as follows:

- Payment of one-half of the total proposal, or **\$1,980.75** will be made in order for Larsen's Landscaping, LLC. to place my project on the job schedule.
- Payment of the final one-half of the total proposal, or **\$1,980.75** will be made upon completion of the project.

I understand that these amounts are estimates only, and that any additional work, changes, or materials, will be outlined in writing (via email, text, or written proposal) to be approved in writing by both Larsen's Landscaping, LLC. and the customer, and are not included in the scope of work or costs outlined above. This estimate does not include the cost of any necessary permits. The cost of permits will be the customer's responsibility. It will also be the customer's responsibility to determine if a permit is necessary. Work will not be performed until any necessary permit(s) are obtained by the property owner. Estimates are valid for 60-days from date on estimate and subject to fluctuating material pricing and delivery/freight fees. Any changes in pricing will be discussed prior to project starting.

We accept cash, check, or cards for deposits and payments. Please note all card transactions will incur a 3.5% processing fee.

A finance charge of 2% (24% annual rate) will be assessed to all past due balances with a minimum monthly finance charge of \$5.00.

Cancellation Policy. Larsen's Landscaping offers a 3-day "cooling off period" for all signed contracts whereby the contract is cancellable with a refund less any labor and design fees that may apply. If you cancel your contract after the 3-day cooling off period, your deposit becomes nonrefundable.

Please fill out the information below to indicate your acceptance of this proposal and the associated payment agreement. This information will be confidential and is

for precautionary collection purposes only.

Driver's License # \_\_\_\_\_ Date of Birth \_\_\_\_\_

Estimate authorized by: \_\_\_\_\_  
Company Representative

Estimate approved by: \_\_\_\_\_  
Customer Representative

Signature Date: \_\_\_\_\_

Signature Date: \_\_\_\_\_

## Mowing Information

Larsen's Landscaping <larsenslandscaping@hotmail.com>

Thu 3/28/2024 1:15 PM

To:Bick Pratt <bpratt@onekamatwp.org>

Bick,

Tina said you were interested in the hourly rate we charge for mowing. We bill our 2 man crew out at \$130.00 per hour, or \$65.00 for each man if only one man comes. If you are interested in having a property added to our mowing route, please send me the address and I will check our route and see if we have room for it.

-Andrea

Larsen's Landscaping, LLC

3091 North US-31 Scottville, MI 49454

231-757-3850 phone

231-757-2515 fax

[larsenslandscaping@hotmail.com](mailto:larsenslandscaping@hotmail.com)



Main - (231) 794-9150 Fax - (231) 887-4163
Address - 1395 Lakeshore Rd. Manistee, MI 49660
Email - anthonysootdoorservices@gmail.com
Web - www.anthonysoutdoorservices.com

2024 Lawn Maintenance Contract

Customer Name: Onekama Township - Schimke Creek Park Phone: 231-889-3308 Email: Invoice by Email: Yes No

Billing Address: 5435 Main St. Service Address: Schimke Creek Park

City, State, Zip: Onekama, MI 49675 City, State, Zip: Onekama, MI 49675

We hereby submit specifications and estimates for: Lawn Maintenance services at the above service address location on a per service basis. Please initial which services you would like.

Initial \$145.00/hour Spring Cleanup (per 2-man crew) Initial \$145.00/hour Fall Cleanup (per 2-man crew) (\$40.00/hour Additional per crew member) (\$40.00/hour Additional per crew member)

Initial \$25.00 Cost per service for lawn cutting (Any weeding or mulching is done at an hourly rate of \$86.00 per hour per two-man crew plus equipment/material charges) \*\*\*Fuel Surcharges May Apply\*\*\*\*

Spring and Fall Clean Up services include removal of natural debris. If debris is to be left on property indicate below and location of where debris is to be left. Above cost does not deviate if customer chooses to have debris removed or remain on property.

Notes:

Lawn cutting services include grass cutting, trimming around trees, maintenance strips etc. and blowing off walkways. This cost does not include the removal of natural debris (brush piles, down tree limbs etc.) although these services are available if requested.

Notes:

This pricing is guaranteed for 1 season and is valid through the 2024 Lawn Maintenance season.

Contract cancelable upon written notification.

Payment to be as follows: Lawn cutting services invoiced on a monthly basis. Spring/Fall Clean Up services invoiced as completed.

All material is guaranteed to be as specified. All work to be completed in a workman like manner according to standard practices. Any alteration or deviation from the above specifications, involving extra costs, will become an extra charge over and above the estimate. All agreements contingent upon strikes, accidents, or delays beyond our control. Anthony's Outdoor Services, LLC is not responsible for "Acts of God," and assumes no liability for naturally occurring condition. Our employees are fully covered by Workman's Compensation Insurance.

NOTE: This proposal may be withdrawn by us if not accepted by April 30, 2024.

Acceptance of Proposal - The above prices, specifications and conditions are satisfactory and are hereby accepted. You are authorized to do the work as specified. Payment will be made as outlined above. I have read the Terms and Conditions and understand them.

Date of Acceptance:

Customer Signature:

Customer Printed Name:

Contractor Signature: Anthony Ganss



Main - (231) 794-9150 Fax - (231) 887-4163
Address - 1395 Lakeshore Rd. Manistee, MI 49660
Email - anthonysootdoorservices@gmail.com
Web - www.anthonysoutdoorservices.com

2024 Lawn Maintenance Contract

Customer Name: Onekama Township - Township Office Phone: 231-889-3308 Email: Invoice by Email: \_\_\_ Yes \_\_\_ No

Billing Address: 5435 Main St. Service Address: 5435 Main St.
City, State, Zip: Onekama, MI 49675 City, State, Zip: Onekama, MI 49675

We hereby submit specifications and estimates for: Lawn Maintenance services at the above service address location on a per service basis. Please initial which services you would like.

Initial \$145.00/hour Spring Cleanup (per 2-man crew) Initial \$145.00/hour Fall Cleanup (per 2-man crew)
(\$40.00/hour Additional per crew member) (\$40.00/hour Additional per crew member)

Initial \$40.00 Cost per service for lawn cutting (Any weeding or mulching is done at an hourly rate of \$86.00 per hour per two-man crew plus equipment/material charges) \*\*\*Fuel Surcharges May Apply\*\*\*\*

Spring and Fall Clean Up services include removal of natural debris. If debris is to be left on property indicate below and location of where debris is to be left. Above cost does not deviate if customer chooses to have debris removed or remain on property.

Notes: \_\_\_\_\_

Lawn cutting services include grass cutting, trimming around trees, maintenance strips etc. and blowing off walkways. This cost does not include the removal of natural debris (brush piles, down tree limbs etc.) although these services are available if requested.

Notes: \_\_\_\_\_

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Contract cancelable upon written notification.

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Lawn cutting services invoiced on a monthly basis. Spring/Fall Clean Up services invoiced as completed.

All material is guaranteed to be as specified. All work to be completed in a workman like manner according to standard practices. Any alteration or deviation from the above specifications, involving extra costs, will become an extra charge over and above the estimate. All agreements contingent upon strikes, accidents, or delays beyond our control. Anthony's Outdoor Services, LLC is not responsible for "Acts of God," and assumes no liability for naturally occurring condition. Our employees are fully covered by Workman's Compensation Insurance.

NOTE: This proposal may be withdrawn by us if not accepted by April 30, 2024.

Acceptance of Proposal - The above prices, specifications and conditions are satisfactory and are hereby accepted. You are authorized to do the work as specified. Payment will be made as outlined above. I have read the Terms and Conditions and understand them.

Date of Acceptance: \_\_\_\_\_

Customer Signature: \_\_\_\_\_

Customer Printed Name: \_\_\_\_\_

Contractor Signature: Anthony Ganss \_\_\_\_\_



## Terms & Conditions

**Termination Clause:** This contract is cancelable upon written notification by either party. Monies invoiced or due for services rendered are due and payable upon such cancellation.

**Transfer:** This Agreement may, upon our approval, which approval shall be in our sole discretion, be transferred to a new owner in the event that you should sell your property prior to the intended expiration date of this Agreement, provided, however, that such new owner assume all of your obligations under this Agreement, such assumption to be in a form satisfactory to us, in our sole discretion.

**Payment Terms:** Should a payment become Sixty (60) days or more delinquent Accounts that are past due will not be plowed or mowed until account is brought up-to-date. Customer understands and accepts that the delays in payments made may result in appropriate legal action being taken to collect monies owed. Customer understands and agrees that costs of such legal action, including without limitation lawyers' fees, costs and expenses of suit or bringing suit, may be passed on to the customer, and customer accepts this condition. Contract shall be binding, inure to the benefit of the parties and their heirs, executors and administrators, and assigns.

**Site Damage:** We do not accept responsibility to repair any physical damage to your site directly caused by us during performance of work covered by this agreement.

### **Dispute Prevention/Resolution:**

*Prevention:* We agree that we have a common interest in preventing any misunderstandings or differences that may arise between us from becoming claims against one another. With the intent of avoiding this, we agree that we shall make good faith efforts to identify in advance and discuss the potential causes of disputes.

*Resolution:* We agree that if, and only if, the dispute still remains unsettled for an additional [thirty, forty-five, etc.] days, then we shall submit the dispute to binding neutral arbitration. In this event, we agree that any controversy or claim arising out of, or relating to our contracts dated, or the breach thereof, shall be settled

by binding arbitration in accordance with the applicable rules of the American Arbitration Association.

*We both agree that any action through arbitration against either of us relating to any breach of this agreement must be commenced within one (1) year from the date of the work*

**Hold Harmless:** In the event that there is a claim, damage, loss, or expense that is caused in whole or in part by any active or passive act or omission by you, anyone directly or indirectly employed by you, or for anyone whose act you may be liable, then, to the fullest extent permitted by law, you will defend, indemnify and hold harmless our representatives and us from and against these claims, damages, losses, and expenses including, but not limited to, attorneys' fees arising out of or resulting from the performance of our work under this Agreement.

**Severability:** Any provision of this Agreement that in any way contravenes the law of any state or country in which this Agreement is effective will, to the extent the law is contravened, be considered separable and inapplicable and will not affect any other provision or provisions of this Agreement.

**Shortages:** Customer acknowledges that product and material shortages or other circumstances beyond Contractor's control may require Contractor, if Contractor finds it necessary or expedient to do so, to make material/substance substitutions and/or modifications to substance mix.

**Extra Service:** Customer agrees to pay to Contractor for any and all Extra Services. Customer may authorize additional Extra Services upon reasonable notice to Contractor by delivering a written Change Order for Extra Services. All Extra Services shall be invoiced by Contractor upon completion of such Extra Services. Customer shall pay for the Extra Services within ten (10) days of receipt of any invoice for Extra Services.

\*\*\*FUEL SURCHARGES MAY APPLY ACCORDING TO FUEL PRICE INCREASES!\*\*\*



Cadillac Culvert Inc.

Cadillac, MI 49601

Phone 231-775-3761  
 Fax # 231-775-0072  
 www.cadillacculvert.com

**Invoice**

<b>Date</b>	<b>Invoice #</b>
3/12/2024	23691

<b>Bill To</b>
CASH SALE - CASH OR CHECK

<b>Ship To</b>
ONEKAMA TOWNSHIP OFFICES PARKS & RECREATION 5435 MAIN STREET PO BOX 458 ONEKAMA, MI 49675

P.O. Number	Terms	Due Date	Ship	Via	Rep	Project
BICK		3/12/2024	3/12/2024	CPU	DRU	
Quantity	Item Code	Description		U/M	Price Each	Amount
6	FPR3618	36" X 18" FIRE PIT RING  CUSTOMER PICKUP / WILL BRING A CHECK UPON ARRIVAL.			80.00	480.00
					<b>Sales Tax (6.0%)</b>	\$0.00

Please remit all invoices to Cadillac Culvert Inc. 5305 M-115 Cadillac, MI 49601

<b>Total</b>	<b>\$480.00</b>
--------------	-----------------

FAMILY FARM & HOME

1183 US HIGHWAY 31S  
 MANISTEE, MI 49660  
 PHONE: (231) 723-6650

\*\*\*CASH\*\*\*

CUST # \*16

EST #  
 DATE : 4/04/24 /H  
 CLERK : 114510  
 TERM # 228

EXP DATE: 4/ 5/24

TIME :12:05  
 \*\*\*\*\*  
 \* QUOTE \*  
 \*\*\*\*\*

QUANTITY	UM	ITEM	DESCRIPTION	SUG. PRICE	PRICE/PER	EXTENSION
6	EA	117180	FIRE PIT RING -36IN	79.99	55.00 /EA	330.00
** ESTIMATE ** ESTIMATE ** TAXABLE 330.00 NON-TAXABLE 0.00 SUB-TOTAL 330.00 TAX AMOUNT 19.80 TOTAL ESTIMATE 349.80						

X  
 Received By \_\_\_\_\_

## Fwd: Digital Fax Store 16

Store 16 <store16@familyfarmandhome.com>

Thu 4/4/2024 12:14 PM

To: Bick Pratt <bpratt@onekamatwp.org>

Cc: Amber Sedelmaier <clerk@onekamatwp.org>

 1 attachments (53 KB)

[Store16-]122114.pdf;

As per our conversation, if you purchase 6, your cost will be \$55.00 each. They are everyday \$79.99. Attached is a quote for \$349.80 after tax. If you wish to be a charge account or Tax Exempt you will need to contact Corporate @ (231)722-8335

Also, please let us know if you want these. We currently have 10.

Thank you

Stacey

----- Forwarded message -----

From: **FFH Store 16** <[uplink@familyfarmandhome.com](mailto:uplink@familyfarmandhome.com)>

Date: Thu, Apr 4, 2024 at 12:10 PM

Subject: Digital Fax Store 16

To: [store16@familyfarmandhome.com](mailto:store16@familyfarmandhome.com) <[store16@familyfarmandhome.com](mailto:store16@familyfarmandhome.com)>

CONFIDENTIALITY NOTICE This e-mail transmission, and any documents, files, or previous e-mail messages attached to it, may contain confidential information, trade secret information, or information that is legally privileged. If you are not the intended recipient, or a person responsible for delivering it to the intended recipient, you are hereby notified that any disclosure, copying, distribution, or use of any of the information contained in or attached to this message is strictly prohibited. If you have received this transmission in error, please immediately notify the sender by reply e-mail, and destroy the original transmission and its attachments. This E-mail is the property of Family Farm & Home.

Onekama Township Parks and Recreation



# BEACH VOLLEYBALL

*and Bonfire*

**SNACKS INCLUDED!**

*palm trees? no lol!*

**HIGH SCHOOL AND UP  
LANGLAND BEACH – SUNDAYS IN JULY  
7:00PM**



For information or to register scan QR or  
visit [OnekamaTwp.org](http://OnekamaTwp.org)  
Questions? [Parks@OnekamaTwp.org](mailto:Parks@OnekamaTwp.org)





# FAMILY FUN DAY

**Saturday, July 13**  
**3:00PM to 9:00PM**



*drop in and out anytime*

Explore Onekama's Parks as a family. Fun activities for all ages. No charge.

- Pitch a tent
- Sandcastle contest
- Nature exploration
- Craft
- Hike
- Bike
- Cook over a fire
- Watch sunset & stars
- Return home by bedtime

Some equipment & food provided.  
Details online.  
Registration required.



For information or to register scan QR  
or visit [OnekamTwp.org](http://OnekamTwp.org)  
or email [Parks@OnekamaTwp.org](mailto:Parks@OnekamaTwp.org)



# ONEKAMA 30 Day Challenge

## VIRTUAL ATHLETIC EVENT

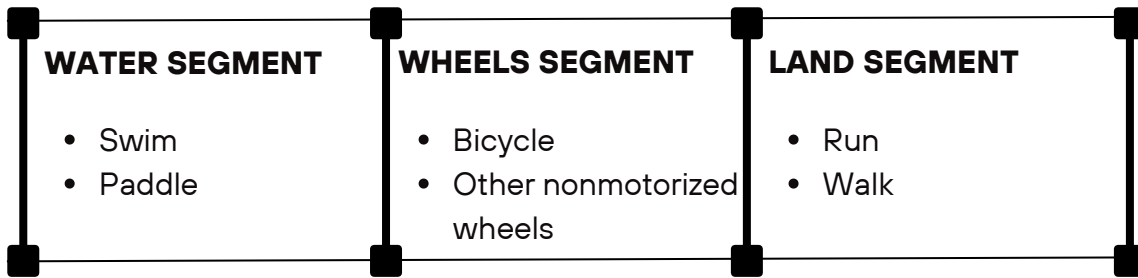
Get yourself, your friends, or your family ready and bring your adventurous spirit for an exciting self-guided athletic challenge. Complete at your own pace, in your own place, and in your own way!



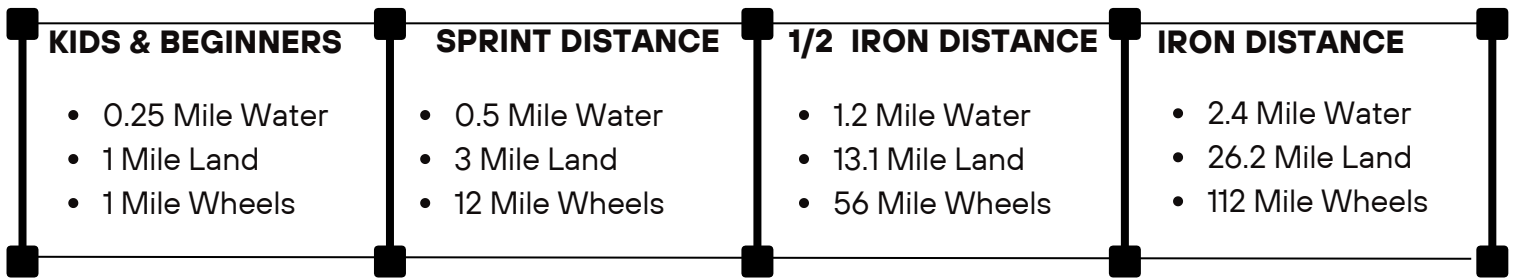
Go a little each day **or** go all the way in one day; divide it up however you like. Divide the activity with your family or team. Report your progress weekly through the Onekama Township website. Those who complete their goal receive Onekama 30 Day Challenge swag. Reception after the Onekama Days 5K on August 3. Get moving outside in Onekama!

**30 DAYS  
STARTS JULY 4  
ENDS AUGUST 3**

### CHOOSE OPTIONS FOR EACH SEGMENT



### CHOOSE DISTANCE



Want **MORE** Challenge? Iron Plus Distance - **Go as far as you can!** Be a top athlete in Onekama!





# Onekama Township Parks & Recreation Committee

## Monthly Meeting Minutes—Final Approved

February 23, 2024 8:30a

In attendance: Michelle Ervin, Gary Madden, Tyler Dula. Attending remotely: Chair Bick Pratt, Al Taylor, Paul Mueller, Ric Alameddine. Absent: Brian Allen, John Wemlinger. Also in attendance: Val Harmon.

Meeting called to order at 8:31a.

Motion to approve the agenda as presented by Madden, seconded by Mueller. All in favor, motion carried.

Public comment: none

Correspondence: none

Chair Pratt announced the Township Board has approved, with stipulations, the \$15,000 donation toward the upgrades to the Village park.

Old business:

Ervin gave an update on the History committee and their building plaques project. She will have a verbiage sample ready to show the Committee at the meeting in March. There are also history recordings being made.

Ervin gave an update on the Education committee and the progress on building the summer events programming. Training and certification events are lined up for the next few weeks.

Chair Pratt to confer with Bob Blackmore to get details worked out for the new maintenance hire for the upcoming season. The person responsible for watering the petunia parade for the 2024 season and other township responsibilities needs to be worked out. The budget presented to the board only included funding for the work to be done within Parks and Recreation.

Chair Pratt reported the Board has approved Allen as the contact person with GTRLC regarding the wetlands project. First step is a physical walk through of the property. There will be an ad hoc wetlands committee consisting of Pratt (chair), Allen, Ervin, Taylor, and Dula.

Dula gave an update regarding his work with the Invasive Species Committee. They will be working on shoreline habitats and encouraging homeowners to work toward natural shorelines. Pratt suggested that discussions regarding natural improvements within the Wetlands shoreline should be included as an agenda item for the next wetlands project ad hoc committee meeting.

There was continuing discussion about the ADA walkway structure at Langland. Chair Pratt to distribute drawings to the group of the proposed plans. If the public receives the project favorably, there is a possibility of expanding it next year.

Chair Pratt to follow up on the April delivery of tables and benches for the township parks.

Dula reported that the removal of invasive species at Carden park has been completed and looks good. Native plants now need to be planted in the open stream bank. Dula to research costs and options. Dula and Chair Pratt to work on the issue of damaged trees in the manicured areas of the park. Dula and Ervin to write a newspaper article about the Carden project for community publicity. Chair Pratt suggested the possibility of installing some sort of base underneath the picnic tables. Perhaps starting at Carden park and expanding to all

seven picnic tables if it is successful. Madden suggested installing a charcoal grill at Carden. This will be considered in the future. This year will include the natural improvements discussed and the ADA table. Ervin said the tables are ADA compliant, so any base put below them should not undermine this compliance. Guest Val Harmon offered her insights regarding materials that are most wheelchair friendly. Dula suggested turning planting native plants along the stream bank could be turned into an educational workshop or volunteer opportunities for high school students. Madden to talk to the school regarding the possibility of working together.

New business:

Ervin reported that she received a new, much lower bid for an educational sign and asked for the Committee's support to pursue this. Val Harmon is an experienced graphic designer and has volunteered to work with Ervin on this project. There was discussion on location to install. At this price, the Committee could pursue more than one sign. She was given the ok to move forward on this project.

Ervin discussed the need to develop a new member packet with pertinent information to bring them up to speed regarding the work the Committee is doing. There was discussion and suggestions on what information might be included.

Chair Pratt reported the budget was favorably reviewed by the board. The final budget will be approved at the March Board meeting.

Chair Pratt stated that Madden's term expires in March. He questioned if the bylaws state there has to be a School Board member as part of Parks & Rec. Madden has been asked by the School Board to stay on as their liaison.

Madden reported to the members about some short- and long-term school infrastructure projects pending. The bus garage may be solarized, and a rain garden has been proposed to deal with parking lot drainage. A long-term project not confirmed yet is to solarize the entire parking lot, which would provide enough power to run the school. Dula discussed grant availability for these projects.

Chair Pratt to change the Committee bylaws to allow for member remote participation, including voting.

The Recreation map is completed and posted in the Township Hall for viewing.

Mueller reminded Pratt that since the repair of the trail and parking lot at North Point was approved the contracts need to be signed with the vendors to do that work.

Meeting adjourned at 9:47a.

\_\_\_\_\_ Chair

Submitted by Michelle Swanson, Recording Secretary

# **Onekama Township Parks & Recreation Committee**

## **Monthly Meeting Minutes—DRAFT**

**March 29, 2024 8:30a**

In attendance: Michelle Ervin, Chair Bick Pratt, Tyler Dula, Brian Allen, John Wemlinger, Ric Alameddine.  
Attending remotely: Al Taylor, Paul Mueller, Gary Madden. Also in attendance: Dave Wallace.

Meeting called to order at 8:33a.

Motion to approve the February meeting minutes by Mueller, seconded by Wemlinger. All in favor, motion carried.

The order of the agenda items was amended to accommodate guest Dave Wallace.

Trails system update—Alameddine

Alameddine is working with Dave Wallace of the Onekama Township Planning Commission on the trails system project. They recommended going with the proposal from Gourdie Fraser in Traverse City. It comes in under budget for the project. He also reported that Networks Northwest recommended the committee get a complete street resolution signed by the Board, which serves as confirmation the Township is interested in building a trail which will make it easier to qualify for possible grants. The Village will also need to sign a similar resolution. Alameddine has found several grant opportunities, including the Michigan Health Endowment Fund. Subject to deadlines and other considerations, he may submit an application for this grant.

Motion to go to the Board for funding for a feasibility study by Alameddine, seconded by Wemlinger. All in favor, motion carried.

Motion to hire a grant writer to support this grant request and future work by Alameddine, seconded by Wemlinger. All in favor, motion carried.

Enhancing community communication—Chair Pratt

Pratt reports that he, Alameddine, Ervin, and Jean Capper will be meeting with Board member Ed Bradford to learn about editing the website. Pratt recommends establishing a new Communications Team ad hoc committee with intention to transition to a subcommittee for purposes of enhancing Parks & Recreation communications with the community.

Motion to nominate at the April meeting four members to establish a Communications ad hoc committee to focus on strategic communications by Ervin, seconded by Alameddine. All in favor, motion carried. The committee will be on an ad hoc basis for now.

Correspondence:

Chair Pratt received an email inquiring about overnight parking at Langland Park. It is not allowed. Ervin was asked what visitors are supposed to do with fish guts. Doug Berry of the Invasive Species Committee said they may dispose of them in personal trash, or the fish cleaning stations in Manistee will accept them and they will be recycled into cat food.

## Budget—Chair Pratt

Pratt reported that the Board has decided against hiring a maintenance worker for this year. They decided to fund Jean Capper for the summer programs, as well as hiring a grant writer for the township. Most of the proposed budget items the Parks & Recreation Committee asked for were approved.

## Committee Reports

Village and Township Joint Efforts—they are working on scheduling the next meeting. Wemlinger reported that a rate schedule for rentals of the event stage has been completed. Chair Pratt expressed his happiness at how the Township Board and the Village Council have been able to work together lately to great success. Dave Wallace stated it should be recognized that the Township and the Village have done something together for the first time in 15 years, and that it is an important development.

History Committee--Ervin reported the History Committee will remain as a Parks & Recreation subcommittee until January 2025 at which point a decision will be made whether to create a new committee and present that request to the board. Ervin gave the members a verbiage sample for the history signs.

Education events are still in progress. Ervin presented a flyer regarding a new event called the 30 Day Challenge promoting physical activity, as well as a volleyball and bonfire on the beach event to be held three times over the summer.

Motion to move forward with the 30 Day Challenge and volleyball & beach events by Alameddine, seconded by Allen. All in favor, motion carried. Ervin to determine costs associated with new events for presentation to the board by Pratt

## Wetlands—Allen

Following this meeting, there will be a visit with members of the GTRLC to the wetlands area to review the wetlands project.

## Old Business:

Chair Pratt to get fire rings in April. Installation of ADA walkway on the south end scheduled next week subject to weather. The seating at the three parks will also be delivered next week subject to weather. Allen volunteered to help Pratt with the installations. Pratt is waiting on two more bids for the Carden Park enhancements.

## Bylaws changes—

Chair Pratt presented proposed bylaws changes to the members. Motion to approve the proposed changes for submission to the Board for their approval by Wemlinger, seconded by Alameddine. All in favor, motion carried.

## Election of officers—

The members discussed the purpose of “Secretary” as a part of the Committee officers slate, since the Committee employs a Recording Secretary. Alameddine suggested replacing it with a new position “Program Director”.

Motion to rescind the previous approval of the bylaws changes as submitted by Wemlinger, seconded by Alameddine. All in favor, motion carried.

Motion to replace “Secretary” as an officer with “Program Director”. All in favor, motion carried.

Ervin agreed to develop a job description for this new position to be presented for discussion at the April meeting.

Email protocol—

There was discussion regarding email usage best practices between Committee members. Pratt asked who wanted to get a new township email address.

The members discussed identifying student volunteering opportunities. Ervin explained the historical purpose of having a school representative on the P&R Committee, and suggested the members consider getting a student back on the Committee.

Chair Pratt is working on getting bids for ongoing sand maintenance at Languard Park.

Dula to move forward sourcing plants for the Carden Park planting project.

Pratt initiated discussion whether mobi-mats should not be installed at the north end of Languard because of water run off and sand removal issues. There should be no water runoff problems with the installation of the rigid walkway at the south end. It was suggested that mobi-mats not be installed at the north end until water runoff issues are resolved and that a sign be installed indicating ADA access is at the south entrance.

New member packet topic tabled for now.

Meeting adjourned at 10:17a.

\_\_\_\_\_ Chair

Submitted by Michelle Swanson, Recording Secretary

# Investigation of the Fish Community of Portage Lake in Manistee County, Michigan, 2023

*Prepared for*

Portage Lake Invasive Plant Control Program

Onekama Township

PO Box 458

Onekama, Michigan, 49675

*Prepared by:*

**ADVANCED ECOLOGICAL MANAGEMENT**

**22071 7 Mile Road**

**Reed City, MI 49677**

**AeM**

ADVANCED  
ECOLOGICAL  
MANAGEMENT

## 1.0 INTRODUCTION

Portage Lake is a public access lake that is approximately 2,110 acres in size and is located Onekama Township, 23 North, Range 16 West, in Sections 22, 25, 26, 27, 28, 33, 34, 35, and 36 of Manistee County, Michigan (Figure 1-1). The fish community of Portage Lake has been historically surveyed by the Michigan Department of Natural Resources (MDNR), and more recently by the Little River Band of Ottawa Indians (LRBOI) and Onekama Township.

Prior to this survey, the most recent comprehensive survey of the lake was conducted by the MDNR in 2009 and included the use of a variety of capture methods, including electrofishing and a variety of nets (Seites, 2009). Recently, some citizen groups have expressed concern that the panfish community of Portage Lake has been experiencing a decreased abundance of catchable sized bluegills (*Lepomis macrochirus*) and yellow perch (*Perca flavescens*). In addition, it had been approximately 14 years since a comprehensive fish survey had been conducted within the lake. Onekama Township contracted with Advanced Ecological Management, LLC (AEM) in 2023 to conduct a fisheries survey of Portage Lake to evaluate the current conditions of the fisheries community. The objectives of this survey were to identify fish species that were present within the lake and determine their relative abundances.

## 2.0 STUDY AREA

Portage Lake is a natural lake that is a drowned river mouth lake as a result of a historical connection to Lake Michigan via Portage Creek, which no longer exists (Seites, 2009). The lake is up to 60 feet deep and has shoal areas (less than 20 feet deep) that account for approximately 65% of the lake surface area (Tonello, 2000).

Much of the shoreline along the east end of the lake contains submergent and emergent weed beds. Large portions of the shoreline include bulrushes and cattails (*Typha* sp.) along with pondweeds and coontail (*Ceratophyllum* sp.), and native chara (*Chara* sp.) in the submerged weed beds. Similarly, the peninsula of land that includes the MDNR boat launch along the north shore contained notable patches of submergent and emergent weed beds.

## 3.0 METHODS

Prior to conducting the survey, AEM consulted with MDNR fisheries biologists to identify suitable survey locations and methodologies to maximize survey success. Fish were collected in Portage Lake using a combination of a boat-mounted electrofisher, large and small mesh fyke nets, gill nets, and a seine. A boat-mounted electrofishing unit and generator (electroshocker) were used to collect fish in shallow water (six feet or less), near-shore areas of the lake (Figure 3-1). Pulsed direct current was used during

the survey to minimize trauma to the fish. Electroshocking duration was automatically recorded as the total seconds of electricity that was discharged from the electroshocker in each transect. Electroshocking was conducted at night to minimize fish avoidance of the electrofishing gear (Smith-Root, 2004).

Three fyke nets were constructed of 0.125-inch "Ace"-type nylon mesh coated with green latex net dip. The lead was 15 feet-long and 3-feet high. The frame and the cab were 10 feet long when fully extended. The frame section is formed by two rectangular spring-steel frames that are 3-feet high 4-feet wide. The cab is constructed of two 3-foot diameter steel hoops. Two large-mesh fyke nets were also placed in the lake and fished overnight for approximately 24 hours (Figure 3-1). The large-mesh fyke nets were constructed of two-inch stretch mesh and the hoop diameter measured four feet with a 50-foot-long center lead. The fyke nets were distributed along the shoreline of the lake and were fished overnight for approximately 24 hours (Figure 3-1).

Two multiple panel monofilament gill nets of varying mesh size were fished in four locations throughout Portage Lake (Figure 3-1). Each gill net consisted of five, 6- by 25-foot panels ranging from 1.5- to 6-inch stretch mesh. The gill nets were set overnight and were fished for approximately 12 hours.

A seine was fished in wadable areas along the shoreline in the vicinity of the MDNR boat ramp along the north shore. Several hauls were attempted as part of the survey.

Catch-per-unit-effort (CPUE) is used as an index of fish abundance. Fish sampling efforts were standardized to units consistent with the Michigan Department of Natural Resources sampling protocol (Schneider et al., 2000). CPUE for the following gear was estimated as follows:

$$CPUE = \frac{N}{t}$$

Where,

- $N$  = number of fish caught
- $t$  = sample duration in hours (boom shocker), or
- $t$  = sample duration in net nights (gill net), or
- $t$  = sample duration in net nights (fyke net).

Weight-length regressions were evaluated for selected fish species and the data were compared to state average length and weight values to evaluate the condition of the fish. Condition (robustness) sometimes



reflects food availability and growth within the weeks prior to sampling (Schneider et al. 2000<sup>b</sup>). The weight-length relationship was expressed on a logarithmic (base 10) scale as follows:

$$\log W = \log a + b \log L$$

Where,

$W$  = total weight

$L$  = total length

$\log a$  = intercept of regression equation

$b$  = slope of regression equation.

As part of the enumeration process, the species, length, weight, and number of fish captured were recorded. Fish were identified to species using various taxonomic references (Bailey et al., 2003; Becker, 1983).

Water temperature, pH, conductivity, and dissolved oxygen were measured in two locations in Portage Lake as part of the fish survey (Figure 3-1). These water quality parameters were measured at two-foot depth increments using a Yellow Springs Instrument Professional Plus water quality meter. Secchi depth was also measured at each water quality sample location.

## 4.0 RESULTS

The fisheries survey of Portage Lake was conducted from June 19 through June 23, 2023. Fyke nets were set along the shoreline during the evenings of June 19<sup>th</sup> through the 22<sup>nd</sup>, gill nets were set during the evenings of June 19<sup>th</sup> and June 20<sup>th</sup>, and electrofishing was conducted throughout the lake during the evenings of June 19<sup>th</sup> and June 21<sup>st</sup> (Figure 3-1). Water quality data were collected during the afternoon (from 13:24 to 14:37pm) of June 23, 2023.

A total of 1,130 fish were collected from Portage Lake by AEM in 2023 representing 28 different taxa (Table 4-1). Rockbass (*Ambloplites rupestris*), round gobies (*Neogobius melanostomus*), alewives (*Alosa pseudoharengus*), largemouth bass (*Micropterus salmoides*), and yellow perch (*Perca flavescens*) were the most frequently collected species in Portage Lake (Table 4-1). A total of 390 fish were collected using electrofishing gear for a Catch Per Unit of Effort (CPUE) of 3.7 fish per minute of electricity discharge into the lake. Fyke net CPUE varied from zero fish per hour of net soak time to a maximum of 7.4 fish per hour of soak time. Gill net CPUE varied from 0.1 fish per hour of net soak time to a maximum of 3.2 fish per hour of soak time.

### *Rockbass*

Rockbass ranged in length from 1.5 inches to 13.0 inches, with an average length of 7.9 inches (standard deviation = 2.7 inches, sample size = 267 fish), and ranged in weight from 0.1 ounces to 23.7 ounces, with an average weight of 8.2 ounces (standard deviation = 5.3 ounces). Eight to 12-inch fish were the most frequently observed lengths of rockbass in Portage Lake (Figure 4-1). The Portage Lake juvenile rockbass sizes were slightly larger than the state average sized rockbass and the larger sized rockbass were consistent with state average sized rockbass (Figure 4-2). Rockbass collected by AEM in 2023 represented approximately 23.6 percent of the total number of fish collected. Rockbass represented approximately 24.8 percent of the total number of fish collected by the MDNR in the 2009 survey of Portage Lake (Seites, 2009), and 28.3 percent of the total number of fish collected by the MDNR in 1999 (Tonello, 2000).

### *Round goby*

A total of 235 round gobies were collected by AEM during the Portage Lake survey (Table 4-1). Round gobies ranged in length from 0.6 inches to 3.0 inches, with an average length of 2.1 inches (standard deviation = 0.6 inches, sample size = 16 fish). Most of the round gobies collected by AEM were caught in the shallow set fyke nets that were set in water four feet deep or less. Round gobies collected by AEM in 2023 represented approximately 20.8 percent of the total number of fish collected. Round gobies represented approximately 1.1 percent of the total number of fish collected by the MDNR in the 2009 survey of Portage Lake (Seites, 2009), and they were not collected by the MDNR in the 1999 survey (Tonello, 2000).

### *Alewife*

Alewives ranged in length from 4.6 inches to 7.9 inches, with an average length of 5.9 inches (standard deviation = 0.7 inches, sample size = 145 fish), and ranged in weight from 0.03 ounces to 0.1 ounces, with an average weight of 0.9 ounces (standard deviation = 0.3 ounces). Six and seven-inch fish were the most frequently observed lengths of alewives in Portage Lake (Figure 4-3). The size of alewives in Portage Lake was consistent with state average sized alewives (Figure 4-4). Most of the alewives were caught in the locations where AEM conducted electrofishing (Figure 3-1).

### *Largemouth bass*

Most of the largemouth bass collected by AEM (125 of the 136 total largemouth) were young-of-the-year fish that were collected in fyke nets located in the east end of Portage Lake. These young-of-the-year fishes were all less than one inch long and were too small to have their weight recorded. Of the largemouth bass that were large enough to be measured, they ranged in length from 11.3 inches to 18.7

inches, with an average length of 11.3 inches (standard deviation = 6.5 inches, sample size = 11 fish), and ranged in weight from 0.3 ounces to 58.2 ounces, with an average weight of 26.5 ounces (standard deviation = 17.9 ounces).

#### *Yellow perch*

Yellow perch ranged in length from 1.0 inches to 13.4 inches, with an average length of 5.7 inches (standard deviation = 1.9 inches, sample size = 129 fish), and ranged in weight from 0.2 ounces to 19.2 ounces, with an average weight of 1.7 ounces (standard deviation = 2.4 ounces). Five to seven-inch fish were the most frequently observed lengths of yellow perch in Portage Lake (Figure 4-5). Similar to the rockbass, the juvenile yellow perch were slightly larger than the state of Michigan average sized yellow perch and the larger yellow perch were consistent with the state of Michigan average sized yellow perch (Figure 4-6). Yellow perch collected by AEM in 2023 represented approximately 12.0 percent of the total number of fish collected. Yellow perch represented approximately 3.7 percent of the total number of fish collected by the MDNR in the 2009 survey of Portage Lake (Seites, 2009), and 23.4 percent of the total number of fish collected by the MDNR in 1999 (Tonello, 2000).

#### *Bluegill*

A total of nine bluegills were collected by AEM during the Portage Lake fish survey. Bluegills ranged in length from 2.2 inches to 8.0 inches, with an average length of 5.4 inches (standard deviation = 2.3 inches, sample size = 9 fish), and ranged in weight from 0.1 ounces to 8.1 ounces, with an average weight of 3.2 ounces (standard deviation = 2.8 ounces). Bluegills collected by AEM in 2023 represented approximately 0.8 percent of the total number of fish collected. Bluegills represented approximately 2.1 percent of the total number of fish collected by the MDNR in the 2009 survey of Portage Lake (Seites, 2009), and 9.9 percent of the total number of fish collected by the MDNR in 1999 (Tonello, 2000).

#### *Pumpkinseed sunfish*

Pumpkinseed sunfish ranged in length from 3.7 inches to 7.9 inches, with an average length of 6.6 inches (standard deviation = 1.3 inches, sample size = 19 fish), and ranged in weight from 0.7 ounces to 7.8 ounces, with an average weight of 4.7 ounces (standard deviation = 2.2 ounces). Eight-inch fish were the most frequently observed lengths of pumpkinseed sunfish in Portage Lake (Figure 4-7). The Portage Lake pumpkinseed sunfish sizes were consistent with state average sized pumpkinseed sunfishes (Figure 4-8). Pumpkinseed sunfish collected by AEM in 2023 represented approximately 1.6 percent of the total number of fish collected. Pumpkinseed sunfish represented approximately 0.4 percent of the total number of fish

collected by the MDNR in the 2009 survey of Portage Lake (Seites, 2009), and 8.6 percent of the total number of fish collected by the MDNR in 1999 (Tonello, 2000).

#### *Smallmouth bass*

Smallmouth bass ranged in length from 3.7 inches to 22.0 inches, with an average length of 12.8 inches (standard deviation = 4.6 inches, sample size = 33 fish), and ranged in weight from 0.4 ounces to 96.0 ounces, with an average weight of 24.9 ounces (standard deviation = 22.4 ounces). Ten to 16-inch fish were the most frequently observed lengths of smallmouth bass in Portage Lake (Figure 4-9). The Portage Lake smallmouth bass sizes were consistent with state average sized smallmouth bass (Figure 4-10).

#### *Northern pike*

Northern pike ranged in length from 16.2 inches to 31.1 inches, with an average length of 24.1 inches (standard deviation = 4.1 inches, sample size = 27 fish), and ranged in weight from 13.4 ounces to 114.6 ounces (7.2 pounds), with an average weight of 58.0 ounces (3.6 pounds; standard deviation = 29.3 ounces). Northern pike in the 22-inch length class were the most frequently observed length of northern pike in Portage Lake (Figure 4-11). The Portage Lake northern pike sizes were consistent with state average sized northern pike (Figure 4-12).

#### *Walleye*

A total of nine walleye were collected by AEM in gill nets during the Portage Lake survey (Table 4-1). Walleye ranged in length from 14.8 inches to 29.7 inches, with an average length of 23.8 inches (standard deviation = 4.7 inches, sample size = 9 fish), and ranged in weight from 19.4 ounces to 166.7 ounces (10.4 pounds), with an average weight of 86.6 ounces (5.4 pounds; standard deviation = 44.0 ounces).

#### *Water quality*

Water quality data were collected in one location in the west portion of Portage Lake, where one of the gill nets was placed, and near the east portion of the basin (Figure 3-1). Water quality data were collected from the surface to the substrate in the western sample location and data were collected to the maximum reach of the recording equipment in the eastern sample location. Water temperature in the west survey location ranged from a minimum of 10.5 °C (50.9 °F) at a depth of 20 feet to a maximum of 21.2 °C (70.2 °F) at the surface (Table 4-2). Dissolved oxygen ranged from a minimum of 9.6 milligrams of oxygen per Liter at the surface to a maximum of 13.7 milligrams of oxygen per Liter at a depth of 21 feet. Dissolved oxygen was adequate to support life at all depths measured by AEM in the west sample location. Conductivity ranged from a minimum of 213 micro-Siemens per centimeter, to a maximum of 309 micro-

Siemens per centimeter, and pH ranged from a minimum of 6.2 to a maximum of 8.4 in the west sample location (Table 4-2).

Water temperature in the east survey location ranged from a minimum of 11.7 °C (53.1 °F) at a depth of 36 feet to a maximum of 21.4 °C (70.5 °F) at the surface (Table 4-2). Dissolved oxygen ranged from a minimum of 9.0 milligrams of oxygen per Liter at the surface to a maximum of 12.6 milligrams of oxygen per Liter at a depth of 20 feet. Dissolved oxygen was adequate to support life at all depths measured by AEM in the east sample location. Conductivity ranged from a minimum of 228 micro-Siemens per centimeter, to a maximum of 312 micro-Siemens per centimeter, and pH ranged from a minimum of 8.0 to a maximum of 8.5 in the east sample location (Table 4-2). Secchi depth was 12.7 feet in the west sample location and was 13.3 feet in the east sample location (Table 4-2).

## **5.0 SUMMARY**

Portage Lake supports a diverse and healthy fish community, with a total of 1,130 fish and a total of 28 species of fish that were observed by AEM during the survey. The lack of catchable sized panfish was a concern raised by the Invasive species committee and was also an impetus for this survey. Panfish, such as bluegill and pumpkinseed sunfish were low in abundance among all the panfish that were collected during the survey. Among panfish, the rockbass, was the most abundant species collected by AEM and the relative abundance of rockbass has remained consistent among the 2000 and 2009 MDNR surveys, and 2023 AEM surveys.

Although bluegills and pumpkinseed sunfish were low in abundance in this survey, they did not appear to be suffering from poor growth. The size of all fish collected by AEM that were compared to their state average sized respective species was consistent or slightly better than the state average sized fish. The relative abundance of bluegills has declined from the 2000 and 2009 MDNR surveys through the 2023 AEM survey of Portage Lake. The relative abundance of pumpkinseed sunfish has remained low among the 2000, 2009 and 2023 surveys, and the relative percentage of pumpkinseed sunfish caught has varied among survey years. Juvenile bluegills and pumpkinseed sunfish were notably absent in shallow-water locations where fyke nets were placed. Round gobies were also notably abundant in those same locations where juvenile panfish were expected to be caught. It is possible that juvenile and egg predation from gobies could be contributing to the lower abundances of bluegills and pumpkinseed sunfish.

Another desirable panfish, the yellow perch, comprised approximately 12 percent of the total catch during the 2023 Portage Lake survey. The relative abundance of yellow perch has varied among the two most

recent surveys conducted by the MDNR and this survey. Consistent with the size of the other species evaluated by AEM, yellow perch sizes were consistent with state of Michigan average sized yellow perch. Approximately 17 percent of the total yellow perch catch (22 fish) was eight inches or larger. The abundance of larger catchable sized yellow perch could be a combination of factors, including production within Portage Lake and of the seasonal movement of larger yellow perch from Lake Michigan in and out of Portage Lake (Seites, 2009).

Smallmouth bass and largemouth bass appeared to be actively or recently spawning in portions of the lake during the survey. Largemouth bass young-of-the-year were abundant in the emergent aquatic vegetation located in the east end of the lake and smallmouth bass were observed to be defending spawning beds around the emergent vegetation located in the northwest portion of the lake near the MDNR boat ramp at the time of the survey.

Several anglers encountered during the survey indicated that Portage Lake contained an abundance of smaller sized northern pike. Most of the northern pike collected by AEM during the survey were collected in gill nets. Several smaller northern pike were also collected in fyke nets and during the electrofishing portion of the survey. Although smaller pike may be abundant in Portage Lake, northern pike size was consistent with state of Michigan average sized northern pike, which could indicate Portage Lake northern pike are not experiencing growth difficulties.

Walleye are a popular gamefish in Portage Lake and the MDNR and LRBOI have frequently surveyed the walleye throughout the lake. Walleye were only collected by AEM in the gill net sets. Gill nets were used sparingly to minimize fish mortality experienced during the survey. Walleye could have moved to the deeper portions of the lake prior to the survey, which would indicate why no walleye were collected during electrofishing activities.

The baitfish community is diverse and abundant within Portage Lake. Alewives were the third most abundant species collected by AEM during the Portage Lake survey (Table 4-1). In addition to the alewives, nine other species of baitfish were collected by AEM.

Members of the Invasive species committee asked AEM to consider aquatic habitat as a potential bottleneck to panfish development within Portage Lake. Although AEM did not conduct a formal aquatic vegetation survey as part of this survey, AEM collected cursory water quality data and observed aquatic vegetation diversity and density throughout the lake while conducting the fish survey. Water quality data indicate the dissolved oxygen is adequate to support life throughout much of the water column within the

lake. The conductivity is consistent with most inland lakes throughout the Lower Peninsula of Michigan and the pH was reasonably consistent throughout the water column and was adequate to support life in the lake. Most of the aquatic vegetation, particularly most of the emergent vegetation along the shoreline, is comprised of native species and occurred at densities that provided great habitat complexity for feeding and hiding cover for fish species that may use those areas. In addition, much of the visible submerged aquatic vegetation did not appear to be particularly dense during the survey. A high density of aquatic vegetation could lead to problems with low dissolved oxygen later in the summer.

Managing the poor panfish abundance appears to largely be an issue of gaining a better understanding of the declining bluegill abundance as both rockbass and pumpkinseed sunfish abundances have remained comparatively consistent over the same period. In addition, although yellow perch abundance has varied from 2000 through 2023, their success may be strongly influenced by seasonal variation from Lake Michigan fish moving in and out of Portage Lake.

It is likely that most anglers currently pursuing panfish find a high rate of success in catching rockbass in Portage Lake as rockbass have remained consistently abundant within Portage Lake from 2000 through 2023. Anglers focusing on shallow waters (three to five feet) to catch bluegill are probably finding poor success based on the survey results of this study. It is also possible that larger bluegill had migrated to deeper water during the time of the survey, which could explain the low catch using electrofishing gear. AEM expected to find juvenile bluegills in shallow water habitat and did not, which indicates that something is affecting their abundance in those shallow areas. Round gobies could be a significant source of bluegill loss based on predation of eggs and possibly young-of-the-year fish.

Evaluating the diet of round gobies in Portage Lake could provide more insight regarding their potential influence on bluegills. Specifically, identifying bluegill spawning habitat and focusing round goby sampling efforts in those locations during ongoing bluegill spawning activities could provide more information regarding the likelihood of their negative influence on bluegills in Portage Lake.

Several photos of fish collected during this 2023 Portage Lake fish survey are included at the end of the report. The photos are provided to illustrate some of the fish that were collected as part of this survey.

## 6.0 REFERENCES

Bailey, R.M., W.C. Latta, and G.R. Smith. 2003. An atlas of Michigan fishes with keys and illustrations for their identification. Miscellaneous Publications, Museum of Zoology, No. 192, University of Michigan, Ann Arbor, MI.

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<sup>a</sup>Schneider, J. C., G. R. Alexander, and J. W. Merna. 2000. Modules for lake and stream surveys. Chapter 2 *in* Schneider, J. C., editor, Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor.

<sup>b</sup>Schneider, J. C., P. W. Laarman, and H. Gowing. 2000. Length-weight relationships. Chapter 17 *in* Schneider, J. C. editor, Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor.

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Table 4-1. Fish collected by gear from Portage Lake by AEM during June 2023.

Common Name	Electroshocker	Fyke Net	Gill Net	Seine	Grand Total
Alewife	137		8		145
Banded killifish	3				3
Black crappie		1			1
Blacknose shiner	1				1
Bluegill	7	2			9
Bluntnose minnow		1			1
Bowfin	4	2			6
Brook silverside	1				1
Brown bullhead	11	2	2		15
Chinook salmon	2	1			3
Emerald shiner				2	2
Four-spine stickleback		1			1
Golden redhorse	7	1			8
Golden shiner	1				1
Johnny darter				1	1
Largemouth bass	6	128	2		136
Longnose gar	1	6			7
Northern pike	2	3	23		28
Pumpkinseed sunfish	14	5			19
Rockbass	42	215	10		267
Round goby	2	227		6	235
Silver redhorse	1			8	9
Smallmouth Bass	25	6	2		33
Spottail shiner	28			5	33
Walleye			9		9
White sucker	7		7		14
Yellow bullhead		6			6
Yellow Perch	88	11	37		136
<b>Total Collected</b>	<b>390</b>	<b>618</b>	<b>100</b>	<b>22</b>	<b>1130</b>

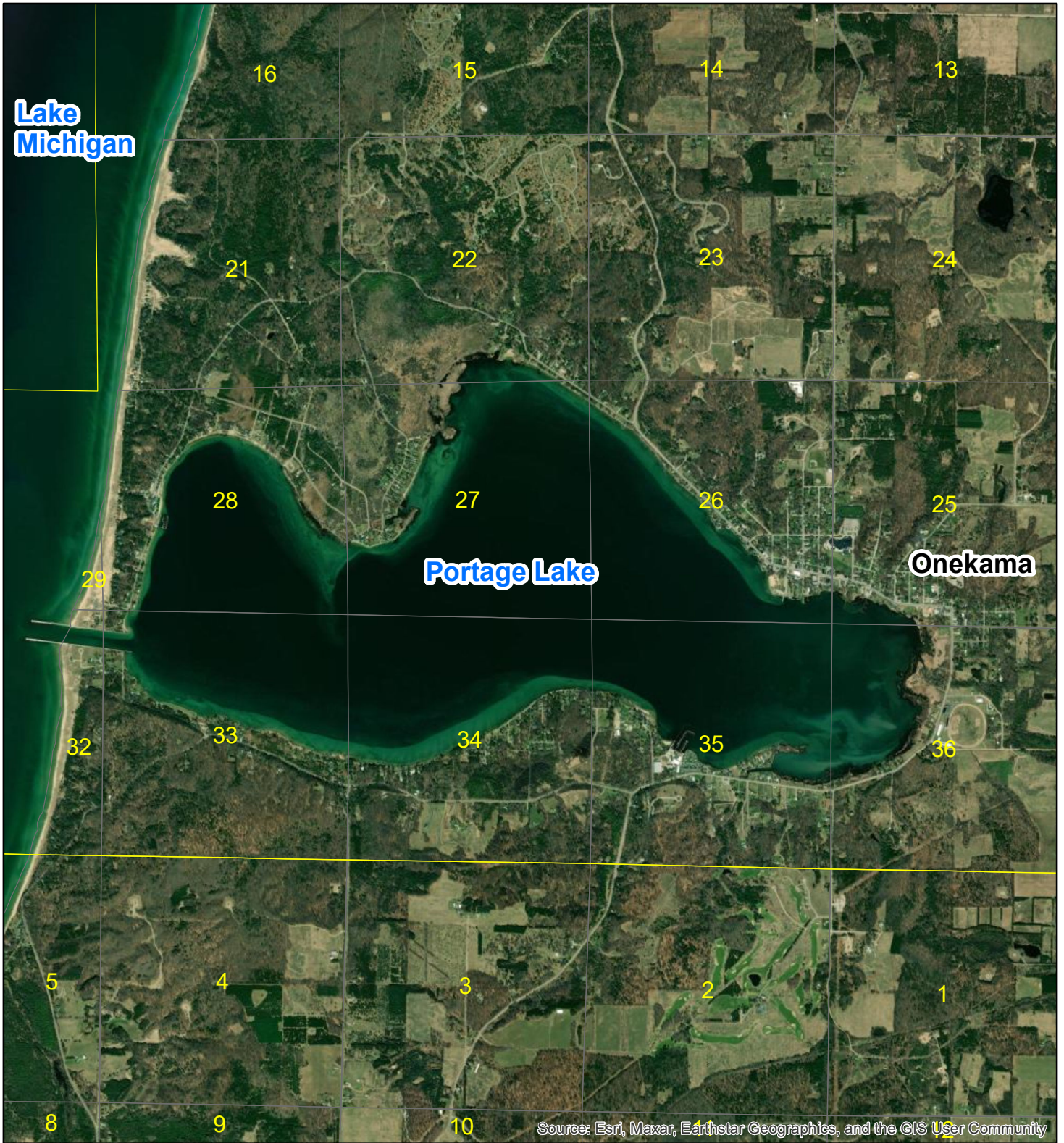
Table 4-2. Portage Lake water quality data collected by AEM on June 23, 2023.

6/23/2023	Time - 13:24	West End		
Depth (feet)	Water Temperature (C)	DO (mg of O <sub>2</sub> /L)	Conductivity (micro Siemens/cm)	pH
0	21.2	9.6	308	7.0
2	21.1	9.6	308	6.9
4	21.1	9.0	308	6.9
6	20.9	9.0	307	6.8
8	20.2	9.8	309	6.2
10	18.7	10.6	292	6.7
12	18.1	10.5	287	8.4
14	17.0	10.8	278	8.3
16	13.3	12.2	232	8.0
18	12.1	12.5	224	8.0
20	10.5	13.6	213	8.1
21	10.5	13.7	213	8.1

Secchi Depth 12.7 feet

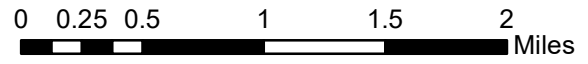
6/23/2023	Time - 14:37	East End		
Depth (feet)	Water Temperature (C)	DO (mg of O <sub>2</sub> /L)	Conductivity (micro Siemens/cm)	pH
0	21.4	9.0	312	8.5
2	21.4	9.0	312	8.5
4	21.4	8.8	312	8.3
6	21.3	9.0	312	8.1
8	20.9	9.0	310	8.1
10	19.3	9.8	295	8.0
12	17.5	11.0	261	8.0
14	15.6	12.0	248	8.1
16	14.3	12.4	241	8.1
18	13.9	12.6	237	8.1
20	13.4	12.6	234	8.2
22	13.1	12.6	232	8.2
24	12.7	12.5	230	8.2
26	12.3	12.4	229	8.2
28	12.1	12.1	228	8.2
30	12.1	11.9	228	8.2
32	11.8	11.3	229	8.1
34	11.7	10.7	230	8.1
36	11.7	10.5	230	8.1

Secchi Depth 13.3 feet

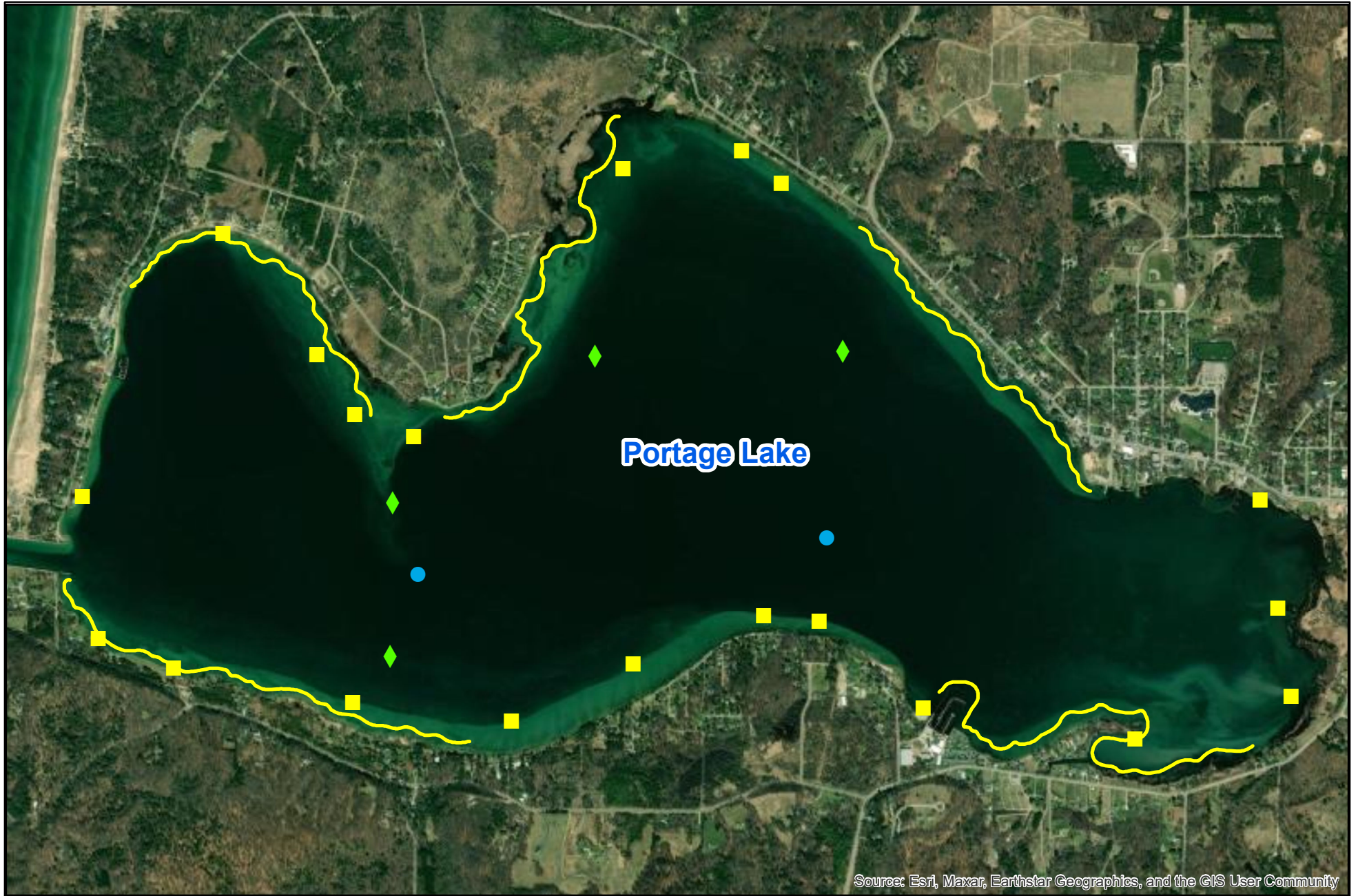


**Legend**

- Township Boundary
- Section Boundary

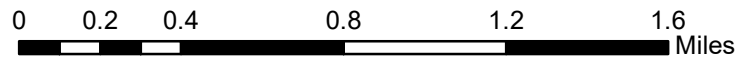


<b>PROJECT</b>	Portage Lake Fish Survey
<b>TITLE</b>	Project Location
<b>FIGURE</b>	1-1



**Legend**

- Water Quality Locations
- Fyke Net Locations
- ◆ Gill Net Locations
- Electrofishing Locations



**AeM** | ADVANCED  
ECOLOGICAL  
MANAGEMENT

PROJECT	Portage Lake Fish Survey
TITLE	Survey Gear Locations
FIGURE	3-1

### Portage Lake Rockbass Length Frequency Distribution June 2023

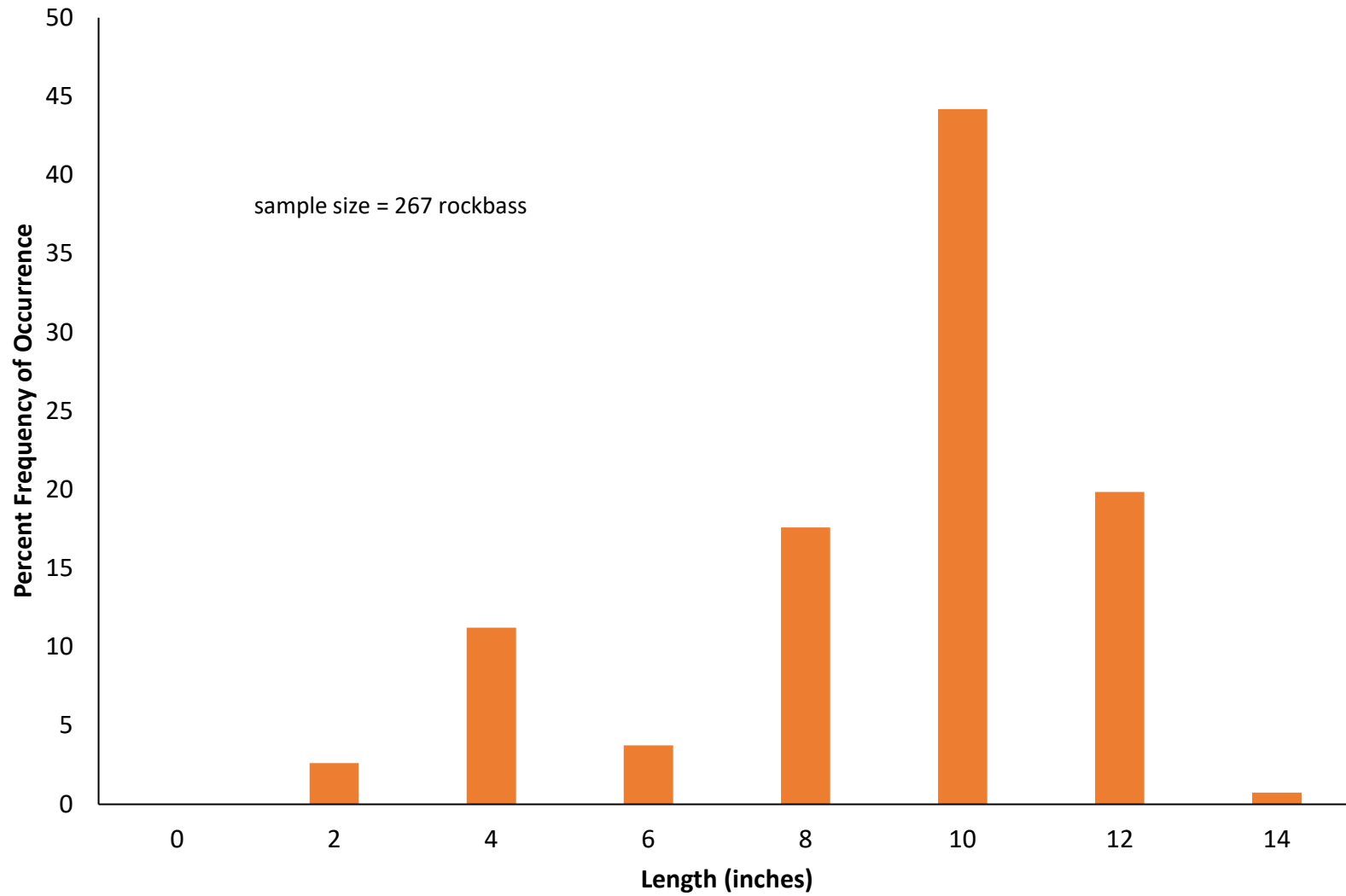


Figure 4-1. Length frequency distribution of rockbass in Portage Lake.

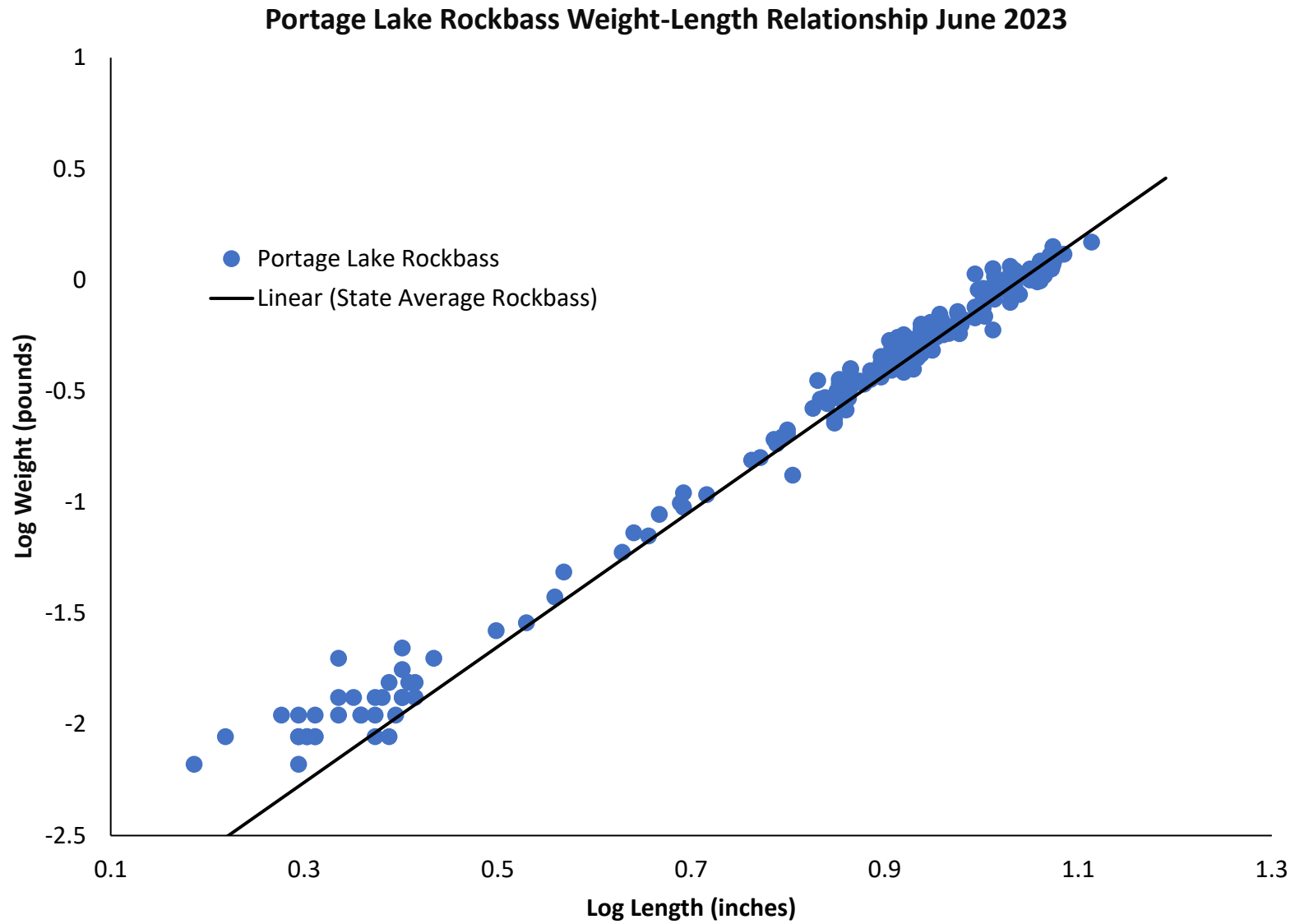


Figure 4-2. Rockbass weight-length relationship in Portage Lake.

### Portage Lake Alewife Length Frequency Distribution June 2023

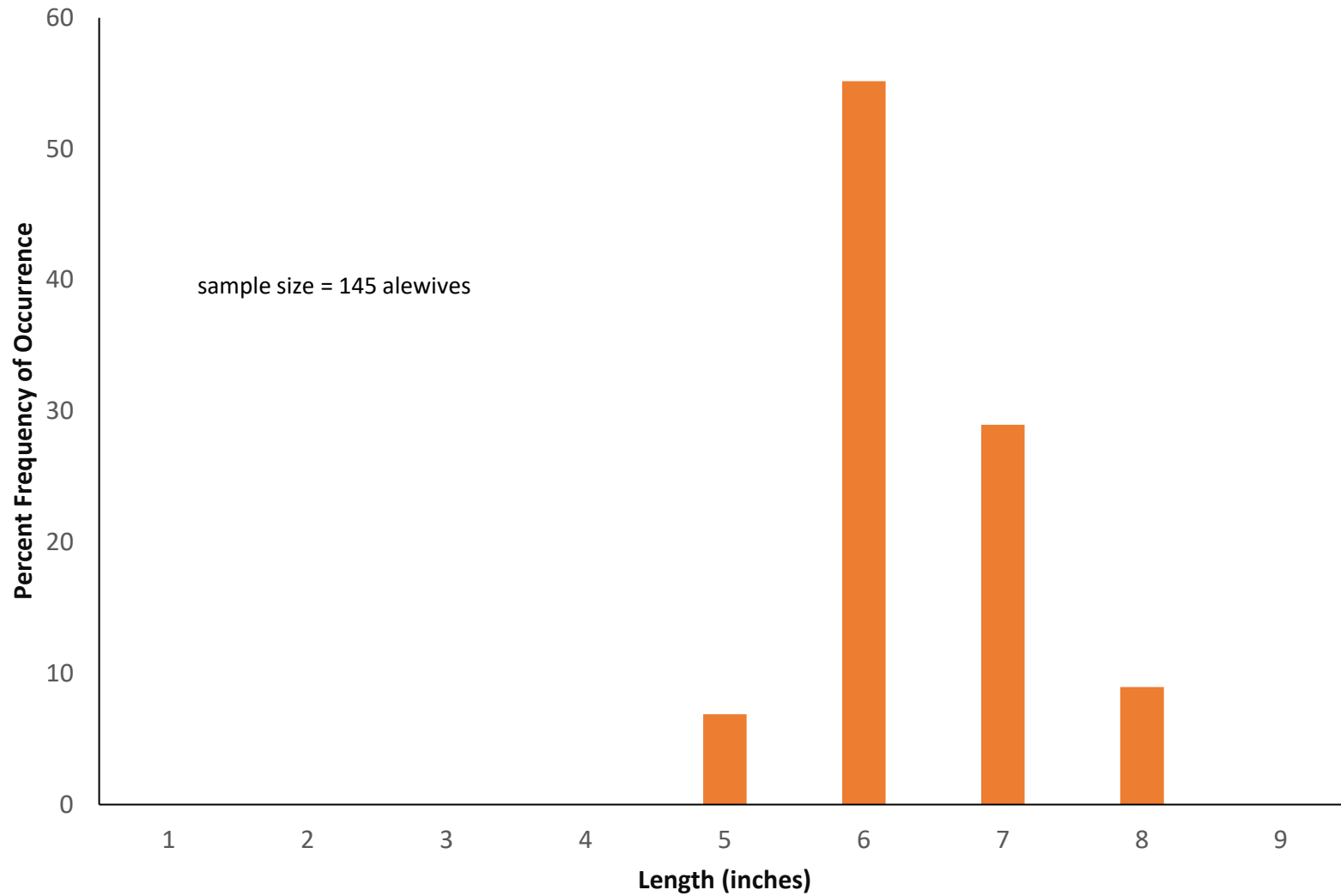


Figure 4-3. Length frequency distribution of alewives in Portage Lake.

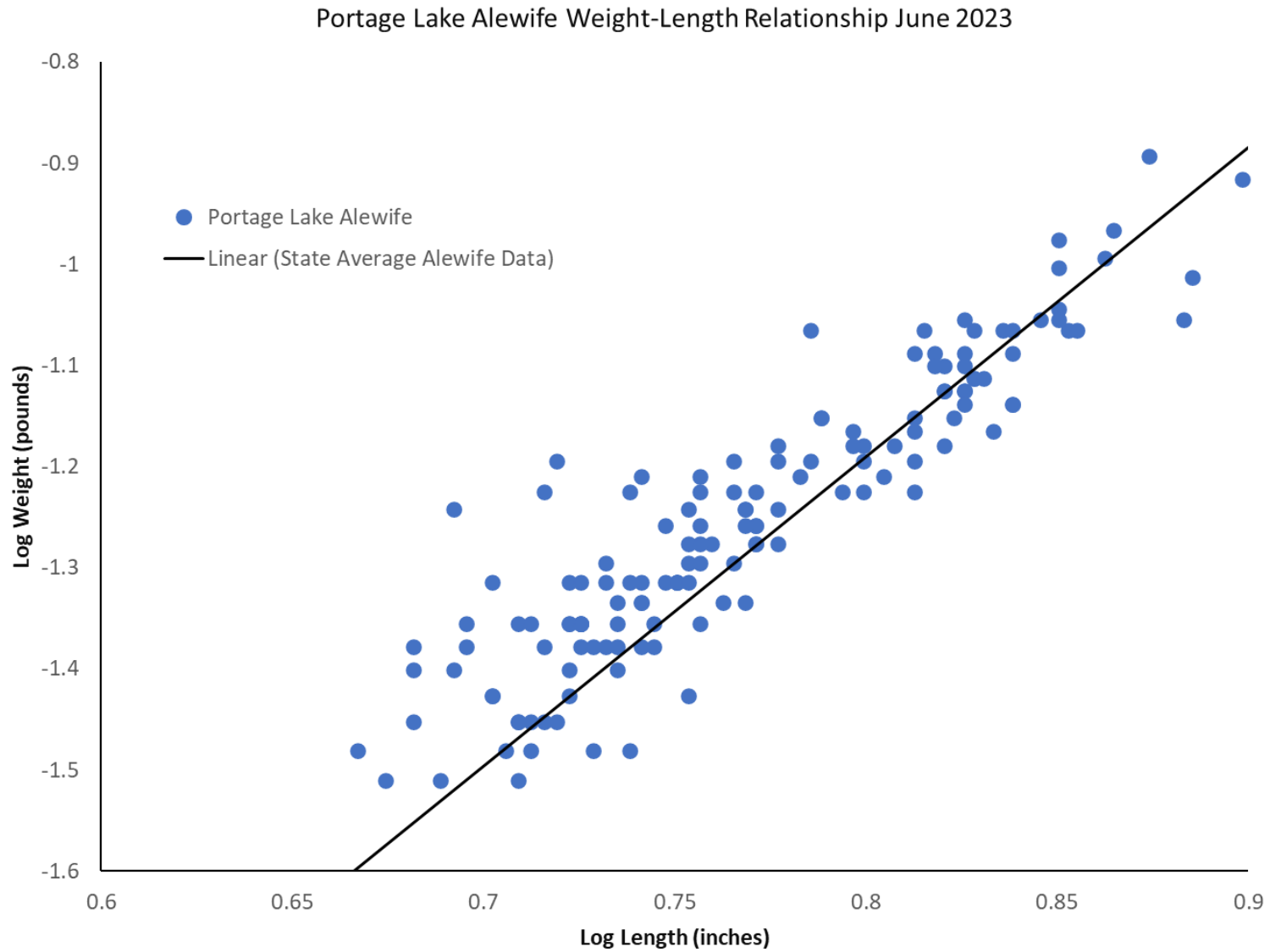


Figure 4-4. Alewife weight-length relationship in Portage Lake.



### Portage Lake Yellow Perch Length Frequency Distribution June 2023

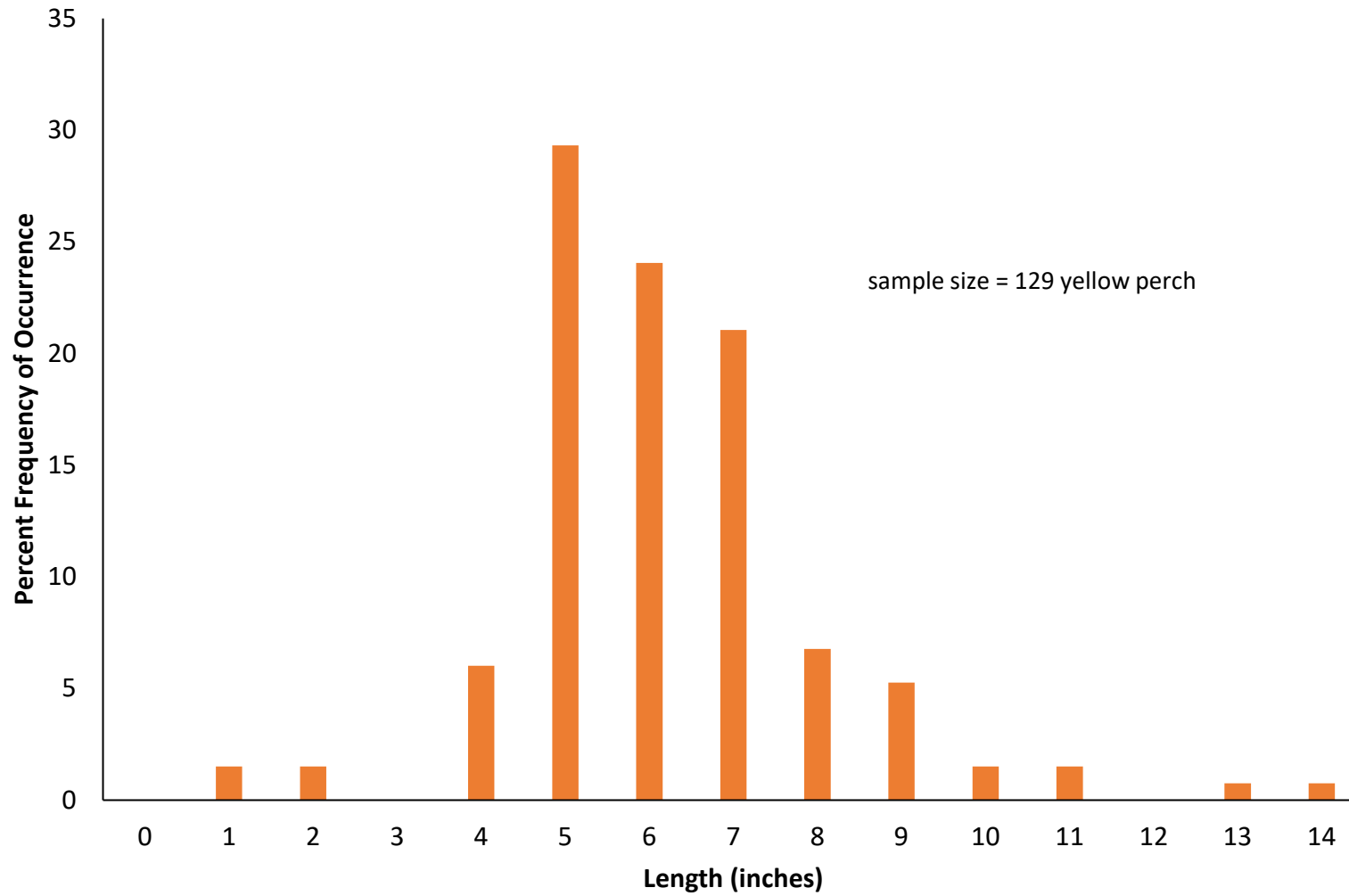


Figure 4-5. Length frequency distribution of yellow perch in Portage Lake.

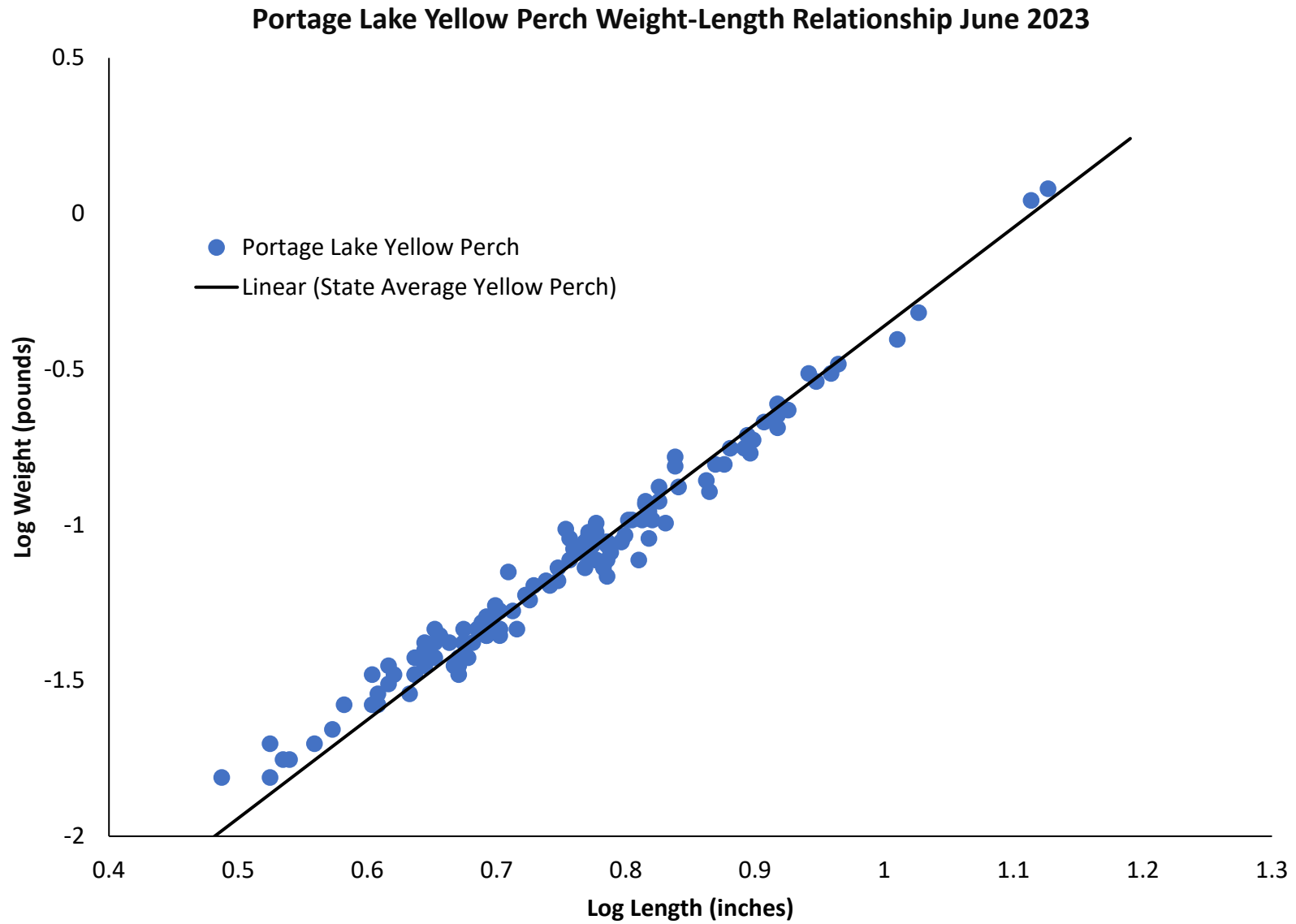


Figure 4-6. Yellow perch weight-length relationship in Portage Lake.

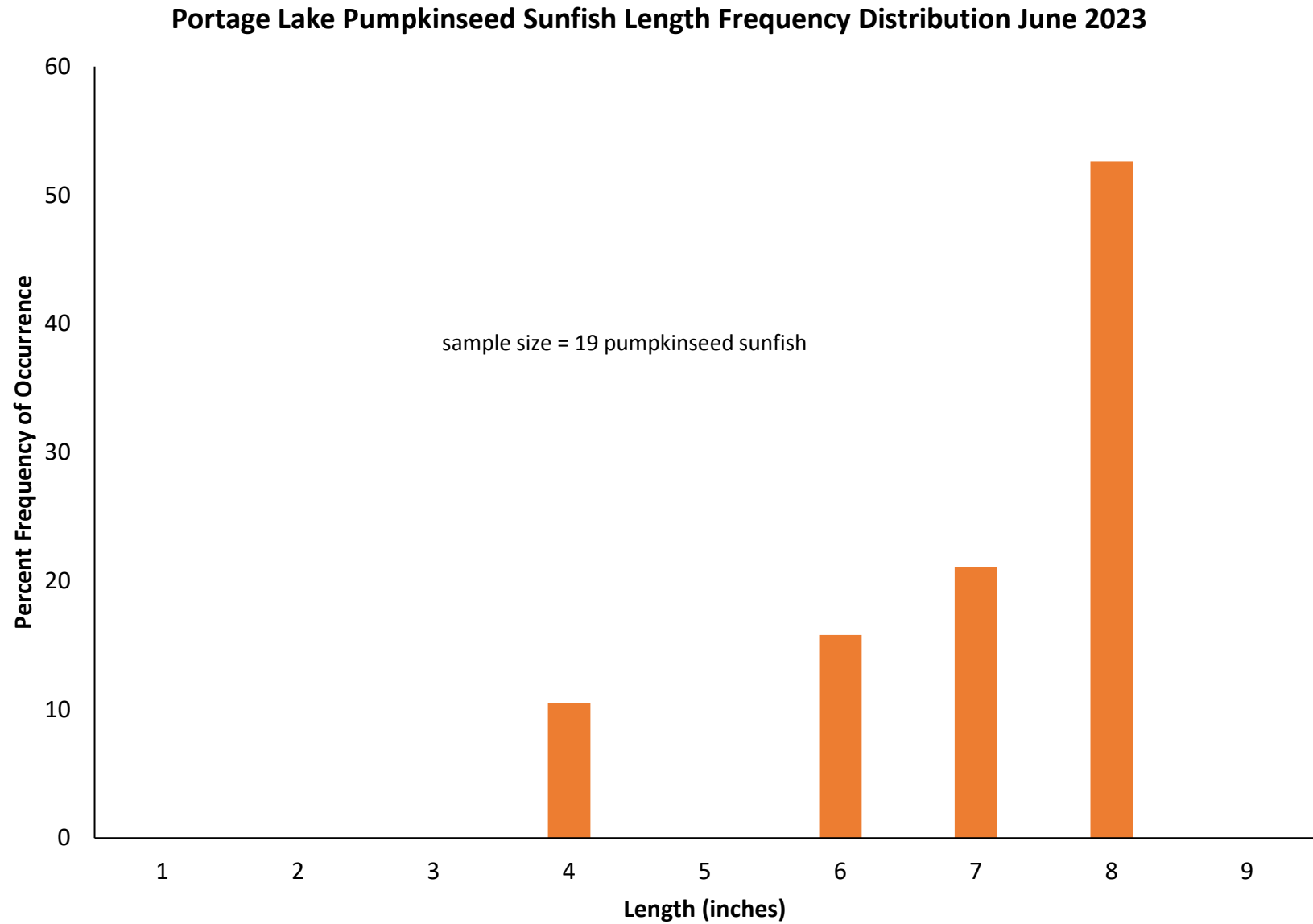


Figure 4-7. Length frequency distribution of pumpkinseed sunfish in Portage Lake.

**Portage Lake Pumpkinseed Sunfish Weight-Length Relationship June 2023**

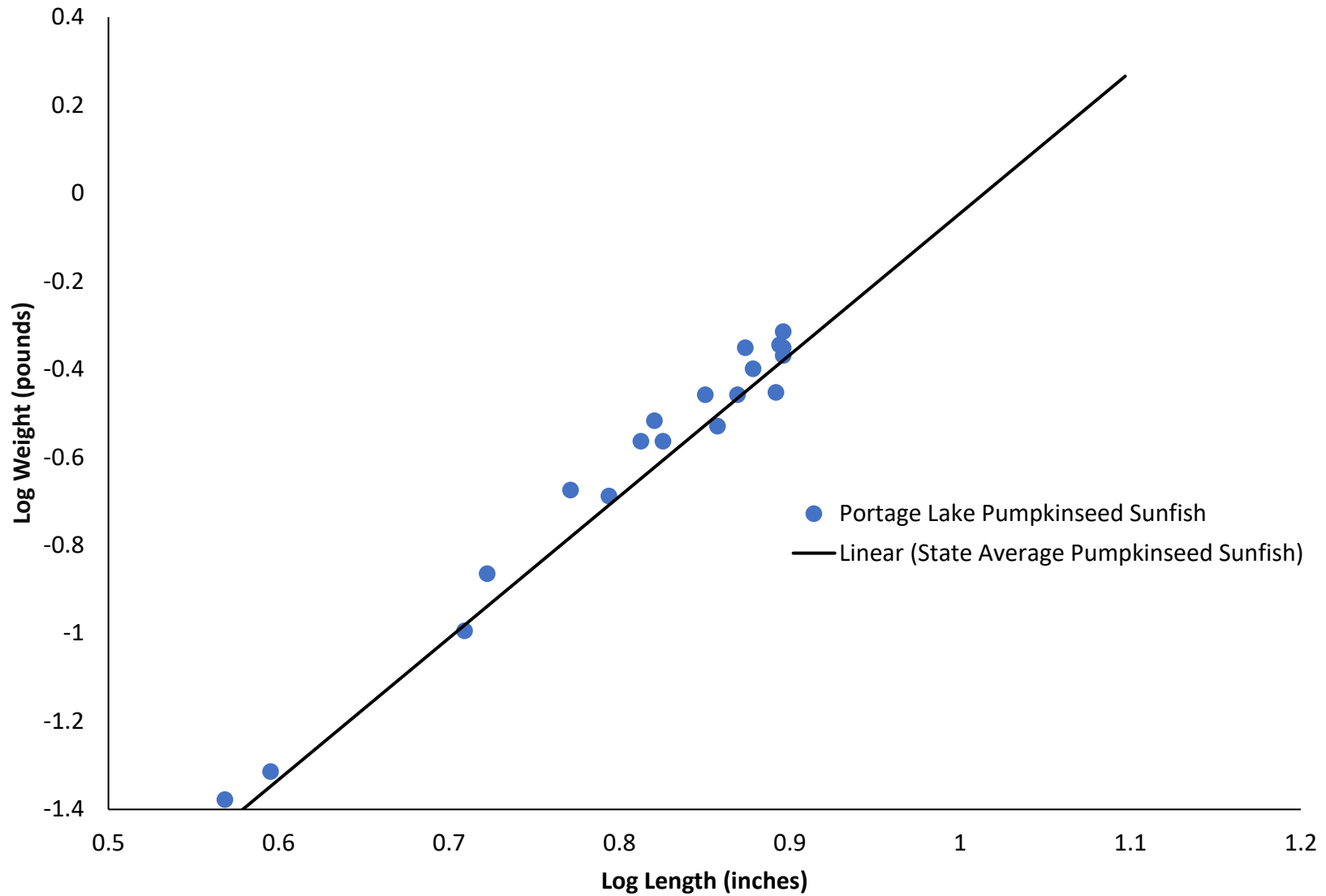


Figure 4-8. Pumpkinseed sunfish weight-length relationship in Portage Lake.

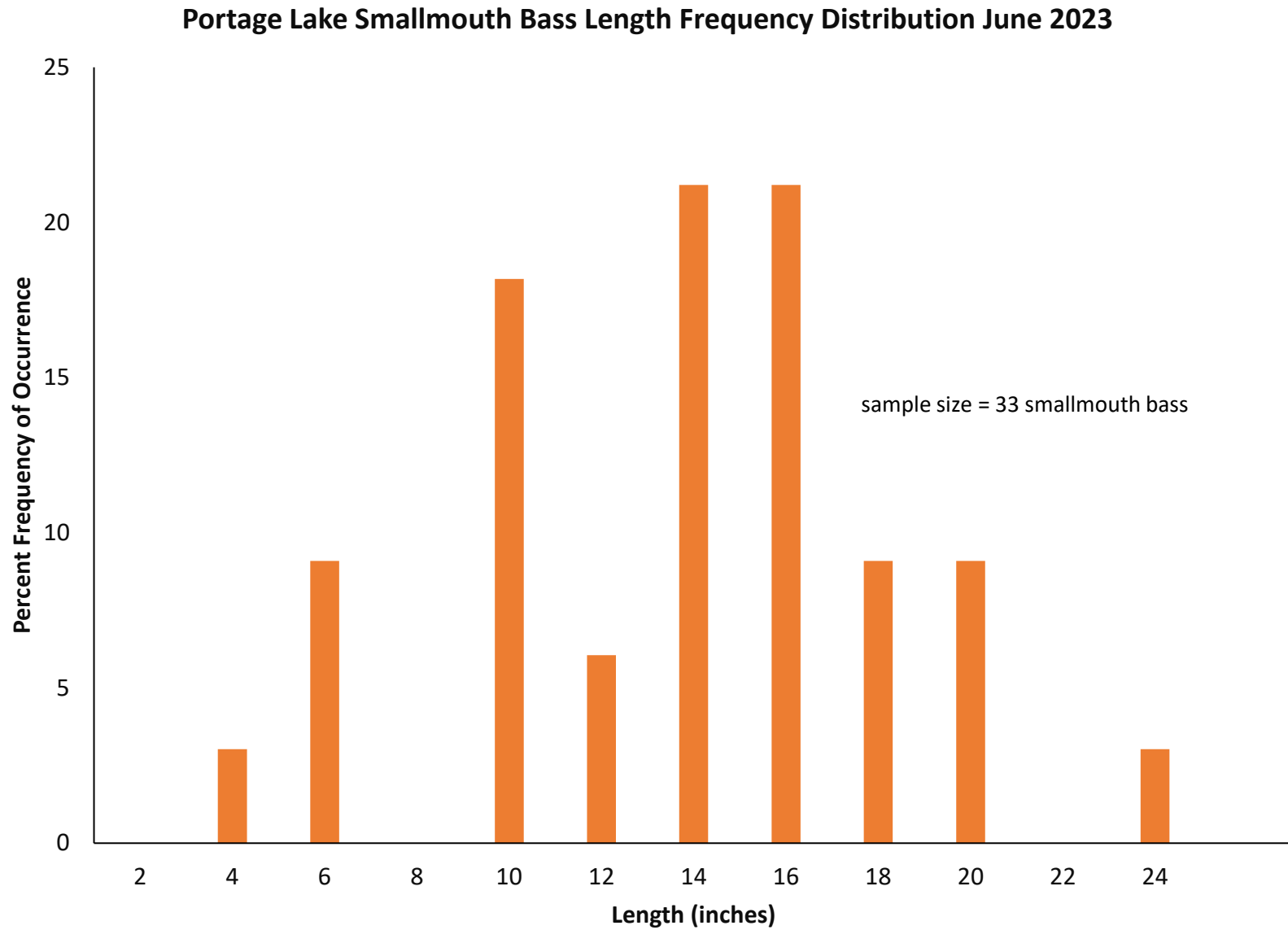


Figure 4-9. Length frequency distribution of smallmouth bass in Portage Lake.

### Portage Lake Smallmouth Bass Weight-Length Relationship June 2023

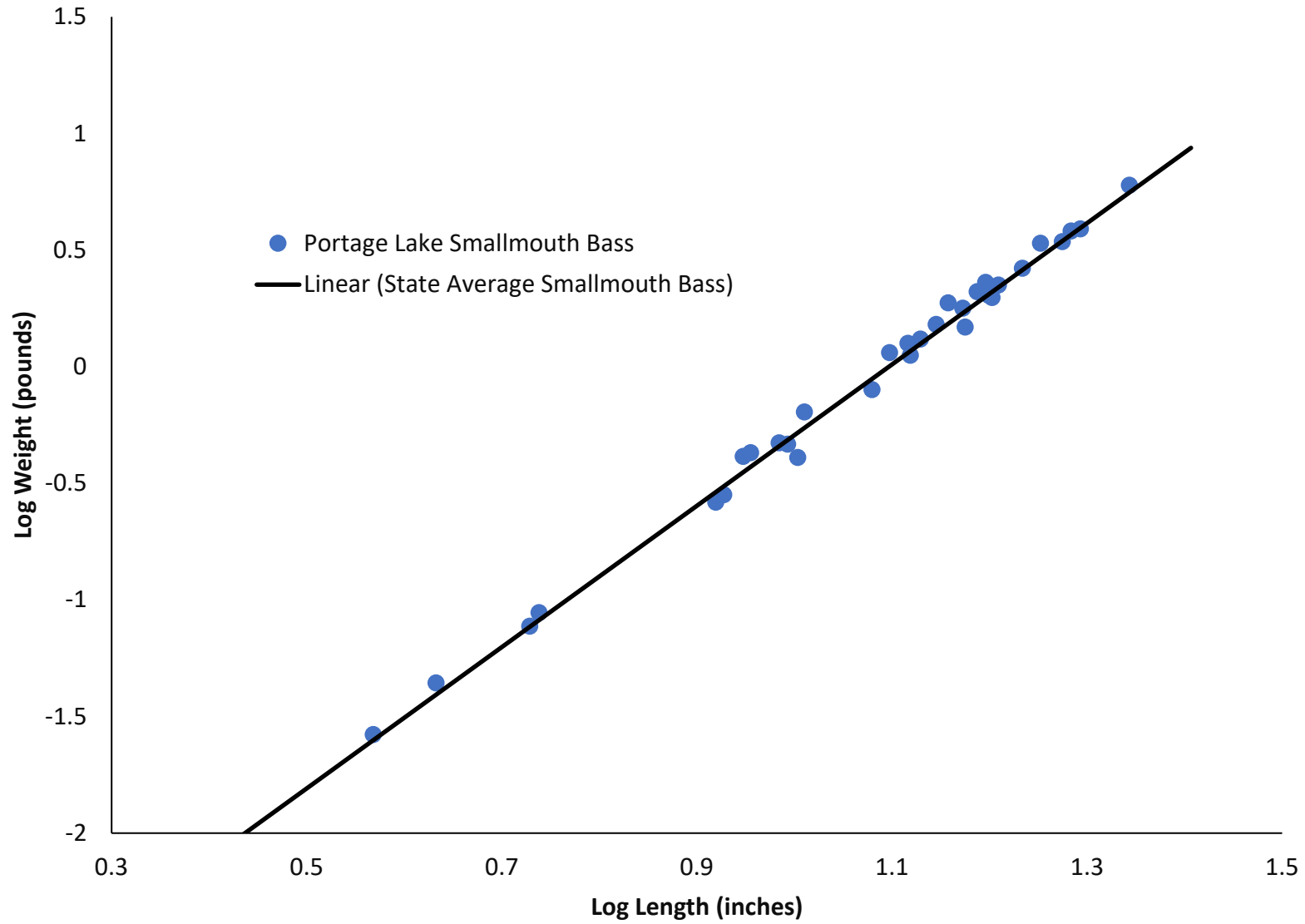


Figure 4-10. Smallmouth bass weight-length relationship in Portage Lake.

### Portage Lake Northern Pike Length Frequency Distribution June 2023

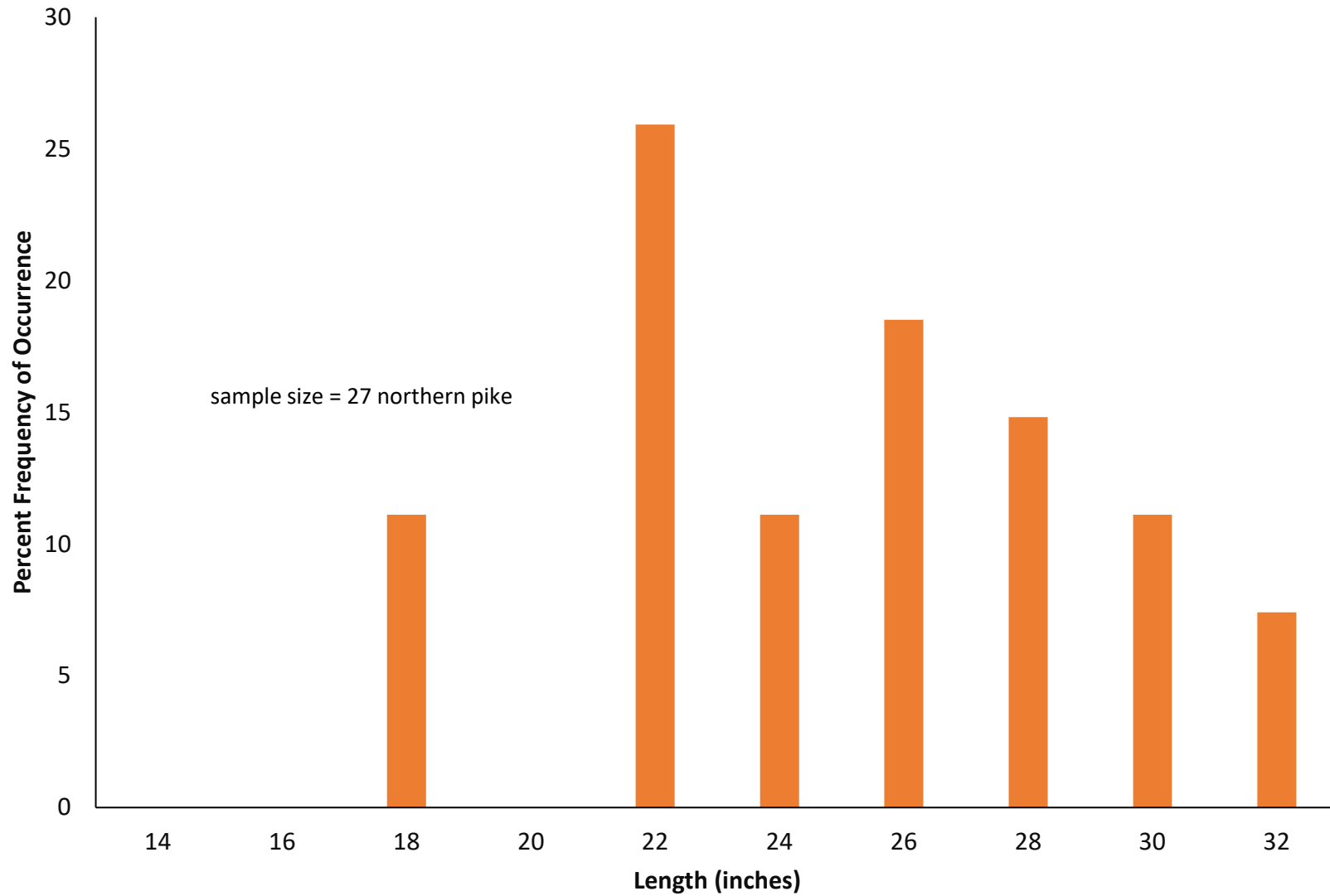


Figure 4-11. Length frequency distribution of northern pike in Portage Lake.

Portage Lake Northern Pike Weight-Length Relationship June 2023

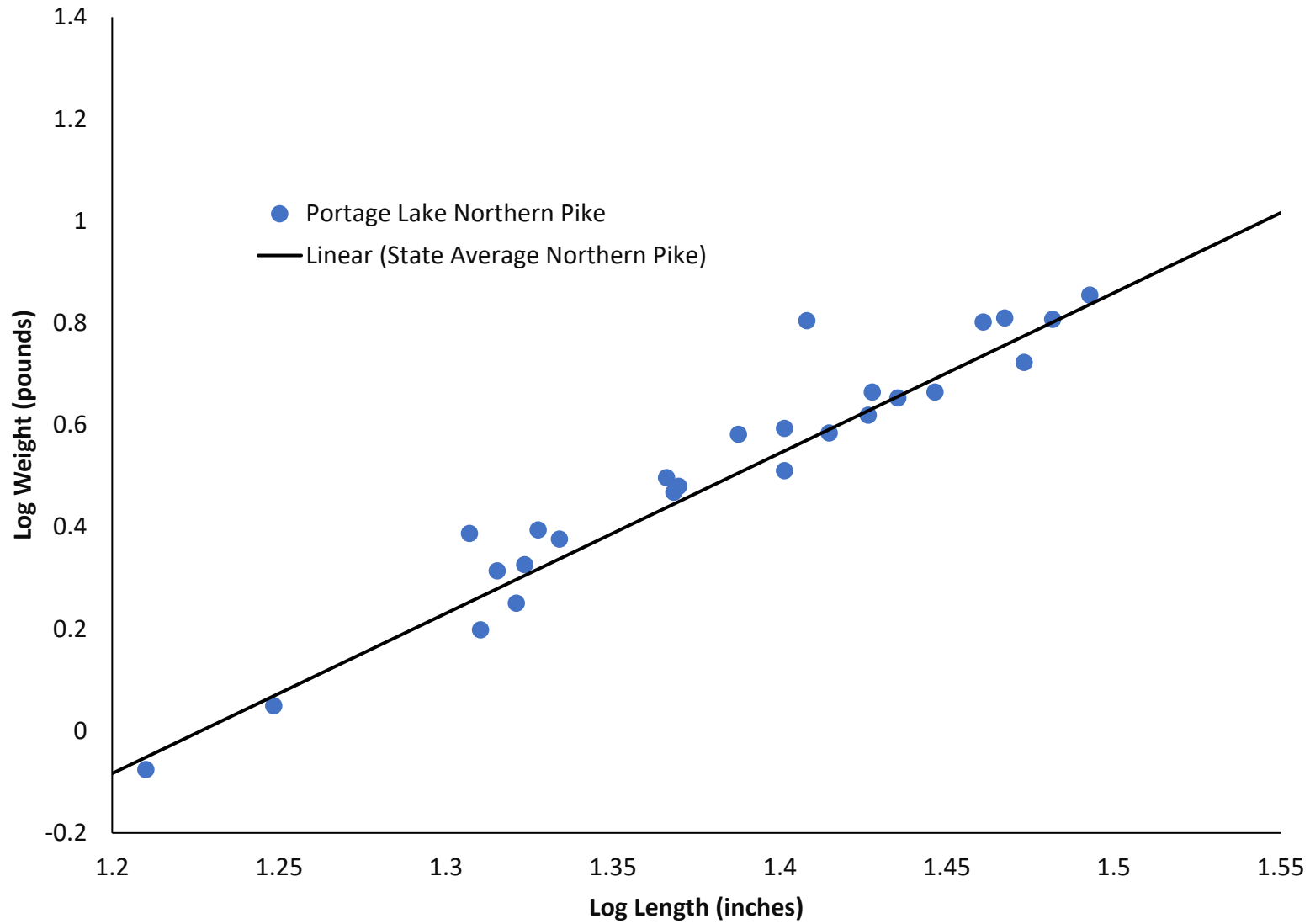


Figure 4-12. Northern pike weight-length relationship in Portage Lake.





Photograph 1. Longnose gar collected from Portage Lake, June 2023.



Photograph 2. Typical smallmouth bass collected from Portage Lake.



Photograph 3. Walleye collected from Portage Lake.



Photograph 4. Yellow perch collected from Portage Lake.



Photograph 5. Silver redhorse collected from Portage Lake.



GRETCHEN WHITMER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF NATURAL RESOURCES  
LANSING



M. SCOTT BOWEN  
DIRECTOR

DATE: February 13, 2024  
TO: Onekama Township Invasive Species Committee  
FROM: Scott Heintzelman, Supervisor, Central Lake Michigan Management Unit  
SUBJECT: Portage Lake memo, Onekama Township Hall, February 7, 2024

Michigan Department of Natural Resources (MDNR) Fisheries Division Unit Manager, Scott Heintzelman, met with the Onekama Township Invasive Species Committee to discuss the findings of the Advanced Ecological Management (AEM) fisheries survey conducted on Portage Lake, summer 2023.

- Survey conducted by AEM staff followed MDNR protocol (net types/gear) to sample fish communities.
- Survey design used by AEM was determined in consultation with MDNR to produce best possible results.
- Over a thousand fish representing 28 different species were collected during the survey by AEM.
- MDNR Fisheries Managers have reviewed the survey results and analysis and generally agree with the summary. The AEM survey is comparable to past MDNR surveys of Portage Lake.
- Concerns related to panfish populations (bluegill/pumpkinseed) raised in the AEM survey summary are warranted, however other recent MDNR survey information was not included and might buffer these conclusions:
  - MDNR creel survey results from 2009 – 2019 consistently show yellow perch and bluegill as being the most caught species in Portage Lake. Although catch rates for both species fluctuates from year to year they remain the most popular fisheries, followed by bass fisheries.
  - MDNR walleye survey conducted in March 2021 caught 100 bluegill as bycatch. Length of bluegill and count was recorded. Bluegill ranged from 3 inches to 11 inches, indicated good size and age distribution.
- Although catch numbers were very low for bluegill and pumpkinseed sunfish during the AEM survey, fish ranged in size from 2 inches to 8 inches indicating several age classes exist in Portage Lake and reproduction is occurring.

Other discussion items: The AEM survey along with all past MDNR surveys of Portage Lake have specified aquatic habitat, and nearshore habitat preservation as being critical to ecology and overall health of the Portage Lake watershed. Potential items the Invasive Species Committee could pursue would be:

- Aquatic habitat education, best management practices for private property owners, recommendations for boat operators to reduce erosion and resuspension of fine materials, educational signage posted at key access points.
- Habitat restoration, including nearshore habitat projects on public property, habitat restoration projects with willing property owners, explore various grant opportunities. Consult with local MDNR Fisheries Biologist.
- Invasive species management, review treatment plans, examine all options, understand risk vs consequences.

If need further information or assistance, please contact me at 231-433-9782, or by email at [heintzelmans@michigan.gov](mailto:heintzelmans@michigan.gov).

cc: Mark Tonello



Photos courtesy of the Portage Lake Association. Photographer: David Maylen..

# Portage Lake

## Lake Management Plan 2023

Prepared for Onekama Township and the Invasive Species Committee

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February 20, 2024



**PLM**  
LAKE & LAND  
MANAGEMENT CORP

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# Lake Management Plan

## Executive Summary

In 2008, a group of concerned citizens began working on Phragmites control, to prevent this invasive species from continuing to spread throughout the Portage Lake Watershed. Throughout the process of learning Best Management Practices (BMPs) and determining priority areas of Phragmites control on Portage Lake, other nonnative, invasive plants were identified. A formal survey was completed on Portage Lake and initiation began to manage these environmentally damaging species in 2009. Although some of the species identified as a concern had been present for quite some time, others were newer infestations. In an attempt to manage all high risk invasive species, a lake management plan was set in place, with goals of identifying and reducing the presence of aquatic invasive species (AIS) throughout Portage Lake as well as the Portage Lake watershed. The plan included controlling high risk species, including those that had been left unmanaged and were continuing to spread in Portage Lake and negatively impact native plants, as well as tracking plant trends, monitoring water quality and ultimately protecting Portage Lake into the future. The following report breaks down the specifics of the previous, current and future management needs.

As part of this integrated program, numerous best management practices have been utilized in this management plan, including biological control methods for Purple loosestrife. Annual monitoring is key to the success of the program and regular surveys found a new nonnative infestation in 2020 and 2022. European frog bit (EFB) was found on the east shoreline of the lake, mixed in with cattails. EFB is a highly concerned floating leaf plant and as part of the early detection rapid response program underway on Portage Lake was addressed quickly and none was found post management. Starry Stonewort (SSW) was positively identified in Portage Lake in 2020 through early detection and rapid response, the negative impacts of this plant have been kept minimal, thus far. In 2023, just over 6 acres of nonnative, submersed aquatic plants were managed in total, ~0.3% of Portage Lake, while at no time has more than nine percent of the lake received herbicide management. This program has successfully removed and managed the exotic infestation population, while preserving much of the lake from exotic plant disturbance. Further, with over 92% of the lake not receiving any herbicide treatment, the native plant community has been left as natural as a lake will allow with adjusting water levels/depths, a constant changing environment and exotic species introductions. In addition, less than 1 acre of emergent, nonnative plants were targeted for control in 2023, showing long term success from the original infestation. As part of an integrated approach, hand pulling also occurred, in an effort to control European frogbit.

Extensive vegetation surveys and water quality testing is included in the management program annually, to allow a checks and balance over the program and ensure the long-term protection of the lake. The abundance of healthy native plants in Portage Lake increases the long-term stability of the lake, which has been continually found in the extensive surveys performed on Portage Lake. While some water quality parameters have maintained themselves with little change over the years, other parameters have shown some fluctuations. One of the most important parameters to test is Total Phosphorus (TP). Generally speaking, a downward trend in TP has been found in many years, with a few random elevations. However, trendline data shows consistent low levels, an excellent sign. Additionally, internal loading has only shown small peaks or elevated levels, meaning that overall lake trends are positive. The Tributaries and Storm Drains around Portage Lake continue to show elevated nutrient levels and prove to be a point source for bringing excess nutrients into the lake. In 2021 and 2023, sampling showed the smallest TP input in recent years, but in 2022, results were similar to historic high levels, showing a source of concern. This information is vital in determining the areas within Portage Lake that need to be focused on to reduce nutrient loading to help reduce the productivity in Portage Lake. Although seasonal fluctuations can occur, long term trend data has to be evaluated for overall health. The ability of Portage Lake to produce algae and aquatic plants is directly related to the overall health (nutrient base) of Portage Lake and its surrounding watershed. While the main goal of the management program is to

protect the long-term ecological health of the lake, it is also important to protect the recreational, aesthetical and financial aspects of the lake as well. All of these factors play into the management efforts on Portage Lake, which need to be continued into next season.

## Introduction

This management plan documents management activities during 2023, examines current conditions in the lake, and provides management recommendations for 2024. The plan will detail an integrated approach to lake management including but not limited to exotic weed control, water quality monitoring and aquatic vegetation surveying.

## Characteristics of the Lake

Portage Lake is a 2110-acre lake located in Onekama Township and the Village of Onekama, Manistee County, Michigan. Public access to the lake is provided by multiple access sties. A large portion of the shoreline has been developed and of that, a majority for single-family year-round homes. A formal lake-use survey was not included in this study, but observations made while working on the lake indicate that



the lake is used for fishing, boating (power & non-power), and swimming. Portage Lake makes up 13.6% of the overall Portage Lake Watershed, which drains into Lake Michigan. Numerous other lakes and tributaries flow into Portage Lake, which has a man-made channel into Lake Michigan on the west end. Portage Lake is a natural lake with two deep holes approximately 60' deep.

A few problems necessitating management of Portage Lake are: (1) exotic and invasive species, and (2) water quality concerns. The presence of multiple exotic species has required annual management of the aquatic and terrestrial plants within and around Portage Lake.

Establishment of weedy exotic aquatic plants, including Eurasian watermilfoil and curly leaf pondweed, exacerbates problems caused by aquatic vegetation in the lake. These weedy exotic plants grow to the surface and cause substantially more interference with recreation than native plants.

## Management Goals for Portage Lake

- The primary goal of management in Portage Lake is to control and manage nonnative plants, to allow recreational use of the lake and promote a healthy fishery. The nonnative or exotic plant species, Eurasian watermilfoil, Starry stonewort, Curlyleaf pondweed, Euroupen frogbit and Phragmites, should be controlled throughout Portage Lake to the maximum extent possible. Native plants should be encouraged throughout the lake to promote an overall healthy ecosystem. Genetic testing in Portage Lake has found that the Eurasian watermilfoil is hybrid, a new genetic strand of milfoil. In reference to Portage Lake, Eurasian milfoil or EWM will be referring to both EWM and Hybrid milfoil as it all needs to be managed as a nonnative or exotic, invasive species.
- Aquatic plant management should preserve species diversity and cover of native plants sufficient to provide habitat for fish and other aquatic organisms. Native plants should be managed to encourage the growth of plants that support the Portage Lake fishery (by creating structure and habitat) provided that they do not excessively interfere with recreational uses of the lake (e.g., swimming and fishing) in high-use areas. Where they must be managed, management techniques that reduce the stature of native plants without killing them (e.g., harvesting, contact herbicides) should be used whenever possible. Specific areas should be set aside where native plants will not be managed, to

provide habitat for fish and other aquatic organisms. Muskgrass (*Chara*) should be allowed to grow throughout the lake, except in where it grows so tall as to interfere with boating and swimming.

- Water quality efforts in Portage Lake should continue to be made to reduce external loading of nutrients. Proper watershed management techniques should be applied where possible and lake residents should be encouraged to practice “lake friendly” lawn maintenance.
- Outreach/education of the Portage Lake residents should continue in an attempt to communicate lake activities and management goals. The Portage Lake website should be maintained as a way to directly relay pertinent information along with annual meetings and newsletters.
- Based on currently survey results, the following species are recommended for specific management on Portage Lake.
  - EWM, an exotic species, is an extremely aggressive submerged aquatic plant that has the abilities to form a monoculture among vegetation. EWM spreads by fragmentation (every inch of plant can sprout new growth) and has a very strong root system. EWM forms a canopy above native plants, choking out the competition. EWM also has the ability to overwinter underneath the ice, allowing it to be present throughout the winter. This gives the plant a head start in growing during the spring and chokes out native plants very quickly. EWM should be controlled as soon as it is found within a waterbody to prevent further infestation and loss of native plant diversity. NOTE: Once a native plant is lost in a lake, there is no guarantee it will return.



- The macroalgae species, Starry stonewort (SSW), should be actively controlled and managed. Starry stonewort is in the same family as Muskgrass (*Chara*) but is considered an exotic invasive species. Starry stonewort, which looks very similar to the beneficial species *Chara*, is appearing in more and more lakes. *Chara* is a highly desired plant because it is typically low growing, keeps the water clear and can slow down the invasion of exotic weed species. Starry stonewort also forms dense mats, but unlike *Chara*, it can grow from 5 to 7 feet tall. Starry stonewort can be very detrimental to a lake’s ecosystem and has the ability to kill off native plants and have a negative impact on a lake’s fisheries.
- European frog-bit, an exotic plant found in Portage Lake in 2022, is a free-floating aquatic plant native to Europe, Asia and Africa. European frog-bit was first found in SE Michigan in 1996 but has recently made its way to west



Michigan over the last 5 years and is now popping up in Northern Michigan and in numerous areas along the Lake Michigan coastline. European frog-bit can form dense mats on the surface of slow-moving waters like bayous, backwaters and wetlands. Mats can impede boat traffic and alter food and habitat for fish. Prolific growth of European frog-bit can also reduce oxygen and light in the water column. The plant is spread by plant fragments or turions (seed pods) transported on boats, trailers and recreational gear. Once established, drifting mats of vegetation spread to connected waters. Control options include chemical, mechanical and physical removal.



- The aquatic invasive terrestrial plants, Purple loosestrife and Phragmites should be controlled along the shoreline and adjacent wetlands where present. Both species are exotic and have the ability to displace beneficial native vegetation. Purple loosestrife grows 2 -4 feet tall and is a vibrant magenta color. It is very aggressive and can quickly become the dominant wetland vegetation. 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. As Portage Lake also hosts a healthy native Phrag community, it is vital to identify each strand for proper management and promote native Phragmites, when present.



- The terrestrial invasive plant, Japanese knotweed should be controlled throughout the Portage Lake Watershed. Japanese knotweed is a large, herbaceous perennial plant native to Eastern Asia. In North America, the species has been classified as an invasive species. Japanese knotweed has hollow stems with distinct raised nodes that give it the appearance of bamboo, though it is not closely related. Reaching a maximum height of about 12’ each growing season, it is typical to see much smaller plants in places where they sprout through cracks in the pavement or are repeatedly cut down. The invasive root system and strong growth can damage concrete foundations, buildings, roads, paving, retaining walls and architectural sites. It can also reduce the capacity of channels to carry water. It forms thick, dense colonies that completely crowd out any other herbaceous species. The success of the species has been partially attributed to its tolerance of a very wide range of soil types, pH and salinity. The plant is also resilient to cutting, vigorously resprouting from the roots. The most effective method of control is by herbicide application close to the flowering stage in late summer or autumn.



- Narrow-leaf cattails, another terrestrial invasive species, which can often be confused with the Common cattail, are often found growing in marches, lakeshores, ponds, ditches, etc. Similar to other invasive species, Narrow-leaf cattails often form monocultures and outcompete other native species, leading to a concern for species habitat and often affecting recreational use of the area. Narrow-leaf cattail’s leaves are about ½ inch wide, roughly half the width of the native broadleaf cattail. The stem is roughly 3-6’ tall. The two species also hybridize, producing a cross that can exhibit characteristics of both species, though is often taller and more aggressive than either parent species and can be more difficult to identify. Management options include mowing, digging, grazing, water level manipulation, and chemical control.



## Lake Management Overview including various Best Management Practices

### Integrated Pest Management (IPM)

IPM approaches to aquatic plant control 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. IPM approaches minimize treatment costs and the use of chemicals. Lake Management planning



ensures the most appropriate, cost-effective treatment for your lake. Planning is an essential phase of Integrated Pest Management and includes lake vegetation surveys, water quality evaluation and a detailed,



written lake management plan. Having the plan in place helps lake users know what to expect from lake management. Survey results provide a permanent record of conditions in the lake and the impact of management practices.

### Prevention

Early detection and rapid response are key to a successful program. As part of any community education and outreach program, preventing introductions is key. More often than not, nonnative aquatic plants (exotic species) were possibly introduced to Portage Lake by plant fragments carried on boats and/or boat trailers. A variety of other troublesome exotic plants and animals that have been introduced to Portage Lake are also transported this way. Preventing their inadvertent introduction to Portage Lake can significantly lower the cost of future lake management. Education can be an effective preventative measure. Newsletter articles should alert lake residents to the threat from exotic nuisance plants and animals. Warning signs should be erected at any public boat access sites, if applicable, that encourage boaters to clean boats and trailers when launching or removing watercraft from the lake.



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### Monitoring

It is important to maintain a record of lake conditions and management activities. Vegetation surveys monitor types and locations of plants in the lake, providing information that is essential to the administration of efficient, cost-effective control measures. Vegetation surveys also document the success or failure of management actions and the amount of native vegetation being maintained in the lake. Water quality monitoring can identify trends in water quality before conditions deteriorate to the point where remediation is prohibitively expensive or impossible. Records of past conditions and management activities also help to keep management consistent despite changes in the membership of the organization. Records should include (at a minimum):

- Temperature, dissolved oxygen and Secchi disk depth should be measured in the lake at both deep hole basins. Temperature and dissolved oxygen profiles should be obtained in the deep hole, so as to monitor the timing and extent of oxygen depletion in the hypolimnion (i.e., bottom water).
- Total phosphorus, nitrates, and ammonia should be measured in the surface and bottom water at least two times per season (spring and late summer) to monitor nutrient accumulation in the hypolimnion.
- Chlorophyll a sampling
- Tributary testing including flow and nutrient sampling

- Lake vegetation should be surveyed on an annual basis (late spring and/or late summer/early fall) to document the results of plant management efforts and provide information necessary for planning future management.

## Early Detection Rapid Response (EDRR)

Early detection and rapid response, EDRR, addresses the critical period between introduction and establishment of a new invasive species population, and is the point when the focus of management shifts from prevention to containment, control and eradication. In Michigan, numerous watch list species are listed with established procedures to appropriately and efficiently respond to new invasions. This list to the right includes some high priority species within Michigan. Other species may be found within Michigan but not in Portage Lake and therefore would be considered a watchlist species for your lake (i.e. Starry stonewort).



Portage Lake has successfully used an EDRR protocol to address the new introductions in the last three years including, Starry stonewort and European frog bit. To better allow the Portage Lake management program and Invasive Species Committee to be successful, if and when a new nonnative species and/or watchlist species is found in Portage Lake, the following plan will take place:

- 1) Immediate notification to the Invasive Species Committee and/or Chair with possible phone call while still on site and/or email/phone call following survey.
- 2) Notification to local municipalities (Township and Village) via email.
- 3) Notification to the State of Michigan, including but not limited to EGLE, CISMA, Michigan Invasive Species Program, DNR.
- 4) Warning signage at the site, if needed, to prevent transport in/and out of area.
- 5) Containment of area if possible.
- 6) Review of management options with committee including but not limited to the following: use of funds from current SAD fund, if applicable; implementation of best management practices for control.
- 7) Control Implementation as quickly as possible to stop further spread.

This policy may be modified and updated as required by the committee. Additional resources are set up to assist in identification and management including [www.misin.msu.edu](http://www.misin.msu.edu); [www.michigan.gov/invasives](http://www.michigan.gov/invasives)

If and when a species is found during an active treatment and if Lake Manager determines immediate threat and if the permits, etc. are in place and if management follows standard best management practices, implementation of control may take place on site.

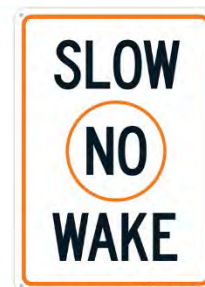
## Wake Boats

The popularity of wake sports has been on the rise over the past decade and with it the number of “wake boats” operating on lakes. Whether wake boarding or wake surfing, these boats are designed to produce large waves. Hull shape, ballast tanks, adjustable plates, and horse power are some of the technologies used. These waves are often equal to or greater than most major storm events which can increase shoreline erosion. Unlike old school/conventional “ski” boats which typically push thrust parallel to the water’s surface, wake boats tend to push thrust at a downward angle and therefore have a greater potential to disrupt bottom sediments in addition to shoreline erosion.



Several recent scientific findings provide unequivocal evidence that the dramatic upsurge in popularity of enhanced wake dependent water sports are having an adverse impact on frequently exposed aquatic ecosystems. Shoreline degradation, shallow water habitat disturbance, safety related incidences, and damage to waterfront property occur primarily as a result of operating too close to shore. Waves decrease in size the longer they travel. When operated too close to the shoreline, extensive damage to natural shorelines, seawalls and waterfront property occur. Impacts from wake boats include but is not limited to high volume sediment resuspension, deposition and accumulation includes loss or degradation of fish spawning areas, less desirable fish species, loss of fish foraging habitat, impaired or destroyed adjoining wetlands and a reduction in the capacity of affected lakes, rivers and wetlands to support diverse and recreational opportunities (Johnstone *et al.*, 2010).

Studies conducted on different wake boat models suggest that thrust (depending on the trim angle) will typically reach a depth of ~12 feet. Operating wake boats in depths greater than 12 feet whenever possible is high recommended. Maintaining isolation areas from shorelines is also recommended and/or trying to avoid shoreline areas of importance due to erosion, habitat, etc. As time goes on there is certain to be more research done in this area and/or regulation. For the time being, being aware of potential effects on your lake and adapting boating practices to minimize impacts is the best practice.



## Fishery

Portage Lake has a diverse fishery including both cool and warm water species. Many of the fish species rely on vegetated areas to spawn, forage and seek refuge. A healthy native aquatic plant community offers favorable habitat for many species that benefit from the complexity of architectural diversity. Exotic invasive aquatic plant species, such as Eurasian watermilfoil and Starry Stonewort are known to displace native plant communities, reduce architectural diversity and have negative effects on fish populations. Managing exotic aquatic plant species while maintaining native plant communities promotes a healthy and stable fish community.



In 2023, an independent fish survey was completed by Advanced Ecological Management, under the oversight of Robert (Doug) Workman, PhD. That report is available in a separate document, but did find a diverse and healthy fish community with 28 species of fish observed. Although certain panfish were low in abundance (bluegill and pumpkin seed) others, the rock bass, were abundant and none appeared in poor health, even when less abundant. “The size of the fish were consistent or slightly better than the state average” and based on observations it is possible that “juvenile and egg predation from gobies could be contributing to lower abundances of bluegills and pumpkinseed sunfish”. Angers have reported small northern pike in the lake, but the survey found



“norther pike were consistent with state of Michigan average sized northern pike, which would indicate Portage Lake northern pike are not experiencing growth difficulties. “The baitfish community is diverse and abundant” and “alewives were the third most abundant species collected by AEM”. Observations were made on water quality and aquatic vegetation as well, as part of the evaluation and found “dissolved oxygen is adequate, conductivity is consistent with most inland lakes, and pH was adequate to support life in the lake”. Additionally, most of the vegetation found was native and at densities that provided great habitat. “A high density of aquatic vegetation could lead to problems with low dissolved oxygen in late summer” and Portage Lake did not appear to be too dense. Overall, further evaluation on gobies may provide more sight to their impact on bluegill and the low levels found in shallower areas.

Source: “Investigation of the Fish Community of Portage Lake in Manistee County, Michigan 2023”

## **Submersed Nonnative Plant Management**

Areas of nonnative plant growth need to be identified and mapped for management. Utilizing latest technologies available, such as GIS software, precise management maps can be created for implementation. Nonnative infestations, such as Eurasian watermilfoil, require prompt control. Methods of management are provided in this lake management plan. Although a variety of options are available and should be weighed out for each lake, the most common management method is treatment using herbicides.

Starry stonewort should be aggressively controlled to reduce biomass as soon as it is detected. Treatments are most effective when controlled early using algaecides such as SeClear G, Copper Sulfate, and/or Chelated Copper.

European frogbit should be aggressively controlled to reduce biomass as soon as it is detected. Physical, mechanical and chemical treatments are management options. Chemical control has proven effective when controlled early using products such as Flumioxazin and/or Diquat.

When management strategies are applicable and used correctly, control is achievable. Although one management strategy may have been successful for one waterbody, many factors impact success from lake to lake and each unique ecosystem and infestation requires evaluation.

## **Emergent Nonnative Plant Management**

Emergent species such as Purple loosestrife and Phragmites need to be actively monitored and control around the lake.

Purple loosestrife is an exotic species, which is out competing native vegetation, destroying valuable wetlands and animal habitat and expanding in density along Portage Lake. Purple loosestrife can be managed through a variety of techniques including hand pulling, digging, spot treatments or biological control. Selective control through the use of triclopyr (Renovate) is a feasible option for large or small infestations. Hand pulling/digging is more viable for small infestations or in response to an early detection and rapid response. The biological control effort, beetles, have shown positive control measures and this method. Portage Lake has utilized all three management efforts in the past.

Both native and nonnative Phragmites is present in the Portage Lake watershed. Nonnative Phrag, which can out compete native vegetation, destroys valuable wetlands and animal habitat. Research has proven that the BMP for Phragmites is to selectively control the plant through the use of glyphosate or imazapyr herbicides. Treatment techniques often include both hand swiping of plants as well as foliar spray. After treatment, controlled burns, cutting, mowing, etc. can be done with success to remove biomass. Burning or mowing prior to application can further the spread of this highly invasive species. Chemical treatment on Portage Lake has successful remove much of this biomass and allowed native plants to naturally recover.

Narrowleaf cattails, another exotic species, can outcompete native cattails and wetland vegetation. Management options are limited and spot treatments can be effective.

Japanese knotweed is yet another highly invasive nonnative plant found growing around Portage Lake. Although terrestrial, there are areas of it growing near the lake and as a highly invasive plant, management of this species should be considered.

## Native Plant Management

Native plants should be controlled primarily by harvesting if required. Unlike Eurasian watermilfoil, most native plants do not regrow rapidly after harvesting, and a single harvest is often sufficient to control them for the entire summer. Normally low-growing species should not be controlled unless unusually fertile growing conditions allow them to grow tall in areas of high recreational use. Contact herbicides applied at higher rates can be effective at controlling native plants that are causing a nuisance close to shore, in between docks.

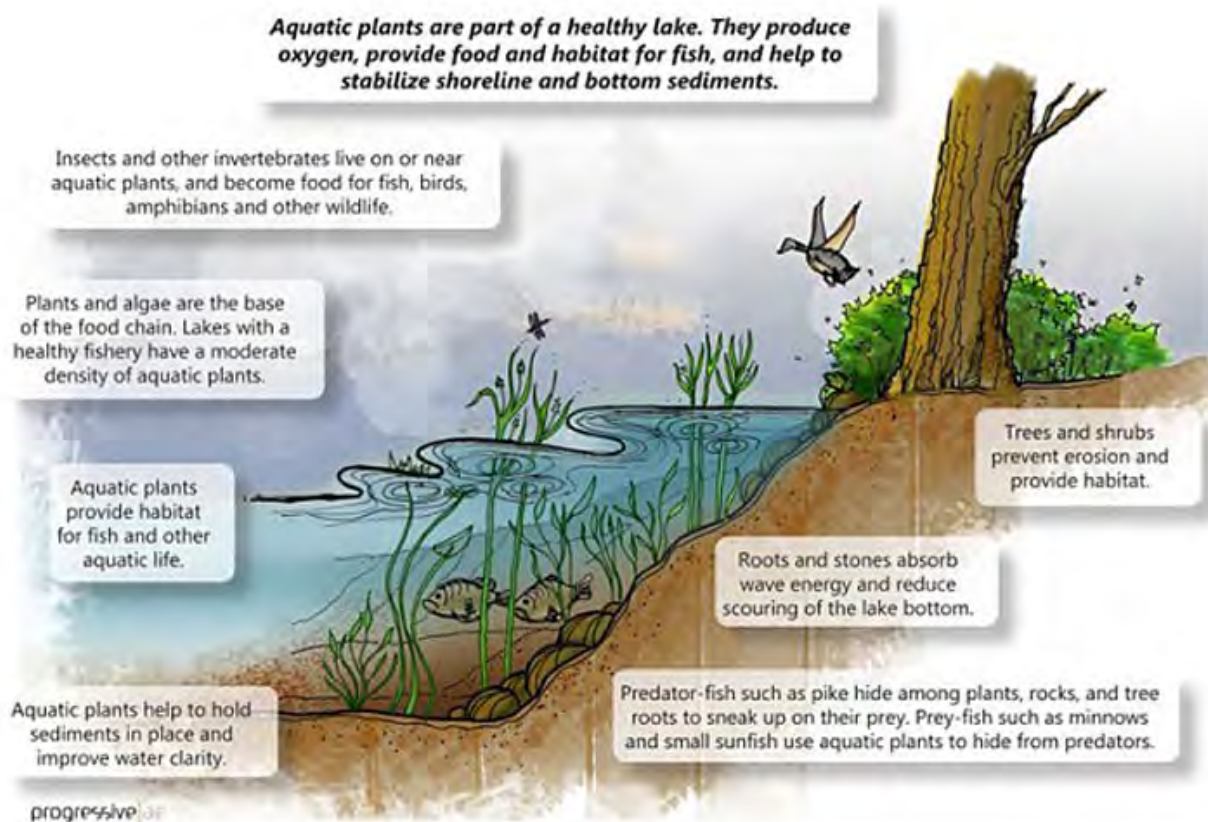


Photo curiosity Progressive AE

## Algae Management

Algae are divided into planktonic, filamentous, and macroalgae forms. Planktonic algae are microscopic, free floating plants, often referred to as "water bloom". In large number, the algae can cause water to appear green, brown, yellow, or even red. Cyanobacteria are planktonic algae and can produce a toxin called cyanotoxins. This doesn't mean that if you see any planktonic algae it will have a toxin, but it is wise to be cautious. These algae blooms can last from days to months if conditions are right. Filamentous algae, commonly called "pond scum" can form raft-like masses over the water surface. Since they are vulnerable to winds and currents, they are generally restricted to bays, bayous, and sheltered shorelines. Filamentous algae can grow attached to the lake bottom, weeds and docks. The filamentous algae will frequently detach from the lake bottom and form floating mats. The macroalgae includes three types, Chara, Starry stonewort and Nitella. Chara grows like a carpet on the bottom of the lake. It is nature's

water filter and is excellent for fish bedding. Chara grows approximately one inch a week during the summer months.

An overabundance of algae is an indicator that there is an excess amount of nutrients within the water column/lake, causing the waterbody to become overly productive. Algae are very beneficial in a lake ecosystem and can be thought of as the base of the food chain. Therefore, some algae is required.

However, when an algae reaches the point of hindering the use of the lake, control measures are available. Firstly, 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. Therefore, many lakes opt to include limited algae control within their management program.

Filamentous algae control is not required at this time, on Portage Lake. Whenever possible reducing nutrient loading entering the lake and watershed is recommended to help reduce future growth. A natural shoreline can also help buffer out nutrients,

Chara, a macroalgae should be encouraged lake wide and is one of the most vital species within the waterbody as it is a natural filter for clarity and is very beneficial for sediment stabilization and the fishery.

Starry stonewort, another macroalgae species, is nonnative and needs to be aggressively managed to prevent ecological damage and the loss of Chara. Although these species look similar, SSW requires immediate management, which can be done through chemical application as well as harvesting (mechanical and suction). This species can spread by fragmentation as well, so harvesting practices need to be very specific to avoid spread. Early detection and rapid response with chemical treatments have proven high effective. Established infestation management practices may differ.

Management of algae is best done through watershed management and reducing the nutrient loading that enters the lake, which can reduce the phosphorus present that feeds algae. If and when algae is present and requires management, a thorough review of options should take place. One common method of algae control is treatment using algaecides. Some algaecides contain copper based products. Whenever using a algaecides, permits, proper licensing and labels must be followed. One of the large concerns with using copper based products is with them building up in the sediments. Although it is true that copper accumulates in the environment, the accumulation occurs in the form of copper carbonates, which are not bioavailable. Copper is a necessary dietary micronutrient and is naturally found in the environment already and like any management tool, should be fully evaluated using best management practices and an integrated approach to determine the cost/risk benefit analysis of the species being discussed.

## **Natural Shoreline/Nutrient Loading Abatement**

Lakeshore property owners should be encouraged to use phosphorus-free fertilizers on lawns and other areas that drain into Portage Lake or the adjacent wetlands. Lakeshore residents should also be encouraged to manage their waterside landscapes according to the recommendations outlined in publications on this topic available from the MSU Extension.

It is also important to remember that rooted plants derive most of their key nutrients from the sediments; thus, they respond slowly, if at all, to reductions in nutrient loading. In fact, if reductions in nutrient loading lead to improved water clarity, the growth of rooted plants will probably increase.

If organic material (muck) accumulates to undesirable levels in shoreline areas, bacterial treatments should be considered as a way to alleviate the buildup.

Shoreline development has led to habitat degradation and as lakes continue to become more and more developed, the impacts continue to be damaging to the lake ecosystem. From mowed grass and sandy

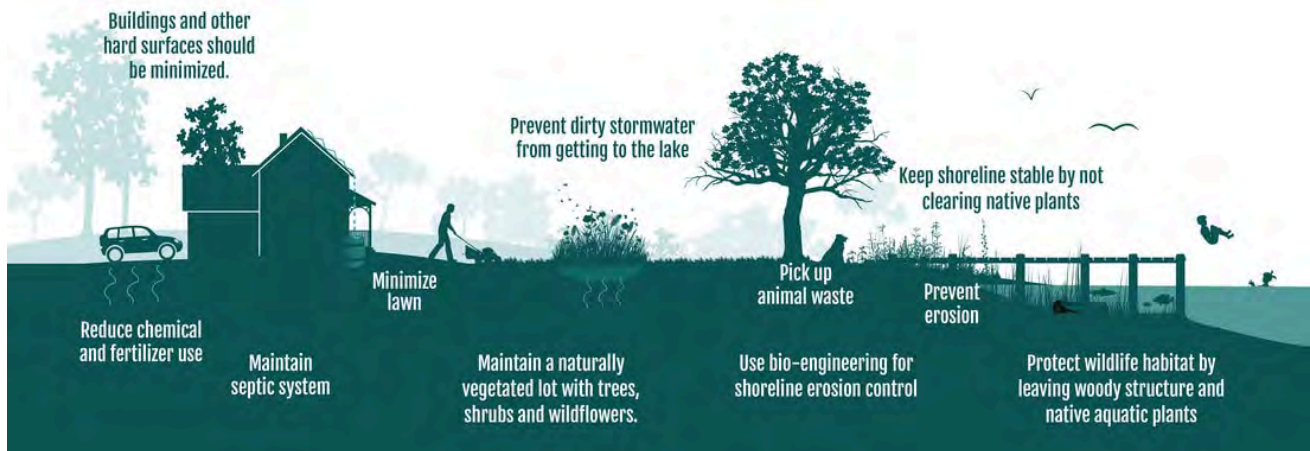
beaches, to seawalls and riprap to wake boat waves and fertilizer, development has negatively impacted a lake in all ecological aspects. By working to reduce the human footprint around the lake, the health of the lake will be improved. Natural shoreline restoration is helpful from reducing nutrient loading and runoff to providing habitat for frogs and fish to naturally defending against Canadian geese congregating in your yard, it is important that action is taken to minimize development impact and restore natural features.

The picture from MSU extension shows the same property with three different landscapes. Maintaining a natural shoreline can greatly aid in the overall health of the lake. “Left, traditional lake front landscape. Middle, residential lake front landscape: natural or restored buffer zones. Right, residential lake front landscape: manicured landscape with buffer zones. Graphics by Kristen Faasee.” Residents are encouraged to incorporate as much “natural” shoreline to their property as possible. Even with seawalls, changes can be made to be more environmentally friendly and preserve habitat while enjoying the beauty of the lake and the recreational access many desire.



Kristen Faasee, MSU Extension

The implementation of natural shorelines should be encouraged around Portage Lake. Converting seawall shorelines back to natural vegetation; plants, trees and shrubs along the water’s edge has many benefits for the lake. Some of benefits of having a natural shoreline are erosion control, nutrient and pollution absorption, increase in wildlife and fish habitat and reduction of nuisance geese on lawns. If seawall removal is not feasible there are other options residents can do to improve and protect the lake. Placing rip rap in front of a seawall will help reduce wave action thus reducing lake scour. Rip rap can also create a suitable shoreline for animals to access the land and provide places for aquatic insects and plants to grow. Also, native vegetation can be planted within the rip rap, creating a more natural shoreline. Adding rip rap is an easy, affordable and effective way to help the lake. For more information please visit: <https://www.shorelinepartnership.org/>



Picture courtesy of MI Natural Shoreline Partnership

## Restoration

Pending the level of a waterbody’s impairment, specific activities such as phosphorus mitigation, native plantings, fish plantings, etc. can be recommended. As this varies tremendous on a site by site basis, it

is generally best to work with healthy lake front living practices, early detection rapid response and education/outreach to prevent infestations and make improvements in the overall ecosystem.

In regards to nonnative plant infestations, it is best to control early. Controlling nonnative plants early is key to lowering the impact to the native plant communities. If and when a monoculture is formed, there is no guarantee that a native species will return. In most cases, once a nonnative plant has been controlled, native plants will naturally flourish in that area. If and when a planting is considered, it is important to only use native species as well as species that have a historical presence within that system. Even native species, once introduced into a new environment can cause negative impacts and have consequences (i.e. Wild Celery (*Vallisneria americana*)).

## Lake Management Approaches

Areas of the lake that support vegetation will grow plants, despite intense efforts to remove them. Aquatic vegetation provides important benefits to a lake, including stabilizing sediments, providing habitat for fish and other aquatic organisms, and slowing the spread of exotic plant species. In general, native plants interfere less with recreation and other human activities than exotic species. Non-native plant species, Eurasian watermilfoil and curly leaf pondweed concentrate their biomass at the water surface where they strongly interfere with boating, swimming and other human activities. This growth form also allows exotic plants to displace native plants and form a monospecific (i.e., single species) plant community. The dense surface canopies of Eurasian watermilfoil and Curly leaf pondweed provide a lower quality habitat than that provided by a diverse community of native plants. Control of exotic plant species minimizes interference of plant growth with human activities and protects the native vegetation of the lake. The goal of environmentally responsible aquatic plant management, therefore, is not to remove all vegetation, but to control the types of plants that grow in the lake and the height of plants, to minimize interference with human activities. All activities performed should be do so using best management practices (BMP) and an integrated pest management (IPM) approach using environmental sound technologies and finically feasible options.

It is important that control techniques meet the needs and expectations of lake users. Each technique has advantages and disadvantages. Many aquatic plants are relatively susceptible to some control measures but resistant to others. Too often, lake groups select a control technique before determining what their needs are and the pros and cons associated with various techniques. Further, upon goals being achieved or shifted, various practices may become better suited (or less) for a desired outcome. Often times, one practice will not meet every stakeholders individual goal, however the established practice for various pests needs to be explored for the outcome that best meets practicability. All practices have inherit risk associated with them and reviewing best management practices can be determine which is best suited for each individual situation.

## Aeration

Aeration can be a beneficial tool to sustain ecological balance within an aquatic ecosystem. By maintaining sufficient oxygen levels throughout a waterbody, the entire eutrophication process can be slowed down, the health of the fishery can be maintained and overall water quality can be improved. The implementation of an aeration system to control rooted aquatic plant growth is not recommended. Rooted plants, such as Eurasian watermilfoil, will not be affected by aeration. Similar to the use of biological control, the impact of aeration on improving water quality and reducing organic sediment will vary greatly from site to site. Therefore, it is extremely important to thoroughly evaluate each site's conditions and expectations before implementing an aeration system. Aeration systems are regulated by EGLE with an extensive and costly monitoring program. Aeration is not permitted and hould not be used for plant management. It can be used to help improve dissolved oxygen levels in lakes. The cost of aeration systems can very and are currently not permittable



in deep water with the State of Michigan. Additional costs include electrical costs and maintenance in addition to the water quality testing and equipment. Project costs are various with ballpark figures of \$10,000-\$15,000 for a 10 acre shallow basins with estimated annually management/testing fees of \$5,000. Some Pros: Potential improvement in DO, water quality. Some Cons: Cost, permitting, maintenance.

## Bacteria augmentation

The use of bacteria product formulations and application techniques has greatly improved in recent years. Granular bacteria products can be applied to specific shoreline areas to reduce organic muck that has accumulated over the years. As waterbodies age, organic sediment can build up due to excessive plant and algae growth. This process is called eutrophication. Increasing native populations of bacteria can slow this process down. Reductions in the depth of muck may depend on many variables. Most importantly, the percent of sediment that is organic. The more organics in the sediment, the greater the potential for muck reduction via bacteria augmentation. Bacteria use is performed under a Rule 97 permit, overseen by EGLE and is a nonrestrive, all natural product. Bacteria augmentation is utilized within lake management for muck control, not plant or algae management. Costs of products can range, with an approximate cost of \$300/acre/application. Application recommendations vary with product and are typically monthly during the warmer months, equating to \$1,500.00/acre/season. Some Pros: All natural product, DIY. Some Cons: Slow results, varied amongst site conditions.

## Benthic barriers

The use of benthic barriers dates back quite far as a form of pest or weed control. Mats can be placed on bottom sediments to stop light penetration and control places in small areas. This method is not selective and should be used with caution in areas of spawning. Securely placing mats and avoiding navigational hazards is highly important as well. This management technique does require a permit through EGLE and should be used in smaller areas to avoid negative impacts to the native plant community. Benthic barriers are not species selective, therefore using them in areas of high native plant diversity is discouraged as they can negatively impact native plants. The cost and practicality of placing them is most appropriate for small scale projects. Various materials can be used but need to be environmentally friendly and costs can vary. For example, Lake Leelanau has spent ~\$200,000 in two years to control several acres (~3.5) of EWM, giving that program an average of \$57,142/acre. The manpower/labor of installing the mats is a large portion of this as well. Some Pros: Chemical free. Some Cons: non selective, cost, labor, navigation, water depth.



## Biological control

Biological control options for nuisance aquatic vegetation are limited. Grass carp, which indiscriminately devour aquatic vegetation, have been restricted in many states because of their nonselective grazing and fear they may escape into nonintended waters. The use of the milfoil weevil (*Euhrychipsis lecontei*) to control Eurasian watermilfoil has been implemented in many Michigan lakes. The idea of using a native weevil to target nonnative plants would be ideal, but the success remains extremely varied. Overwintering, shoreline habitat, being eaten by fish are some concerns evaluated when reviewing the appropriateness of planting them on a waterbody. PLM Lake & Land Management Corp has many years of experience participating in weevil stocking, evaluations and longterm observations related to their performance and



sustainability. Although the milfoil weevils may impact EWM populations in certain situations, the use of this tool remains unpredictable. Often time control was off the top few inches of the plant, potentially stopping a canopy from forming, but not controlling the entire plant and leaving it available for fragmentation as well as negative impacts to native plant communities. In recent years, the production of milfoil weevils has ceased. Historically, a weevil cost ~\$1.00/bug and thousands would be needed per acre with annual stocking. The use of Purple loosestrife beetles (*Galerucella* beetle) has shown some success on dense infestations of Purple loosestrife with less impact on sparse populations. Some Pros: non chemical; natural. Some Cons: Cost; habitat/overwintering/shoreline; being eaten by fish; results are varied.

## Chemical control

Michigan Department of Environment, Great Lakes and Energy (EGLE) regulates the use of chemical control in lakes and ponds across Michigan. This highly restrictive practice uses federal and state approved herbicides and/or algaecides under permits for controlling plants or algae. Dosage, timing, product, and location and among some factors restricted by the permit. The use of aquatic herbicides, is the most common strategy for controlling nonnative or exotic plant species. Aquatic herbicides provide predictable results and there is a great deal of research and data regarding these products. There are two types of herbicides, systemic or contact. Many of the aquatic herbicides available can be used to selectively control exotic species with minimal or no impact on native species.

Systemic herbicides are capable of killing the entire Eurasian watermilfoil plant with little or no impact on most native plant species. Under ideal conditions, several consecutive annual applications of these herbicides can reduce Eurasian watermilfoil to maintenance (low) abundance, such that only relatively small spot treatments are required to keep it under control. For this strategy to succeed, it is necessary to treat most of the Eurasian watermilfoil in the lake each time. There are currently five systemic herbicides, 2,4-D (Sculpin G or Navigate), Triclopyr (Renovate 3 & OTF), Fluridone (Sonar or Avast), and ProcellaCOR which can be used to achieve long-term, selective control of Eurasian watermilfoil. ProcellaCOR has systemic like capabilities, while using low application rates and potentially allowing for multiple season control. Triclopyr is a systemic herbicide with selectivity very similar to 2,4-D. Triclopyr is not subject to the well setback restrictions that currently affect 2,4-D. Therefore, triclopyr can be used to control Eurasian watermilfoil in near shore areas. A combination of both systemic herbicides in Portage Lake could greatly reduce the growing Eurasian watermilfoil problem.

Several contact herbicides, including diquat (Reward) can also provide short-term control of Eurasian watermilfoil and other nonnative species. These herbicides kill only the shoots of the plant, and plants regrow relatively rapidly from their unaffected below ground parts.

Chemical control should only be used by licensed and trained applicators. The State of Michigan has a rigorous licensing protocol. Additionally, using an experienced applicator can ensure that proper dosages and labels are followed. The label is the law when using aquatic herbicides. When using any sort of drug or chemical, from Tylenol to caffeine to herbicides, inherent risk is involved. Aquatic herbicides have inherent risk that is reduced through proper use. Using a licensed applicator does increase the cost of chemical control, as does applying them under a State of Michigan EGLE permit. Pending the type of product as well as the location within the lake, water depth, etc., the rate of products can vary, further impacting cost. Some products can provide residual (seasonal or multiple season control) while others are short term. Cost per acre of control can vary, but systemic control with the goal of seasonal management can range from \$400-\$800/acre. Some Pros: selective; lower per acre cost than other options; can be used numerous water types, i.e. flow, no-flow, deep, shallow, turbid, etc.; fast acting; used in small and large scale systems. Some Cons: use of chemicals is often misunderstood and not organic; plant response can vary; may require annual management; water use restrictions may apply including irrigation restrictions.

## Diver assisted suction harvesting (DASH)

DASH utilizes a suction hose and a diver that hand removes individual plants in selected areas (similar to a vacuum). On land, the collection of material is removed to an offsite location. This management option is also permitted through EGLE. Although very costly on a per acre basis, it is more commonly used on very small infestations. Bottom sediment type is a consideration with this management type as the area can become very stirred up and make visibility extremely difficult, impacting the end results. As fragmentation is a concern, prevention of spreading plants needs to be a consideration. This tool can be used specifically for both nonnative and native species. DASH costs can vary pending projects and is typically charged on a per day basis/project based on depth, location from access/shore, etc. With varying costs, an approximate range is \$6,000- \$9,000/acre. Some Pros: Non chemical management. Some Cons: Cost; offsite disposal; turbidity/visibility may impact results, distance from shore/access site.

## EutroSORB – Phosphorus Filtration Technology

Reducing the phosphorus loading coming into the waterbody, specifically from the numerous creeks and storm drains entering Portage Lake would directly improve the waterbody. Through new technology, SePRO (a leader in water quality enhancement technology) has developed a phosphorus filtration product, EutroSORB, that rapidly binds nutrients in flowing water. This proactive water management technique is a critical need for most waterbodies large and small. This ecologically benign product can be used to offset the need for responsive algae management. EutroSORB bags filter phosphorus from entering a waterbody for a safe, efficient and environmental sound alternative for nutrient control. As a new technology, prices are not yet available as the State of Michigan is still finalizing the permitting process. Some Pros: proactive approach; non herbicide; preventative. Some Cons: permitting.

### EutroSORB™ Phosphorus Filtration Technology



## Mechanical harvesting

Mechanical harvesting is best suited for native plant species. Most native plant species have a higher tolerance to aquatic herbicides and require higher dosage rates (higher cost and reduced selectivity).

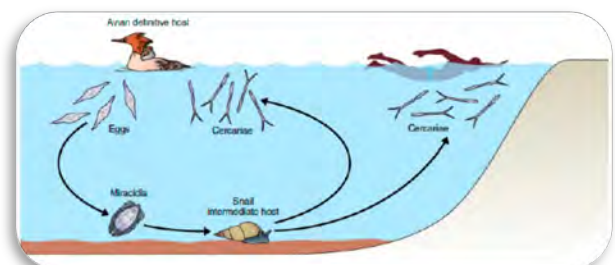


Mechanical harvesting can be used to provide relief from native plant species if they are causing a recreational nuisance. Harvesting does not kill the plants, but simply reduces it's stature, leaving lower growth for fish habitat and sediment stabilization. Mechanical harvesting of Eurasian watermilfoil is not recommended as it will expedite its spread throughout a lake through fragmentation. Harvesting is typically charged on a per hour basis and there is often a minimum mobilization fee associated with moving equipment into an area, meaning that it is often best suited for medium

or larger projects. Cost per acre can range and are often estimated at \$300- \$700/hour. Some Pros: Non chemical; quick results. Some Cons: Non selective; depth/distance from shore; dumping/offload sites; speed on water.

## Swimmers itch

Swimmers itch, caused by a parasite that travels through waterfowl (i.e. Mergansers) after eating snails and is present in the water column. This parasite can cause an allergic reaction on the skin of lake users, resulting in a rash. Although managing a lake for swimmers itch is difficult, there are preventions that swimmers can use to reduce the impact. Applying





sunscreen prior to water entry to create a barrier on your skin, toweling dry immediately upon leaving the water and swimming in deeper water are recommended. Michigan Department of Environment, Great Lakes and Energy (EGLE) no longer permits the control of Swimmers Itch using copper sulfate, which was historically done. Reducing the presence of the parasite by limiting the presence of the hosts (Mergansers) is promising. Much research is being done on this front currently across the State of Michigan and additional management recommendations may become available in the future.

## Lake Management Activities Conducted in 2023

### Water Quality

Water quality was evaluated on May 2, June 7, July 27, and September 20, 2023. The May sampling included storm drain and tributary testing. In June, deep hole testing and shoreline testing of Portage Lake occurred. The later July sampling for deep hole testing occurred (this was an additional sampling added into the program in 2015) as well as shoreline sampling. During the last sampling; tributaries, shoreline and the deep hole basins were sampled. During the deep hole sampling the following occurred, (1) a depth profile of water temperature and dissolved oxygen concentrations were measured at ten feet intervals at both Deep Hole Basins and the Secchi disk depth was measured, (2) samples for LakeCheck™ analysis was collected from the deep holes of the lake (surface, bottom and every 10' between) for numerous parameters, (3) chlorophyll and algal composition analysis was collected from surface, mid thermocline and bottom samples. During the shoreline sampling, the following occurred, (1) depth profile for water temperature and dissolved oxygen concentrations were measured at the surface, (2) samples for LakeCheck™ analysis was collected at the surface for numerous parameters, (3) chlorophyll and algae composition analysis was collected at the surface. During the Storm Drain sampling the following occurred at four designated drains, (1) Flow testing, (2) surface reading of temperature and dissolved oxygen (3) samples for LakeCheck™ analysis was collected. During the tributary testing, the following occurred at seven designated tributaries, (1) surface reading for temperature and dissolved oxygen, (2) samples for LakeCheck™ analysis was collected and (3) flow was determined. LakeCheck measures at the various sites included some or all of the following parameters: Conductivity, Total Dissolved Solids, pH, Conductivity, Total Phosphorus, Oxidative Reduction Potential (ORP), Alkalinity, Ammonia, Nitrates and Total Kjeldahl Nitrogen. The additional tributary testing included sampling at one tributary and including testing multiple locations from the entrance at the lake, upstream. Parameters tested included Total Phosphorus, Nitrates and Alkalinity.



Eurasian watermilfoil

### Weather Challenges of 2023

Michigan winters are usually quite different from year to year. While some are very cold and have high snowfall amounts, others are the opposite. The winter of 2022/2023 was once again, relatively mild. When looking at the previous few winters, which were also rather mild, it brings some concern with how the lakes, specifically the plants, will respond the following summer. Weather patterns can have impacts well into the next few seasons, so when we have a mild Michigan winter, it is not helpful with controlling exotic species. Further, ice coverage came late and was not as thick as normal; leading to more sunlight penetration and ability for EWM to overwinter. Weather patterns throughout the summer also have impacts. Each lake responds differently from the weather impact and as Portage Lake tends to be slow to grow in the spring, the longer, warmer falls may impact growth differently than smaller, inland lakes. Finally, weather patterns have brought unusually high-water levels to the Great Lakes, which in turn have had large impacts on Portage Lake. Changes in water levels will have impacts on a waterbody, both short and long term and do need to be taken into consideration when managing aquatic plants.

Exotic species tend to benefit from changes in weather conditions. In Portage Lake, little plant growth is evident early on into the growing season and it is not until mid-summer that diverse plant coverage is

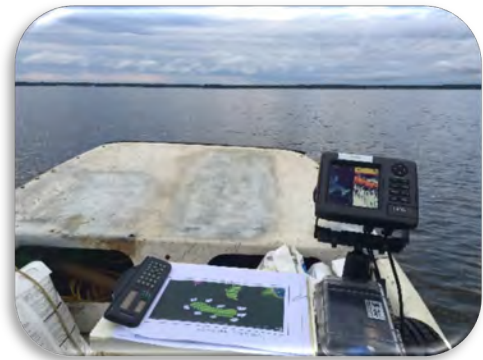
found. Weather patterns can have impacts on lakes and individual plant trends that may not be evident right way.

## Aquatic Plant Control

Nonnative (submersed) plant treatments were conducted in June to control Eurasian watermilfoil (EWM) and Curlyleaf pondweed in Portage Lake. Phragmites, Japanese knotweed and narrowleaf cattails (individually done) was also treated throughout the summer and fall of 2023. The lake was closely monitored this year for any areas of exotic plant growth and treated accordingly.

Control for European frogbit was performed by PLM in August 2023 via physical removal methods (hand pulling). The North County CISMA group was also contracted in 2023 to do physical removal of European frogbit.

The management strategy for the control of Eurasian watermilfoil has been working, with substantial reductions in EWM treatments from when the initial treatments began. Although some years see some fluctuation, overall there is a downward trend. However, despite our efforts, EWM control is a constant battle that is heightened with hybrid watermilfoil. The presence of Hybrid watermilfoil supports the conclusion that milfoil treatments will continue to be required annually. Although fewer acres of milfoil management have been required in recent years, the recommended application rates have increased, which uses up the budget more quickly. It is important to plan according for increasing costs from the economy as well as from an evolving plant community. In 2020, through early detection and rapid response, Starry stonewort was identified and treated quickly, in hopes of limiting the spread lake wide. 2023 surveys found the previous year's actions to be very successful, and no growth was found. In 2022, through early detection and rapid response, European frogbit (EFB) was identified and treated quickly as well. A few small areas of EFB were found in 2023. Having a management program in place allowed for both SSW and EFB to be detected and managed within a matter of days versus months. Post survey results have showed a highly effective treatment and time will tell on future impact from these species.



A reflection of proper/successful management is a good fishery, which has been verified through Michigan DNR surveys, independently contracted surveys (separate reports available), as well as the fishing reports on the lake.

The Phragmites Treatment Program has been very effective as well. After the initial treatment of 83 acres, the follow up years have required just small treatments in proportion to the initial application. In certain years, Purple loosestrife beetles have been planted as a biological control method in the Portage Lake Plan. Access to beetles is currently limited and has prevented new plantings.

The below maps and table show a breakdown of the treatments in Portage Lake in 2023.

### Map 1: Portage Lake June 2023 Treatment Map



June 15, 2023 EWM and CLP Treatment, 6.35 acres Flumioxazin, marked in yellow.

### Map 2: Portage Lake 2023 Emergent Treatment Map



2023 Emergent Treatment Map ~ 1 acre Phragmites (red) and Japanese knotweed (green)

### Map 3: Private nonnative emergent treatment areas

#### Private Nonnative Emergent Treatment Areas

i.e. Narrowleaf cattails <0.2acres



### Map 4: Portage Lake 2009 EWM Infestation Treatment Map

Portage Lake  
Onekama, MI  
2009 EWM Treatment (161acres)



**Table 1: Submersed Plant Treatment Quantities 2023**

		Product	Rate lbs/Acre	Acres	Total Acres
<b>2023</b>	15-Jun	Flumioxazin	200ppb	6.35	6.35

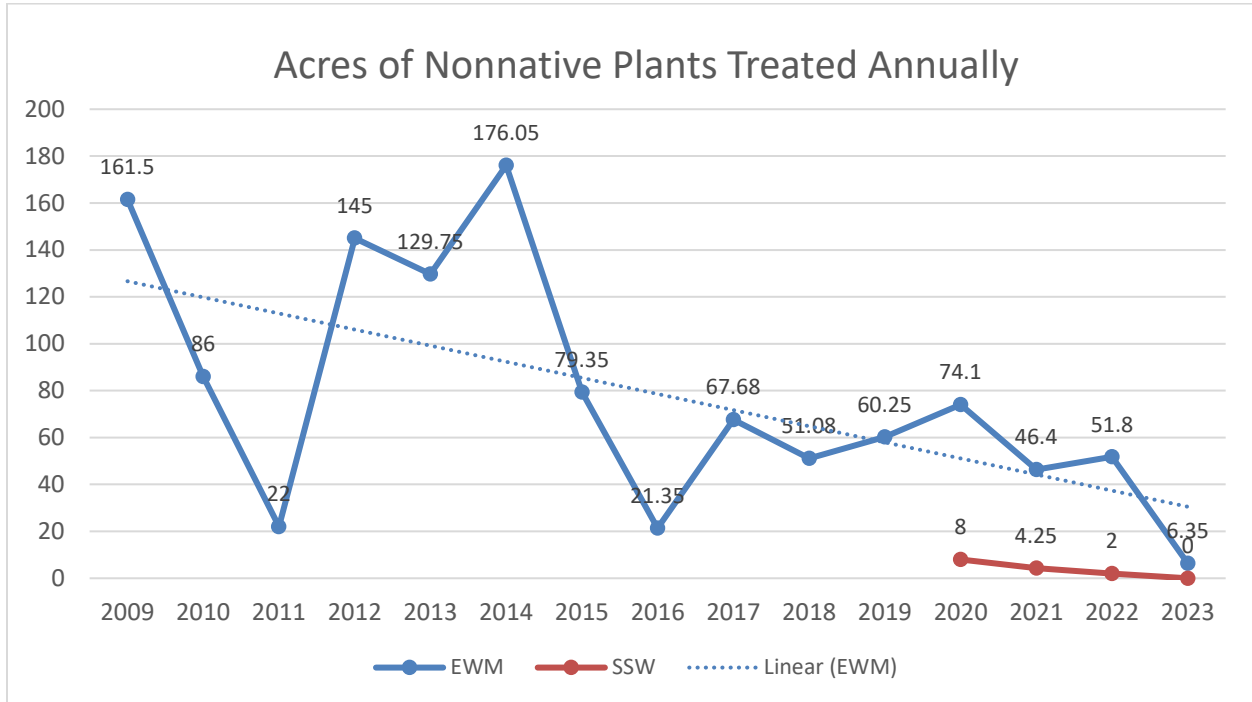
For a complete, historical overview of product usage, treatment dates, acres, etc., please see addendum 2.

**Table 2: Terrestrial Treatment Summary 2023-2009**

(Phragmites, Narrow leaf cattails, Yellow iris, Purple loosestrife, Japanese knotweed)-

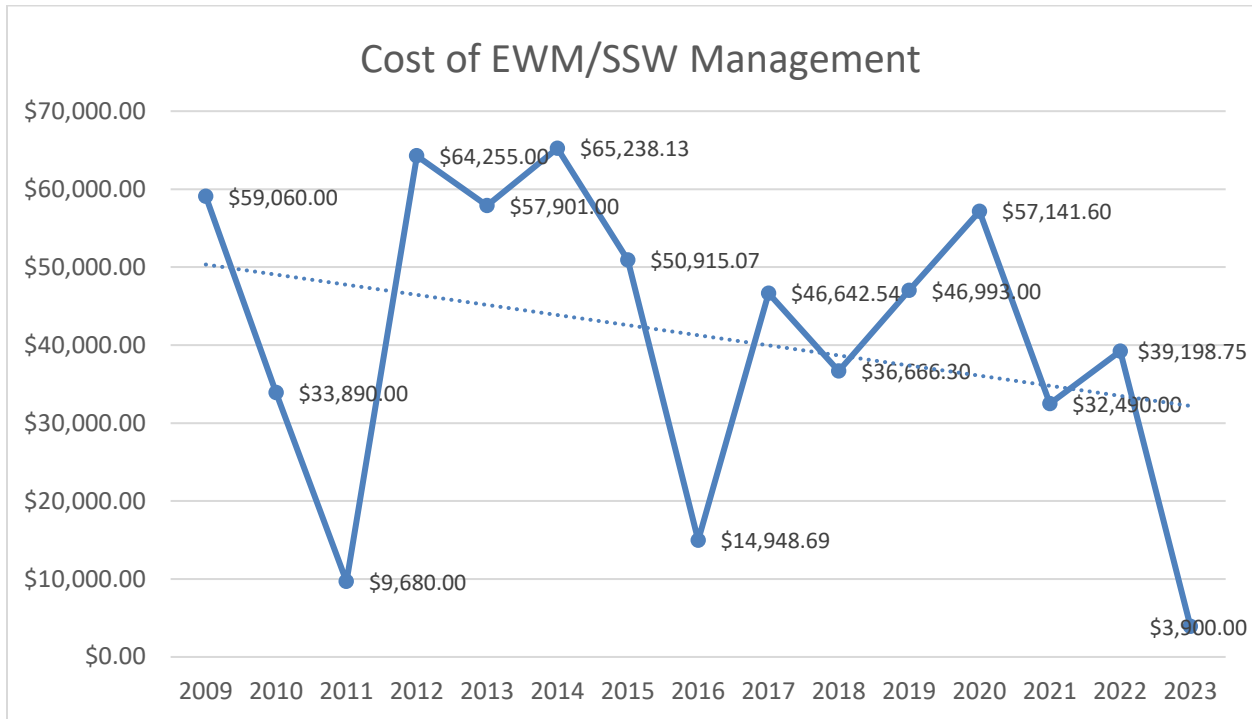
Year	Product	Rate	Acres
2023	Glyphosate, Milestone	5%	1.0
2022	Glyphosate	5%	0.2
2021	Glyphosate	5%	0.23
2020	Glyphosate	5%	0.35
2019	Glyphosate/Imazapyr	3%	6.8
2018	Glyphosate/Imazapyr	1.5,3%	0.2
2017	Glyphosate/Imazapyr	1-3%	0.15
2016	Glyphosate/Imazapyr	1-3%	0.48
2015	Glyphosate/Imazapyr; Triclopyr	1-3%	4
2014	Glyphosate/Imazapyr	4%	6.2
2013	Glyphosate/Imazapyr	2%	7.9
2012	Glyphosate/Imazapyr	2%	13.5
2011	Glyphosate/Imazapyr	2%	7
2010	Glyphosate/Imazapyr	2%	10
2009	Glyphosate/Imazapyr	2%	83

**Graph 1: Annual Management Acres**



This graph shows acres of EWM and SSW treated since the start of the program. The EWM trendline shows a clear trend down, indicating the success of reducing the coverage of EWM through proper management techniques.

**Graph 2: Annual Management Cost**



Graph 2 shows the cost of EWM and SSW treatment since the start of the program. The overall trendline here is decreasing as well, an excellent sign. Although unit costs have increased with application rates and economic impacts, the program has been able to keep a similar budget and minimize cost increases whenever possible.

## Planning/Evaluation

Surveys of the aquatic vegetation of the lake were conducted on June 7, 15, 28; July 27; August 2, 18, 31; September 20, 21 and 27, 2023. Surveys of the lake were made frequently throughout the summer months for pre or post treatment evaluation, to collect water quality parameters, as well as to have additional survey data available for management purposes. Vegetation surveys determine the locations of target and non-target plant species. The results of the surveys are used to determine the most appropriate management strategy. The vegetation surveys also document the success of the prescribed management program. An AVAS survey is the State of Michigan’s method for conducting a complete aquatic vegetation survey. The Aquatic Vegetation Assessment Site (AVAS) survey divides the parts of the lake capable of growing plants (littoral zone) into subareas and records the cover of each aquatic plant found in each “site”. This method of surveying considers not only the types of plant species present in the lake but also the densities of those species. AVAS surveys are also an excellent way to track plant species trends over time. A goal of invasive plant management is to have native plants increase while exotic plants decrease over time. The success of this goal can be illustrated using the AVAS data collected over several years. Since different native plants grow at varying times throughout the season, it is important to evaluate the lake multiple times to account for *all* species in the lake. The first evaluation is conducted in the spring/early summer while the second is conducted in late summer or fall.

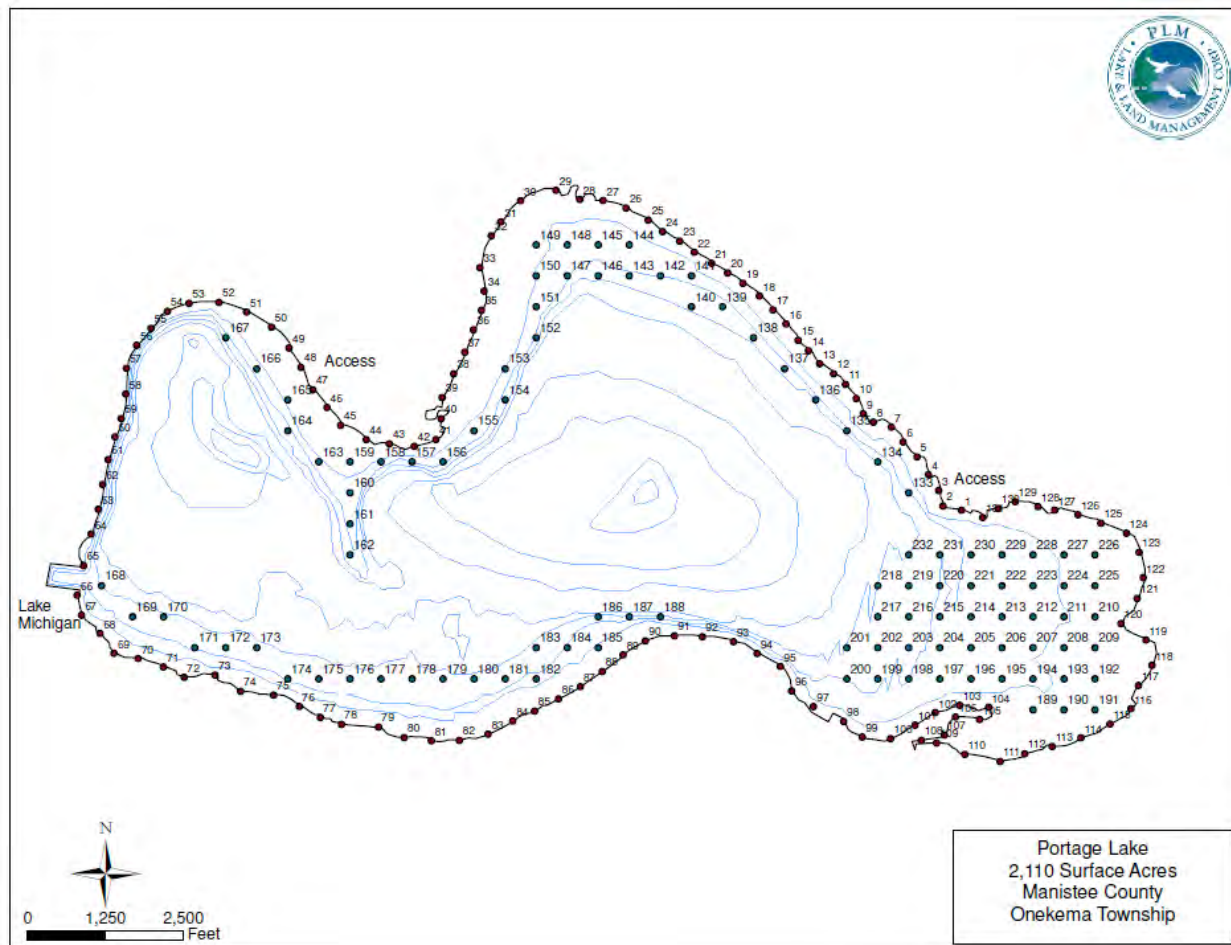
**Table 3: Plant Species Found in Portage Lake –2023**

\* Based from boat survey, not as precise as a walking shoreline survey

AVAS Code	Common Name	Scientific Name	% Cumulative Cover June 2023	% Cumulative Cover September 2023
	<i>Submerged- Exotic</i>			
1	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>	0.20	0.65
2	Curlyleaf pondweed	<i>Potamogeton crispus</i>	0.82	0.01
29	Starry stonewort	<i>Nitellopsis obtusa</i>	0.00	0.00
	<i>Submerged- Native</i>			
3	Muskgrass	<i>Chara</i>	26.80	37.41
4	Thinleaf pondweed	<i>Potamogeton spp.</i>	4.06	2.26
5	Flatstem pondweed	<i>Potamogeton zosteriformis</i>	2.01	4.52
6	Robbins pondweed	<i>Potamogeton robbinsii</i>	0.00	0.22
7	Variable leaf pondweed	<i>Potamogeton gramineus</i>	4.62	4.97
8	White stem pondweed	<i>Potamogeton praelongus</i>	2.77	6.00
9	Richardsons pondweed	<i>Potamogeton richardsonii</i>	4.84	5.29
10	Illinois pondweed	<i>Potamogeton illinoensis</i>	2.34	5.78
11	Largeleaf pondweed	<i>Potamogeton amplifolius</i>	1.55	2.20
12	American pondweed	<i>Potamogeton americanus</i>	0.00	0.18
14	Water stargrass	<i>Zosteria dubia</i>	0.09	0.00
15	Wild Celery	<i>Vallisneria Americana</i>	7.46	17.34
17	Northern milfoil	<i>Myriophyllum sibiricum</i>	0.06	0.21
19	Variable leaf watermilfoil	<i>Myriophyllum heterophyllum</i>	0.00	0.01
20	Coontail	<i>Ceratophyllum demersum</i>	0.78	0.95
21	Elodea	<i>Elodea Canadensis</i>	1.59	0.98
22	Bladderwort	<i>Utricularia vulgaris</i>	0.65	0.32
24	Buttercup	<i>Ranunculus longirostris</i>	0.04	0.00
25	Naiad	<i>Najas flexilis</i>	2.03	12.41
27	Sago pondweed	<i>Potamogeton pectinatus</i>	0.75	3.38
48	Water smartweed	<i>Polygonum amphibium</i>	0.00	0.00
	<i>Floating leaf- Native</i>			
30	Water lily	<i>Nymphaea odorata</i>	0.00	0.00
33	Duckweed	<i>Lemna minor</i>	0.04	0.00
	<i>Floating leaf- Exotic</i>			
50	European frogbit	<i>Hydrocharis moresus-ranae</i>	0.00	0.09
	<i>Emergent- Native</i>			

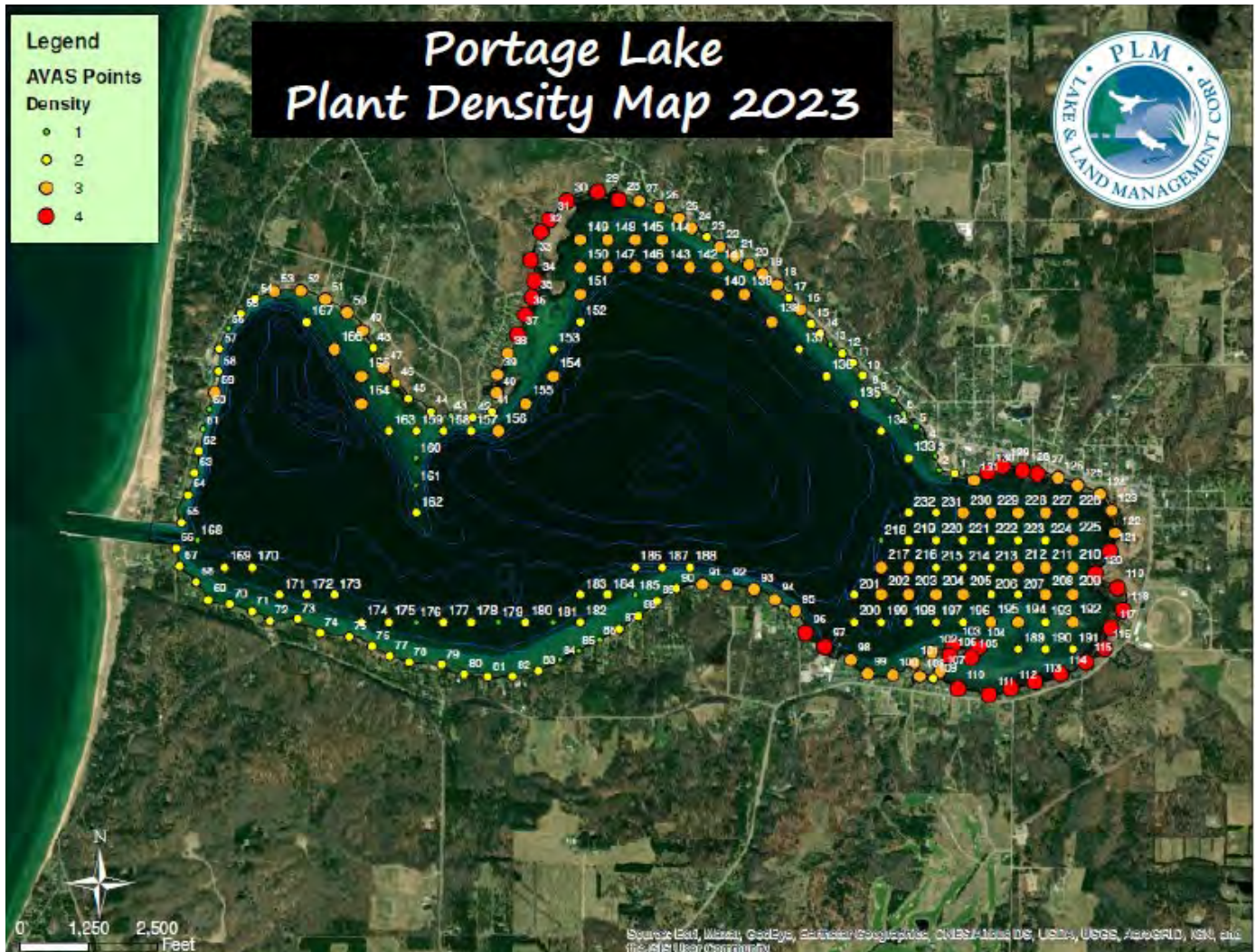
37	Pickerelweed	<i>Pontederia cordata</i>	0.00	0.00
39	Cattail	<i>Typha spp.</i>	9.31	9.99
40	Bulrush	<i>Scirpus spp.</i>	8.31	9.08
42	Swamp loosestrife	<i>Dianthera americana</i>	0.00	0.00
	<b>Emergent - Exotic</b>			
43	Purple loosestrife	<i>Lythrum salicaria</i>	0.00	0.00
44	Common reed	<i>Phragmites</i>	0.07	0.02
46	Slender spike rush	<i>Eleocharis baldwinii</i>	0.00	0.04
	<b>Total</b>		<b>81.29</b>	<b>124.31</b>

Map 6: Portage Lake AVAS/Grid Combination Map (updated in 2022)

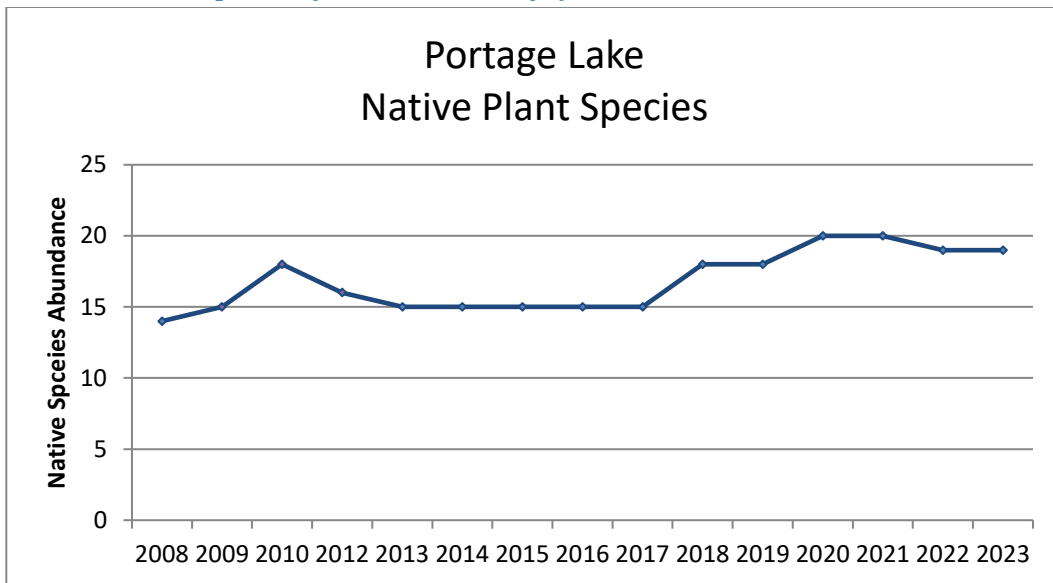




Map 7: Portage Lake 2023 Plant Density Map

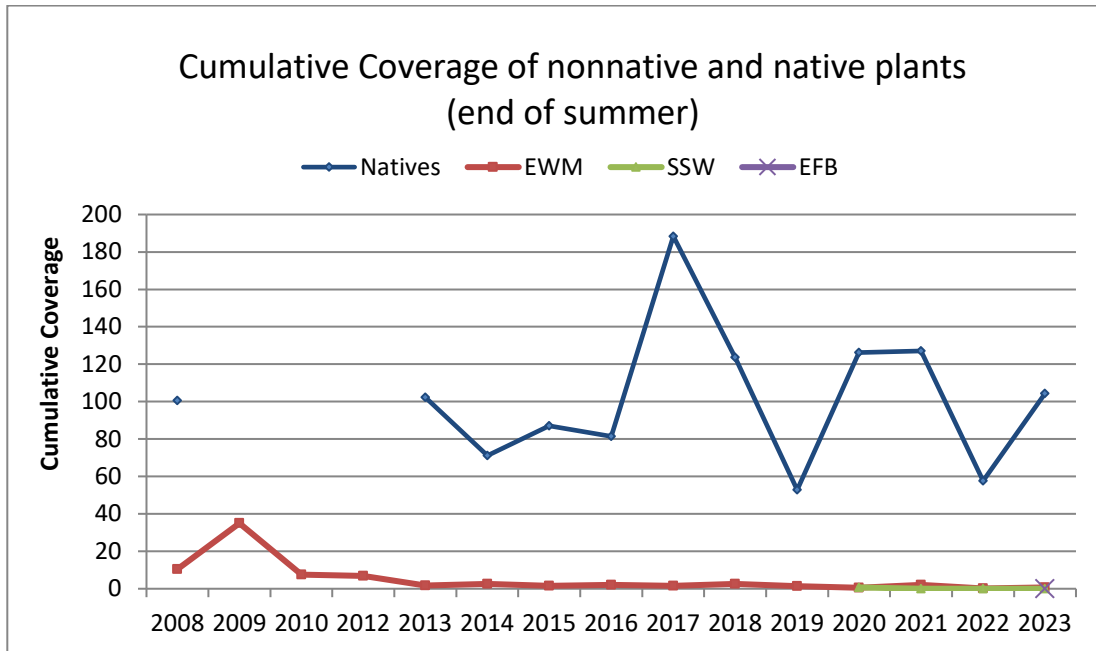


Graph 3: Native Plant Species (Fall AVAS Surveys)



Graph 3 shows the diversity of native plants in Portage Lake. Portage Lake has excellent native plant diversity and this has been maintained throughout managing the nonnative plant species within the waterbody. Although seasonal fluctuation is expected, trendlines are strong and maintaining a diverse native plant community has been archived.

**Graph 4: EWM, SSW & Native Plant Cumulative Cover (Fall Data)**



Graph 4 shows the cumulative coverage of EWM, SSW, EFB & Native plants from 2008-2023. The overall decline in the presence of EWM from the start of the management program shows the success of the program and that the population is currently being maintained at very low levels. The 2019 survey found great diversity but lower density, likely contributed to the weather patterns and a cooler September than the previous few years when increases in plant densities were found. As thought in 2019, the 2020 densities increased, with a warmer fall and earlier survey. In 2022, the number of sites surveyed increased with the additional points, and therefore the comparison of data is skewed and further reflection of numbers can be determined upon additional data being collected. The native plant population will naturally vary from year to year based on weather, water depth and many other factors; but has been maintained during the management of EWM. EWM data marked with purple dots was not collected by PLM, some data provided in Portage Lake LMP's, 2009-2012.

## Current Conditions in the Lake

### Aquatic Vegetation

Over the years, the presence of Eurasian watermilfoil and Curlyleaf pondweed undoubtedly reduced native plant diversity in the lake. Curlyleaf pondweed, although aggressive, naturally dies out mid-season and the increase in native plants after that die off is evident when looking at the early and late season surveys. With the new introduction of Starry stonewort, potential impact to native plant communities is increased with this aggressive species. Native plants currently have good diversity and density in the lake and though proper management, they can be maintained.

Native plant diversity will continue to be promoted in the lake. The native plant species in Portage Lake benefit the lake, performing such functions as stabilizing sediments and providing habitat for fish and other aquatic organisms. In general, native species cause few problems, compared with those caused by exotic plants. Plant diversity is key to maintaining and improving the overall ecological balance of Portage Lake.

All of the plants listed in Table 3 are native North American species except Eurasian watermilfoil, Curlyleaf pondweed, Starry stonewort, European frogbit, Purple loosestrife and Phragmites. These plants are non-indigenous aquatic nuisance species, i.e., plants from other places. These exotic plants cause considerably more problems than most native species. Eurasian watermilfoil and Starry stonewort can attain nuisance levels of growth at almost any time of year, whereas curly leaf pondweed completes its lifecycle and drops out of the water column by approximately the Fourth of July.

The native plant species benefit the lake, performing such functions as stabilizing sediments and providing habitat for fish and aquatic organisms. In general, native species cause few problems, compared with those caused by exotic plants. Three species commonly found in Portage Lake:

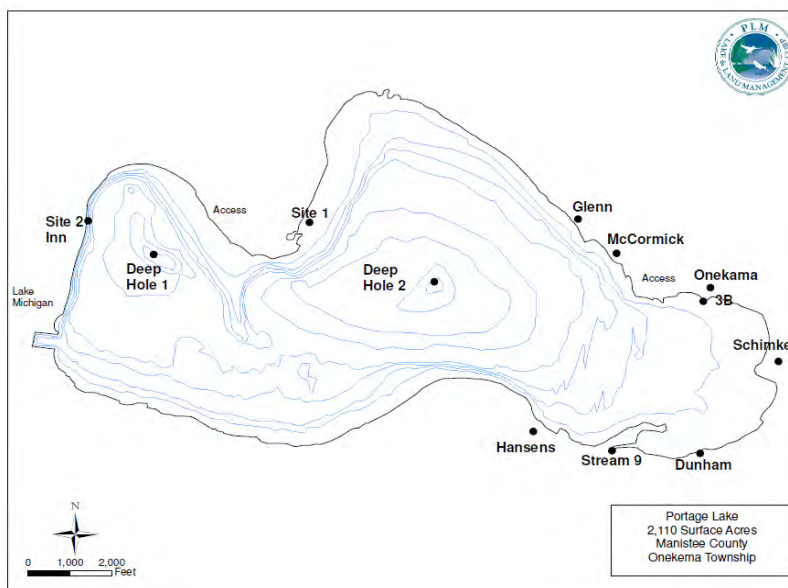


### Water Quality Monitoring

Water quality monitoring is a critical part of lake management. Water quality monitoring provides an ongoing record of conditions in a waterbody. Changes in water quality can indicate threats from sources such as failed or inadequate septic systems, agricultural and lawn runoff, burgeoning development and erosion from construction site. Prompt identification of threats to water quality makes it possible to remedy them before irreversible harm has been done. Riparian’s enjoyment of the water resource and the value of their property depend on maintaining water quality. The following tables break down the parameters tested in the different locations in Portage Lake including the Deep Hole Basins (Basin 1 and Basin 2), Shoreline Sites (3A, 3B, 3D), Tributaries (Glen Creek, McCormick Creek, Onekama Creek, Schimke Creek, Dunham Creek, Stream #9, Hansen Creek) and Storm Drains (#2, #5, #6, #7).

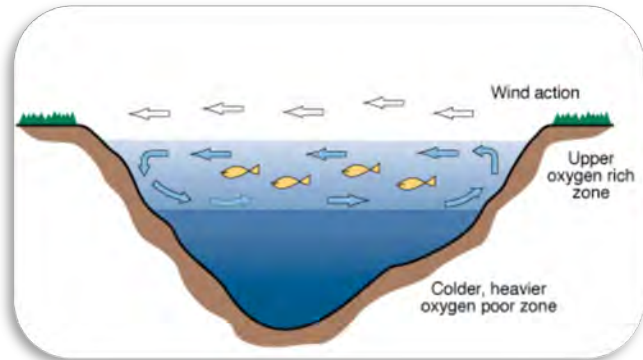
The graphs and tables below contain historical water quality data on Portage Lake that has been collected from numerous parties other than PLM. All information was made available to PLM via the Invasive Species Committee, on behalf of the Portage Lake Watershed Forever and Onekama Township and used with permission.

### Map 8: Portage Lake Water Quality Testing Locations



## Temperature and Dissolved Oxygen Profiles

Depth profiles of temperature and dissolved oxygen indicate that on June 7 the lake was already stratified. The surface levels were above saturation, 10.01 mg/L at Basin 1 and 9.98 mg/L at Basin 2 with shoreline ranging from 8.09 to 11.09 mg/L. At this time, Portage Lake had adequate dissolved oxygen all the way down to 60' in depth (12.73 mg/L in Basin 1 and 12.23 mg/L in Basin 2). On June 7, the lake was thermally stratified, with a thermocline at approximately 30' in Basin 1 and 20' in Basin 2 - similar to 2022 but much deeper than in 2021. The epilimnion (i.e., water above the thermocline) was well oxygenated, with oxygen concentrations at adequate levels to support a healthy fishery. Conditions in the hypolimnion (i.e., water below the thermocline) were also oxygenated.



On May 2, four storm drains (table 9) and seven tributaries (table 4) were tested coming into Portage Lake. The storm drains had similar DO levels to past years, including Drain #2 Zosel Park, which couldn't be sampled in 2021 due to water levels. All of the tributaries were well oxygenated ranging from 10.89 to 111.78 mg/L, slightly increased from 2022.

In late July, the lake was still strongly divided. The late July sampling was added into the program in 2015 and has been sampled since. Basin 1 was stratified and unlike many years when it has been anoxic at the bottom of the lake (void of oxygen), there was plenty of dissolved oxygen this year. Readings at 60' were 8.13 mg/L. The thermocline in Basin 1 was still at 30', similar to most recent years. Oxygen levels stayed more consistent all the way to the bottom than most years. Excellent news for Basin 1! In Basin 2, the surface waters had dissolved oxygen levels at 9.38 mg/L (similar to past years) and a thermocline at 30' with dissolved oxygen at 12.2 mg/L. Dissolved oxygen levels the last few years have been better in the July sampling, but in 2022 and 2023, levels were concerning again. Basin 2 deep sample had a reading of 1.83 mg/L (it was 0.3 mg/L in 2022) compared to 4.83 mg/L in 2020/ In 2023, oxygen levels below 50' were concerning, showing signs of anoxic water, whereas in 2022, levels below 40' were concerning. Having multiple deep holes is a benefit, as cold water fish can relocate between the deep holes.

During the fall, the lake was still stratified strongly in Basin 1 and not in Basin 2 during the sampling period. In years past, both mixing and no mixing has been found during this sampling period. The warmer Michigan fall seasons of the last few years will impact this greatly. Basin 1 was stratified and unlike the June and July readings, was anoxic below the thermocline (void of oxygen). DO levels ranged from 10 mg/L at the surface to 1.83 mg/L at the bottom, similar to 2022 and much lower than in 2021. In Basin 2, which is often already mixed at this time of year due to the fetch of the lake, was still strongly stratified at 30' during the sampling. Dissolved oxygen was present at and above the thermocline, but dropped drastically below the thermocline. Top to bottom dissolved oxygen ranged from 9.81 mg/L at the surface, 6.37 mg/L at the thermocline and 0.11 mg/L at the bottom.

Substantial oxygen demand leads to rapid deoxygenation of the hypolimnion upon thermal stratification in the spring and oxygen concentrations are frequently decreased in bottom waters during the summer. Depletion of oxygen beneath the thermocline during the summer is a common symptom of eutrophication, and often leads to elevated internal nutrient loading as the result of the release of phosphorus from hypolimnetic sediments. The 2019 sampling showed good oxygen levels present in the hypolimnion, compared to previous years, as did some of the 2020 readings. The 2021 and 2022 sampling wasn't as positive and overall in 2023, were better up until the September sampling.

## pH

pH describes the balance between acids and bases in the water. Neutral values of pH are desirable. Low pH values typically result either from the growth of bog vegetation (such as peat moss), acid precipitation (“acid rain”), or acid runoff (as in acid mine drainage). Excessive growth of certain plants and algae can raise pH values. A majority of Michigan lakes have pH values in the 7-9 range. Portage Lake pH was recorded in Basin 1 and Basin 2 in the June, July and September as well as in the tributaries and shoreline sites. The pH average in June was 8.5, in July 8.2 and in September averaged 8.04. The shoreline sampling was similar to the deep hole basins as was the tributary and storm drain sampling. This data is consistent with previous samplings.

## Total Alkalinity

Alkalinity, in addition to pH, measures the amount of dissolved bases and the balance of acids and bases in the water. Alkalinity specifically measures the concentration of carbonates and bicarbonates in the water. These compounds and other ions associated with them can make water “hard”. High alkalinity lakes are hardwater lakes, while low alkalinity lakes are softwater lakes. Different kinds of plants, algae and other aquatic organisms live in hardwater versus softwater. Alkalinity is a basic characteristic of water and is neither inherently good nor bad. Total Alkalinity was measured in June, July and September in both Basin 1 and Basin 2. The average sampling between both basins in June was 123 mg/L with a range of 118-126 mg/L. The July samples were similar with an average of 116 mg/L with a range of 111 - 119 mg/L. The September samples were similar with an average of 116 mg/L with a range of 105 - 129 mg/L. All samplings show the lake to be considered “soft” with readings under 150 mg/L, a typical threshold of a hardwater lake. Overall, the 2023 readings on the lake are similar than previous readings, but overall show consistent softwater data for Portage Lake.

## Conductivity and Total Dissolved Solids

Conductivity and Total Dissolved Solids (TDS) measure the total amount of material dissolved in the water. Higher values indicate potentially rich, more productive water, whereas lower values indicate potentially clean, less productive water. (If nutrient pollution is occurring, the total phosphorus concentration is a much better indicator of potential productivity.) The combined readings of TDS on Portage Lake ranged from June readings averaging 291 ug/L, July averages of 292 ug/L to September readings averaging 292 ug/L. (Shoreline samplings were very similar to deep basins). The tributary sampling was slightly higher, averaging 335 ug/L in May and 289 ug/L in September. Overall, these averages classify the overall TDS of Portage Lake as Low Dissolved material. The conductivity readings on Portage Lake are slightly lower than the TDS readings with the basin average of 189 uS/cm in June, 290 uS/cm in late July and 190 uS/cm in September. (uS/cm=microsiemens per centimeter). Higher levels can likely be due to runoff, which is also supported by the slightly higher conductivity readings from the tributaries (May average Conductivity reading is 218 uS/cm while September average is 234 uS/cm). Tributary readings are similar to past readings.

## Oxidative Reduction Potential (ORP)

The oxidative reduction potential of a lake measures the ability of the water to serve as potential oxidizers and indicates the degree of reductants present within the water (the ability to gain or lose electrons). The reduction potential measurement has proven useful as an analytical tool in monitoring changes in a system rather than determining their absolute value. Like pH, the redox potential represents an intensity factor. It does not characterize the capacity of the system for oxidation or reduction; in much the same way that pH does not characterize the buffering capacity. Generally speaking, higher ORP values, the healthier the lake. As a lake stratifies and oxygen levels decrease towards the bottom of the lake, ORP values will decrease even in a healthy lake due to the lack of oxygen. This is because there are many bacteria working in the sediments to decompose the material and they use up the available oxygen. ORP is measured in addition to pH and dissolved oxygen as it can provide additional information of the water quality and degree of pollution, if present. High ORP values indicate high levels of oxygen in the water and that bacteria that decompose the dead matter can work more effectively.

The deep basins ranged from 61 - 126 mV in June sampling to 69 - 113 mV in the late July sampling to 38 - 123 mV in the end of summer/fall sampling, indicating oxidized conditions. Tributaries and shoreline samples had similar results to past years.

### Turbidity

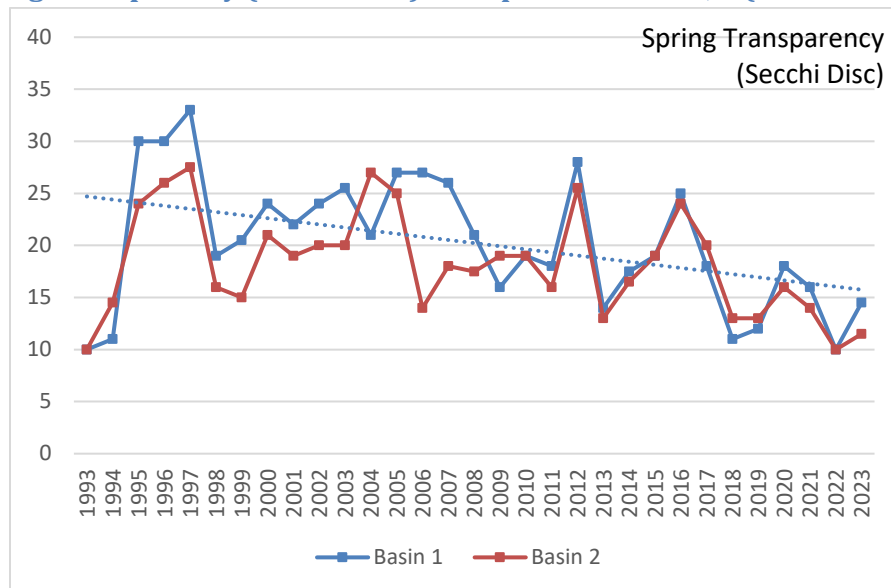
Turbidity is a measure of the clarity of the water, specifically from the presence of suspended particles in the water. Turbidity will typically increase as the suspended particles in the water increase, lowering clarity of the water. Turbidity may be caused by a variety of factors from the bottom sediments, erosion, algae production, and runoff and possibly from fish species such as carp. Suspended particles can capture heat from the sun raising water temperature as well (often witnessed in shallow waters). Turbidity readings on Portage Lake ranged from 0.51 - 1 NTU's in June to 0.45 -1.77 (at the bottom) NTU's in late July to 0.54 - 7.5 NTU's in September. This outlier result is likely due to the bottom sediments getting disrupted during sampling and should be thrown out based on historical data. Shoreline sampling ranged from 0.92 - 1.48 NTU's in June, 0.38 - 1.11 NTU's in late July and 0.74 - 0.79 NTU's in September, all decreased from 2022! The 2023 turbidity readings are overall lower than previous years, indicating potentially improved clarity. The World Health Organization (WHO) requires drinking water be less than 5 NTU's, but recreational water can be significantly higher. Overall, the turbidity readings on Portage Lake are within safe drinking water standards (this does not mean that the lake water should be used for drinking as it is not filtered).

### Secchi Disk Depth

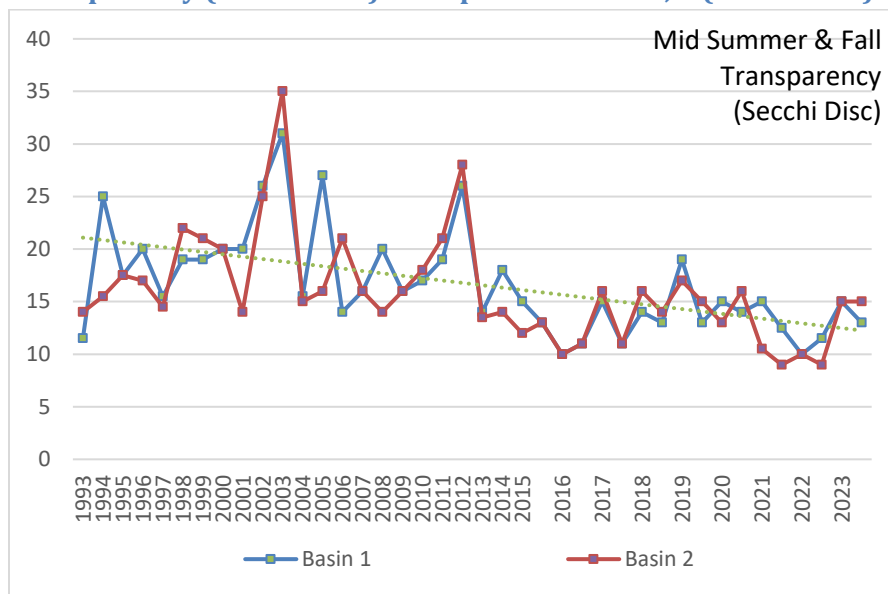
The Secchi disk depth is another measure of water clarity, determined by measuring the depth to which a black and white disk can be seen from the surface. (Larger numbers represent greater water clarity.) In June, Basin 1 was 14.5' and Basin 2 11.5'. Clarity improved some into summer, with the Secchi disk depth of 15' in late July in Basin 1 and 15' in Basin 2. Reading were 13' in Basin 1 and Basin 2 was at 15' in September. Generally speaking these results are slightly above the last few years. Water clarity can fluctuate from week to week depending on several environmental factors such as rain fall & algal production. Basin 2 may likely be more affected by the fetch of the lake, therefore could likely have a lower Secchi disk reading. These clarity readings show that sunlight is available for plant and algae throughout a good portion of the lake. Reviewing trendline data for clarity, Portage Lake clarity is decreasing.



**Graph 5: Spring Transparency (Secchi Disk) - Deep Hole Basins 1, 2 (1993-2023)**



**Graph 6: Fall Transparency (Secchi Disk) – Deep Hole Basins 1, 2 (1993-2023)**



### Total Phosphorus

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 concentrations in June in Basin 1 were 8 µg/L at the lake surface, and 8 µg/L at thermocline depth and 8 µg/L in the bottom water. In Basin 2, 8 µg/L at the lake surface, and 8 µg/L at thermocline depth and 8 µg/L in the bottom water. The June shoreline readings from sites Cove was 8 µg/L, 3B was 8 µg/L and the Inn was 8 µg/L.

The tributary TP readings in May ranged from 8 - 29 µg/L. similar to 2022 data but not as aligned with historic data. Storm Drain TP May readings were all 8 µg/L, much below previous results. In the past, higher TP readings have been found coming from the tributaries and storm drains.

Late July Total Phosphorus concentrations were 8 µg/L at the surface, 8 µg/L in the thermocline and 8 µg/L at bottom in both basin. No increases from the June testing and readings are still well below levels of concern. This indicates that the TP is consistent from top to bottom and even with a void of dissolved oxygen, TP levels are not elevated, indicating no internal loading.

End of summer Total Phosphorus concentrations were: Basin 1 8 µg/L at the surface, 8 µg/L at 30' and 8 µg/L at bottom, same results as Basin 2. These samples are considered relatively low.

In 2017, levels were increased from 2016, but in 2018, levels had decreased and were back similarly to 2016 concentrations. Overall, the sampling in 2019, 2020, 2021, 2022 and 2023 are all similar, with very few fluctuations overall. This is a positive sign for Portage Lake.

In years past, tributary sampling showed Stream #9 was generally the highest of the reading; however, in recent years, this is not always been the case. In 2023, the tributaries were similar in the spring and fall and are classified as enriched. Historically, the tributary samplings show higher levels of TP compared to the basins. Stream #9, which has had additional tributary upstream testing completed upstream in the past, did not have enough flow or water present in the creek, to collect adequate samples in 2021 or 2022. Stream #9 fall sampling, came back very high at 202 µg/L, and was likely contamination during

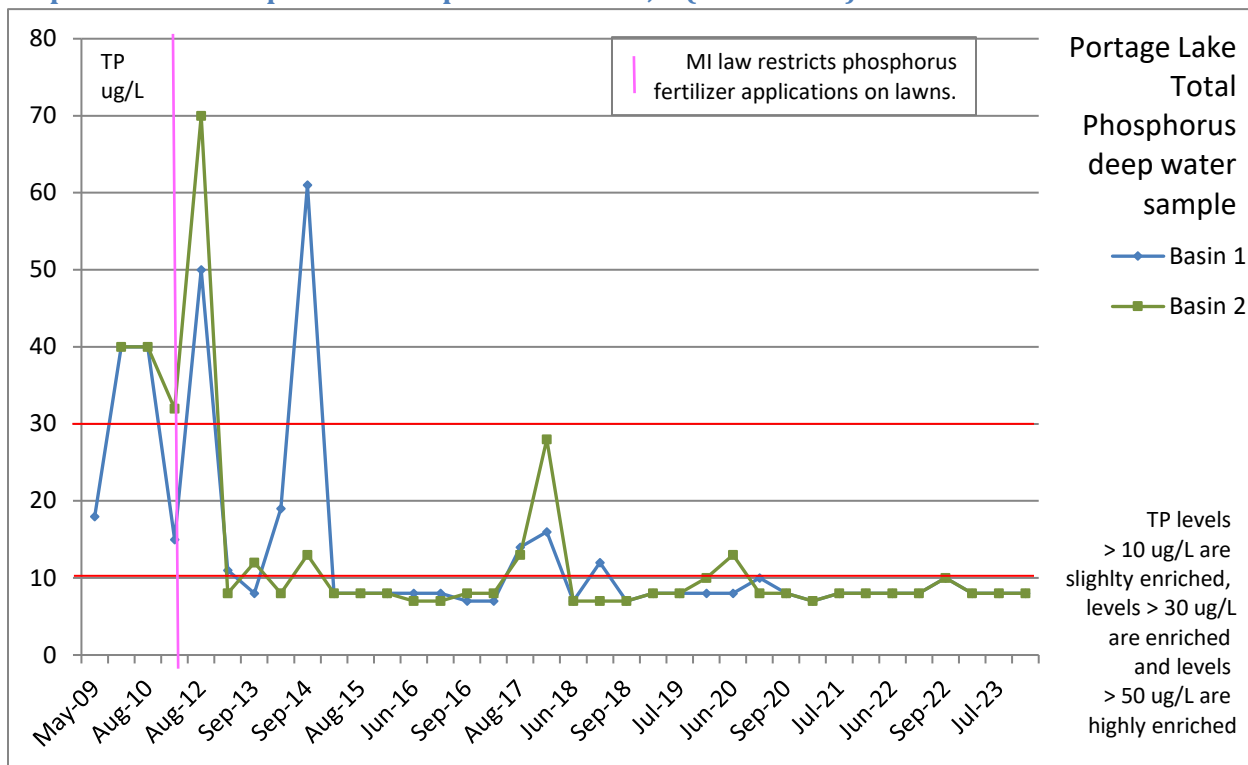
sampling, based on the lack of flow from this area. As an extreme outlier, this result has been removed from some of the graphs below.

Overall readings show that higher phosphorus concentrations are found in the tributaries and that internal loading was not a contributing factor to TP in 2023, same as in 2022. The 2023 data shows the TP had stayed low in both Basins, similar to what was found in 2019-2022, and still well below historical data. Past data has shown that Basin 2 is routinely higher in concentrations than Basin 1, which is expected due to the fetch and potential lack of oxygen of Portage Lake; however, the last few years of data has shown a declining trend.

See below graphs of TP concentrations from 2023. Basin 1 and 2 are graphed using data previously collected on Portage Lake (via various sources, provided to PLM via the Portage Lake Watershed Forever website with permission from the committee).

Beginning January 1, 2012, Michigan law restricts phosphorus fertilizer applications on lawns. This is noted in graphs as an event to track Phosphorus trends post ban.

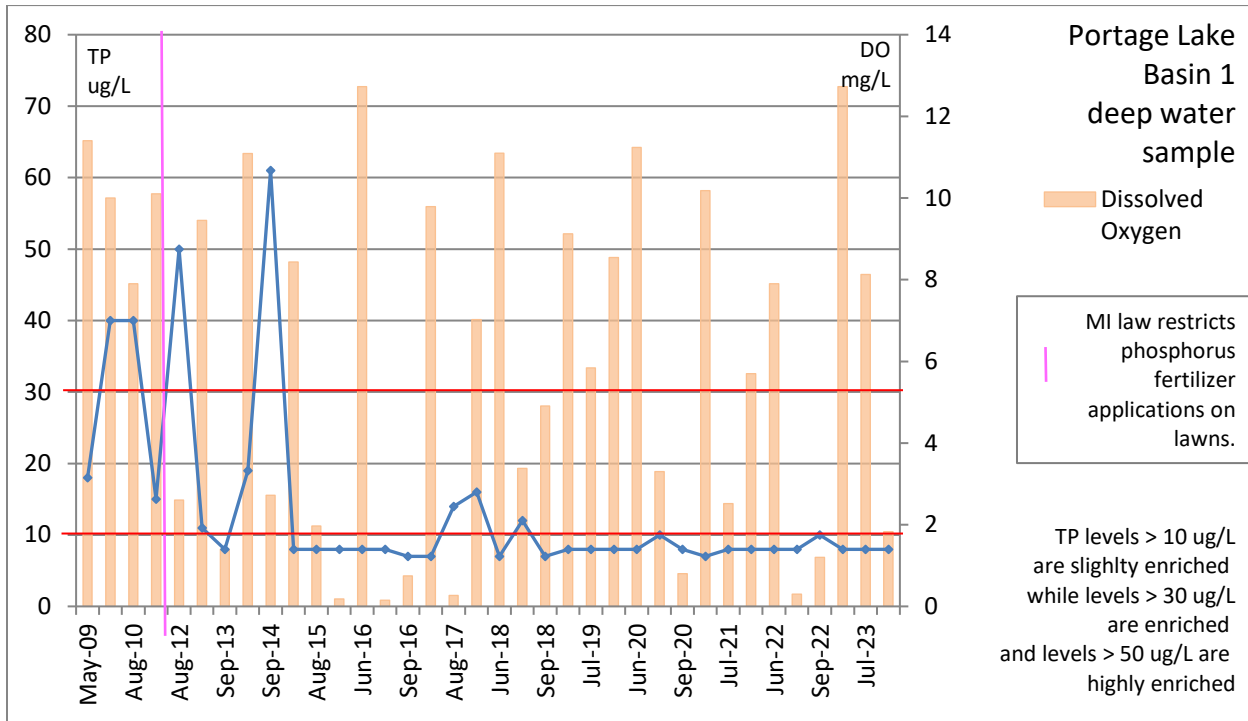
**Graph 7: Total Phosphorus – Deep Hole Basins 1, 2 (2009-2023)**



There have been a few spikes in TP over time but generally speaking, the bottom waters of Portage Lake are not classified enriched based on the sampling in recent years. Note: Basin 2 May 2009 sample is not graphed as the reading of 340 ug/L is an extreme outlier and not reflective of the overall lake results.

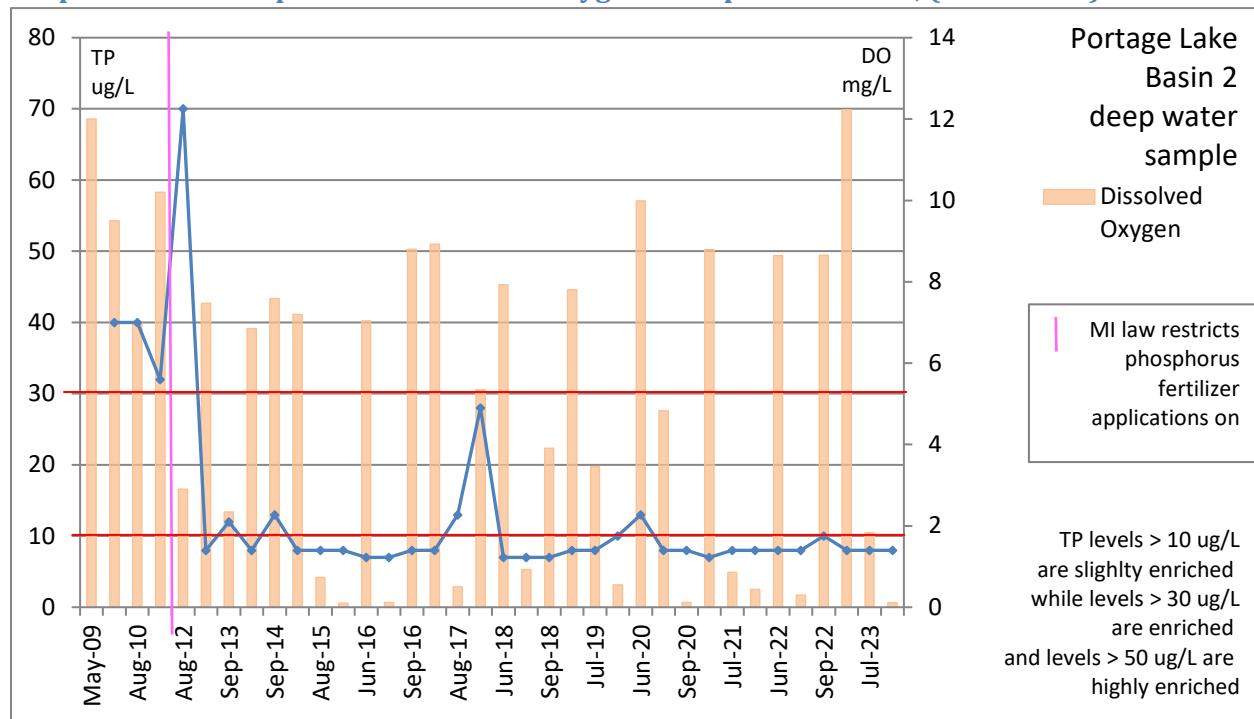


**Graph 8: Total Phosphorus & Dissolved Oxygen - Deep Hole Basin 1, (2009-2023)**



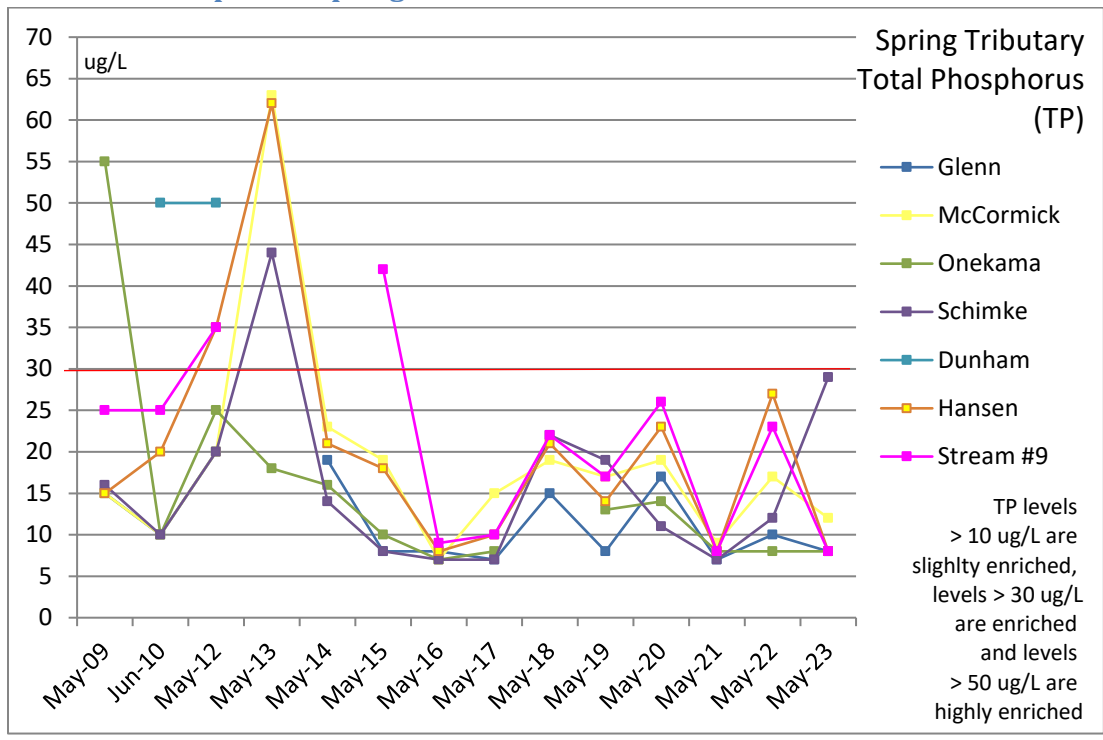
Looking at the trendlines, Basin 1 has higher DO levels during mid to late summer months than Basin 2. Higher DO levels are better. Internal loading (spikes in TP) can take place when DO levels decrease. There is no indication of internal loading taking place.

**Graph 9: Total Phosphorus & Dissolved Oxygen - Deep Hole Basin 2, (2009-2023)**

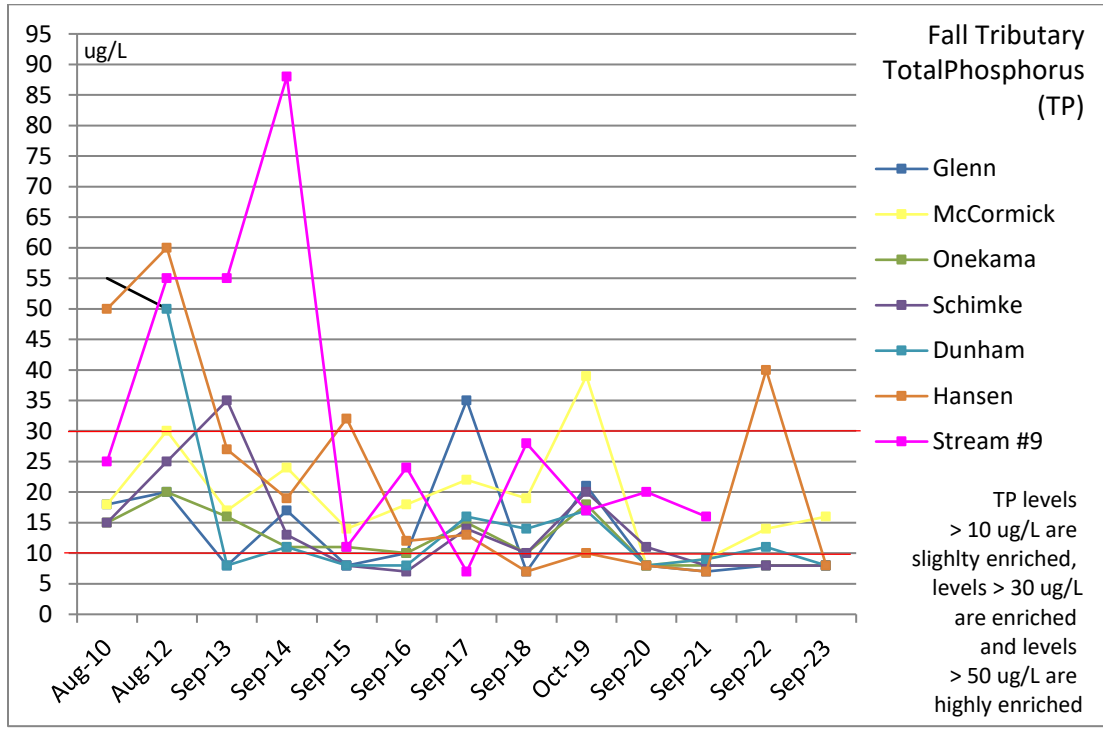


Looking at the trendline data, DO has consistency declined in the mid to late summer months, leading to anoxic conditions. However, TP levels have stayed low; which is an excellent sign. There is no indication of internal loading in Basin 2.

**Graph 10: Total Phosphorus Spring - Tributaries 2009-2023**

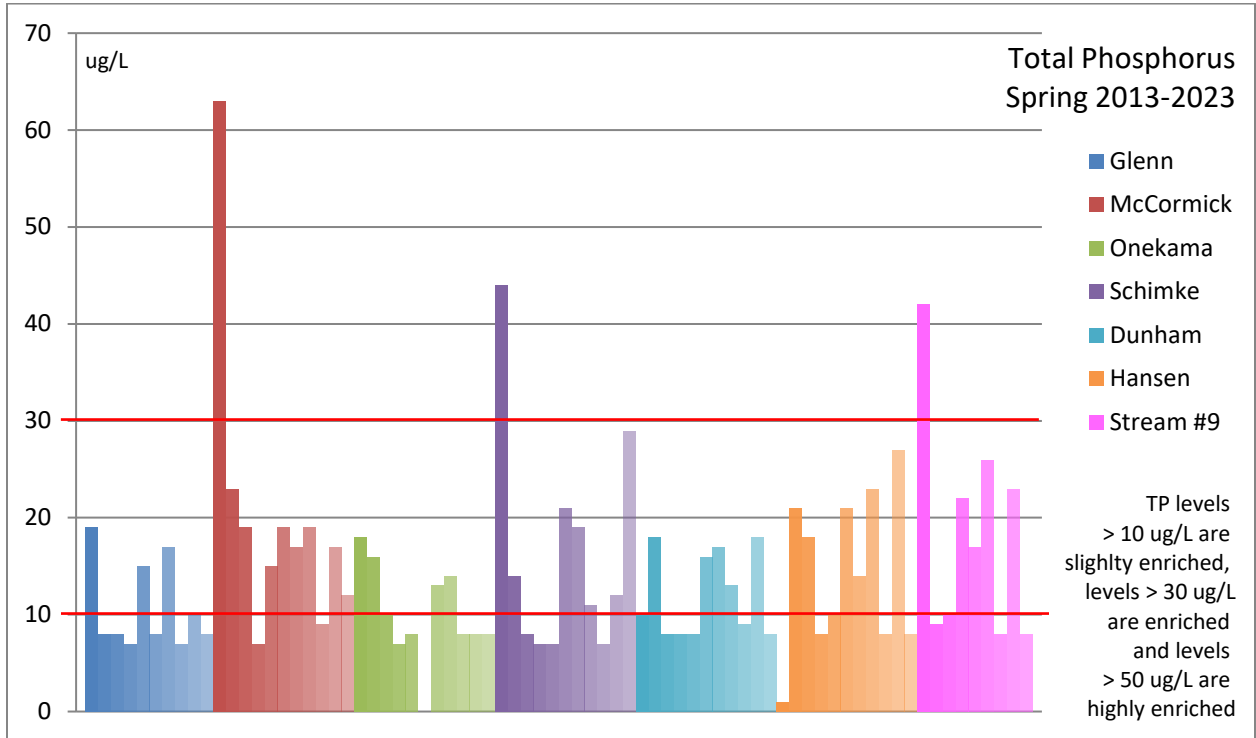


**Graph 11: Total Phosphorus Fall - Tributaries 2009-2023**



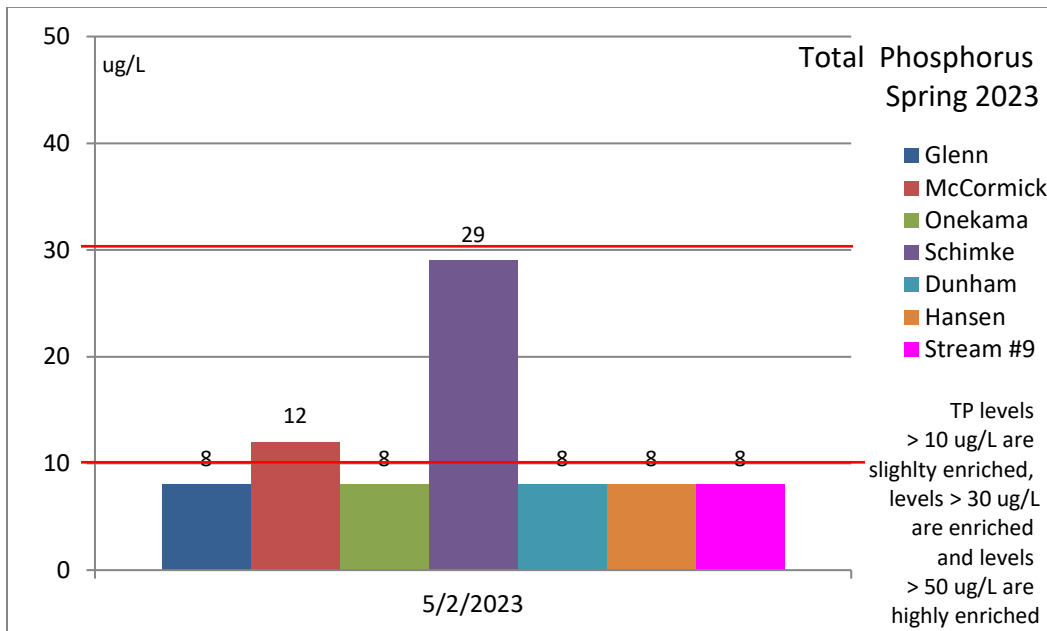
Graphs 10 and 11 indicate there are fluctuations between the creeks over time. See below graphs to show the 2023 comparisons between the creeks. Glenn Creek May 2013 and Stream #9 2023 samples were removed from this graph as an extreme outliers, likely from a contaminated sample. Stream #9 was not sampled in 2013.

**Graph 12: Total Phosphorus - Tributaries 2013-2023**



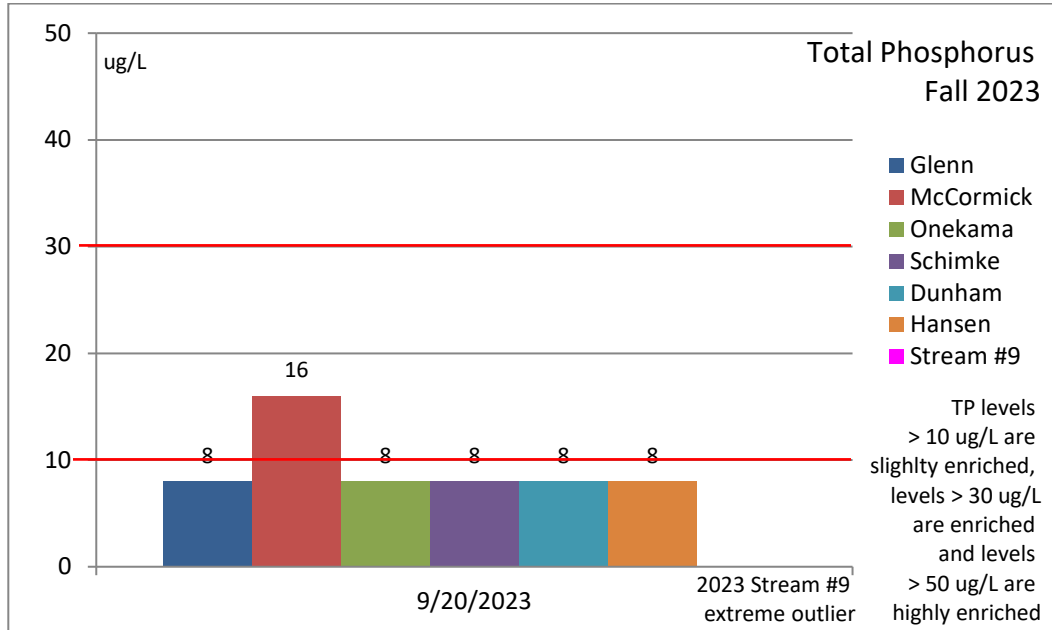
Graph 12 shows the fluctuation in TP in each Tributary over time. Historically, the tributaries have been and remain a point source of pollution for Portage Lake. Stream #9

**Graph 13: Total Phosphorus - Tributaries May 2023**



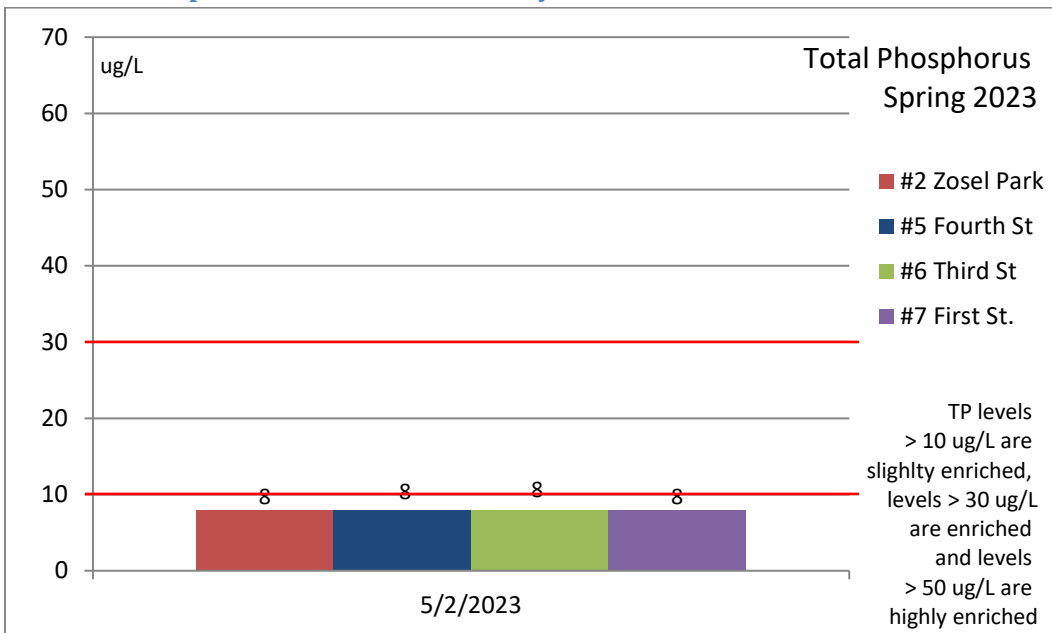
Graph 13 includes the Total Phosphorus from each Tributary tested in 2023, showing overall decrease from 2022!

**Graph 14: Total Phosphorus – Tributaries End of Summer 2023**



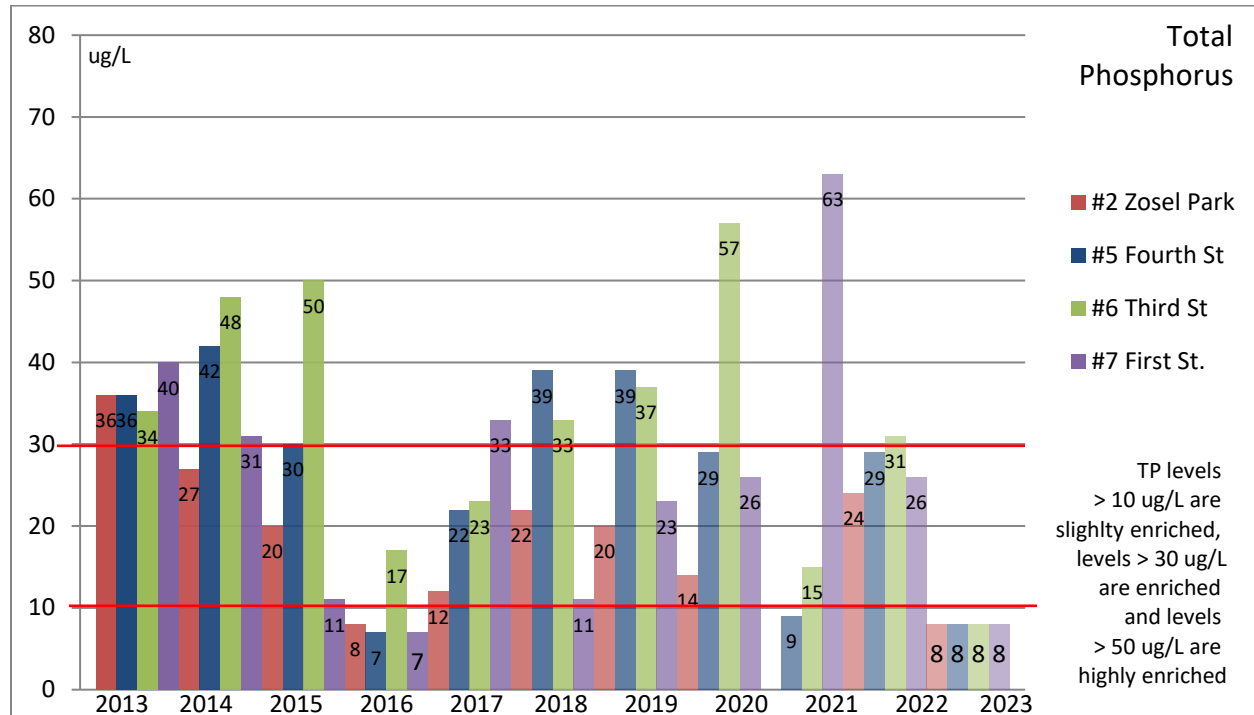
Graph 14 illustrates the TP in the fall sampling, which generally speaking is lower than the spring sampling. Rainfall and flow are traditionally higher in the spring, correlating with increased phosphorus inputs.

**Graph 15: Total Phosphorus – Storm Drains May 2023**



As the graph illustrates, there is little fluctuation between the TP in the different storm drains around Portage Lake and overall and unlike most years were samples are very enriched, 2023 samples were very low.

**Graph 16: Total Phosphorus – Storm Drains May 2013 - 2023**

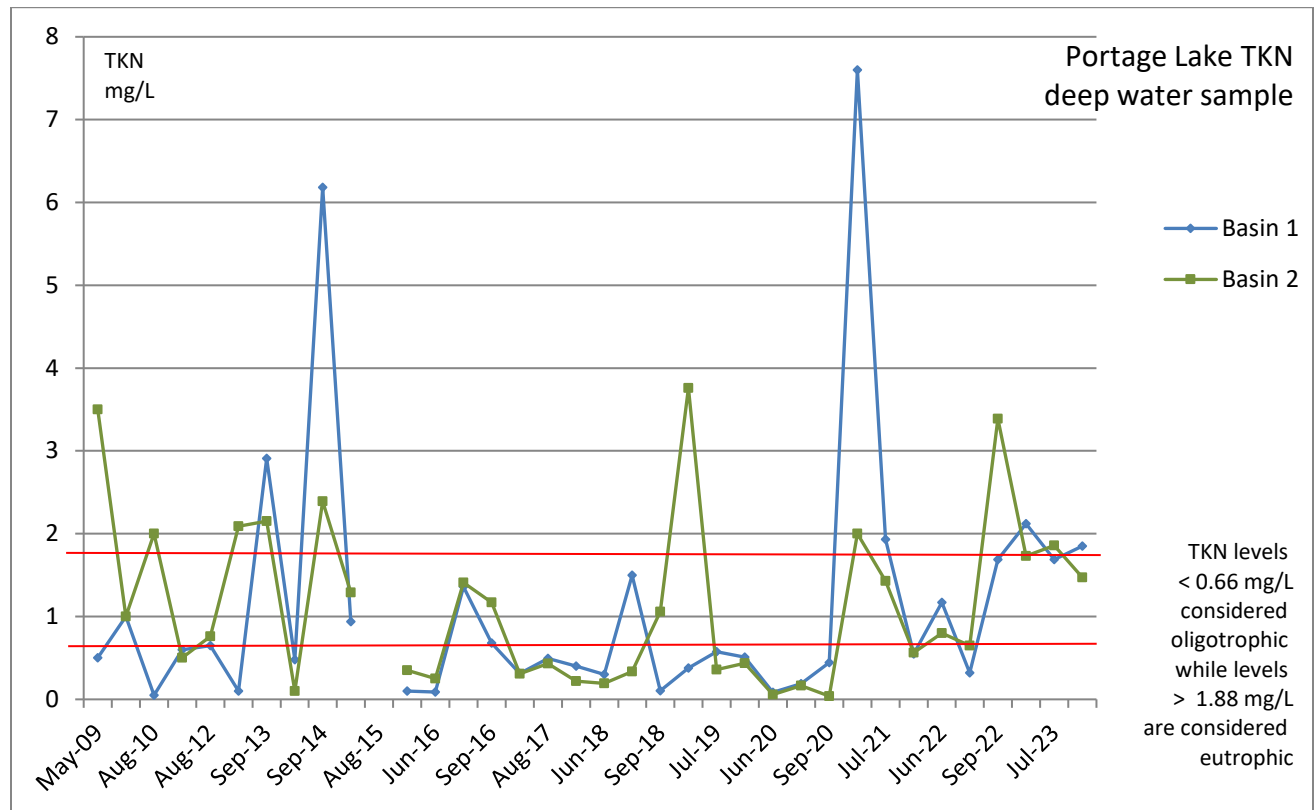


Graph 16 shows the storm drain TP over time and most of the TP concentrations are considered enriched. These sites are a key introduction point of Phosphorus into Portage Lake. Historical data shows a decline in TP in 2016 and 2023; but that was short lived in the past and additional testing will show if that is a trend

### Total Kjeldahl Nitrogen (TKN)

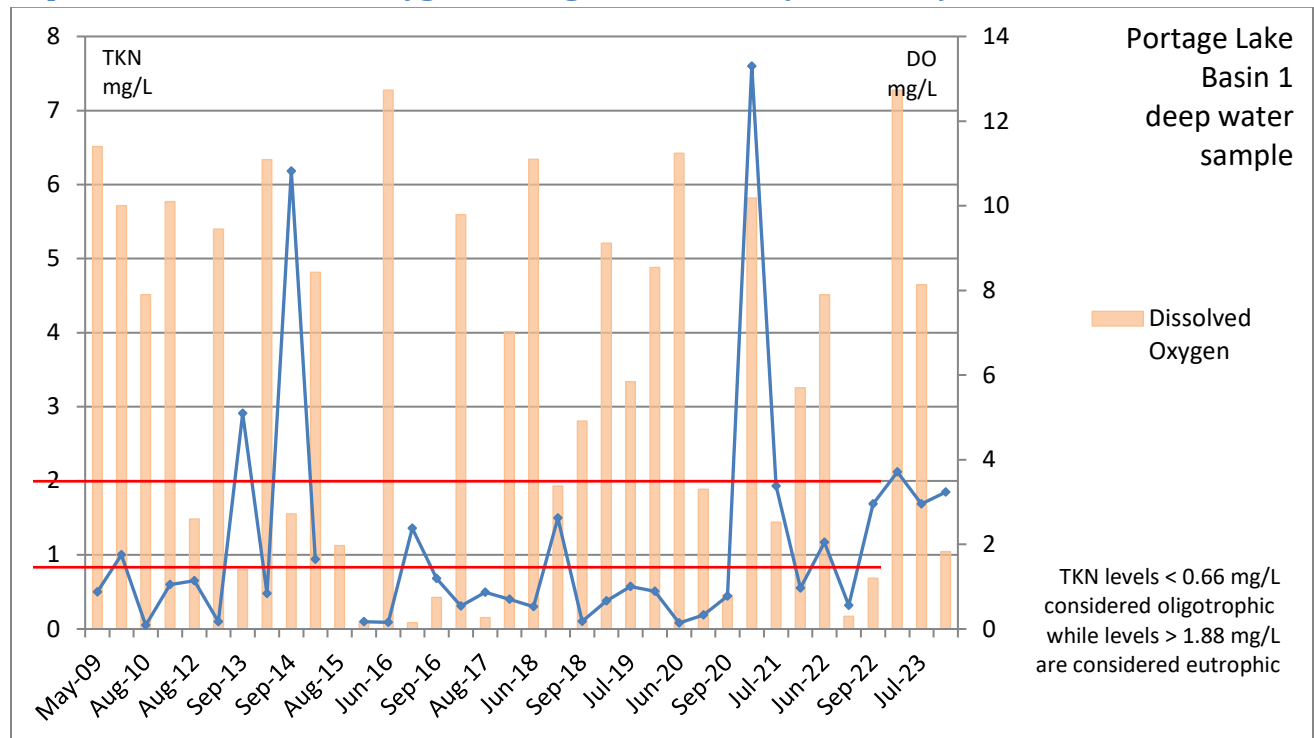
TKN measures the total organic amount of nitrogen (nitrate and nitrite) and ammonia in the water. Nitrogen is the plant nutrient (i.e. fertilizer) most likely to control the amount of rooted plant growth in lakes and ponds. Most Midwestern lakes have more nitrogen and more rooted plant growth than is desirable, so lower values are generally considered better. The major sources of nitrogen in lakes are from agriculture (animal waste, fertilizer) and atmospheric emissions (fossil fuel). Lakes with a TKN value of 0.66 mg/L or less are typically classified as oligotrophic lakes (having fewer nutrients, less productivity). Lakes with TKN values above 1.88 mg/L may be classified as eutrophic (highly productive and nutrient rich). Nitrates do not accumulate very much in the bottom waters during the summer because when nitrate is void of oxygen it turns into ammonia. Therefore, ammonia testing is an excellent way to determine internal loading of nitrogen. The TKN readings on Portage Lake at Basins 1 and 2 in June ranged from 1.97 mg/L to 3.62 mg/L, in late July from 1.67 mg/L to 2.46 mg/L and in September from 1.47 mg/L - 2.59 mg/L between both basins. The shoreline samples ranged from 1.85 mg/L- 3.26 throughout the summer. All of these readings are slightly higher than previous years and dissolved oxygen was present, for the most part in 2023. These levels classify the lake as eutrophic and would indicate a lake that could have substantial rooted plant growth.

**Graph 17: TKN – Portage Lake Basins 1, 2 (2009-2023)**

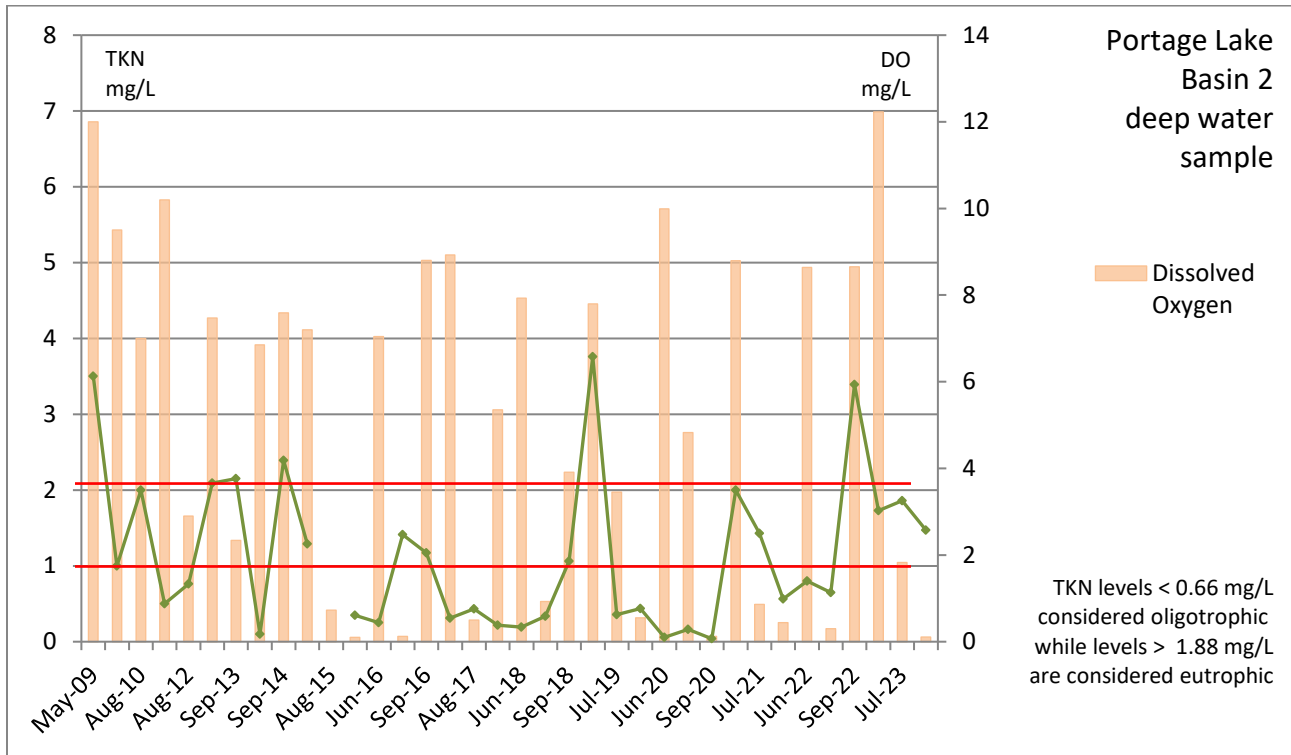


As the above graph illustrates, the TKN concentrations on Portage Lake have fluctuated some in recent years with some large spikes. A larger spike (or outlier) in August 2015 is not graphed. 2022 and 2023 sampling shows elevated levels and additional sampling in 2024 is highly recommended to determine if this is a trend that continues. The below graphs illustrates Basin 1 in more detail and that the spike in 2022 and 2023 are not correlated to DO levels.

**Graph 18: TKN & Dissolved Oxygen– Portage Lake Basin 1 (2009-2019)**



**Graph 19: TKN & Dissolved Oxygen- Portage Lake Basin, 2 (2009-2023)**



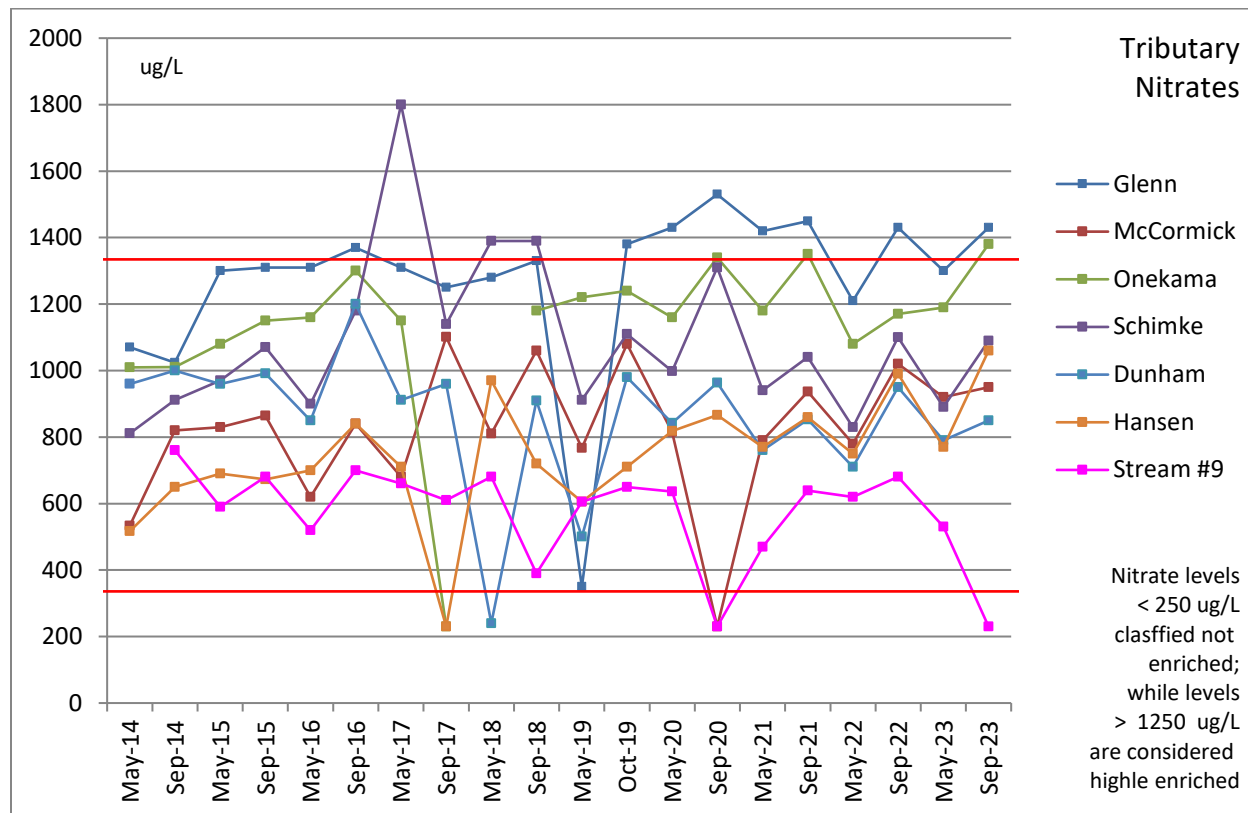
Basin 2 has followed a similar pattern to Basin 1, despite low DO levels.

### Nitrates

Nitrates measure the total amount of in-organic nitrogen in the water. Again, nitrogen is an important plant nutrient (i.e., fertilizer) and the nutrient most likely to limit the growth of rooted plants. Most Midwestern lakes have more nitrogen and more rooted plant growth than is desirable, so lower values are generally considered better. Nitrate levels under 250 µg N/L are considered not enriched while readings between 250-750 µg N/L are slightly enriched, readings from 750-1250 µg N/L are enriched and readings over 1250 µg N/L are highly enriched. The sampling in both Basins were consistent this year. The June concentrations of nitrates in Basin 1 and 2 were ranged from 230 µg N/L to 500 µg N/L. The late July readings ranged from 230 µg N/L to 400 µg N/L and September concentrations of nitrates were 230 µg N/L to 280 µg N/L throughout the water column. Nitrates in the tributaries ranged from 530 µg N/ to 1300 µg N/L in the spring and from 230 µg N/ to 1430 µg N/L in September, which were similar to last season. Nitrates are typically higher in the spring when the water is colder because the bacteria needed to digest the nitrates are not as productive in cooler temperatures. Nitrates will often decrease over the spring and be slightly less in the lake by the end of the summer. Based on the higher levels of nitrates observed in inlets (Tributaries and Storm Drains) in May and September, loading of the lake appears to be mainly from external sources. External sources for nitrate pollution are agricultural practices (manure, fertilizer), animal feedlots, urban runoff and municipal wastewater runoff. Based on the location of Portage Lake and the makeup of the surrounding watershed, nitrate enrichment is most likely coming from agricultural practices that have leached into the groundwater and animal feedlots. Nitrates did not accumulate very much in the bottom waters during the summer. The nitrates did not accumulate because when nitrate is void of oxygen it turns into ammonia. Therefore, ammonia testing is a better way to determine internal loading of nitrogen.

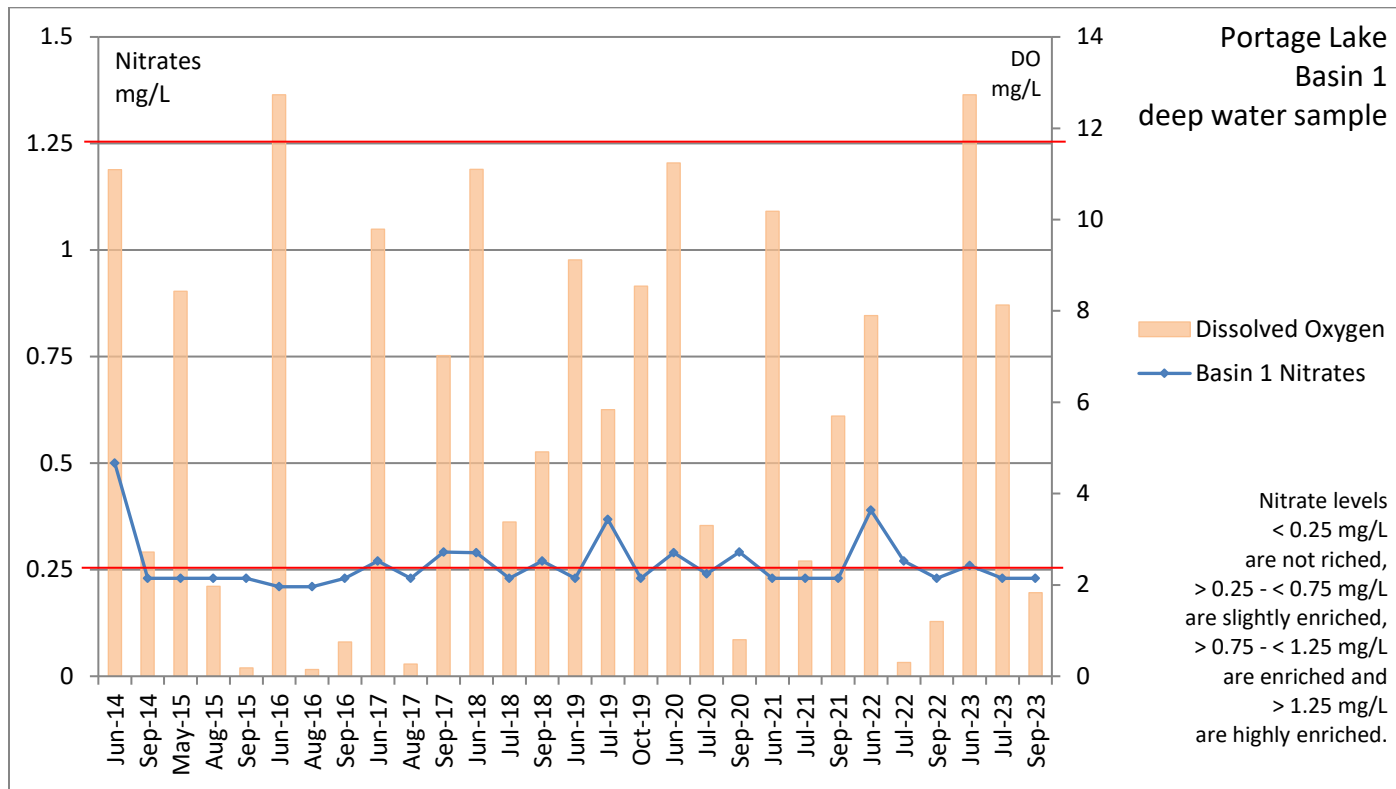
These samples show that the lake (at the time of sampling) may be Phosphorus limited. Phosphorus limited lakes tend to have a TN:TP >15. In 2023, the average TN was 263 ug/L in the basins and the TP 8.0 ug/L, giving a TN:TP of 32. This reading indicates Phosphorus may be the limiting nutrient. This is common in most lakes in this geographical area.

**Graph 20: Nitrates- Portage Lake Tributaries**



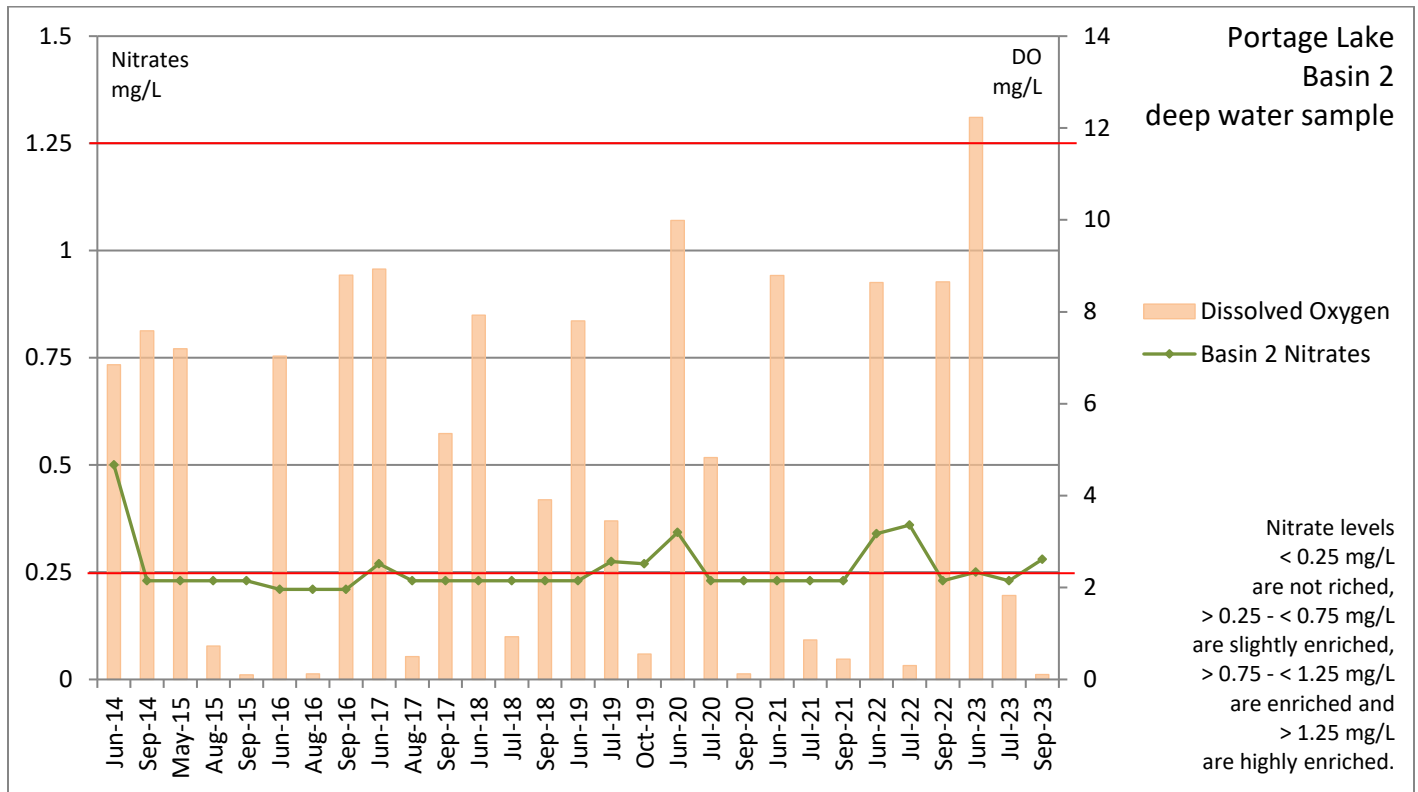
Graph 20 shows the nitrate concentrations in the Portage Lake Tributaries range from slightly enriched to highly enriched. It is recommended to continue testing.

**Graph 21: Portage Lake Nitrates Basin 1 (2014-2023)**





**Graph 22: Portage Lake Nitrates Basin 2 (2014-2023)**

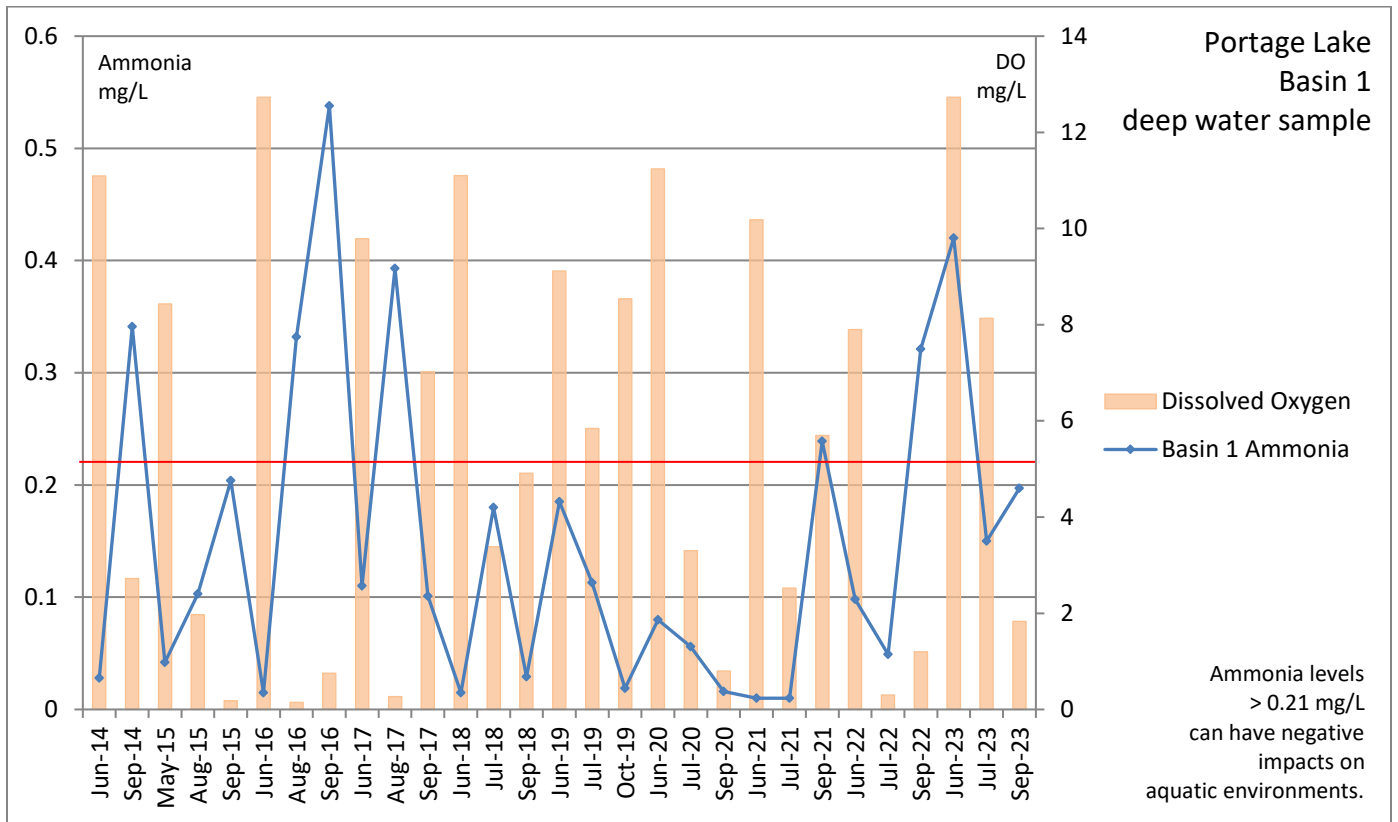


Graphs 21 and 22 show the DO levels with the nitrates in both Basins. Nitrate levels do not increase with decreased DO levels.

### Ammonia

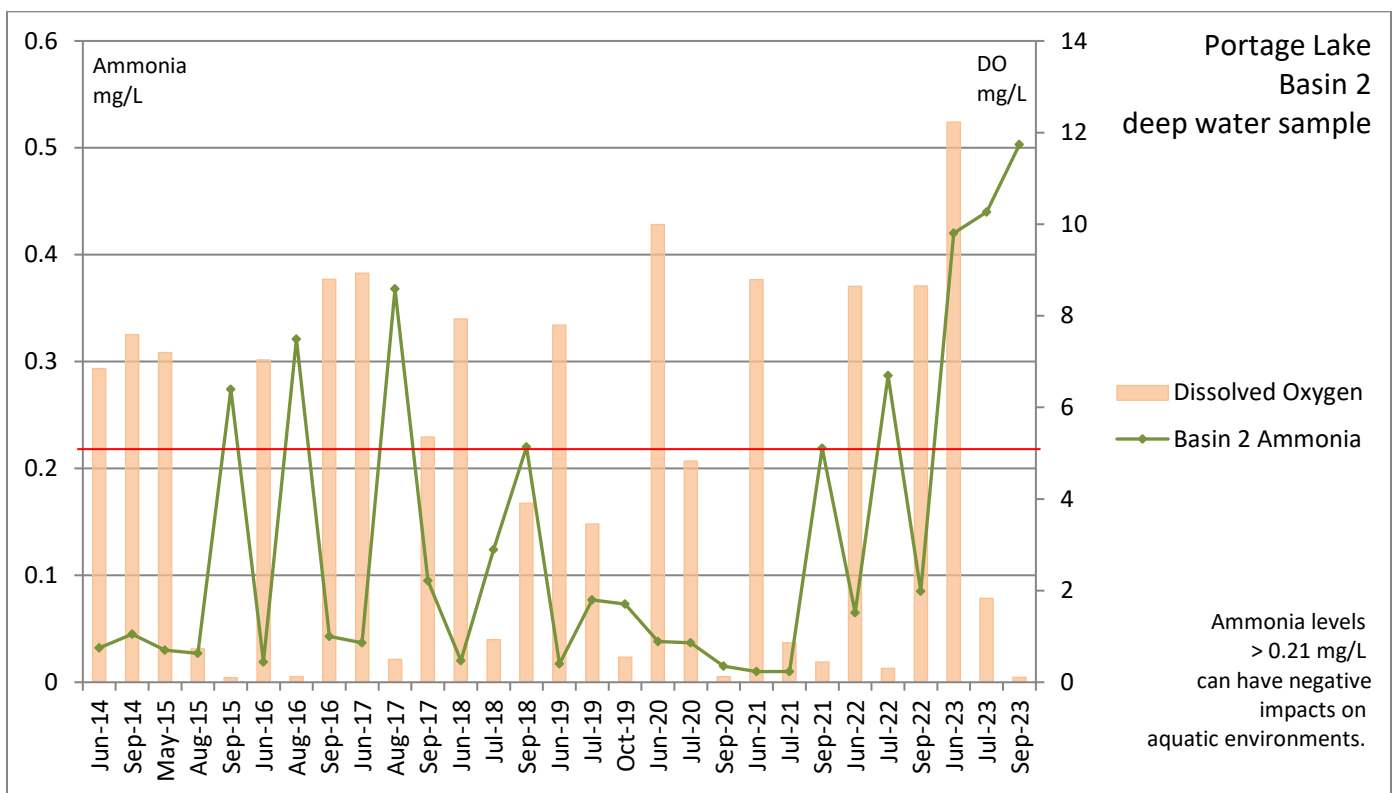
Ammonia is a form of nitrogen found in organic materials, sewage, and many fertilizers. It is the first form of nitrogen released when organic matter decays. Also, when ammonia degrades it consumes oxygen, which worsens already existing anaerobic conditions. However, ammonia can be used by most aquatic plants and is therefore an important nutrient. When oxygen is present in a lake ecosystem, ammonia will convert to nitrates. Ammonia is toxic to fish at relatively low concentrations in pH-neutral or alkaline water. In fish, ammonia affects hatching and growth rates, and can cause changes in tissues of gills, the liver and the kidneys. Ammonia concentrations below 1 mg/L (or 1000 ug/L) are generally considered suitable for healthy fisheries; however, Ammonia concentrations can have impacts on aquatic organisms at lower levels. It is important to review all ammonia concentrations based on the specific lake type, temperature, pH and dissolved oxygen. Michigan EGLE includes standards in part 4 (Water Resources Protection, Water Quality Standards) that ammonia shouldn't exceeded the Aquatic Maximum Value (AMV) threshold of 0.21 mg/L (210 ug/L) in which they feel negative impacts can occur in aquatic communities. Further, the Final Acute Value (FAV) shouldn't exceed a concentration of 0.42 mg/L (or 420 ug/L) where short term exposure can lead to negative impacts on aquatic organisms. Ammonia concentrations usually do not become elevated until water is void of oxygen and the nitrates are converted. Therefore, concentrations of Ammonia do not become elevated until anaerobic conditions are present, typically mid-summer. The concentration of ammonia at the Basin 1 in June was 0.015 mg/L (or 15 ug/L) at the surface and 0.042 mg/L (42 ug/L) at the bottom while in Basin 2 it was 0.015 mg/L (or 15 ug/L) at the surface and 0.042 mg/L (or 42 ug/L) at the bottom. In late July, the concentrations were 0.015 mg/L at the surface and 0.15 mg/L at the bottom in Basin 1 and 0.015 mg/L at the surface and 0.044 mg/L at the bottom in Basin 2. The September concentrations were 0.015 mg/L at the surface and 0.19 mg/L at the bottom in Basin 1 and 0.015 mg/L at the surface and 0.503 mg/L at the bottom in Basin 2. All readings are well within range for a healthy fishery. The shoreline areas ranged from 0.015 mg/L - 0.1 mg/L in June, all considered very low. As oxygen is not an issue here, this is expected.

**Graph 23: Ammonia- Portage Lake Basin 1 (2014-2023)**



Graph 23 shows ammonia in Basin 1 is elevated when DO levels decline (i.e. in 2016); which is expected in anaerobic conditions. Although some thresholds have concentration spikes elevated on Portage Lake, the general review of the Ammonia trend is low. When spikes have been seen, internal loading of ammonia was likely.

**Graph 24: Ammonia- Portage Lake Basin 2 (2014-2023)**

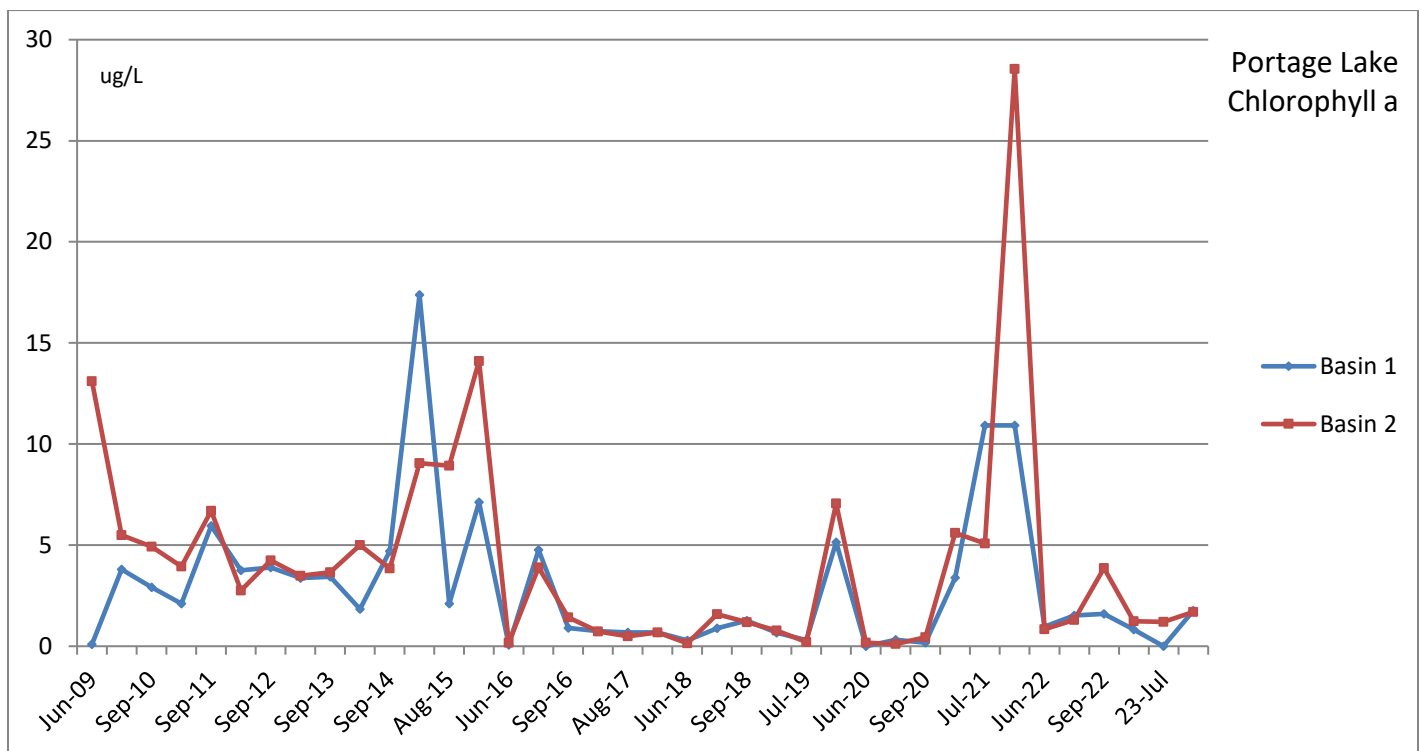


Basin 2 follows Basin 1 with spikes in Ammonia concentrations when DO levels drop.

## Chlorophyll

Chlorophyll measures the amount of plankton (green algae) in the water. Some plankton or algal growth is essential to support the growth of other organisms (e.g., fish) in the lake, but human activities and natural eutrophication often lead to excessive algal growth; thus, lower concentrations of chlorophyll are usually considered desirable. Chlorophyll concentrations in Portage Lake Deep Basins in June ranged from 0 ug/L to 1.57 µg/L indicating similar plankton populations than previous years. Shoreline samplings sites averaged 0.00 ug/L in June. Chlorophyll in the Deep Basins ranged from 0.0 ug/L - 1.216 ug/L in late July, while shoreline sites averaged 1.89 ug/L. In September, Chlorophyll ranged from 1.27 ug/L to 2.2 ug/L. The shoreline sites averaged 1.7 ug/L in September. A higher level, in shallow, warmer waters is common as the warmer water can be a breeding ground for plankton. Overall, chlorophyll levels have varied some in recent years, were much higher in 2021 and more consistent with historical data (and lower) in 2022 and 2023. Additional sampling is recommended and over time, sampling technology has improved as well.

Graph 25: Chlorophyll a- Portage Lake Deep Basins



Chlorophyll a sampling has declined over the last few years with some spikes, likely weather related and 2021 sampling showed large increases and returned to more consistent data in 2022 and 2023. Additional sampling is recommended.

## Algae and Zooplankton Composition

Algal composition testing was performed at both deep Basins as well as the shoreline testing sites in June, late July and September. The June testing showed the majority genera present included (presented as most abundant to least abundant); Cyanophyta (blue green algae): *Microcystis sp.*, Bacillariophyta (diatoms): *Cyclotella sp.*, *Asterionella sp.*, *Fragilaria sp.*, *Tabellaria sp.*; Chlorophyta (green algae): *Chlamydomonas sp.*, *Scenedesmus sp.*, *Spirogyra sp.*, *Pediastrum sp.* The July sampling found Bacillariophyta (diatoms): *Fragilaria sp.*, *Cyclotella sp.*; Chlorophyta (green algae): *Pediastrum sp.*, *Chlorella sp.*, *Gloeocystis sp.*, *Ulothrix sp.*; Euglenophyta, specifically *Trachelomonas sp.*; Cyanophyta (blue green algae), specifically *Microcystis sp.*, The September sampling found Cyanophyta (blue green algae), specifically *Microcystis sp.*, *Gloeotrichia sp.*, the most abundant species and genera of phytoplankton followed by Chlorophyta (green algae): *Pediastrum sp.*, *Chlorella sp.*; Bacillariophyta

(diatoms): *Fragilaria sp.* Some blue green algae, including *Microcystis sp.*, can produce toxins. These toxins are normally released when the algae near the end of the life cycle and often occur for short phases during a growing season, often times towards the end of the season after the water temperatures and nutrient loading have reached a high. Further, blue green algae are not consumed by Zebra mussels, so if Zebra mussels are present in a lake ecosystem, it is likely to have lower green algae populations and higher blue green algae, as the Zebra Mussels will filter the green algae out of the water column and leave the blue green algae alone. The levels of blue green algae are not high enough to warrant a concern at this time. The blue green algae “scum” that forms on the lake surface when densities are extremely high should be avoided if that were to occur, but the densities in Portage Lake are not high enough to cause a bloom at this point.

The zooplankton communities were also identified while looking at the phytoplankton and numerous species of zooplankton were documented including; *Cladocera sp. (Daphnia)*., *Rotifer sp.*, *Brachiopoda sp.*, and *Copepods sp.* Diverse and present phytoplankton is required to have a healthy zooplankton community as the base of the food chain.

### **Fecal Indicator Bacteria (E. Coli)**

Fecal Indicator Bacteria (E. Coli) measurements count the number of live fecal indicator bacteria in the sample. These bacteria are considered reliable indicators of fecal contamination when they are found in a pond or lake; it is very likely that the water is being contaminated by animal feces. Contamination can potentially be derived from a number of sources, including failed septic systems, agriculture runoff, or waterfowl or wildlife droppings.

In the last decade, E.Coli monitoring has become a priority for the watershed in order to ensure healthy, clean water for the area’s residents and visitors. E.Coli data has been collected throughout the watershed by various entities including District 10 Heath Department, Onekama Village, Onekama Township and PLM Lake & Land Management. Between 2009 and 2023, over 400 composite samples have been collected around Portage Lake and its tributaries.

In 2023, the scope of the E.Coli monitoring included road end beaches and tributary streams by District Heath Department. A total of three samples at 10 sites were collected six times between June and August. Areas of concern were found in Schmeke Creek (next to fairgrounds) and in Stream #9 (M22 at Easy Street). These areas had elevated levels throughout much of the summer to justify a body contact advisory in those areas.

The majority of the sample sites in the Portage Lake watershed that have been monitored for E.Coli have had consistently low concentrations meaning that in the context of E.Coli, water quality is high and public health risk is low.

**Table 4: Portage Lake E.coli Testing, District 10 Health Department 2023**

**Portage Lake Surface Water Monitoring – 2023**

**E. coli Results: Colony\* forming units(cfu)/100ml (3 samples/site A,B,C)**

**District 10 Health Department**

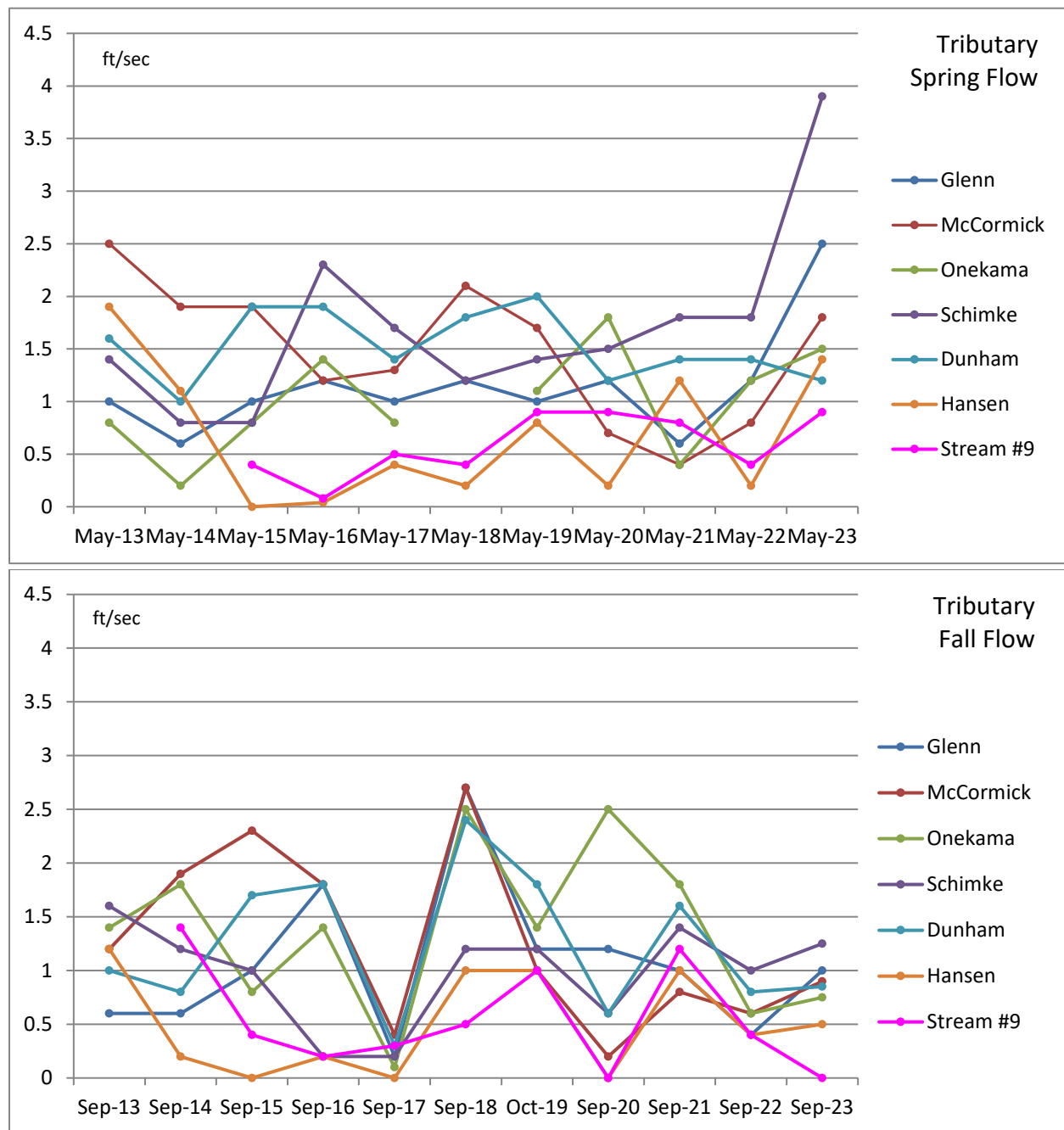
Location/Date	June 14	June 26	July 12	July 26	Aug 9	Aug 23
1. Portage Point Road (Hilltop)	A: <1.0 B: <1.0 C: 1.0	A: 24.1 B: 3.1 C: 13.2	A: <1 B: 3.0 C: 33.0	A: 39.3 B: 6.3 C: 11.0	A: 2.0 B: <1 C: <1	A: <1 B: 2.0 C: 1.0
2. Bayview (Batmore)	A: <1.0 B: 2.0 C: 1.0	A: <1.0 B: 5.2 C: <1.0	A: <1.0 B: <1.0 C: 1.0	A: 5.2 B: <1.0 C: 1.0	A: 1.0 B: <1 C: 1.0	A: 62.4 B: 38.3 C: 13.5
3. Ardmore Road (Public Access)	A: 11.0 B: 7.3 C: 56.5	A: 16.9 B: 4.1 C: 16	A: 2.0 B: <1.0 C: 3.1	A: 39.9 B: 25.3 C: 18.3	A: <1 B: <1 C: <1	A: 12.2 B: 10.8 C: 13.5
4. Portage Point Inn Beach	A: 2.0 B: 2.0 C: <1.0	A: 13.4 B: 12.1 C: 18.3	A: 3.1 B: 4.1 C: 2.0	A: 28.1 B: 35.5 C: 96.0	A: 4.1 B: 8.4 C: 2.0	A: 76.7 B: 68.3 C: 88.0
5. 3rd Street Public Access Portage Point	A: 2.0 B: 3.0 C: 1.0	A: 59.8 B: 118.7 C: 73.3	A: <1.0 B: <1.0 C: 1.0	A: 7.3 B: 9.8 C: 7.2	A: 3.1 B: 1.0 C: <1	A: 141.4 B: 178.5 C: 143.9
6. Shemkey Creek next to Fair Grounds	A: 178.2 B: 172.3 C: 178.2	A: 461.1 B: 410.6 C: 461.1	A: 325.5 B: 201.4 C: 224.7	A: 365.4 B: 298.7 C: 387.3	A: 204.6 B: 178.9 C: 172.3	A: 111.2 B: 88.2 C: 121.1
7. Stream 9 M-22 @ Easy Street	A: >2419.6 B: 67.0 C: 83.6	A: 135.4 B: 95.9 C: 84.2	A: 79.8 B: 90.9 C: 150.0	A: 461.1 B: 648.8 C: 488.4	A: >2419.6 B: >2419.6 C: 2419.6	A: 547.5 B: 727.0 C: 648.8
8. Portage Lake Covenant Bible Camp	A: 6.3 B: 6.3 C: 7.5	A: 7.5 B: 6.3 C: 8.5	A: 3.1 B: 2.0 C: 11.00	A: 14.6 B: 8.5 C: 8.6	A: 1.0 B: <1 C: 8.5	A: 6.3 B: 5.2 C: 4.1
9. Leonard Road Public Access	A: <1.0 B: 2.0 C: 2.0	A: 17.3 B: 10.9 C: 21.3	A: 2.0 B: 4.1 C: 3.1	A: 6.3 B: 3.1 C: 1.0	A: 1.0 B: <1 C: 8.5	A: 5.2 B: 11.0 C: 18.9
10. Morey Road Public Access	A: 42.0 B: 49.5 C: 55.6	A: 228.2 B: 178.5 C: 142.1	A: 6.3 B: 5.2 C: 5.2	A: 35.0 B: 20.3 C: 14.6	A: 24.3 B: 14.8 C: 19.9	A: 2.0 B: 5.2 C: 3.0

\*Live Colonies per 100ml sample. <300 colonies/100ml is considered the safe limit for swimming (calculated from geometric mean of 3 samples/site). As a reminder on interpreting the results, bacteria levels greater than 300 cfu / 100

**Tributary Flow and Phosphorus**

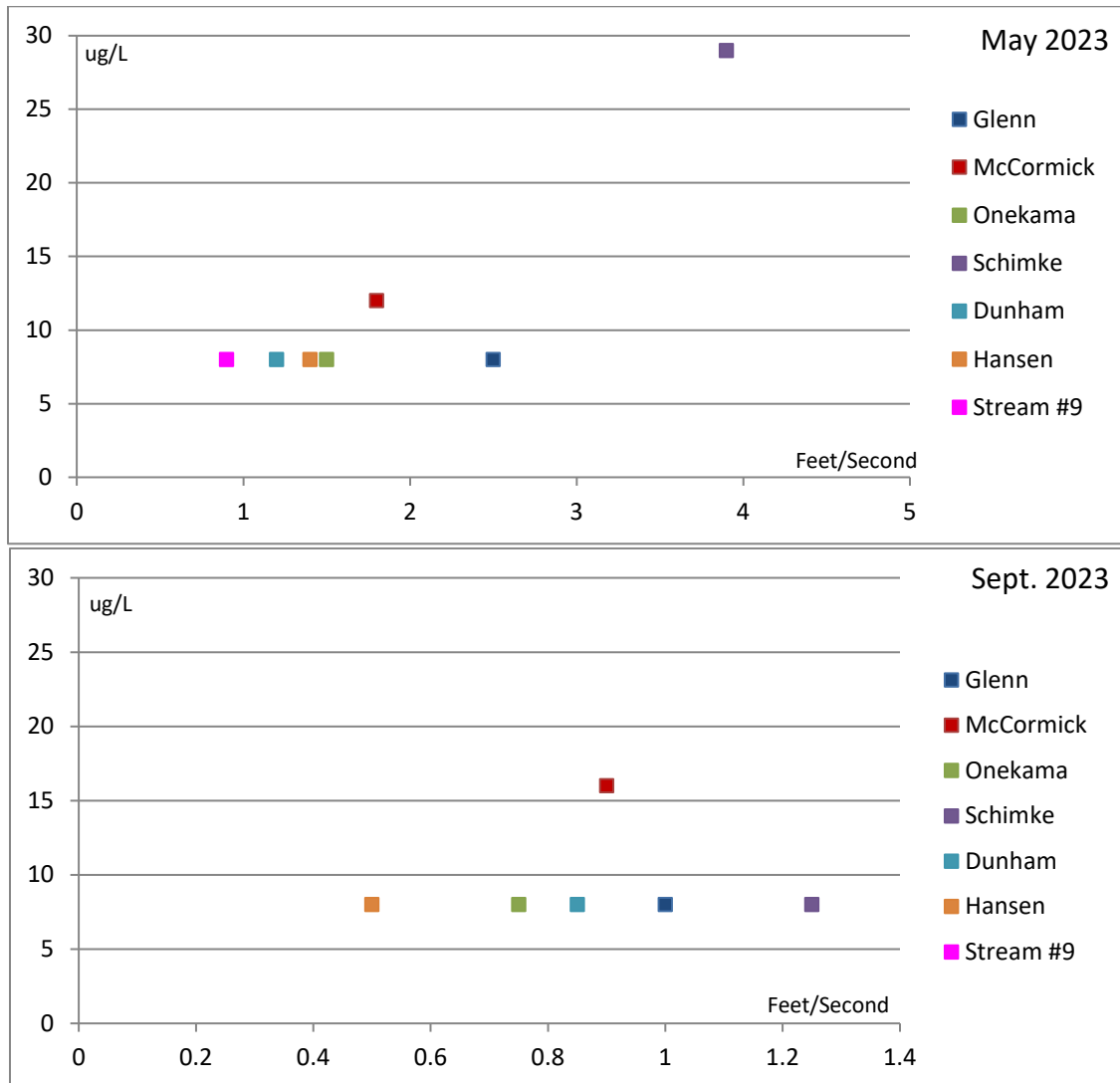
Flow rate data was determined, using a digital flow meter, at the seven tributaries studied in May and in September. Flow ranged from 0.2 feet/second - 1.8 feet/second in the May sampling and from 0.4 feet/second - 1 feet/second in September. Schimke Creek was the fastest flowing in 2022. The rates of flow varied from each creek and the basic chemistry varied as well. Nutrients coming in from the creeks are a concern, as it is a transport from the watershed into Portage Lake. Total Phosphorus is graphed below along with flow to see how the flow and TP are connected.

Graph 26 and 27: Tributary Flow Rates –May (top); September (bottom) 2013-2023



Historically, these graphs illustrate that there is a decline in flow rate at the end of the summer versus the beginning of the summer. Typically, higher flows in spring will increase nutrient inputs in the spring and they decrease in the fall. This is standardly due to snow melt and spring rain. Generally speaking, the flow in 2023 and 2022 had a higher range and overall higher average. This likely correlated with higher water levels in the watershed. Higher water levels in the watershed could be having impacts on other parameters including nutrient levels as well as plant growth.

**Graph 28 and 29: Tributary Flow Rates and Phosphorus (ug/L) comparisons – May 2023 (top) – September 2023 (bottom)**



In years past, these graphs have illustrated a correlation between flow and TP. The greater the flow, the higher the Total Phosphorus. (This correlation has historically been strong.) In 2021 and 2022, the TP concentrations were all very similar, down from recent years, regardless to flow. Spring 2023 results support previous correlations with higher the flow, the higher the input of TP into Portage Lake.

### Additional Tributary/Upstream testing

Tributary testing was expanded in 2016 to include testing four creeks upstream to determine if there were any point source locations determined or pinpointed. Determining any area of concern would allow future work to reduce nutrient loading into the lake be done. Using best management practices throughout the entire watershed, but especially on the creeks leading directly into the lake are essential. Determining if there is a location within the first few miles of the creek off of the lake that has elevated nutrient levels would allow future focus to be determined.

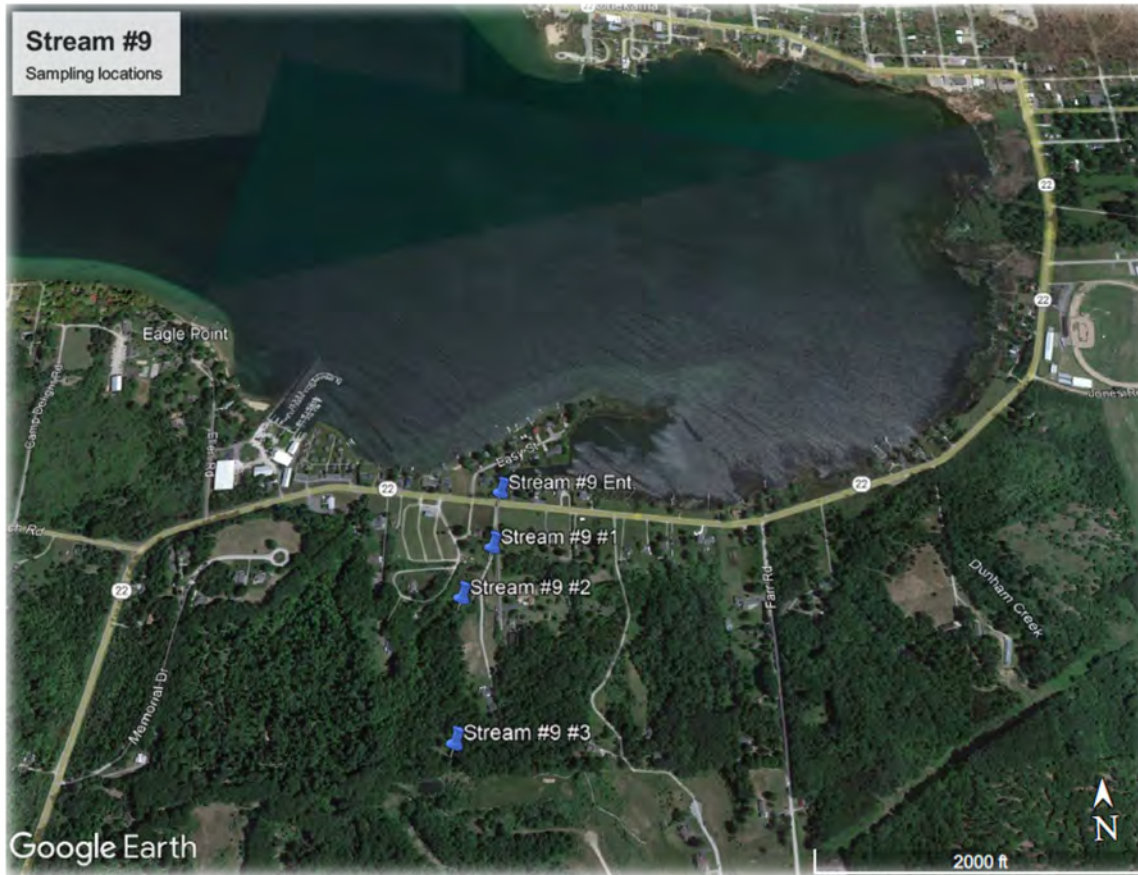
Based on historical data of nutrient levels from the tributaries, four creeks were selected to have additional testing done. Those creeks include: McCormick, Schimke, Hansen and Stream #9. During this test, each creek was also tested upstream at locations that were determined upon walking up the creek. Upon walking upstream, visual observations were made for any concerns including but not limited to drain tiles, erosions, buffers, invasive, flow issues, sources of nutrient inputs, etc. Based on observations

the following locations were selected as potential sources of nutrient inputs: culverts, wetlands, location of golf course, farming field, houses, roads, etc.

Of the data collected, most locations came up somewhat enriched, with the largest concern being Stream #9. Because Stream #9 was the largest concern in 2016, it was selected for upstream testing in 2017 and all the years since. The last few years have shown lower TP than prior testing, which is a positive sign.

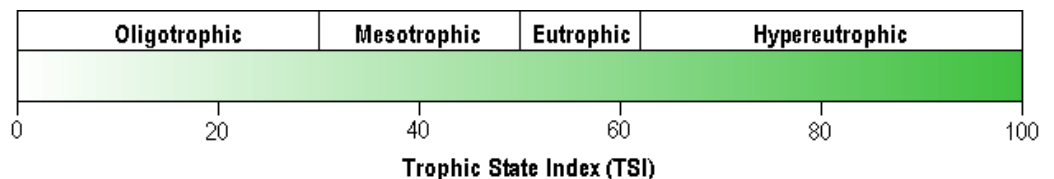
The water depth and flow going into the lake in 2021- 2023 was too low for upstream sampling. Evaluating conditions in 2024 is recommended to determine if additional sampling is needed.

**Map 9: Portage Lake Stream #9 sampling locations**



**Evaluation of Trophic Status**

Carlson’s Trophic State Index (TSI) is used to measure the trophic state of individual lakes.



Lakes are ranked from 1 to 100 based on Secchi disc depth, Total phosphorus concentrations and/or Chlorophyll a levels. Based on that ranking, the TSI is determined. This chart gives the approximate classification for each category.

Portage Lake’s June data yielded values between 30 and 42, in 2023 (Table 52). In general, these values rate Portage Lake as mesotrophic. Characteristics associated with oligotrophic to meso- oligotrophic lakes are low nutrient levels, clear water and low productivity. High dissolved oxygen levels typically occur and survival of cold water fish is possible. Mesotrophic lakes tend to have moderate nutrient levels,



clear water and moderate productivity. Rooted plants are abundant and the lake can still support a cold water fishery. As the picture to the right shows, eutrophic lakes (not Portage Lake at this time, but given for comparison) have high nutrient levels, turbid water, algae blooms are likely and sometimes severe. Plants are abundant and dissolved oxygen is often depleted from bottom waters, restricting fish populations to warm water species.

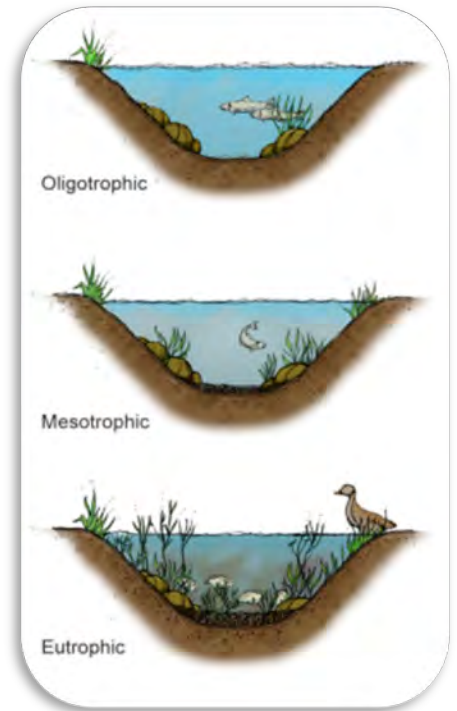


Photo curiosity Progressive AE

**Table 5: 2023 Trophic State Index (TSI) Values**

Site	Secchi Depth	Total Phosphorus	Chlorophyll a
Basin 1 - June	39	30	30
Basin 2 - June	42	30	30
Basin 1- July	38	30	30
Basin 2- July	38	30	30
Basin 1 - Sept.	40	30	30
Basin 2 - Sept.	38	30	30

## 2023 Water Quality Concerns/Recommendations

Current water quality problems in Portage Lake can result from nutrient loading from the watershed and nutrient rich bottom sediments in the lake. Please note that the overall nutrient levels in Portage Lake are still relatively low compared to most Michigan waterbodies. Reductions in external nutrient loads may eventually reduce internally generated water quality problems, though improvements will require that dramatic reductions in external loading be sustained for long periods of time. Even if sufficient loading reductions are achieved, many years will be required before improvement is evident. In order to manage external nutrient inputs, it would be necessary to develop and implement a watershed management plan for the Portage Lake watershed. Watershed activities and public awareness using good management practices in the watershed will have long term positive improvements in the lake. This could be one cause of the decrease in nutrient levels in the lake.

## Management Recommendations for 2024

Management options are dependent on many factors, including but not limited to, species abundance (density), species richness, species location and many lake characteristics. Whenever an exotic species is found within an aquatic environment, action needs to be taken to prevent long term ecological damage as well as recreational and aesthetic loss that will take place.

## Submersed Aquatic Plants

The 2024 aquatic plant management program should detect and manage/treat any areas where Eurasian watermilfoil or hybrid watermilfoil and Starry stonewort are present in addition to any other invasive, exotic species.

As part of the plan, alternative options will be presented, when appropriate and deemed necessary, to review various options available for each nonnative plant of concern. Regarding European frog bit, physical (hand) removal will be a primary control avenue if areas are small, contained and pending labor support available for this undertaking.

As part of this program, the Invasive Species Committee would prefer to avoid using Copper based products as part of their program whenever possible. Before Copper based products are used, specific review of the species, acreage and management goals needs to be reviewed.

### Emergent Vegetation Management

Purple loosestrife and Phragmites should continue to be addressed around the perimeter of the lake to prevent the further spread of these exotic species. Continuing biological control of Purple Loosestrife with beetles, if available, is recommended to continue. In addition, any other invasive terrestrial plants including but not limited to Japanese knotweed, honey suckle, garlic mustard and autumn olive should be targeted for control.

### Monitoring

Aquatic vegetation and water quality should continue to be monitored to document the condition of the lake and to provide warning of any changes in the condition of the lake that need to be addressed by additional lake management activities.

### Proposed Budget

The following budget is proposed based on previous requirement on Portage Lake and the budget is limited to the management and treatment of Portage Lake. If additional costs are required in the maintenance of the SAD or from outside factors, they may not be included in this budget. Note: Hybrid milfoil genetic research is evolving and as such, application rates, product choices and/or tools may adjust over time impacting the cost/acre. The budget may have to be adjusted long term to account for genetically changing plants.

**Table 6: Proposed 2024 Budget Portage Lake**

Proposed/ Estimated Budget*	2024
Nonnative Emergent Control	\$1,500
Nonnative Weed Control	\$49,500
Permit	\$1,600
Lake Management	\$25,000
Contingency Funds	\$6,000
<b>Total</b>	<b>\$83,600</b>
<i>*updated to include expanded professional services</i>	

### The Recommended Management Schedule for 2024:

- A spring and fall vegetation survey (to evaluate conditions in the lake).
- Exotic plant management/treatment, as required
- Pre and post implementation surveys as required, in addition to a mid-summer survey
- Extensive water quality monitoring throughout season
- Late summer/fall Phragmites Control
- Community Education/outreach activities
- Fish Study follow up, if deemed necessary
- Cold season sampling (optional)
- Early Detection Rapid Response (EDRR) to new infestations

## Addendum 1 Product Explanation guide

### Aquathol K

Active ingredient- Dipotassium Endothall 40.3%

Use- Contact herbicide

Half-life- 5-8days

Target Species- Curlyleaf pondweed

Mode of action- Respiration is inhibited, during which, oxygen consumption is also inhibited.

Effects are greater in the dark, due to the fact that the results are non-photosynthesis-based.

### Flumioxazin

Active ingredient- Flumioxazin 51%

Trade names- Clipper, Propeller

Use-systemic herbicide

Half-life- >1-4 days pending pH

Target Species- Eurasian watermilfoil

Mode of action- Inhibitor of the enzyme protoporphyrinogen oxidase. This enzyme is part of the chlorophyll biosynthesis pathway and its inhibition leads to a loss of chlorophyll and carotenoids and irreversible damage to the cell membrane function and structure.

### ProcellaCOR

Active ingredient- Florpyrauxifen-benzyl 2.7%

Use- Systemic herbicide

Half-life- 1-6days (pH and temp. dependent)

Target Species- Eurasian watermilfoil, Curlyleaf pondweed, some pondweeds

Mode of action- Indoleacetic acid (IAA) is the main auxin in plants, regulating growth and development which is triggered to disrupt growth by binding to it. Roots are most sensitive to fluctuations in IAA level. This product mimics the plant growth hormone auxin that causes excessive elongation of plant cells that ultimately kills the plant.

### Navigate (2,4-d)

Active ingredient- 2,4-dichlorophenoxy acetic acid 27.6%

Use- Systemic herbicide

Half-life- 15days

Target Species- Eurasian watermilfoil

Mode of action- Acts as a plant growth hormone (auxin) which stimulates rapid excessive growth which interferes with cell division, food utilization, and other vital processes of the plant. Systemic effects are more specific to dicots as opposed to monocots.

### Renovate 3

Active ingredient- Triclopyr 44.4%

Use- Systemic herbicide

Half-life- 1 day with light

Target Species- Eurasian watermilfoil

Mode of action- Acts as a plant growth hormone (auxin) which stimulates rapid excessive growth which interferes with cell division, food utilization, and other vital processes of the plant. Systemic effects are more specific to dicots as opposed to monocots.

### Renovate OTF

Active ingredient- Triclopyr 14.0%

Use- Systemic herbicide

Half-life- 1 day with light

Target Species- Eurasian watermilfoil

Mode of action- Acts as a plant growth hormone (auxin) which stimulates rapid excessive growth which interferes with cell division, food utilization, and other vital processes of the plant. Systemic effects are more specific to dicots as opposed to monocots.

## SeClear G

Active ingredient- Copper Sulfate Pentahydrate 58.9%

Use- Algaecide

Target Species- Starry stonewort

Mode of action- Copper is regulated by plants/algae because it is an essential mineral. Too much copper can be toxic to plants as it inhibits photosynthesis. Copper naturally occurs in the environment and is highly soluble in water and it can bind with sediments.

## Sculpín G

Active ingredient- 2,4-dichlorophenoxyacetic acid, dimethylamine salt 20%

Use- Systemic herbicide

Half-life- 14days

Target Species- Eurasian watermilfoil

Mode of action- Acts as a plant growth hormone (auxin) which stimulates rapid excessive growth which interferes with cell division, food utilization, and other vital processes of the plant. Systemic effects are more specific to dicots as opposed to monocots.

## Tribune

Active ingredient- Diquat dibromide 37.3%

Use- Contact herbicide

Half-life- 48hours

Target Species- Eurasian watermilfoil, Curlyleaf pondweed

Mode of action- Reduction of a free radical through the natural processes of respiration and photosynthesis. The salts formed can bond and release with electrons in the plant over and over again, virtually "short circuiting" the plants ability to use photosynthesis.

## Addendum 2 Product Terminology

**Active ingredient:** An active ingredient are the chemicals in the pesticide that kills, controls or repels pests. Often, the active ingredient makes up a small portion of the whole product.

**Inert ingredient:** An inert or other ingredient are combined with active ingredients to make a pesticide product. Inert ingredients are used to stabilize the product, help it stick, sink, dissolve, improve ease of application, drift among other factors.

**Half-life:** The half-life of an herbicide is the length of time it takes for 50% of the herbicide to break down to secondary compounds. "The half-life can help estimate whether or not a pesticide tends to build up in the environment. Pesticides with shorter half-lives tend to build up less because they are much less likely to persist in the environment." National Pesticide Information Center

**Systemic herbicide:** Systemic herbicides are absorbed and transported through the plant's vascular system, killing the entire plant.

**Contact herbicide:** Contact herbicides kill the part of the plant in contact with the chemical but the roots may survive.

**Selective herbicide:** A selective herbicide is formulated to control specific weeds. It is a material that is toxic to some plant species but not all.

## Addendum 3A Portage Lake Product Use Overview

**Table 7: Submersed Plant Control Program Product Use Overview**

Year	Date	Product	Rate lbs/Acre	Acres	Total Acres	Total Product	% active ingredient	Total active ingredient used
<b>2023</b>	15-Jun	Flumioxazin	200ppb	6.35	6.35	20lbs	51%	10.2lbs
<b>2022</b>	6-Jun	Flumioxazin	200ppb	6.5	53.9	20lbs	51%	10.2lbs
	27-Jul	Flumioxazin	200ppb	0.2		0.5lbs	51%	0.25lbs
	7-Sep	Flumioxazin	200ppb	0.2		0.5lbs	51%	0.25lbs
		SeClear G	50lbs	2		100lbs	58.90%	58.9lbs
		ProcellaCOR/Diquat	6pdu/1gal	45		270pdu/45g	2.7%/37.3%	23.10ou/16.78gal
<b>2021</b>	17-Jun	Aquathal K	1gal	6.5	50.65	6.5gal	40.30%	2.6195gal
	12-Aug	ProcellaCOR/Diquat	4pdu/1gal	1.5		6pdu/1.5g	2.7%/37.3%	0.51ou/0.55gal
		ProcellaCOR/Diquat	5pdu/1gal	16		80pdu/16g	2.7%/37.3%	6.84ou/5.96gal
		Sculpin G	300lbs	22.4		6720lbs	20%	1344lbs
		SeClear G	50lbs	4.25		212.5lbs	58.90%	125.16lbs
<b>2020</b>	17-Jun	Clipper	200ppb	6.3	82.1	19.8lbs	51%	10lbs
	2-Aug	ProcellaCOR/Ren3	4pdu/3.5g	13.5		47.25pdu/54g	22.7%/44.4%	4ou/23.9gal
		Sculpin G	240lbs	4.15		1000lbs	20%	200lbs
		ProcellaCOR/Diquat	4pdu/1gal	19.65		78.6pdu/19.65g	2.7%/37.3%	6.7ou/7.3gal
		ProcellaCOR	9pdu	30.5		247.5pdu	2.70%	21.18ou
		SeClear G	50lbs	8		400lbs	58.90%	235.6lbs
<b>2019</b>	17-Jun	Clipper	200ppb	6.3	60.25	19.8lbs	51%	8.5lbs
	15-Aug	Renovate 3	4g	4.5		18gal	44.40%	7.99gal
		Renovate OTF	240lbs	25.25		6312.5lbs	14%	883.75lbs
		Sculpin G	240lbs	20		4800lbs	20%	960lbs
		ProcellaCOR	11pdu	4.2		45.6pdu	2.70%	3.9ou
<b>2018</b>	17-Jun	Clipper	200ppb	1.58	51.08	5lbs	51%	2.55lbs
	15-Aug	Renovate 3	4gal	4.5		18gal	44.40%	7.99gal
		Renovate OTF	200ppb	8		1600lbs	14%	224lbs
		ProcellaCOR	11.43pdu	3.5		40.4pdu	2.70%	3.45ou
		Sculpin G	240lbs	33.5		8040lbs	20%	1608lbs
<b>2017</b>	14-Jun	Clipper	200ppb	1.58	67.68	5.53lbs	51%	2.82lbs
	15-Aug	Renovate OTF	240lbs	13		3120lbs	14%	436.8lbs
		Renovate OTF	200lbs	14		2800lbs	14%	392lbs
		Renovate 3	4gal	5.6		22.4gal	44.40%	9.94gal
		Sculpin G	240lbs	29.5		7080lbs	20%	1416lbs
		Sculpin G	200lbs	4		800lbs	20%	160lbs
<b>2016</b>	27-Jun	Clipper	200ppb	1.25	21.35	3.9lbs	51%	1.98lbs
	2-Aug	Renovate OTF	200lbs	6.6		1320lbs	14%	184.8lbs
		Renovate OTF	240lbs	3.5		840lbs	14%	117.6lbs
	3-Aug	Renovate OTF	200lbs	3		600lbs	14%	8.4lbs
		Renovate 3	4gals	2		8gal	44.40%	3.55gal
		Sculpin G	240lbs	5		1200lbs	20%	240lbs

<b>2015</b>	19-Jun	Clipper	200ppb	1.25	79.35	4lbs	51%	2.04lbs
	28-Jul	Renovate OTF	200lbs	4		800lbs	14%	112lbs
	28-Jul	Renovate OTF	240lbs	3.8		920lbs	14%	128.8lbs
	28-Jul	Sculpin G	200lbs	4		800lbs	20%	160lbs
	28-Jul	Sculpin G	240lbs	66.3		15920lbs	20%	3184lbs
<b>2014</b>	26-Jun	Renovate OTF	200lbs	1.5	176.05	300lbs	14%	42lbs
	29-Jul	Renovate OTF	200lbs	0.8		160lbs	14%	22.4lbs
		Renovate LZR Max	120lbs	95		11360lbs	18%	2044.8lbs
		Sculpin G	200lbs	10		2000lbs	20%	400lbs
		Clipper	200ppb	1.25		4lbs	51%	2lbs
	8-Sep	Sculpin G	160lbs	23		3680lbs	20%	736lbs
		Sculpin G	200lbs	12.5		2500lbs	20%	500lbs
		Sculpin G	240lbs	6		1440lbs	20%	288lbs
		Renovate LZR Max	160lbs	26		4160lbs	18%	748.8lbs
<b>Year</b>	<b>Date</b>	<b>Product</b>	<b>Rate lbs/Acre</b>	<b>Acres</b>	<b>Total Acres</b>	<b>Total Product</b>	<b>% active ingredient</b>	<b>Total active ingredient used</b>
<b>2013</b>	24,27 - Jun	Renovate OTF	160lbs	5	129.75	800lbs	14%	112lbs
		Renovate Max G	160lbs	39		6240lbs	18%	1123.2lbs
		Sculpin G	160lbs	74.5		11920lbs	20%	2384lbs
	8-Aug	Sculpin G	160lbs	10		1600lbs	20%	320lbs
		Clipper	200ppb	1.25		4lbs	51%	2.04lbs
<b>2012</b>	9-Jul	Renovate OTF	120lbs	10	145	1200lbs	14%	168lbs
		Renovate Max G	160lbs	55		8800lbs	18%	1584lbs
	24-Jul	Renovate OTF	120lbs	5		600lbs	14%	84lbs
		Renovate Max G	120lbs	40		4800lbs	18%	864lbs
		Sculpin G (2,4-D)	160lbs	35		5600lbs	20%	1120lbs
<b>2011</b>	27-Jul	Renovate OTF	120lbs	22	22	2640lbs	14%	369.6lbs
<b>2010</b>	29-Jun	Renovate OTF	120lbs	5	86	600lbs	14%	84lbs
		Navigate 2,4-D	100lbs	17		1700lbs	27.60%	469.2lbs
	27-Sep	Renovate OTF	120lbs	14		1680lbs	14%	235.2lbs
		Navigate 2,4-D	120lbs	50		6000lbs	27.60%	1656lbs
<b>2009</b>	15-Sep	Renovate OTF	120lbs	~41.5	161.5	5000lbs	14%	700lbs
		Navigate 2,4-D	100lbs	120		12000lbs	27.60%	3312lbs
<b>Total</b>					<b>1193.01</b>			

## Addendum 3B Portage Lake Treatment Cost Overview

**Table 8: Portage Lake Treatment Cost Overview**

Year	Date	Product	Price	Total Price
<b>2023</b>	15-Jun	Flumioxazin	\$3900.00	\$3,900.00
<b>2022</b>	6-Jun	Flumioxazin	\$3,298.75	
	27-Jul	Flumioxazin	\$0.00	
	7-Sep	Flumioxazin	\$650.00	
		SeClear G	\$600.00	
		ProcellaCOR/Diquat	\$34,650.00	\$39,198.75
<b>2021</b>	17-Jun	Aquathal K	\$1,072.50	
	12-Aug	ProcellaCOR/Diquat	\$862.50	
		ProcellaCOR/Diquat	\$10,800.00	

		Sculpin G	\$18,480.00	
		SeClear G	\$1,275.00	\$32,490.00
<b>2020</b>	17-Jun	Clipper	\$4,000.35	
	2-Aug	ProcellaCOR/Ren3	\$9,450.00	
		Sculpin G	\$2,739.00	
		ProcellaCOR/Diquat	\$11,102.25	
		ProcellaCOR	\$27,450.00	
		SeClear G	\$2,400.00	\$57,141.60
<b>2019</b>	17-Jun	Clipper	\$4,000.50	
	15-Aug	Renovate 3	\$1,620.00	
		Renovate OTF	\$22,472.50	
		Sculpin G	\$13,200.00	
		ProcellaCOR	\$5,700.00	\$46,993.00
<b>2018</b>	17-Jun	Clipper	\$1,003.50	
	15-Aug	Renovate 3	\$1,620.00	
		Renovate OTF	\$5,932.80	
		ProcellaCOR	\$6,000.00	
		Sculpin G	\$22,110.00	\$36,666.30
<b>2017</b>	14-Jun	Clipper	\$1,003.30	
	15-Aug	Renovate OTF	\$11,570.00	
		Renovate OTF	\$10,383.24	
		Renovate 3	\$2,016.00	
		Sculpin G	\$19,470.00	
		Sculpin G	\$2,200.00	\$46,642.54
<b>2016</b>	27-Jun	Clipper	\$793.75	
	2-Aug	Renovate OTF	\$4,894.96	
		Renovate OTF	\$3,115.00	
	3-Aug	Renovate OTF	\$2,224.98	
		Renovate 3	\$720.00	
		Sculpin G	\$3,200.00	\$14,948.69
<b>2015</b>	19-Jun	Clipper	\$768.75	
	28-Jul	Renovate OTF	\$2,933.32	
	28-Jul	Renovate OTF	\$3,344.00	
	28-Jul	Sculpin G	\$2,100.00	
	28-Jul	Sculpin G	\$41,769.00	\$50,915.07
<b>2014</b>	26-Jun	Renovate OTF	\$1,031.25	
	29-Jul	Renovate OTF	\$550.00	
		Renovate LZR Max	\$47,500.00	
		Sculpin G	\$5,187.50	
		Clipper	\$750.00	
	8-Sep	Sculpin G	\$0.00	
		Sculpin G	\$6,484.38	
		Sculpin G	\$3,735.00	
		Renovate LZR Max	\$0.00	\$65,238.13
<b>2013</b>	24,27 -Jun	Renovate OTF	\$2,800.00	
		Renovate Max G	\$19,500.00	
		Sculpin G	\$32,258.50	
	8-Aug	Sculpin G	\$4,330.00	
		Clipper	\$812.50	\$59,701.00
<b>2012</b>	9-Jul	Renovate OTF	\$4,400.00	



		Renovate Max G	\$27,500.00	
	24-Jul	Renovate OTF	\$2,200.00	
		Renovate Max G	\$15,000.00	
		Sculpin G (2,4-D)	\$15,155.00	\$64,255.00
<b>2011</b>	27-Jul	Renovate OTF	\$9,680.00	\$9,680.00
<b>2010</b>	29-Jun	Renovate OTF	\$2,200.00	
		Navigate 2,4-D	\$5,780.00	
	27-Sep	Renovate OTF	\$6,160.00	
		Navigate 2,4-D	\$19,750.00	\$33,890.00
<b>2009</b>	15-Sep	Renovate OTF	\$18,260.00	
		Navigate 2,4-D	\$40,800.00	\$59,060.00
<b>Total Price</b>				<b>\$620,720.08</b>

## Addendum 4 Portage Lake Water Quality Data

**Table 9: Tributary Water Quality Portage Lake -2023**

5/2/2023 Part Sun	Temp (F)	D.O. (mg/L)	Cond. (uS/cm)	TDS (ug/L)	pH (S.U.)	TP (ug/L)	ALK (mg/L)	Nitrate (ug/L)	Flow (Ft/sec)
Glenn	45.5	11.12	379.9	247	7.5	8	196	1300	2.5
McCormick	44.6	10.89	351	233	7.45	12	187	920	1.8
Onekama*	44.78	11.39	354.6	230	7.45	8	182	1190	1.5
Schimke	42.44	11.56	289.1	188	7.51	29	130	890	3.9
Dunham	44.06	11.78	338.6	220	7.47	8	169	790	1.2
Hansen	43.34	11.07	374.5	243	7.48	8	191	770	1.4
Stream #9	44.6	11.48	263.3	171	7.46	8	135	530	0.9
9/20/2023	Temp (F)	D.O. (mg/L)	Cond. (uS/cm)	TDS (ug/L)	pH (S.U.)	TP (ug/L)	ALK (mg/L)	Nitrate (ug/L)	Flow (Ft/sec)
Glenn	51.674	11.16	293	261	8.15	8	185	1430	1
McCormick	52.466	10.06	290	255	8.16	16	202	950	0.9
Onekama	52.268	11.11	283	249	8.3	8	193	1380	0.75
Schimke	53.69	10.97	287	249	8.34	8	197	1090	1.25
Dunham	52.25	11.3	371	241	8.16	8	192	850	0.85
Hansen	54.878	10.2	307	261	8.05	8	208	1060	0.5
Stream #9	56.408	11.11	193	125	8.06	202	196	230	0

**Table 9: Storm Drain Sampling Portage Lake -2023**

May 2, 2023	Temp (F)	D.O. (mg/L)	Cond. (uS/cm)	TDS (mg/L)	pH (S.U)	TP (ug/L)	Nitrate (ug/L)	Flow (Ft/sec)	Weather Rain, 35 degrees
#2 Zosel Park	45.68	10.18	437.6	284	7.43	8	640	0.4	
#5 Fourth St	48.56	7.85	486.8	317	7.37	8	400	1.1	
#6 Third St	44.06	10.85	293.2	191	7.47	8	880	1.3	
#7 First St.	44.6	11.24	321	209	7.46	8	141	1.4	

**Table 10: Shoreline Sampling Portage Lake -2023**

Jun6 Secchi	Temp (F)	D.O. (mg/L)	Cond. (uS/cm)	TDS (ug/L)	pH (S.U.)	TP (ug/L)	ORP (mV)	Turb. (NTU)	TKN (mg/L)	Nitrate (ug/L)	ALK (mg/L)	Chl. A (ug/L)
Cove- 2'	68.9	8.09	309.4	201	8.29	8	88	1.48	2.16	230	132	1.07
Inn- 13'	67.28	10.09	296.3	193	8.68	8	83.8	0.82	2.09	230	126	1.5
#3B- 4'	69.62	11.09	294.1	191	8.7	8	122.7	0.92	2	230	136	2.08
Jul 27 Secchi	Temp (F)	D.O. (mg/L)	Cond. (uS/cm)	TDS (ug/L)	pH (S.U.)	TP (ug/L)	ORP (mV)	Turb. (NTU)	TKN (mg/L)	Nitrate (ug/L)	ALK (mg/L)	Chl. A (ug/L)
Cove-6'	75.02	7.45	281	183	8.69	8	70.5	1.11	2.75	230	75.02	0
Inn-7'	74.48	9.02	283	184	8.66	8	74.9	0.38	2.25	230	74.48	0
#3B- 5'	75.2	9.41	261	170	8.76	8	69.5	0.5	3.61	230	75.2	0
Sep20 Secchi	Temp (F)	D.O. (mg/L)	Conduct- ivity (uS/cm)	TDS (ug/L)	pH (S.U.)	TP (ug/L)	ORP (mV)	Turb. (NTU)	TKN (mg/L)	Nitrate (ug/L)	ALK (mg/L)	Chlor. A (ug/L)
Cove-4'	64.76	9.65	282	183	8.63	8	73.9	0.74	3.26	230	109	1.72
Inn- 8'	64.76	9.81	277	181	8.74	8	73.9	0.78	3.24	230	108	1.6
#3B- 4'	63.68	10.35	304	198	8.66	8	77.7	0.79	1.85	230	135	1.7

In 2019, samplings were moved to new shoreline sites. 3B remained the same standard site 3B, but 3A was moved to the small cove and 3D was moved to Portage Point Inn.

**Table 11: Deep Hole Basin 1 Portage Lake -2023**

(Secchi Disc: June 14.5', July 15', Sept.13')

Basin 1 6/7/23	Temp (F)	D.O. (mg/L)	Cond. (uS/cm)	TDS (ug/L)	pH (S.U.)	TP (ug/L)	ORP (mV)	Turb. (NTU)	TKN (mg/L)	Nitrate (ug/L)	Amm. (mg/L)	ALK (mg/L)	Chl. A (ug/L)
s.	67.64	10.01	296.8	193	8.68	8	82.4	0.71	1.97	230	15	124	1.39
10'	66.74	10.1	296.4	193	8.68	-	91.2	0.66	-	-	-	-	-
20'	66.56	10.15	296.1	192	8.68	-	95.1	0.74	-	-	-	-	-
30'	56.12	12.3	287.3	187	8.58	8	110.4	1.00	3.62	500	25	118	1.11
40'	52.16	12.76	283.2	184	8.52	-	117.2	0.52	-	-	-	-	-
50'	51.08	12.65	283.8	184	8.45	-	125	0.51	-	-	-	-	-
60'	50.54	12.73	285.3	185	8.5	8	126.2	0.69	2.12	260	42	126	0
Basin1 7/27/23	Temp (F)	D.O. (mg/L)	Cond. (uS/cm)	TDS (ug/L)	pH (S.U.)	TP (ug/L)	ORP (mV)	Turb. (NTU)	TKN (mg/L)	Nitrate (ug/L)	Amm. (mg/L)	ALK (mg/L)	Chl. A (ug/L)
s.	75.02	9.1	284.3	185	8.66	8	73	0.45	1.67	230	15	115	0
10'	74.3	9.25	284	185	8.65	-	73.5	0.5	-	-	-	-	-
20'	73.94	9.1	285.3	1585	8.56	-	76.9	0.5	-	-	-	-	-
30'	56.84	13.15	287.6	184	8.57	8	84.1	0.57	1.68	400	15	112	0
40'	51.8	12.88	285.3	186	8.52	-	91.3	0.75	-	-	-	-	-
50'	50.9	10.22	294.1	191	8.13	-	100.9	1.05	-	-	-	-	-
60'	50.72	8.13	298.4	194	7.92	8	79.4	1.01	1.69	230	15	114	0
Basin1 9/20/23	Temp (F)	D.O. (mg/L)	Cond. (uS/cm)	TDS (ug/L)	pH (S.U.)	TP (ug/L)	ORP (mV)	Turb. (NTU)	TKN (mg/L)	Nitrate (ug/L)	Amm. (mg/L)	ALK (mg/L)	Chl. A (ug/L)
s.	64.76	10	277.8	181	8.74	8	73.9	0.82	1.75	230	15	129	2.2
10'	64.58	10.04	277.9	181	8.72	-	76.6	0.72	-	-	-	-	-
20'	55.4	10.62	284.5	185	8.44	-	87.6	0.54	-	-	-	-	-
30'	51.8	8.14	291.6	189	8.01	8	100.9	1.29	1.81	290	77	124	1.58
40'	50.36	7.91	290.2	189	7.75	-	115.9	1.39	-	-	-	-	-
50'	50.18	5.81	294.7	192	7.55	-	121.2	2.74	-	-	-	-	-
60'	50.18	1.83	292.4	190	7.75	8	38	2.07	1.85	280	197	110	1.52

**Table 12: Deep Hole Basin 2 Portage Lake -2023**

(Secchi Disc: June 11.5', July 15', Sept. 15')

Basin 2 6/7/23	Temp (F)	D.O. (mg/L)	Cond. (uS/cm)	TDS (ug/L)	pH (S.U.)	TP (ug/L)	ORP (mV)	Turb. (NTU)	TKN (mg/L)	Nitrate (ug/L)	Amm. (mg/L)	ALK (mg/L)	Chl. A (ug/L)
s.	68.18	9.98	297	193	8.66	8	61.9	0.75	2.08	230	15	121	1.09
10'	68.18	10.02	297	193	8.66	-	62.8	0.75	-	-	-	-	-
20'	61.7	11.82	291.1	189	8.63	-	67	0.76	-	-	-	-	-
30'	59.72	12.19	290.4	189	8.61	8	69.9	0.7	1.76	240	62	125	1.57
40'	57.2	12.42	289.5	188	8.6	-	73	0.68	-	-	-	-	-
50'	55.76	12.35	290.5	189	8.57	-	75.7	0.67	-	-	-	-	-
60'	55.22	12.23	292	190	8.56	8	77.6	0.58	1.73	250	42	124	1.04
Basin2 7/27/23	Temp (F)	D.O. (mg/L)	Cond. (uS/cm)	TDS (ug/L)	pH (S.U.)	TP (ug/L)	ORP (mV)	Turb. (NTU)	TKN (mg/L)	Nitrate (ug/L)	Amm. (mg/L)	ALK (mg/L)	Chl. A (ug/L)
s.	75.02	9.38	282.6	184	8.6	8	75.3	0.62	2.46	230	15	119	0
10'	75.02	9.39	282.7	184	8.61	-	77.8	0.57	-	-	-	-	-
20'	71.42	10.25	285.6	186	8.51	-	83.1	0.56	-	-	-	-	-
30'	59.72	12.2	290.9	189	8.57	8	88.1	0.65	1.9	230	15	111	0.929
40'	55.04	6.14	306.9	199	7.71	-	113.3	1.17	-	-	-	-	-
50'	54.32	2.2	315.1	205	7.41	-	121	1.77	-	-	-	-	-
60'	54.14	1.83	315.8	205	7.41	8	69.9	1.5	1.86	230	44	118	1.21
Basin2 9/20/23	Temp (F)	D.O. (mg/L)	Cond. (uS/cm)	TDS (ug/L)	pH (S.U.)	TP (ug/L)	ORP (mV)	Turb. (NTU)	TKN (mg/L)	Nitrate (ug/L)	Amm. (mg/L)	ALK (mg/L)	Chl. A (ug/L)
s.	64.58	9.81	279.1	181	8.66	8	90.2	0.86	2.59	230	15	105	1.27
10'	64.58	9.82	279.1	181	8.66	-	93.6	0.93	-	-	-	-	-
20'	64.58	9.76	279.2	182	8.65	-	98.1	0.87	-	-	-	-	-
30'	58.64	6.37	295.4	192	7.8	8	123.2	0.87	2.06	230	17	101	1.72
40'	56.12	0.41	318	207	7.32	-	73	0.097	-	-	-	-	-
50'	55.58	0.15	321.5	209	7.32	-	74.1	2.05	-	-	-	-	-
60'	55.04	0.11	320.7	209	7.32	8	73.5	7.5	1.47	230	503	129	2.11