

2023 Lake Parker Water Quality Monitoring Results: Lay Monitoring Program and LaRosa Partnership Program

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Lake Monitoring and Community Outreach Coordinator

UVM Lake Champlain Sea Grant and VT DEC Lakes & Ponds Program



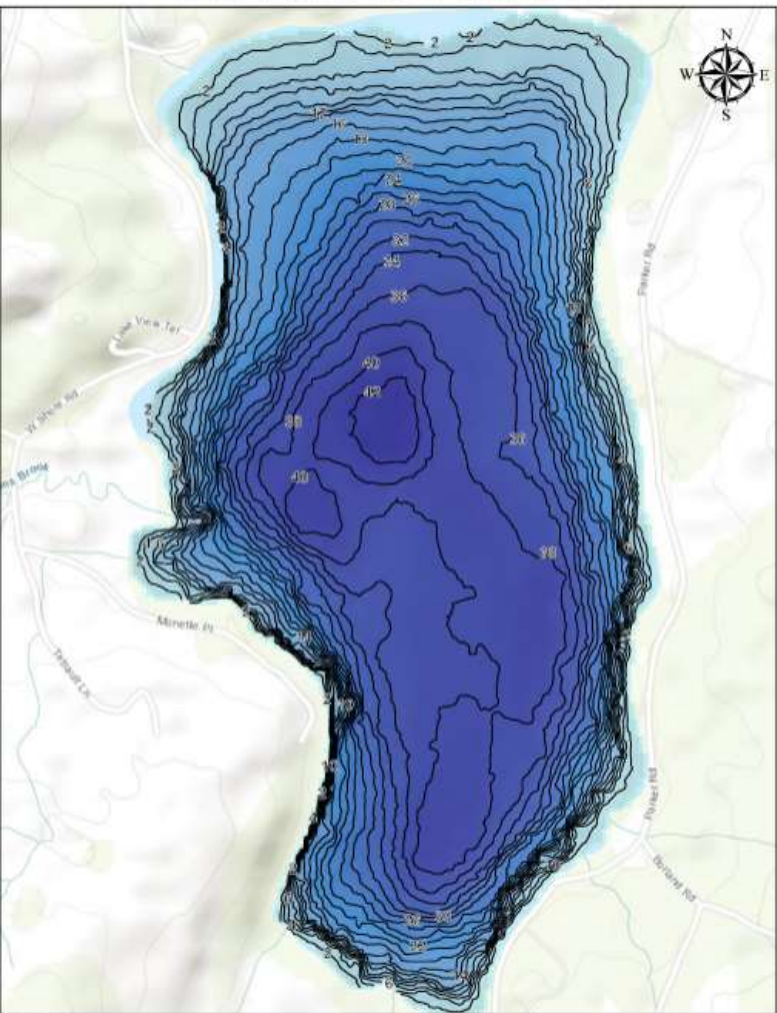


Lay Monitoring Program (LMP) 2023 Lake Sampling Overview

- Biweekly from June through August (total of 6 samples for summer mean):
 - *Basic Sampling*: Measure Secchi disk transparency depth (clarity)
 - *Supplemental Sampling*: Collect epilimnetic and hypolimnetic water samples that are lab tested for total phosphorus (nutrient) concentration and chlorophyll-a (algae) concentration
 - Pilot caffeine sampling (wastewater)
 - Complete a lake sampling webform (and report cyanobacteria conditions)



Lake Parker, West Glover, VT



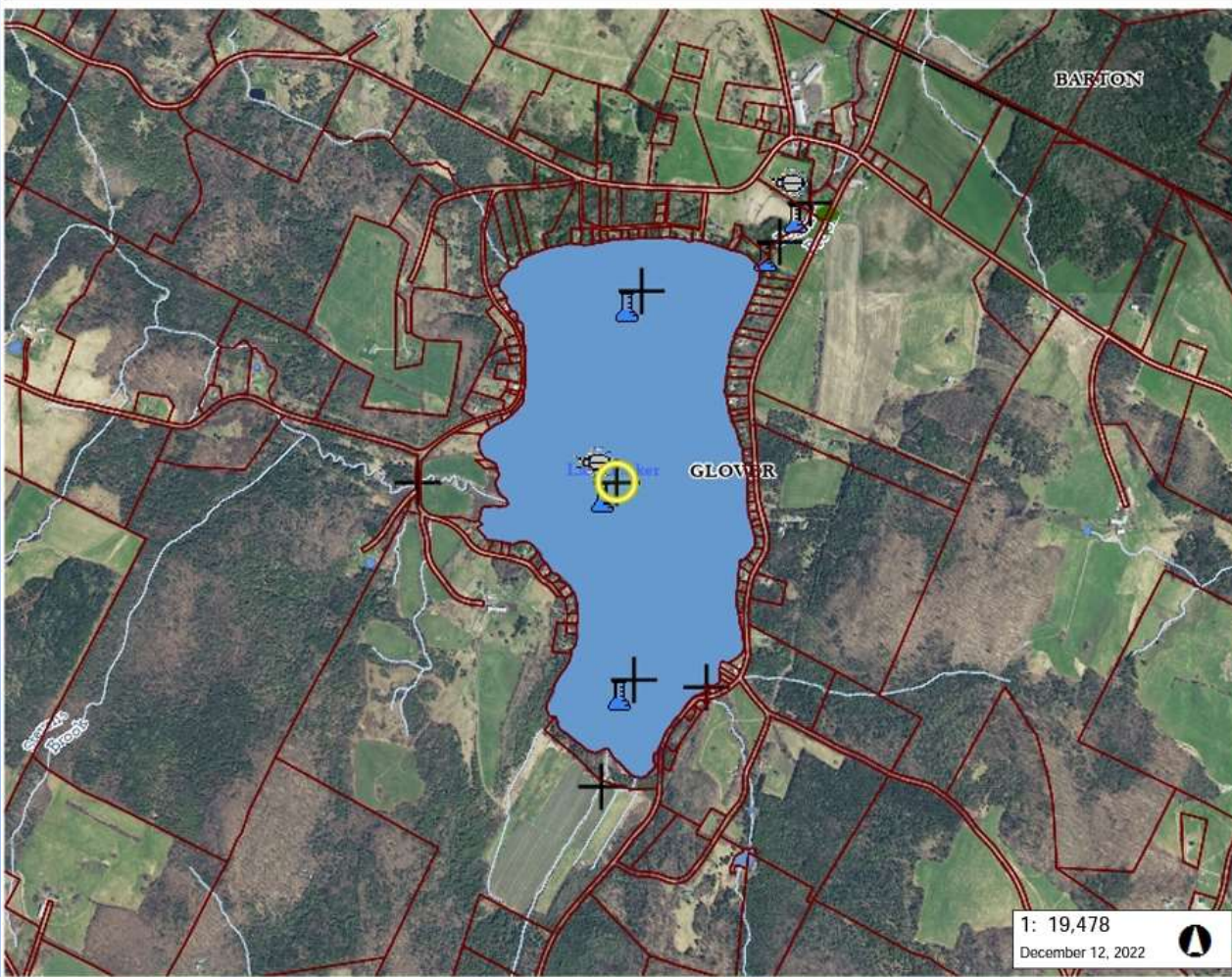
Legend
Depth (ft.)
 High : 0
 Low : 44

— Depth Contour (2 ft.)

Source Data Collected: 8/14/2018

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
 LAKES & PONDS PROGRAM

0 0.1 0.2 0.4 Miles



990.0 0 495.00 990.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 1623 Ft. 1cm = 195 Meters
 © Vermont Agency of Natural Resources THIS MAP IS NOT TO BE USED FOR NAVIGATION

1: 19,478
 December 12, 2022

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. ANR and the State of Vermont make no representations of any kind, including but not limited to, the warranties of merchantability, or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.

Vermont Lake Score Card

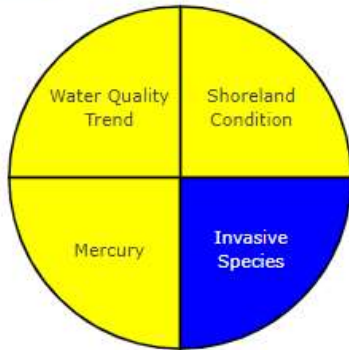
Lake Parker

<https://dec.vermont.gov/watershed/lakes-ponds/data-maps/scorecard>

Scores

Water Quality Data

Lake Information



Watershed: **Highly Disturbed**

WQ Standards: **Stressed**

Details

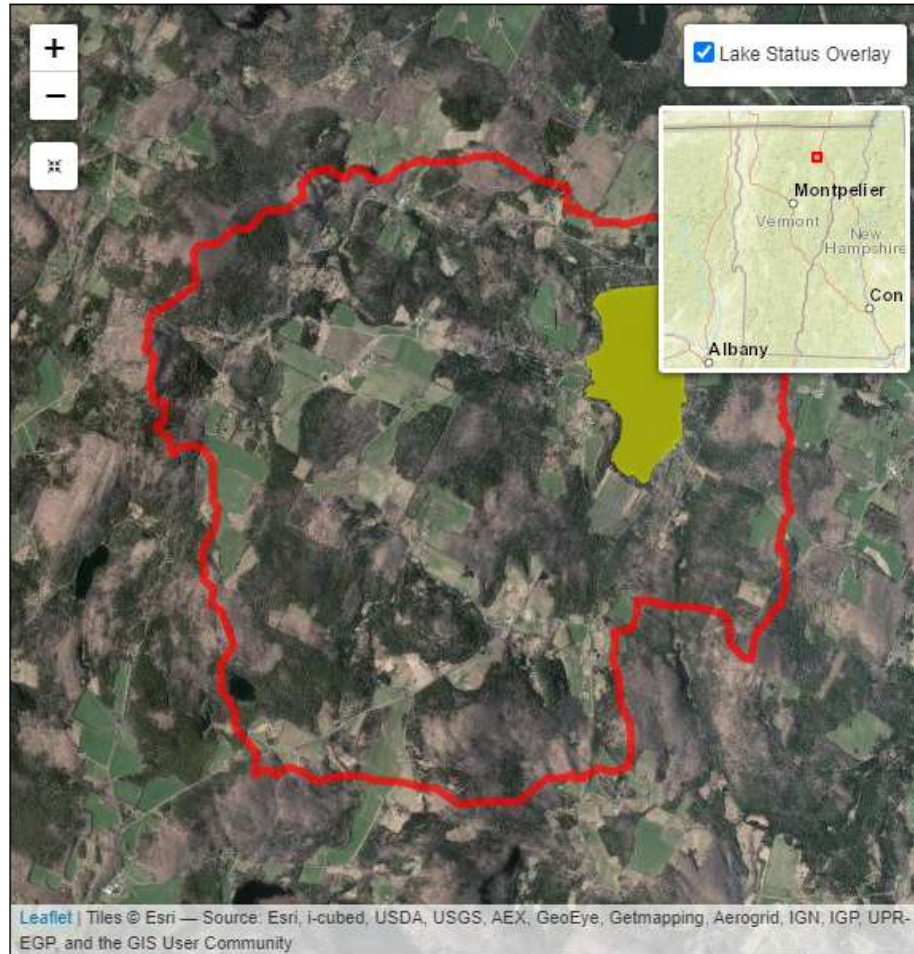
Stressed - Organic Enrichment - DO

Stressed - Phosphorus

Color Scoring System

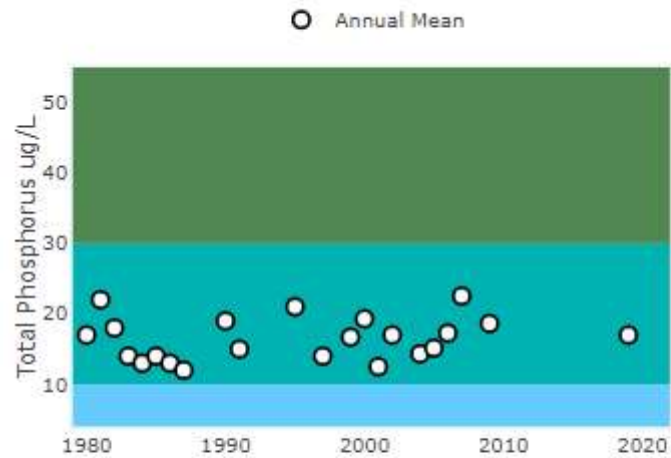
- Good Conditions
- Fair Conditions
- Poor Conditions
- Insufficient Data

[Learn How Lakes Are Scored](#)



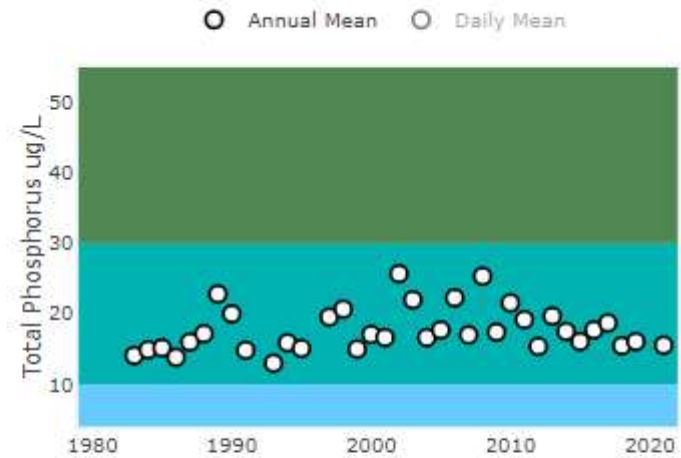
Spring Phosphorus

Trend: Stable (p-value=0.3361)



Summer Phosphorus

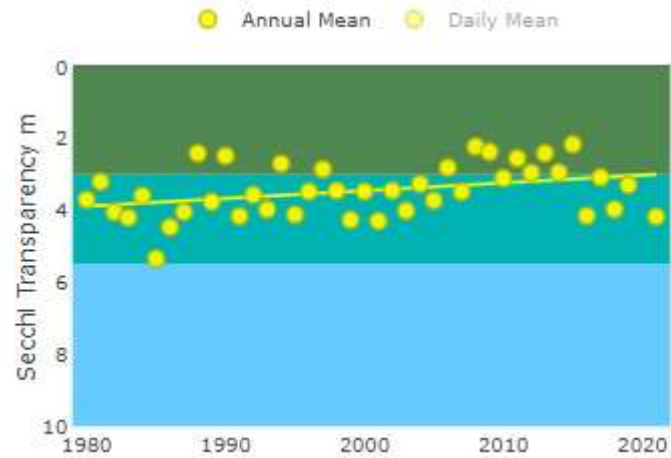
Trend: Stable (p-value=0.0993)



LAKE PARKER SCORE CARD WATER QUALITY TRENDS

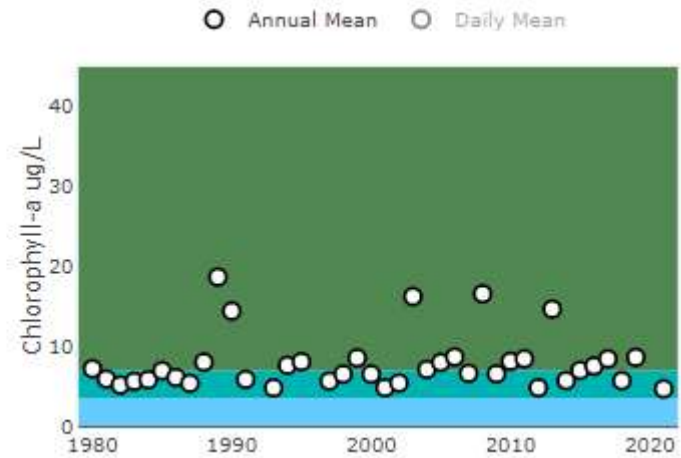
Summer Secchi

Trend: Significantly Decreasing (p-value=0.0262)



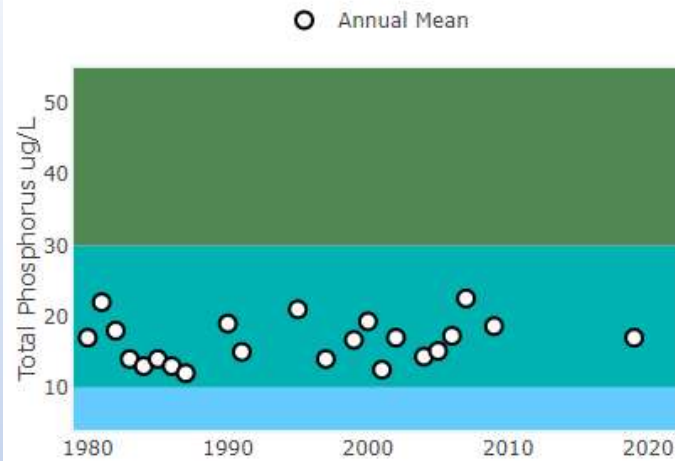
Summer Chlorophyll-a

Trend: Stable (p-value=0.271)



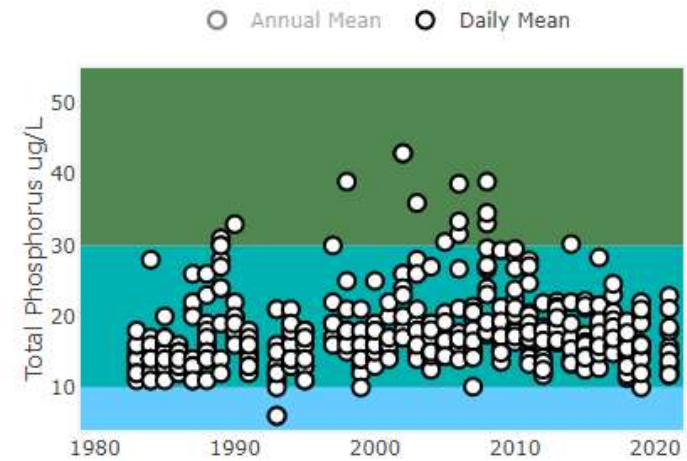
Spring Phosphorus

Trend: Stable (p-value=0.3361)



Summer Phosphorus

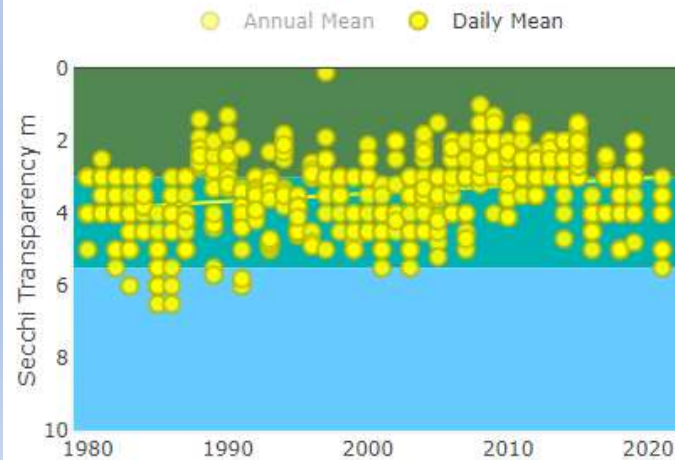
Trend: Stable (p-value=0.0993)



LAKE PARKER SCORE CARD WATER QUALITY TRENDS

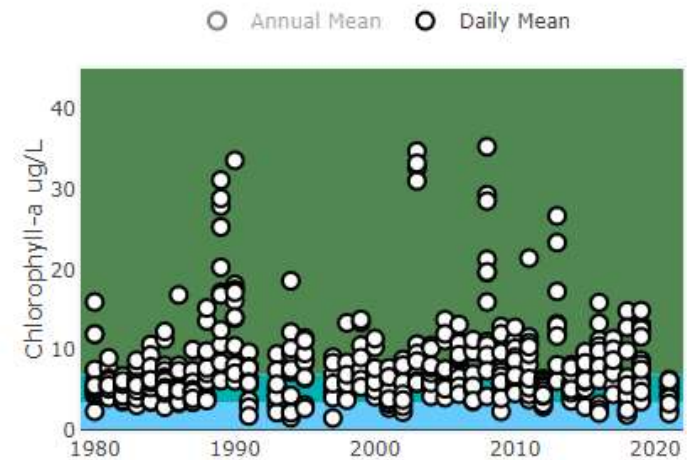
Summer Secchi

Trend: Significantly Decreasing (p-value=0.0262)

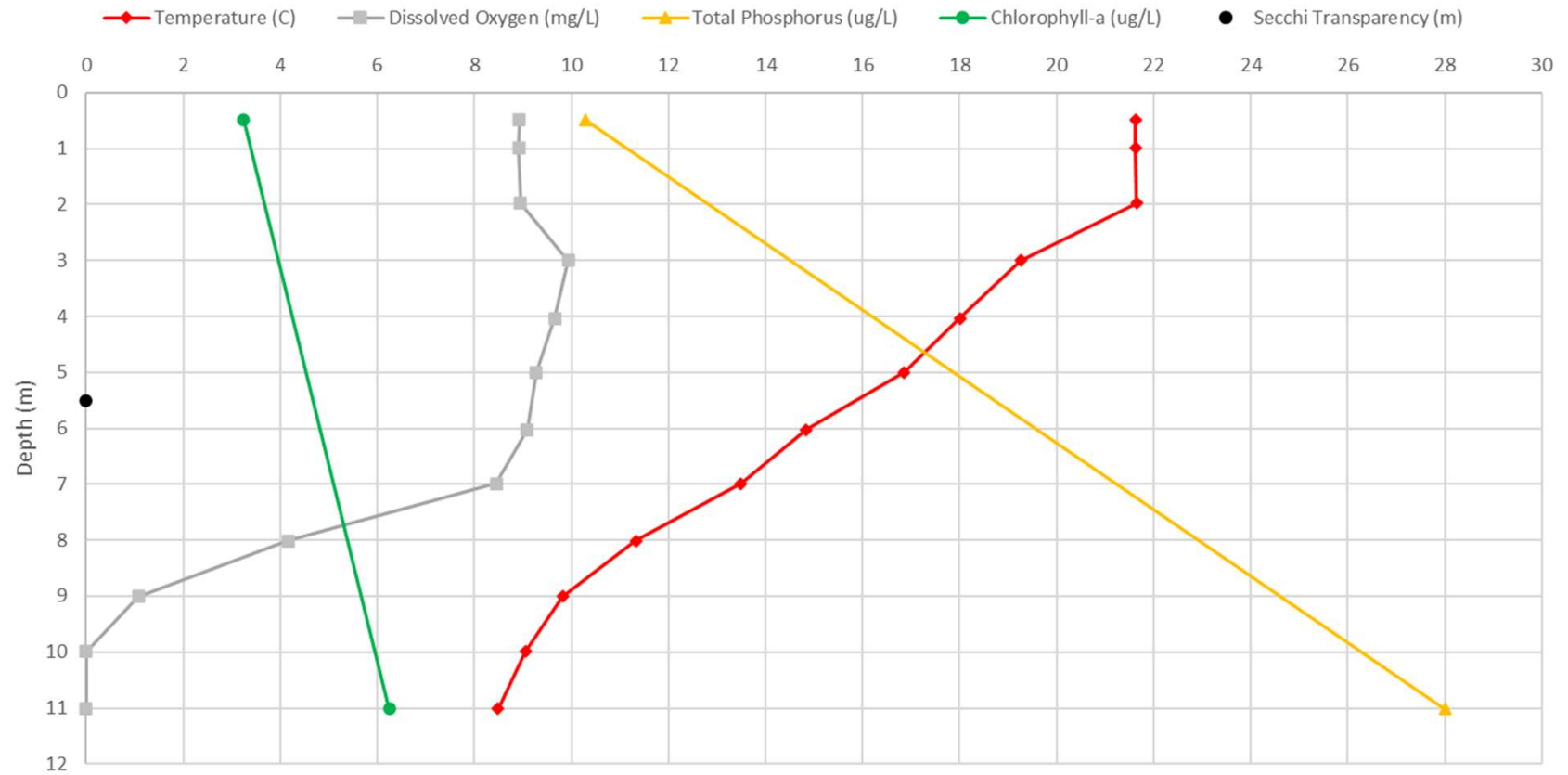


Summer Chlorophyll-a

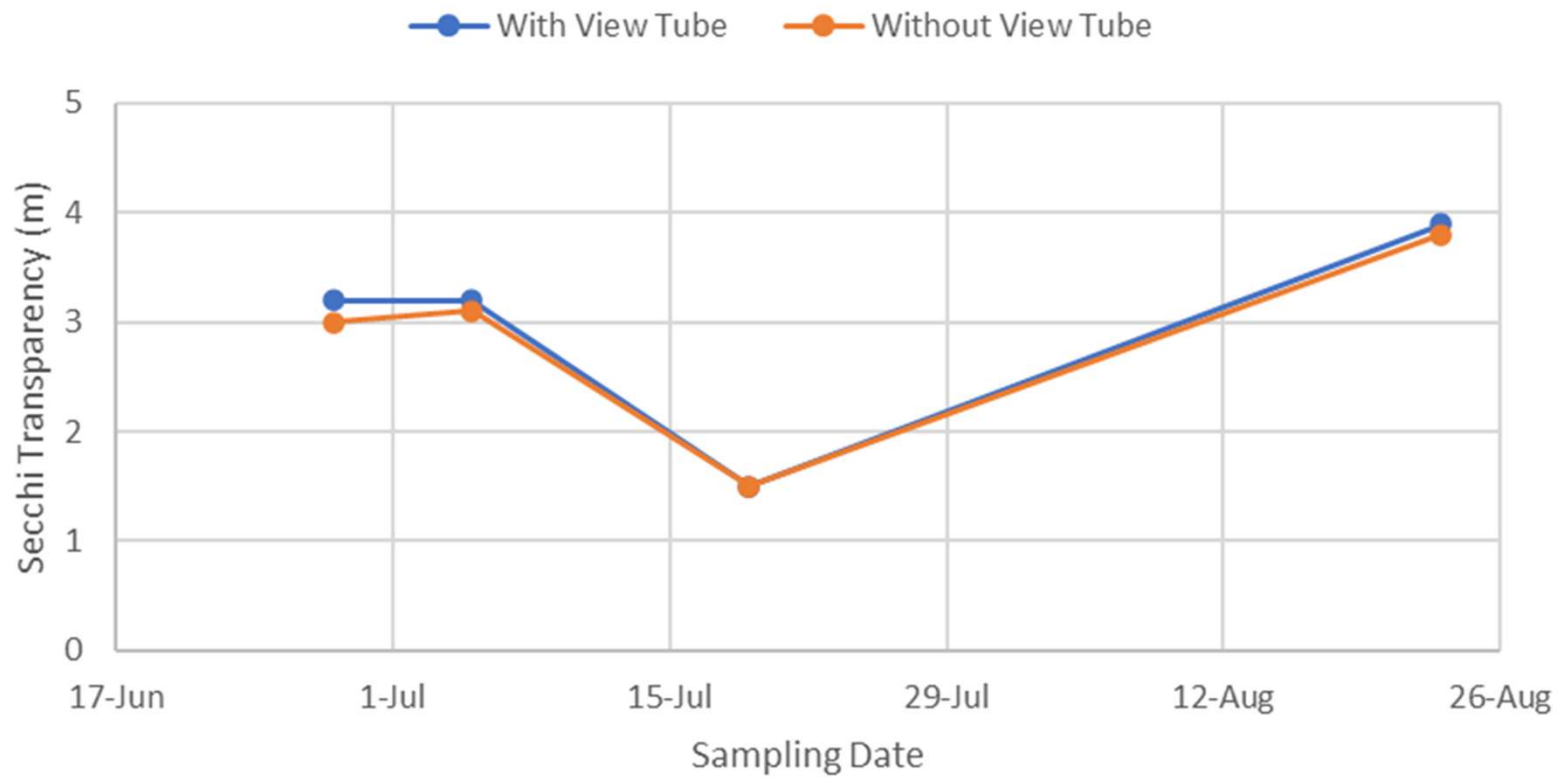
Trend: Stable (p-value=0.271)



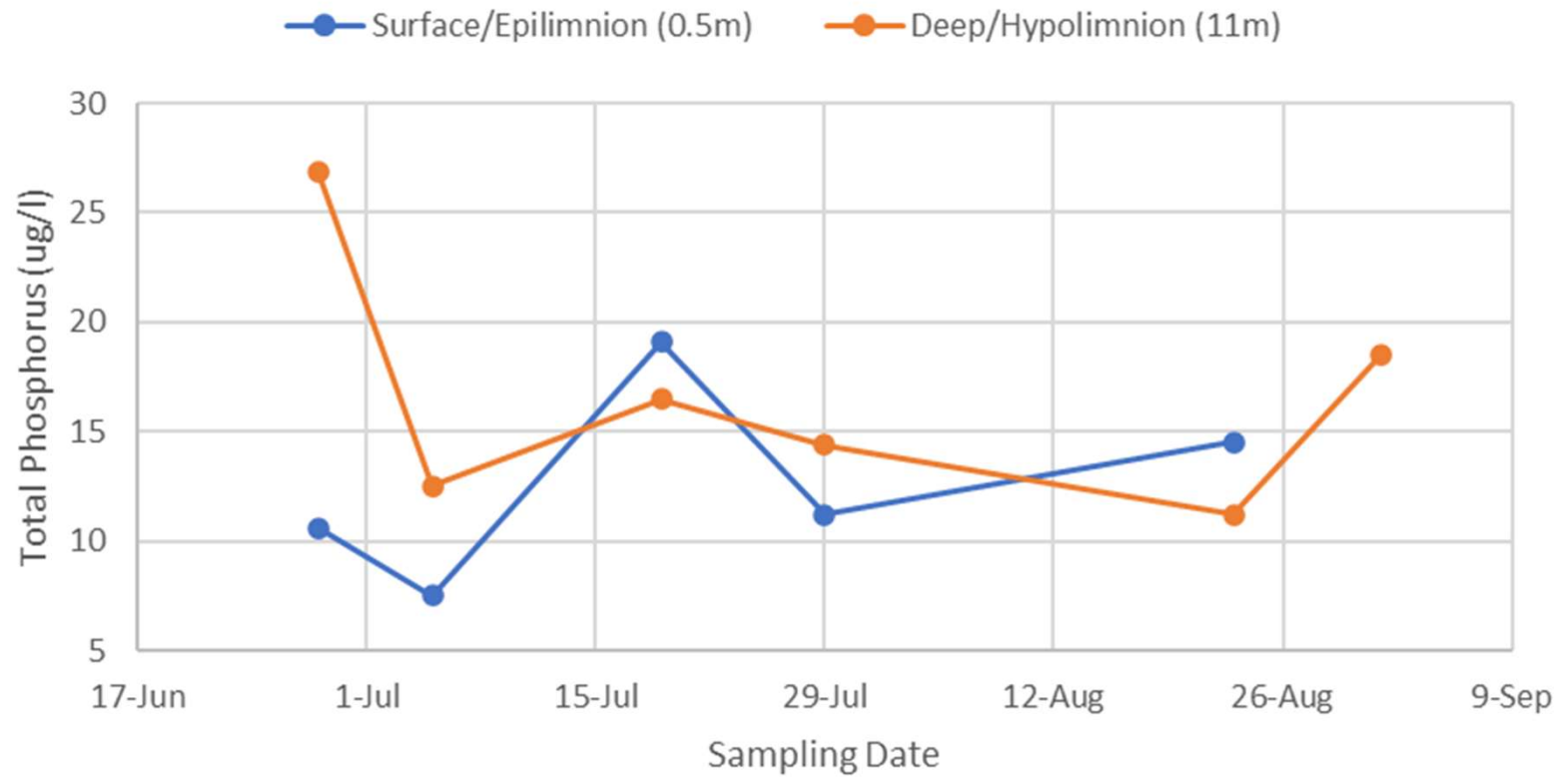
Lake Parker Water Quality Vertical Profile 6/28/2023



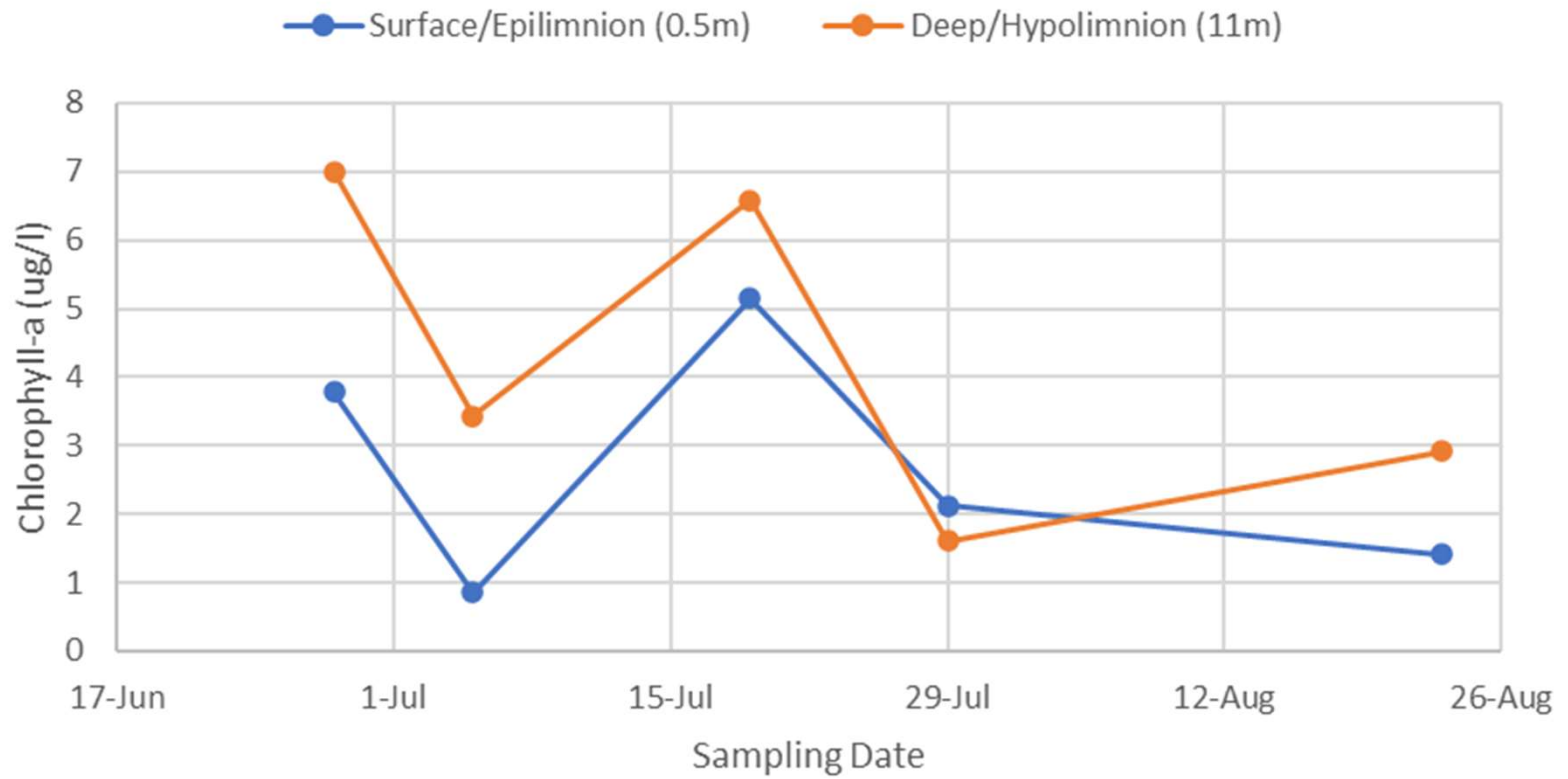
2023 Lake Parker Lay Monitoring Secchi Transparency



2023 Lake Parker Lay Monitoring Total Phosphorus

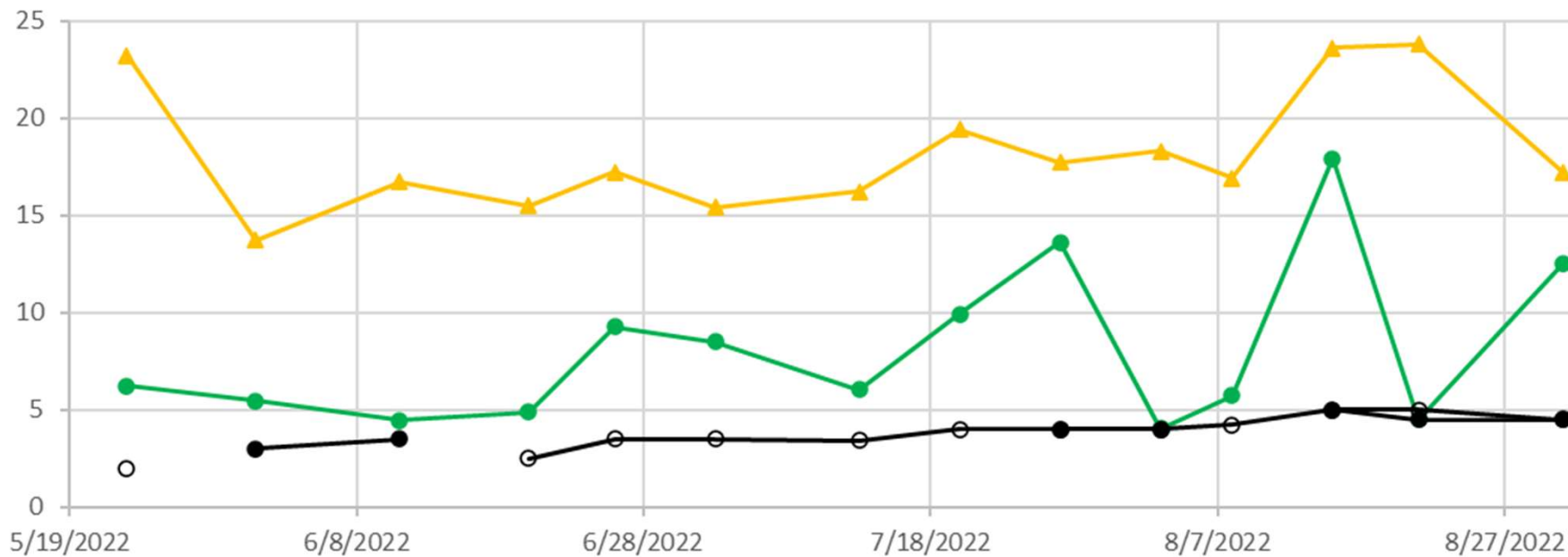


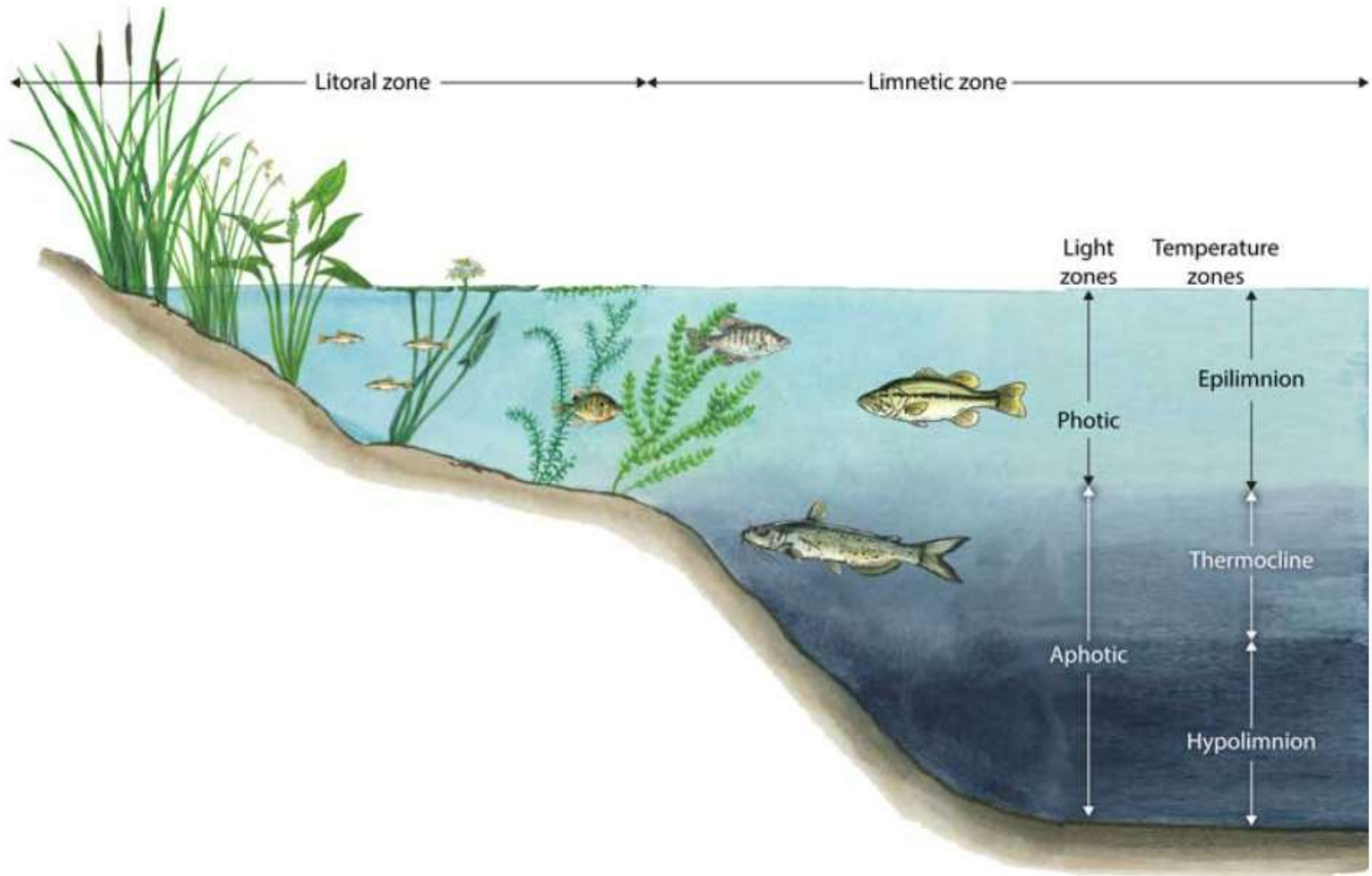
2023 Lake Parker Lay Monitoring Chlorophyll-a



2022 Lake Parker Lay Monitoring Results

—▲— Hose Total Phosphorus (ug/l) —●— Hose Chlorophyll-a (ug/l)
—●— Secchi Depth Without View Tube (m) —○— Secchi Depth With View Tube (m)

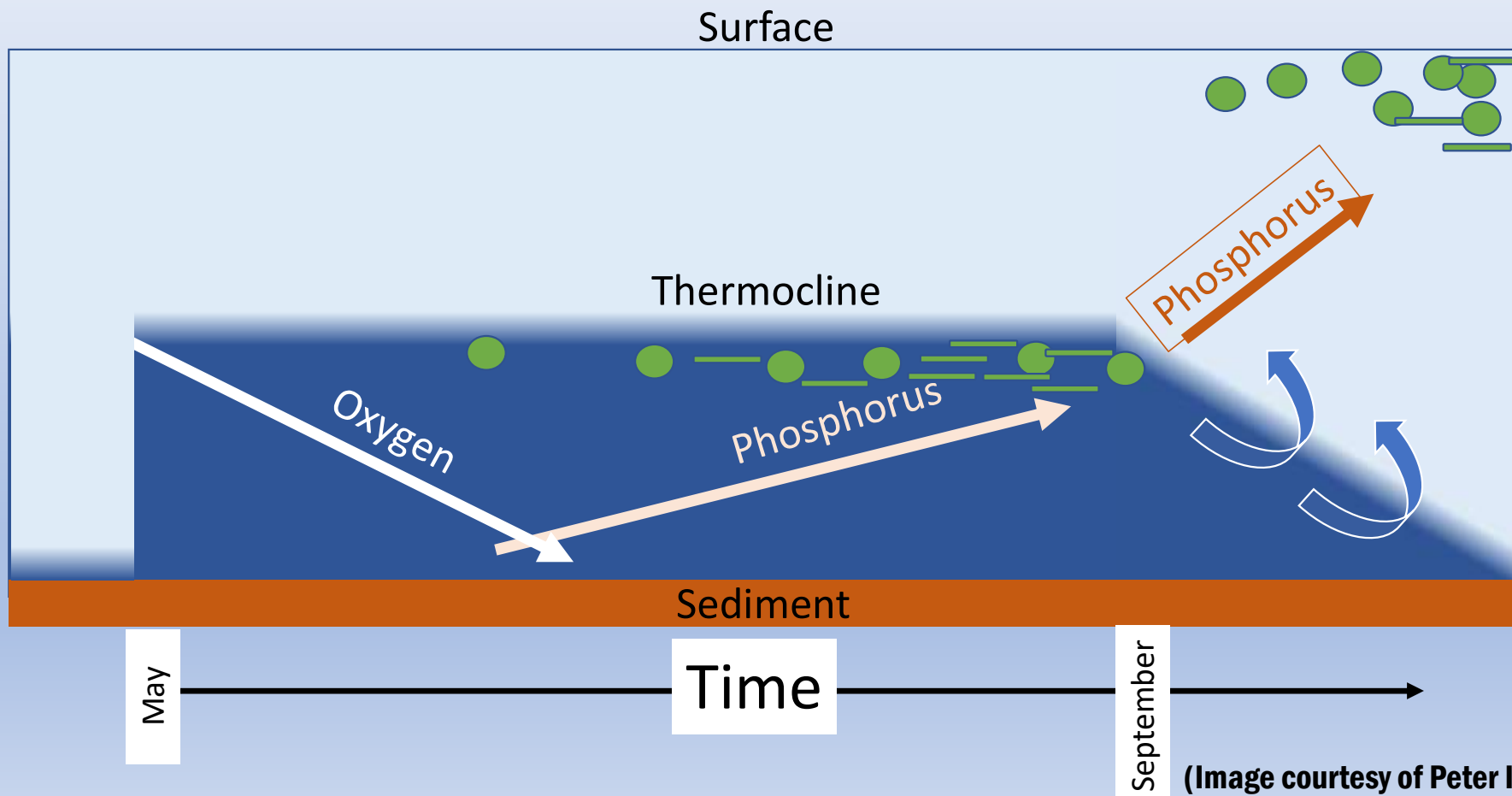




(Image courtesy of Kasco Marine)

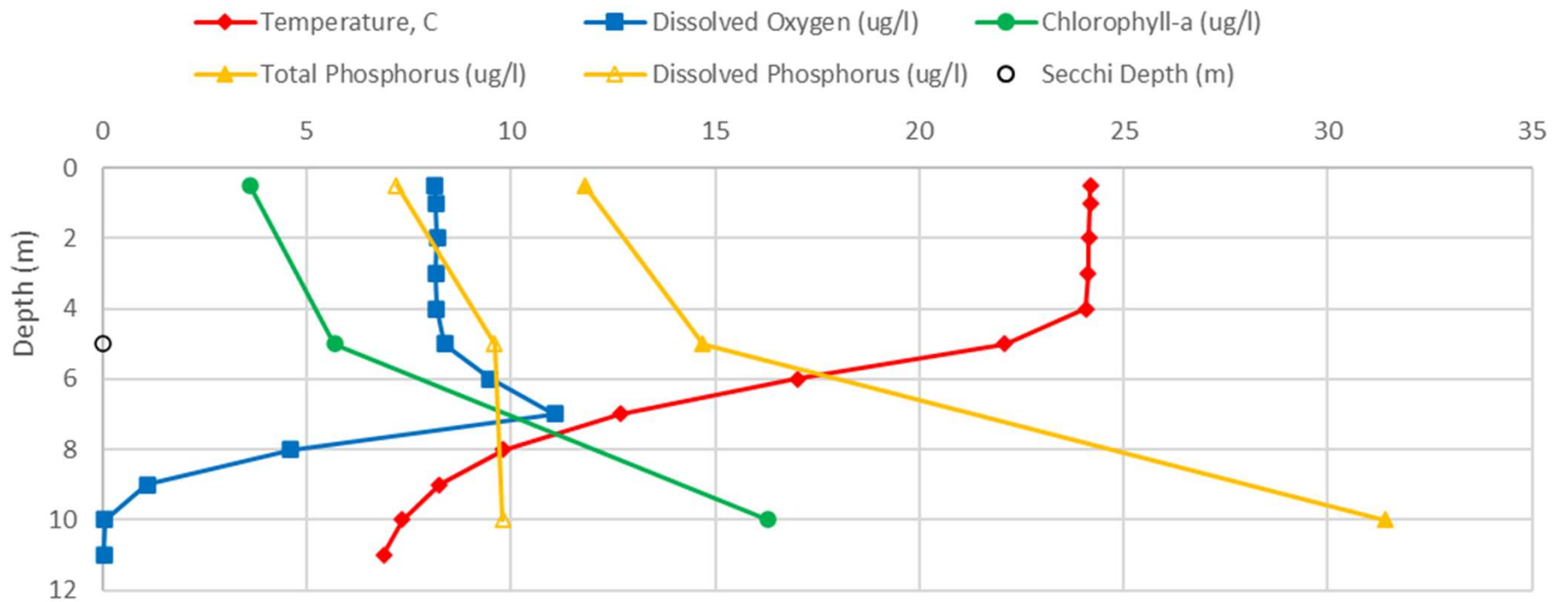
<https://kascomarine.com/blog/pond-lake-zone-identification/>

Internal Phosphorus Loading From Anoxic Sediment



(Image courtesy of Peter Isles, VT DEC)

Lake Parker Water Quality Vertical Profile on July 29, 2022



Sampling Date	Hose Sample Depth (m)	Hose Total Phosphorus (ug/l)	Hose Chlorophyll-a (ug/l)	Secchi Depth Without View Tube (m)	Secchi Depth With View Tube (m)
5/23/2022	4	23.2	6.2		2
6/1/2022	6	13.7	5.46	3	
6/11/2022	7	16.7	4.44	3.5	
6/20/2022	5	15.5	4.88		2.5
6/26/2022	7	17.2	9.24		3.5
7/3/2022	7	15.4	8.48		3.5
7/13/2022	6.8	16.2	6.01		3.4
7/20/2022	8	19.4	9.92		4
7/27/2022	8	17.7	13.6	4	4
8/3/2022	8	18.3	4.01	4	4
8/8/2022	8.4	16.9	5.7		4.2
8/15/2022	10	23.6	17.9	5	5
8/21/2022	10	23.8	4.47	4.5	5
8/31/2022	9	17.2	12.5	4.5	4.5
Mean		18.2	8.06	4.07	3.8
VT Class B2 Standards	Photosynthetic (Euphotic) Zone	18	7	2.6	2.6

LAKE PARKER

Annual Data (Station 1)

Year	Days Sampled	Secchi (m)	Secchi View Tube (m)	Chloro-a (µg/l)	Summer TP (µg/l)	Spring TP (µg/l)
1979	23	3.2		6.2		
1980	13	3.7		7.2		17.0
1981	13	3.2		5.9		22.0
1982	13	4.0		5.2		18.0
1983	13	4.2		5.6	14.1	14.0
1984	13	3.6		5.8	14.9	13.0
1985	12	5.3		6.9	15.2	14.0
1986	12	4.5		6.1	13.8	13.0
1987	12	4.0		5.4	16.0	12.0
1988	12	2.4		8.0	17.2	
1989	12	3.8		18.7	22.8	
1990	12	2.5		14.4	20.0	19.0
1991	12	4.2		5.9	14.8	15.0
1992	13	3.6				
1993	12	4.0		4.8	13.0	
1994	10	2.7		7.6	15.9	
1995	11	4.1		8.1	15.1	21.0
1996	9	3.5				
1997	9	2.8		5.7	19.6	14.0
1998	9	3.4		6.5	20.7	
1999	11	4.3		8.5	15.0	16.7
2000	12	3.5		6.5	17.1	19.3

VT Standard*

* VT Water Quality Standards Nutrient Criteria for Class B2 Lakes > 20 acres.

Annual Data (Station 1)

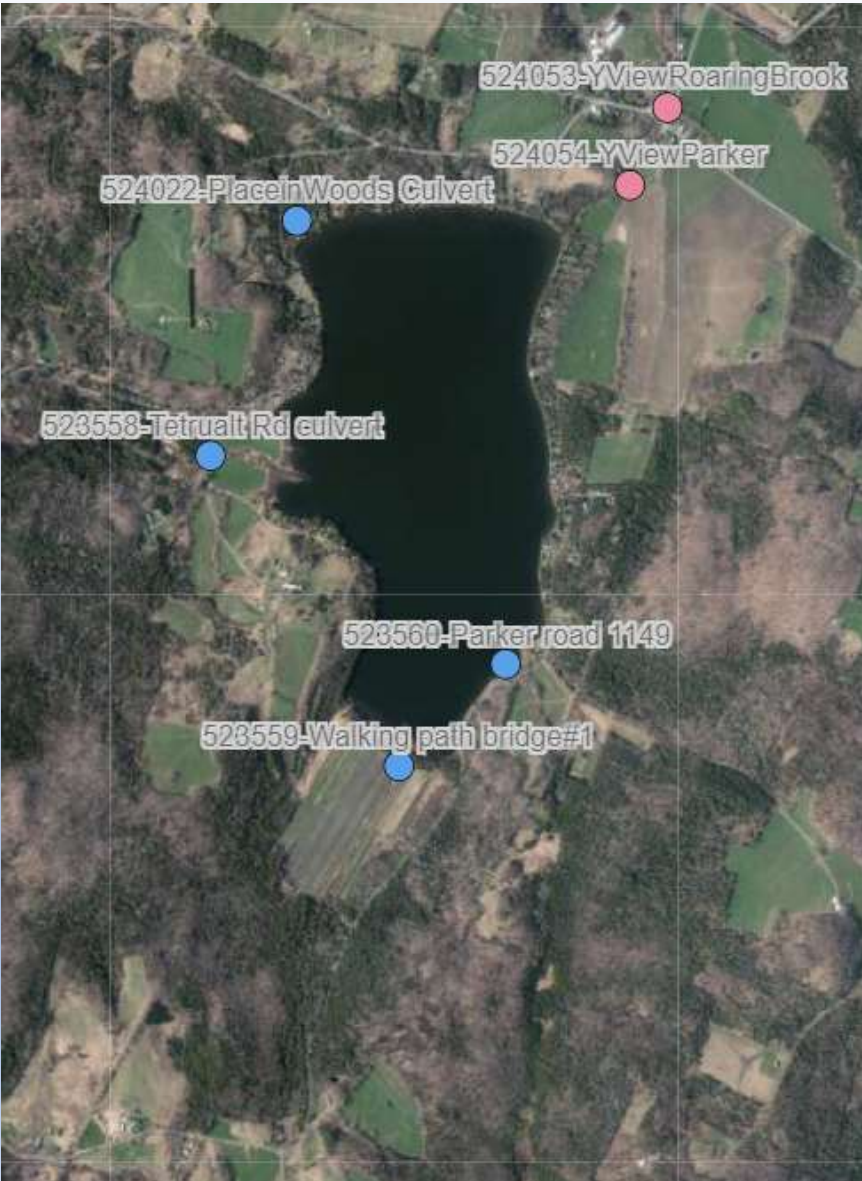
Year	Days Sampled	Secchi (m)	Secchi View Tube (m)	Chloro-a (µg/l)	Summer TP (µg/l)	Spring TP (µg/l)
2001	11	4.3		4.8	16.6	12.3
2002	10	3.4		5.4	25.7	17.0
2003	12	4.0		16.2	22.0	
2004	13	3.3		7.1	16.6	14.3
2005	11	3.7		8.0	17.7	15.1
2006	12	2.8		8.7	22.3	17.3
2007	12	3.5		6.6	17.0	22.5
2008	14	2.2		16.6	25.3	
2009	15	2.4		6.5	17.4	18.6
2010	14	3.1		8.1	21.6	
2011	14	2.5		8.4	19.2	
2012	12	2.9		4.8	15.4	
2013	9	2.4		14.7	19.7	
2014	12	2.9		5.7	17.5	
2015	15	2.2		7.0	16.1	
2016	14	4.1		7.5	17.7	
2017	12	3.1		8.4	18.7	
2018	13	4.0		5.7	15.5	
2019	15	3.3		8.6	16.1	17.0
2021	13	4.2		4.7	15.6	

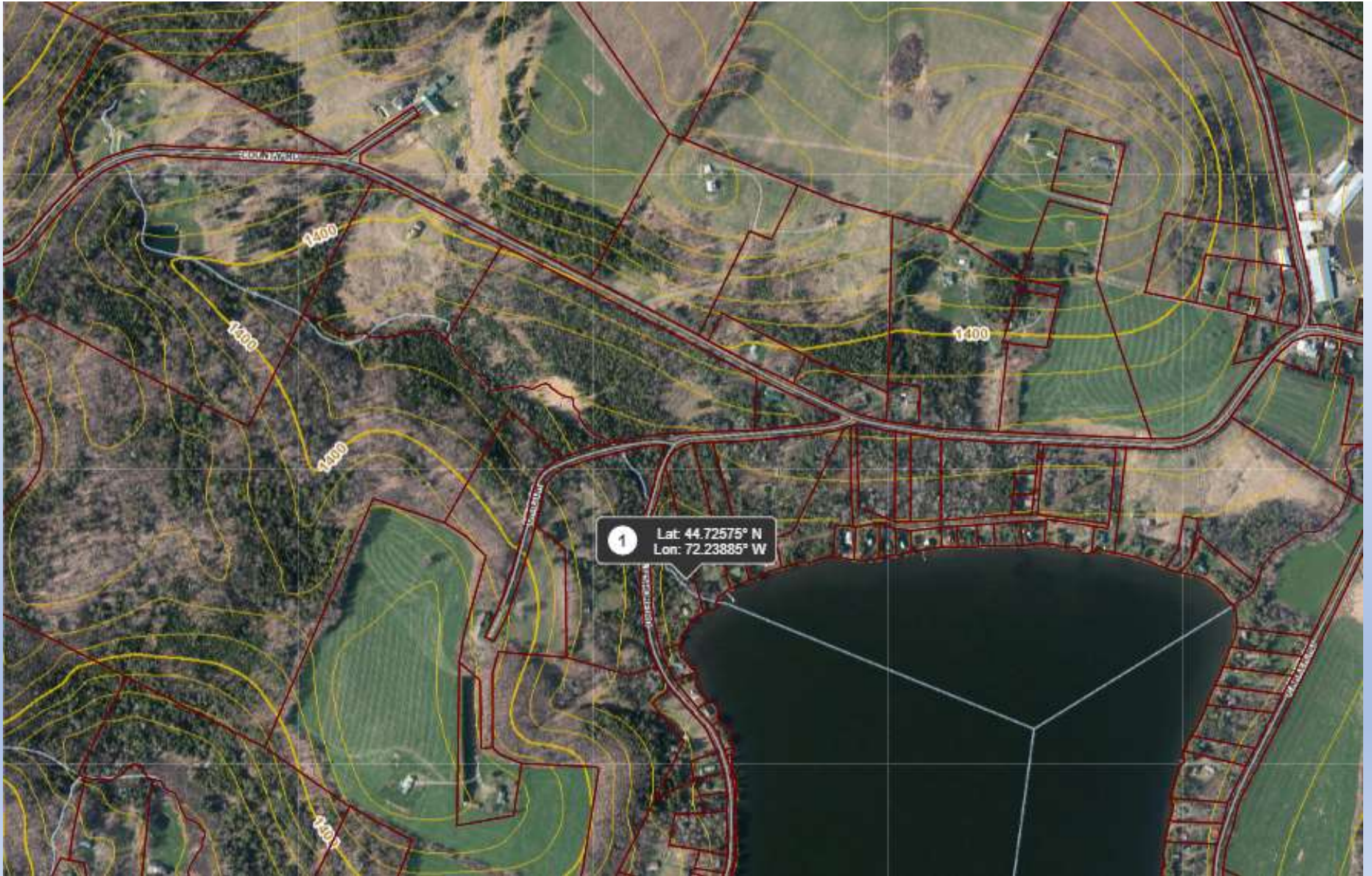
VT Standard*

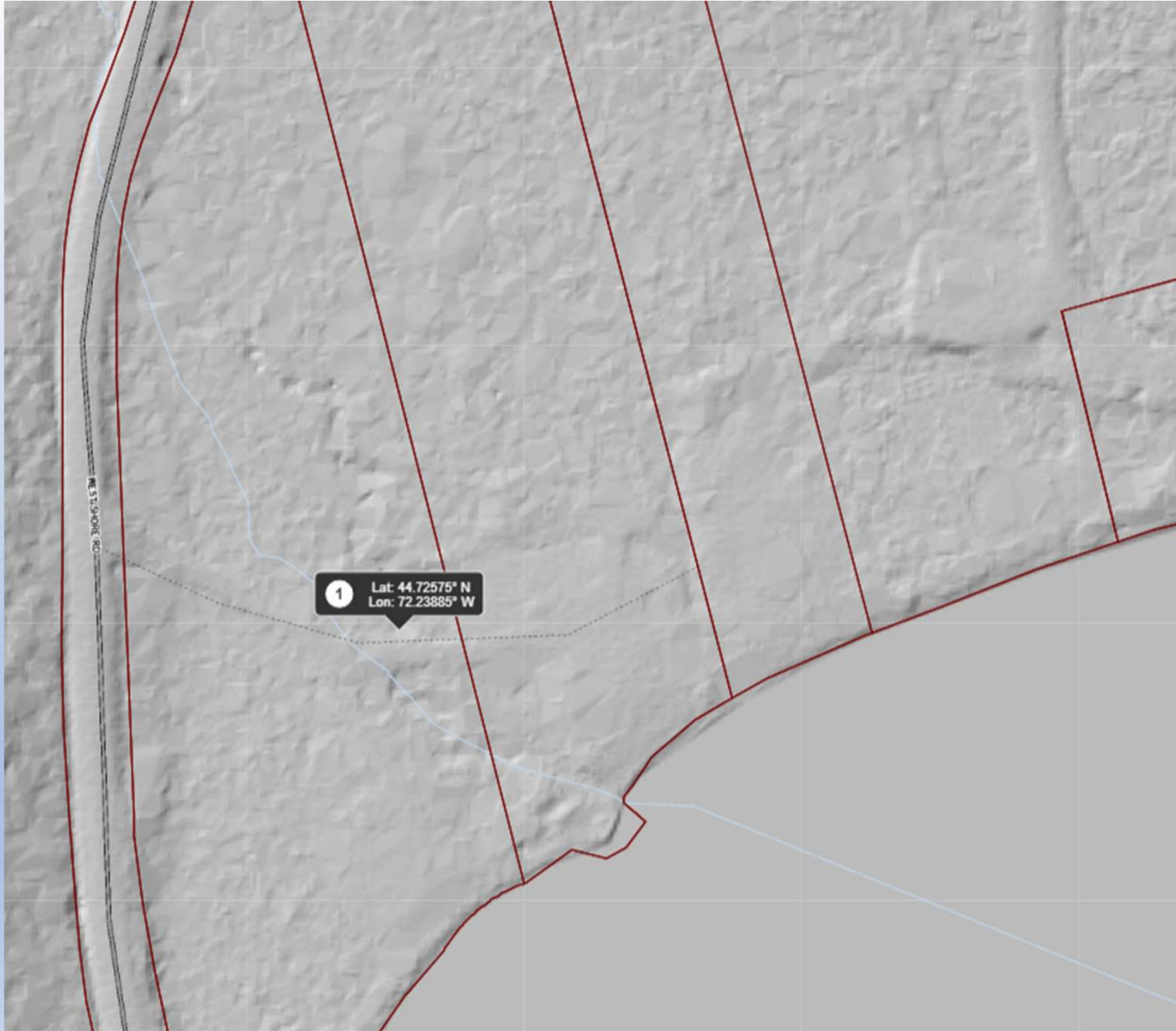
* VT Water Quality Standards Nutrient Criteria for Class B2 Lakes > 20 acres.

LaRosa Partnership Program (LPP) Tributary Sampling Overview

- Tributaries first sampled in 2022 ~biweekly (8X) from April through July + ~2 storm events
- 523558-Tetrualt Rd culvert
 - Effects from upstream farms
 - Overall concern with nutrient levels in lake
 - Large sediment deposits at mouth of brook
- 523559-Walking path bridge#1
 - Effects from upstream farm
 - Overall concern with nutrient levels in lake
- 523560-Parker road 1149
 - Overall concern with nutrient levels in lake
- 524022-PlaceinWoods Culvert
 - Added in 2023







LPP Sample Parameters Overview

Total Phosphorus

- *Impacts*
 - Feeds plants, algae and cyanobacteria
 - Aquatic Biota, Aesthetics, Recreation Uses
- *Human Sources*
 - Runoff from roads, lawns, agriculture, logging
 - Malfunctioning septic systems
- *Vermont Water Quality Standards Nutrient Criteria for Aquatic Biota Use (+ Biological Criteria)*
 - Not to be exceeded at low median monthly flow (baseflow) during June through October
 - 12 ug/L for small high gradient streams (SHG)
 - 15 ug/L for medium high gradient streams (MHG)
 - 27 ug/L for warm-water medium gradient streams and rivers (WWMG)

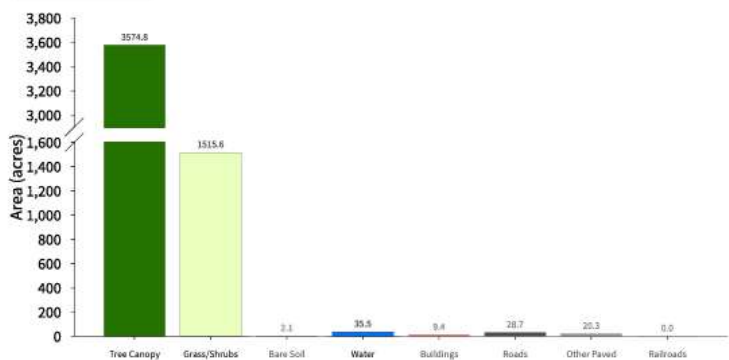
Total Nitrogen

- *Impacts*
 - Feeds plants, algae and cyanobacteria
 - Aquatic Biota, Aesthetics, Recreation Uses
- *Human Sources*
 - Runoff from roads, lawns, agriculture, logging
 - Malfunctioning septic systems
- *Vermont Water Quality Standards*
 - Not to exceed 5.0 mg/l as NO₃-N at flows exceeding low median monthly flows, in Class B(1) and B(2) waters.
 - Not to exceed 2.0 mg/l as NO₃-N at flows exceeding low median monthly flows, in Class A(1) and A(2) waters at or below 2,500 feet elev.



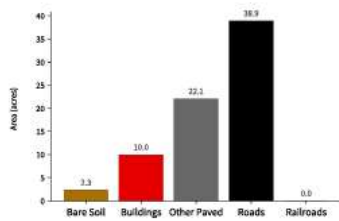
High-Resolution Land Cover Summary

Base Land Cover* (Top-Down**)

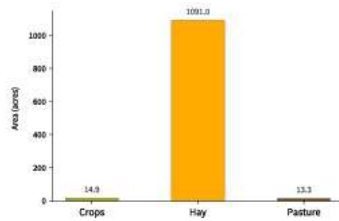


Supplemental Land Cover

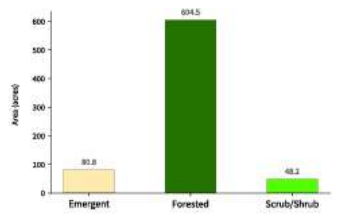
Impervious Surfaces (73.33 acres - 1.4 % of total) (Bottom-Up**)



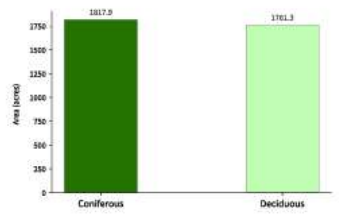
Agriculture (1,119.18 acres - 21.6 % of total)



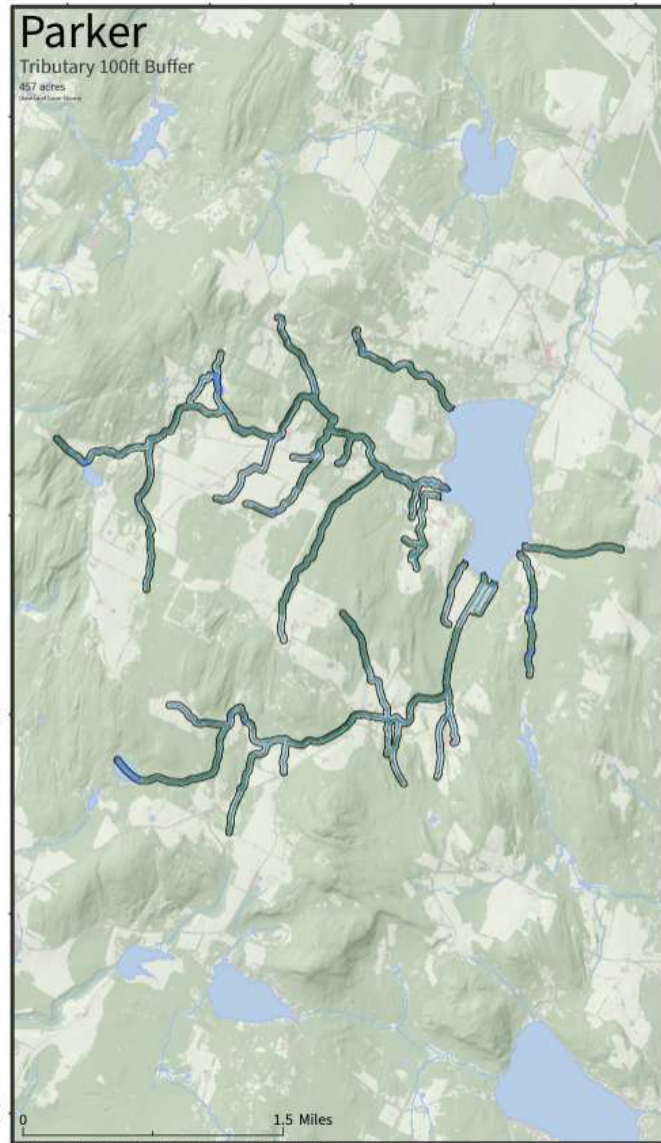
Wetlands (733.53 acres - 14.1 % of total)



Tree Canopy (3,579.22 acres - 69 % of total)

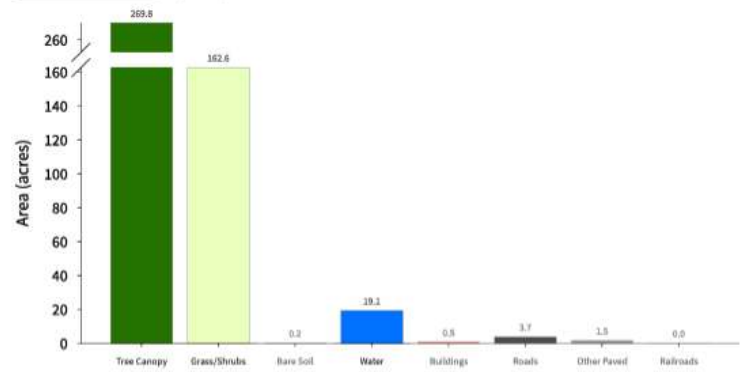


*This report is a traditional land cover mapping approach. Land cover is mapped as the uppermost land cover class.
 **This report is a bottom-up land cover mapping approach. Land cover is mapped as the lowermost land cover class. This approach results in larger overall percentages of the total land cover area than the top-down approach.



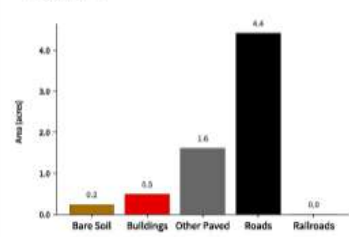
High-Resolution Land Cover Summary

Base Land Cover (Top-Down*)

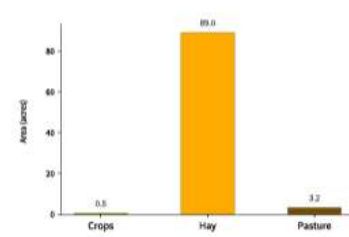


Supplemental Land Cover

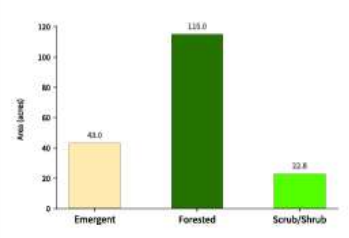
Impervious Surfaces (6.76 acres - 1.5% of total) (Bottom-Up**)



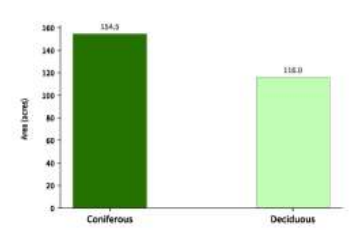
Agriculture (92.66 acres - 20.3% of total)



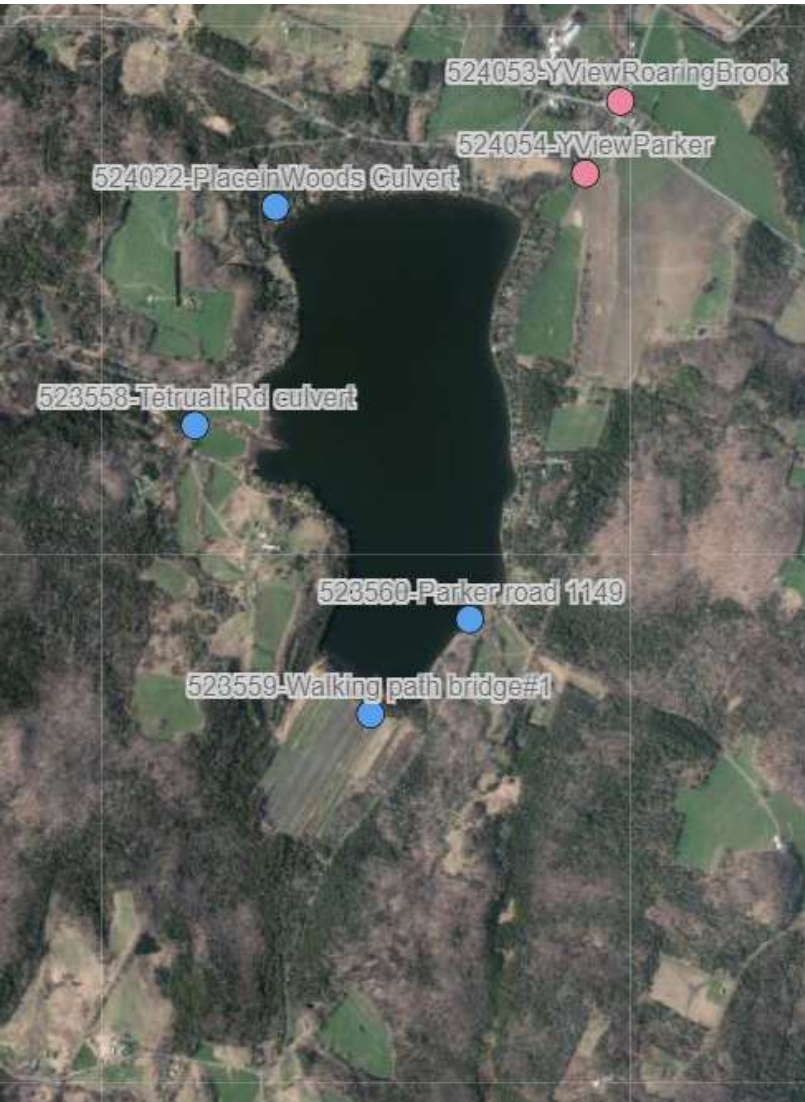
Wetlands (180.77 acres - 39.6% of total)



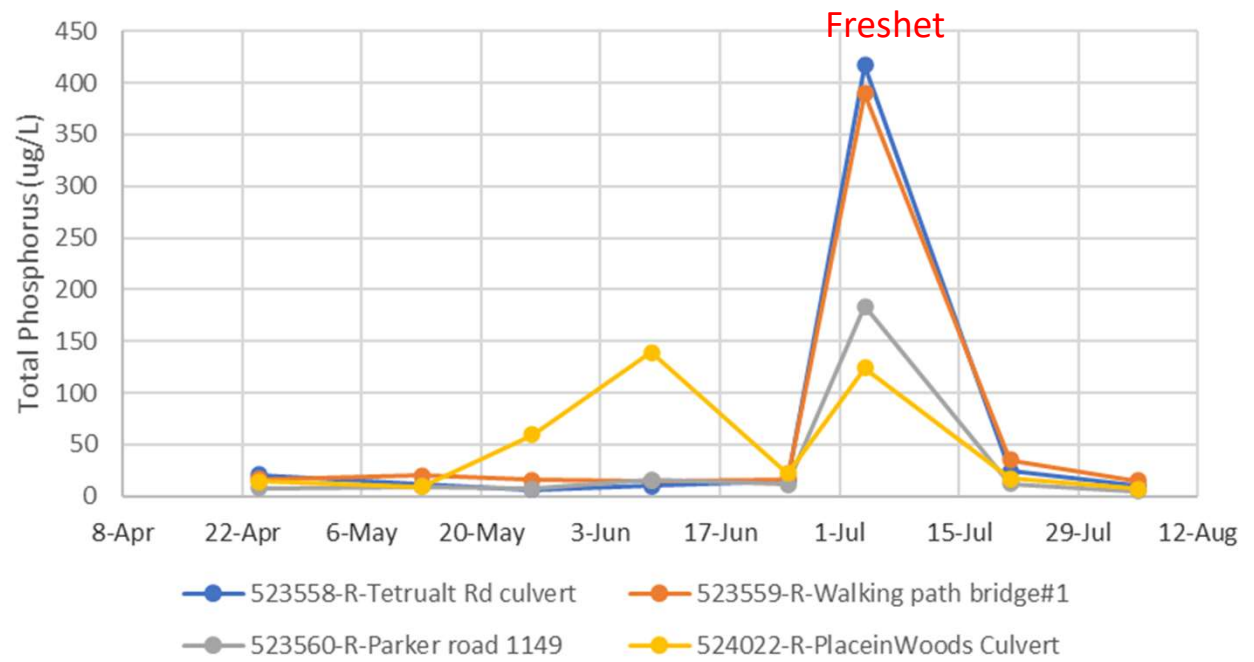
Tree Canopy (270.5 acres - 59.2% of total)

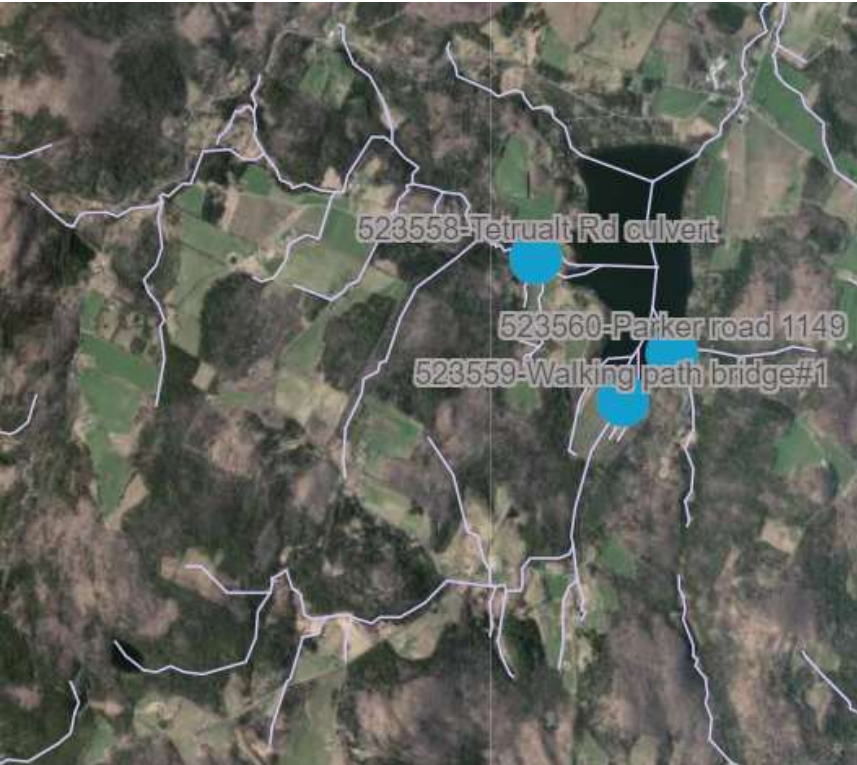


*The Source 2 (modified Land cover mapping approach) land cover is reported as the upper level land cover class.
 **The Source 2 (modified Land cover mapping approach) land cover is reported as the bottom level land cover class. This approach results in improved mapping of features such as buildings and other features.
 See EPA's 2012 High-Resolution Land Cover (HRLC) Report for more details.

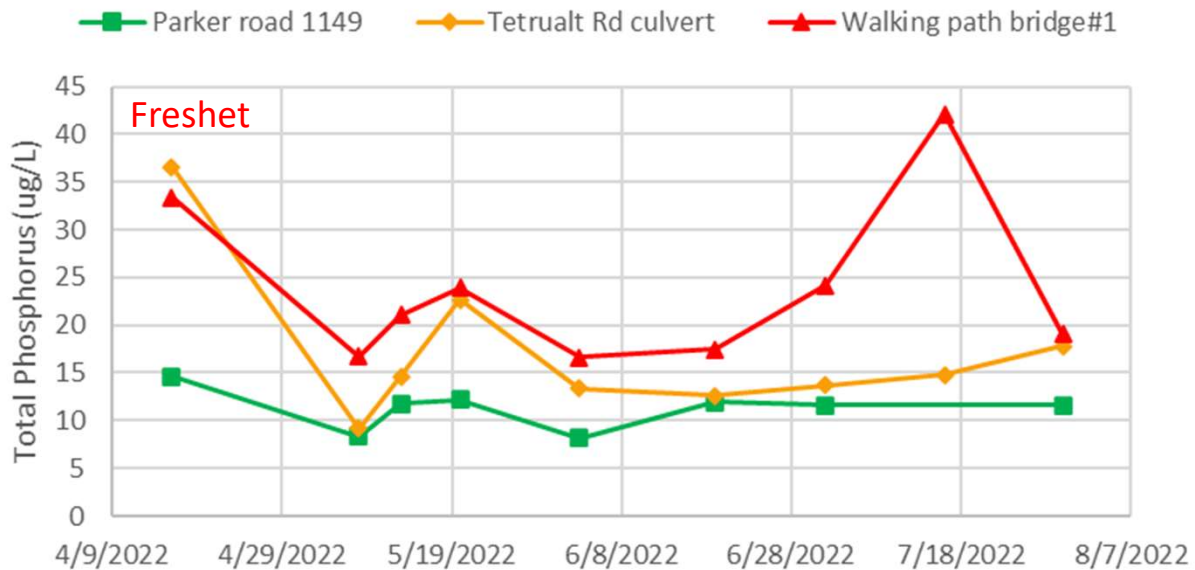


2023 Lake Parker Tributary Total Phosphorus Monitoring

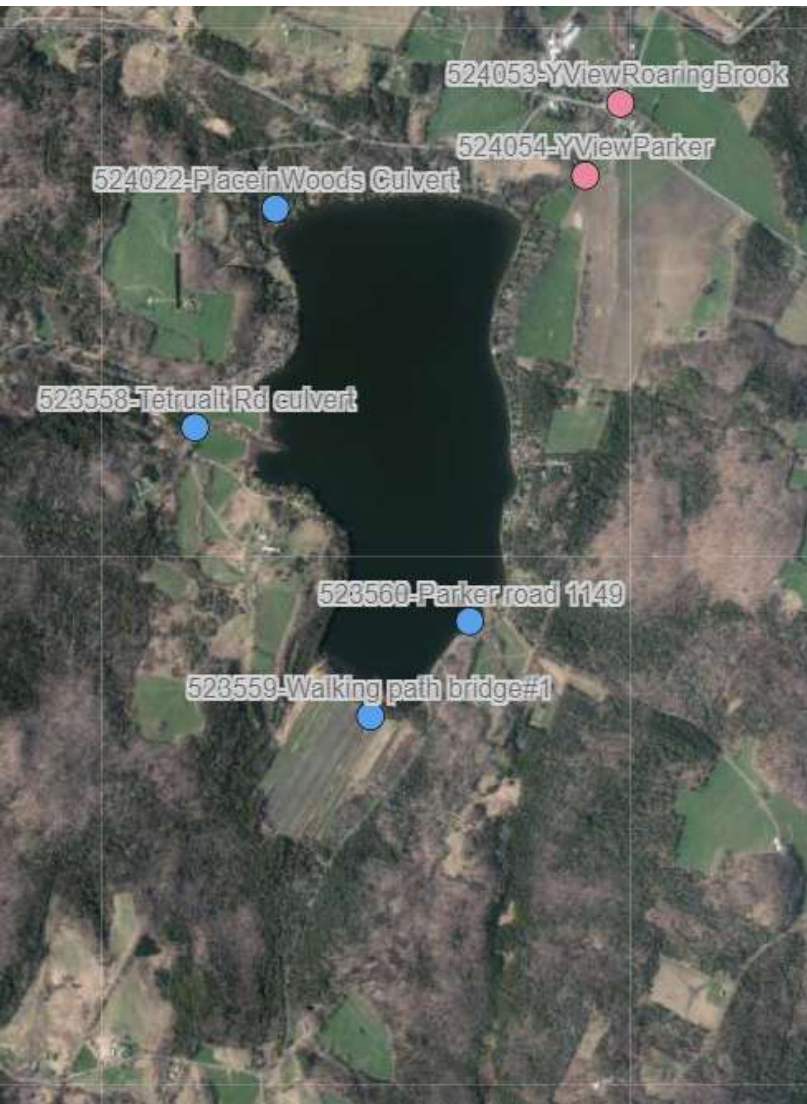




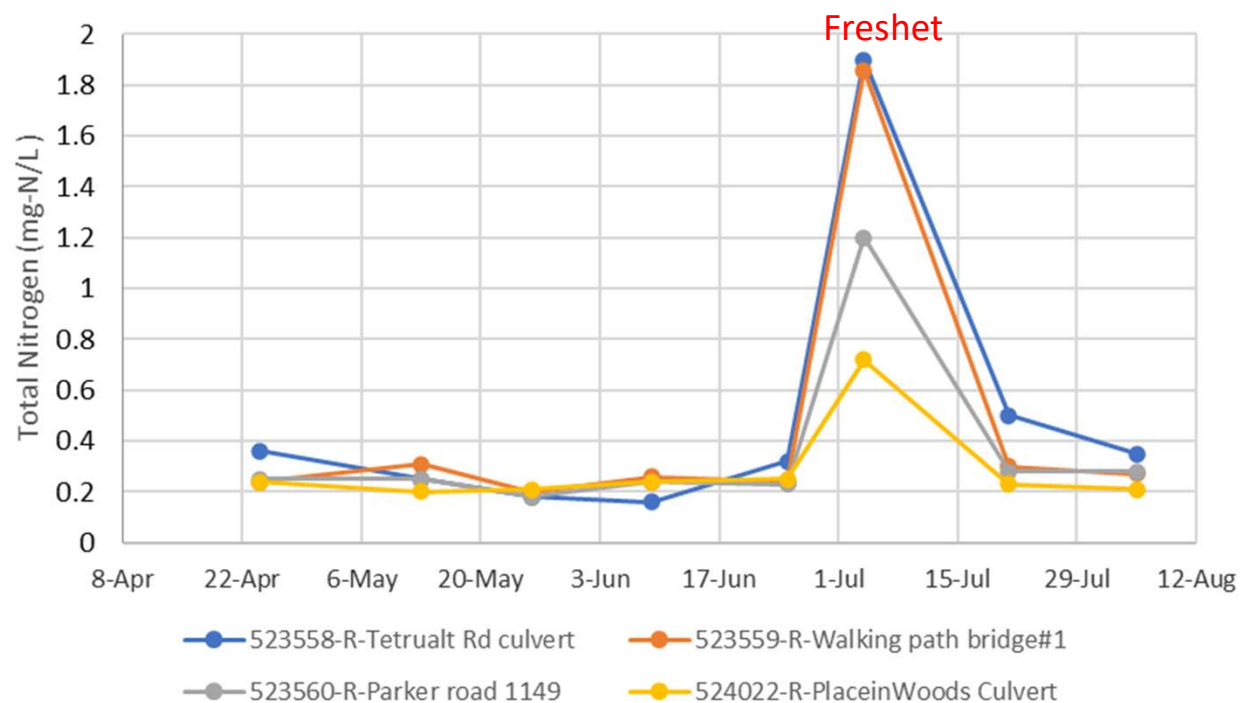
2022 Lake Parker Tributary Total Phosphorus Monitoring Results

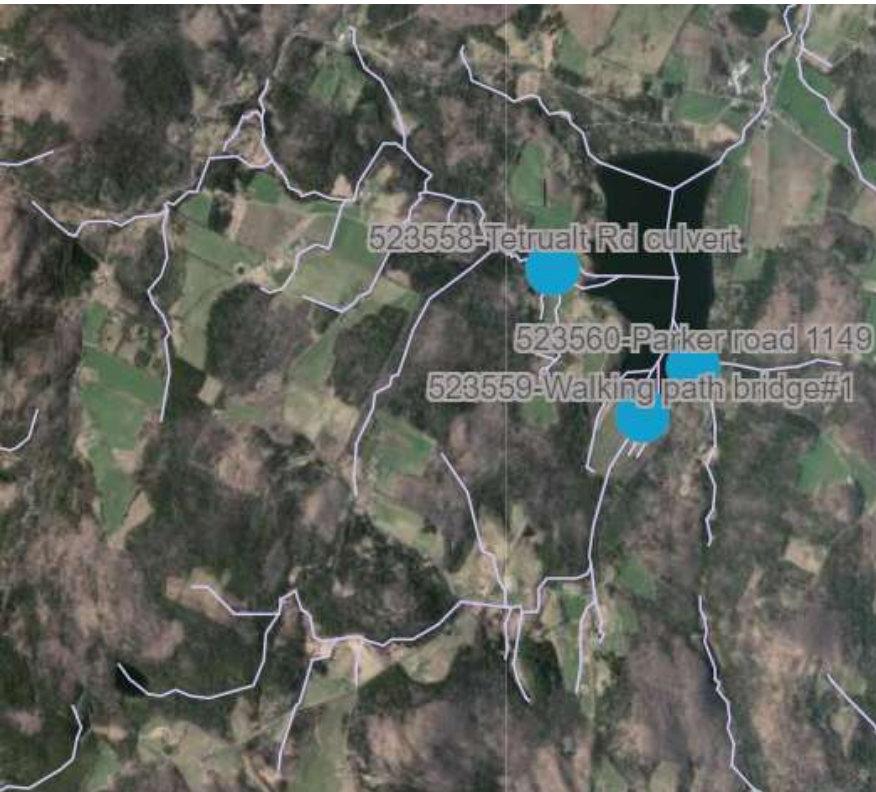


Tributary	Minimum TP (ug/l)	Average TP (ug/l)	2022 Max TP (ug/l)
Parker road 1149	8.2	11.3	14.6
Tetrualt Rd culvert	9.2	17.3	36.6
Walking path bridge#1	16.6	23.8	42.1

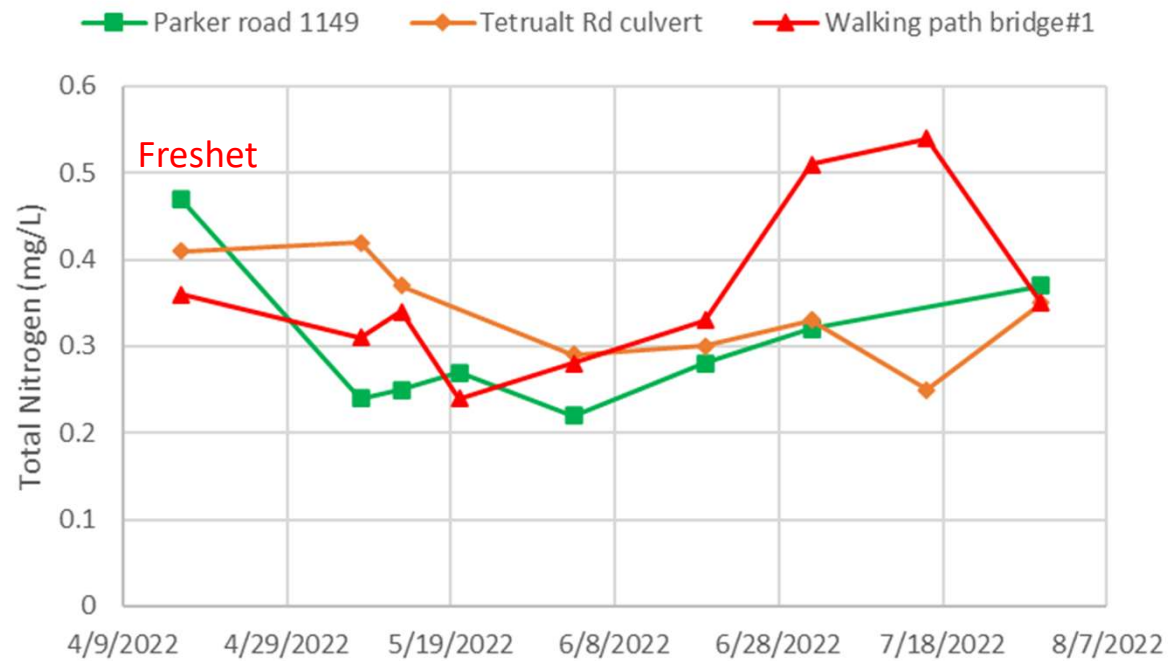


2023 Lake Parker Tributary Total Nitrogen Monitoring



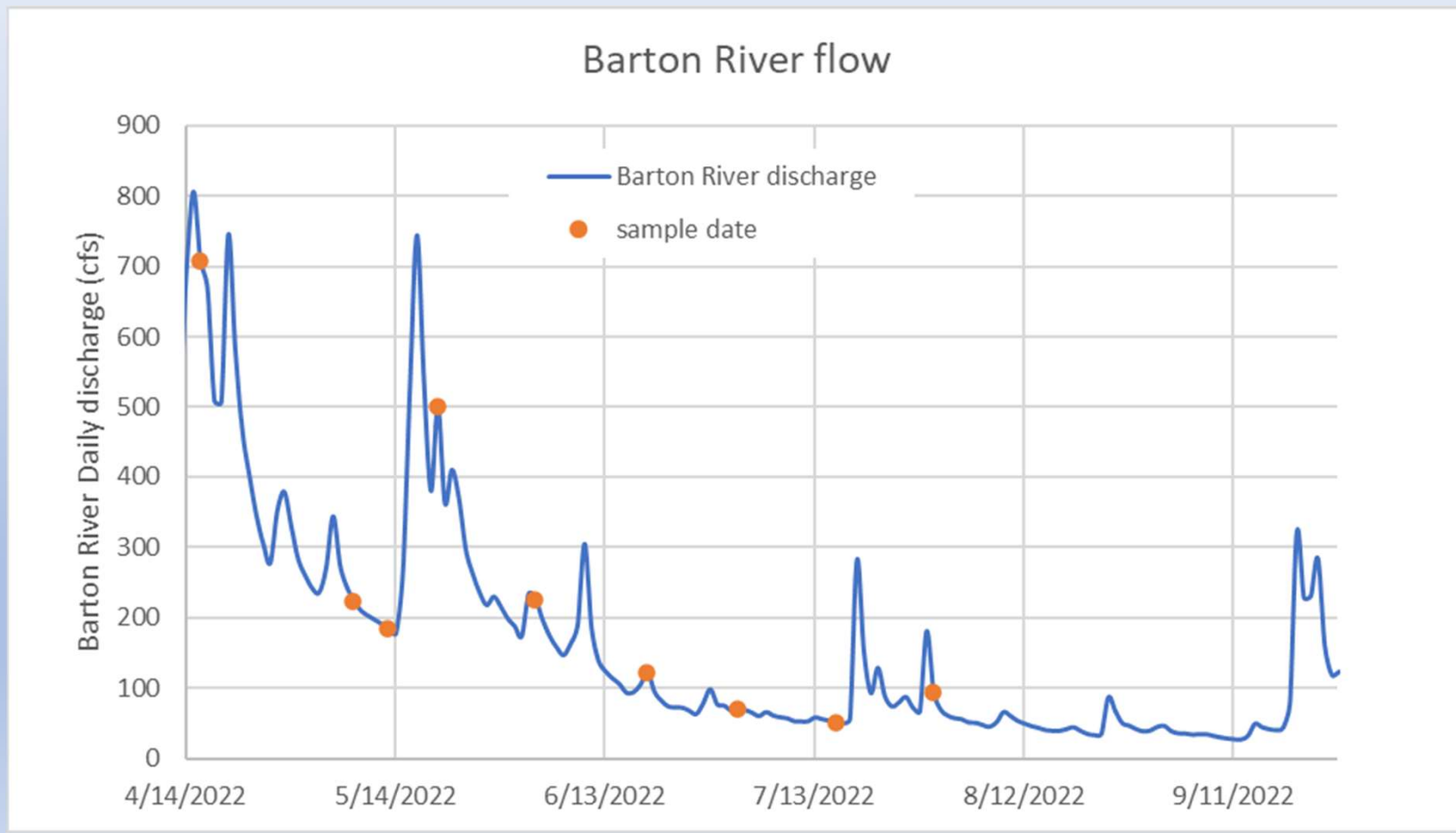
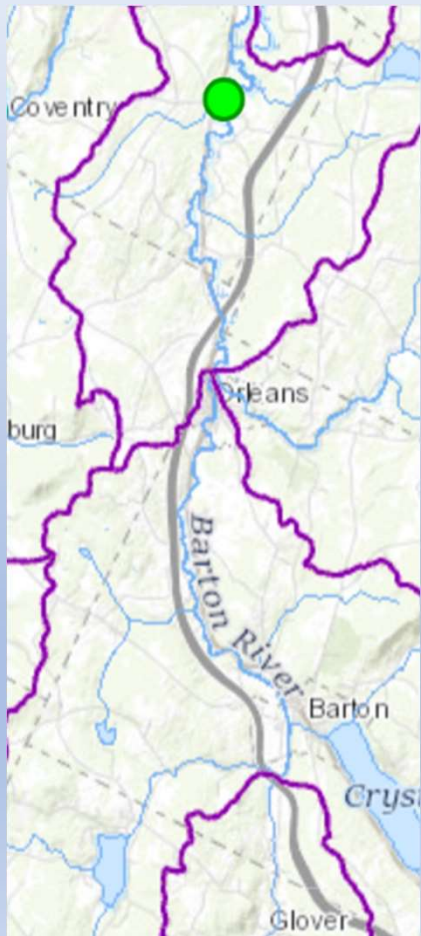


2022 Lake Parker Total Nitrogen Monitoring Results



Tributary Site	Minimum TN (ug/L)	Average TN (ug/L)	Maximum TN (ug/L)
Parker road 1149	0.22	0.3	0.47
Tetrualt Rd culvert	0.25	0.34	0.42
Walking path bridge#1	0.24	0.36	0.54

USGS Streamflow – Barton River, Coventry



2023 Monitoring Summary & 2024 Next Steps



- Lay Monitoring Program (LMP)
 - 2023 Summary: Total phosphorus and chlorophyll-a concentrations were initially low in the epilimnion and elevated in the hypolimnion due to internal loading from anoxic sediment in June. After early July flood epilimnetic concentrations increased and then decreased, tracking similarly to hypolimnetic concentrations and Secchi transparency
 - 2024 Next Steps: LMP volunteer continues collecting biweekly epilimnetic (0.5 m) and hypolimnetic (20 m) samples. Caffeine testing will also continue at a lower lab reporting limit (≤ 0.1 ug/L). LMP staff collects duplicate samples, vertical profile data, and additional metalimnetic sample during annual visit.
- LaRosa Partnership Program (LPP)
 - 2023 Summary: High TP during Freshet (July 4th flood) at all sites
 - 2024 Next Steps: LPP volunteer continues collecting biweekly samples June through August (align with LMP)