2024 Lake Morey Water Quality Monitoring Results

Mark Mitchell, Lake Monitoring and Community Outreach Coordinator

VT Department of Environmental Conservation, UVM Lake Champlain Sea Grant

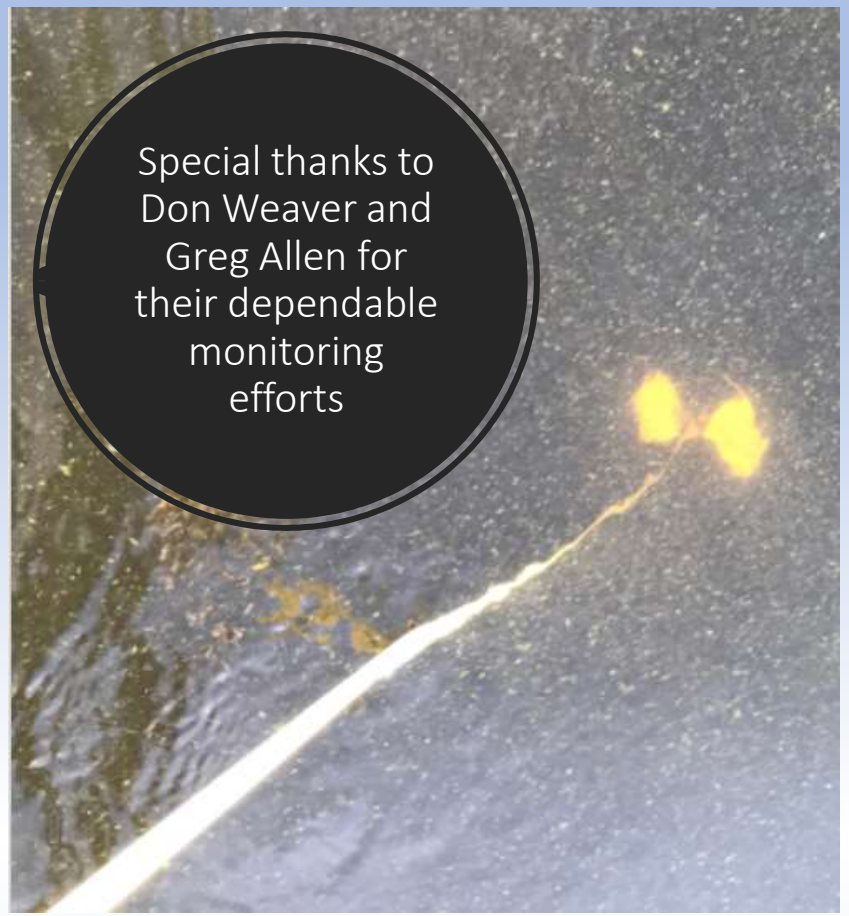
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
LAKES & PONDS PROGRAM

VERMONT LAY MONITORING PROGRAM •1979•

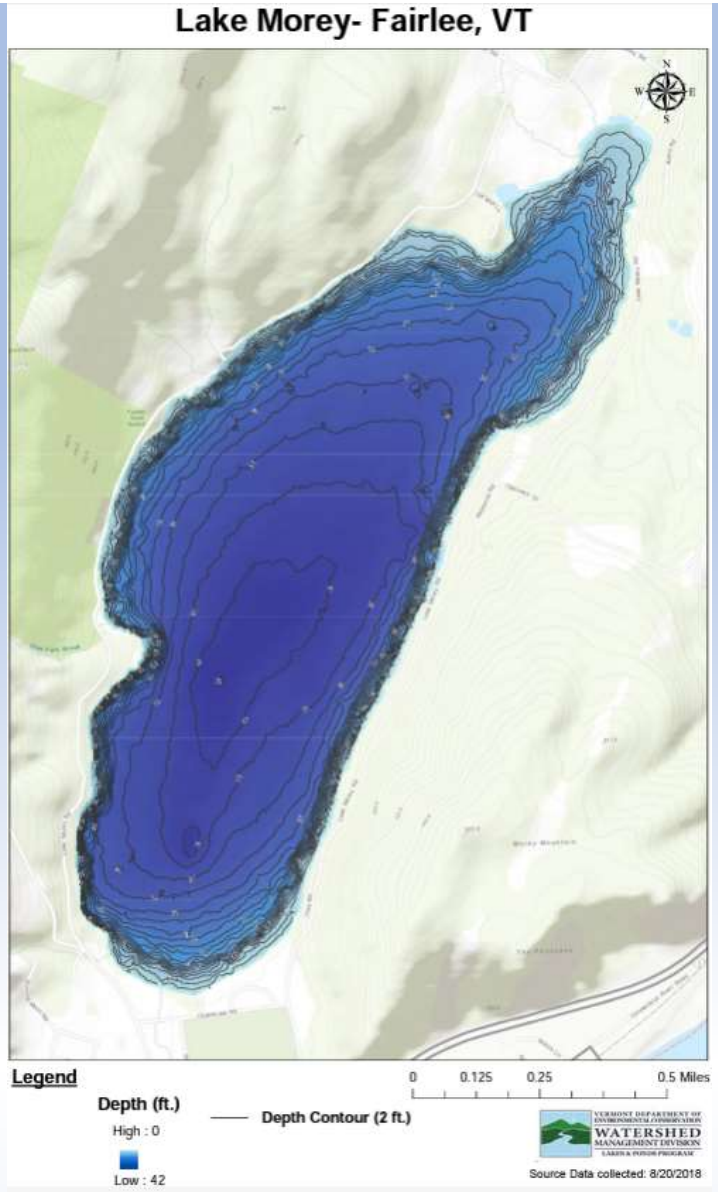
Sea Grant
Lake Champlain

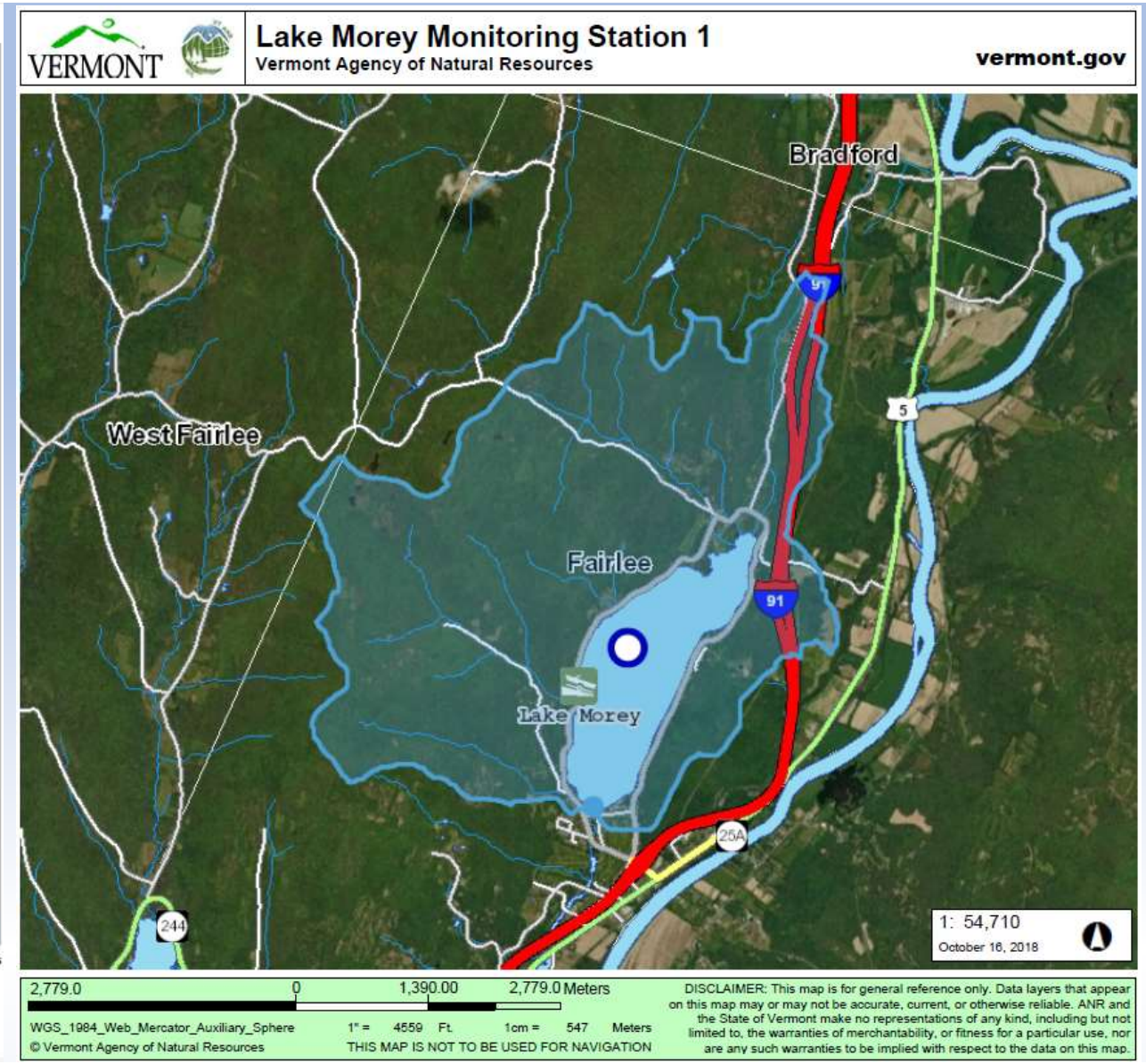
Lay Monitoring Program (LMP) 2023 Lake Sampling Overview

- 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)



https://dec.vermont.gov/watershed/lakes-ponds/monitor/lay-monitoring


Lake Morey- Fairlee, VT
Legend
Depth (ft.)
High : 0
Low : 42
Depth Contour (2 ft.)
0 0.125 0.25 0.5 Miles
WATERSHED MANAGEMENT DIVISION
Source Data collected: 8/20/2018

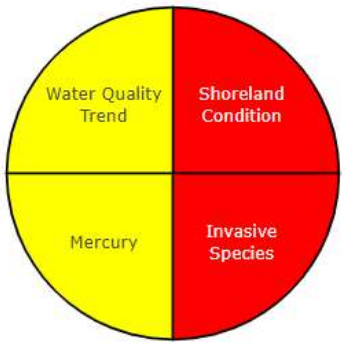

VERMONT
Lake Morey Monitoring Station 1
Vermont Agency of Natural Resources
vermont.gov
Bradford
West Fairlee
Fairlee
Lake Morey
91
5
25A
244
1: 54,710
October 16, 2018
2,779.0 0 1,390.00 2,779.0 Meters
WGS_1984_Web_Mercator_Auxiliary_Sphere
1" = 4559 Ft 1cm = 547 Meters
© Vermont Agency of Natural Resources
THIS MAP IS NOT TO BE USED FOR NAVIGATION
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 Morey

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

Scores | Water Quality Data | Lake Information



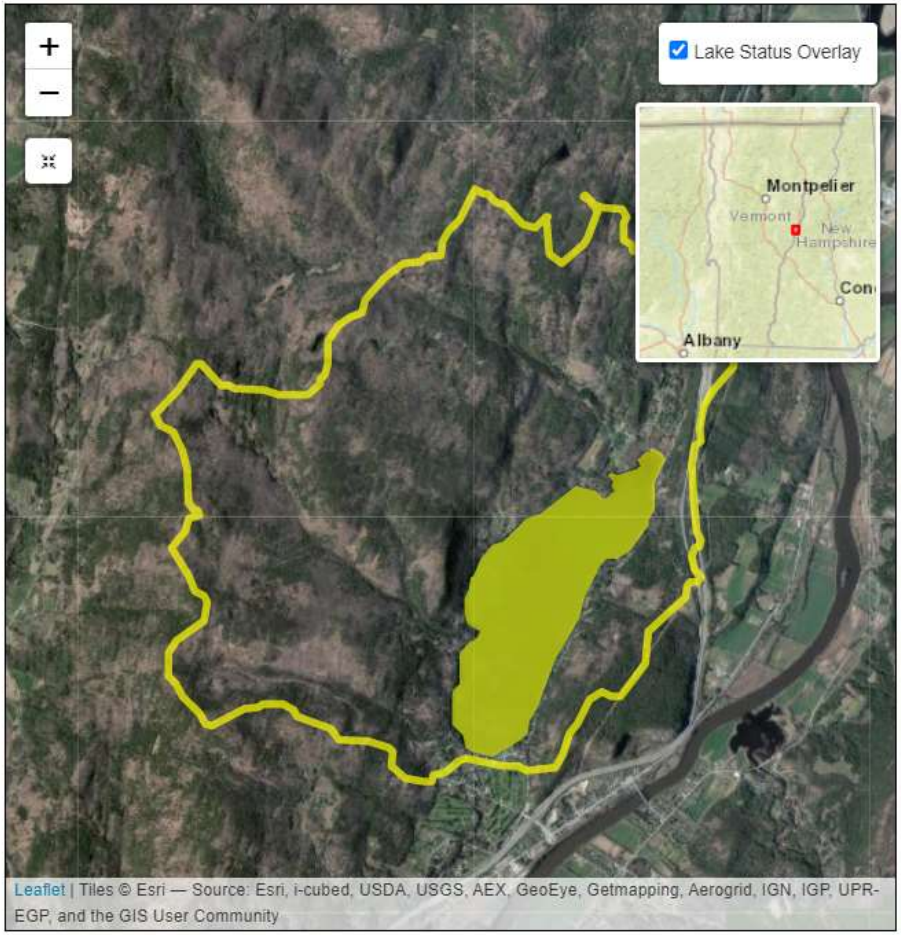
Watershed:	Moderately Disturbed
WQ Standards:	Stressed

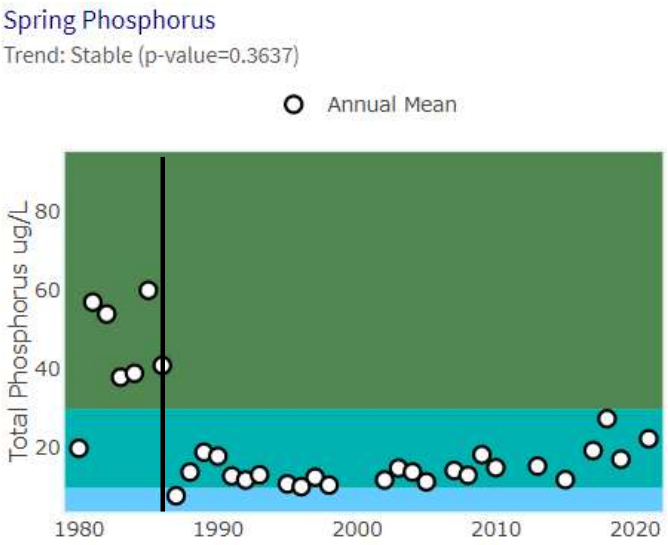
Details

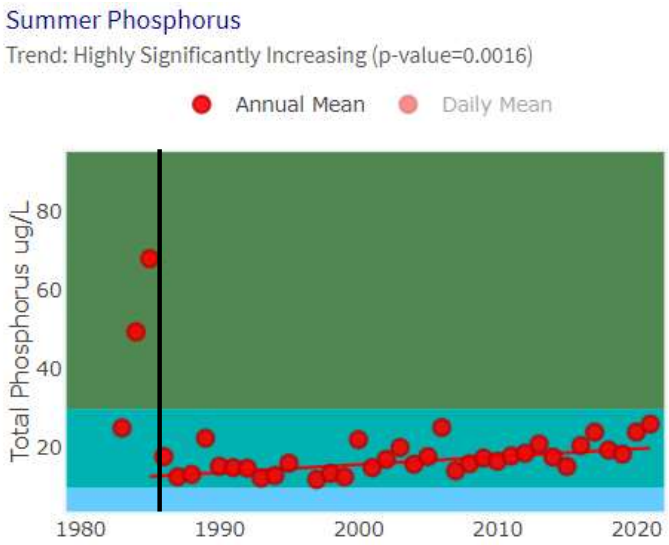
Stressed – Phosphorus

Color Scoring System
- Good Conditions
- Fair Conditions
- Poor Conditions
- Insufficient Data

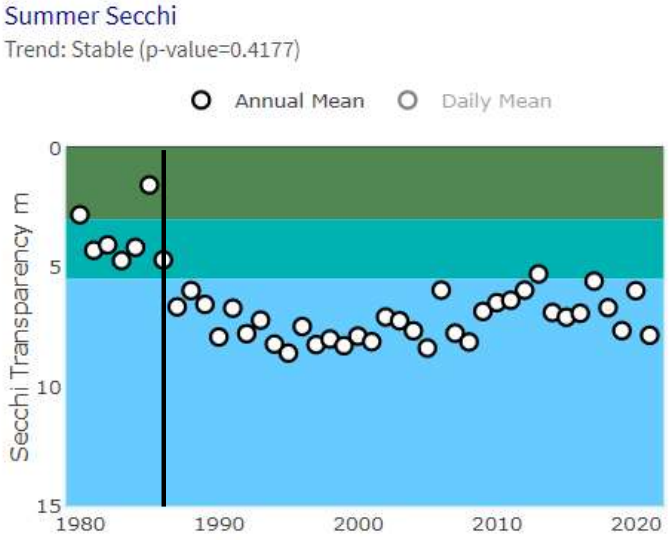
Learn How Lakes Are Scored

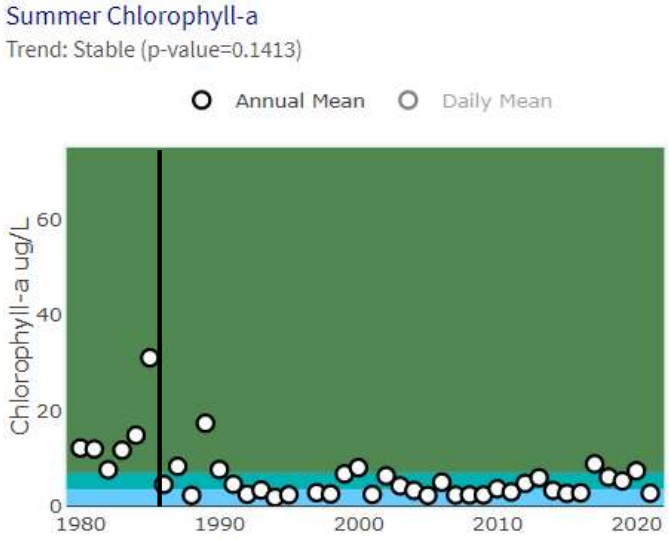


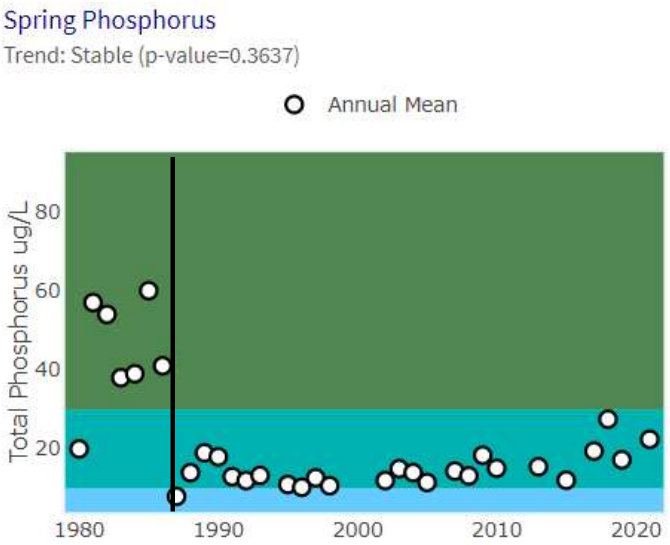


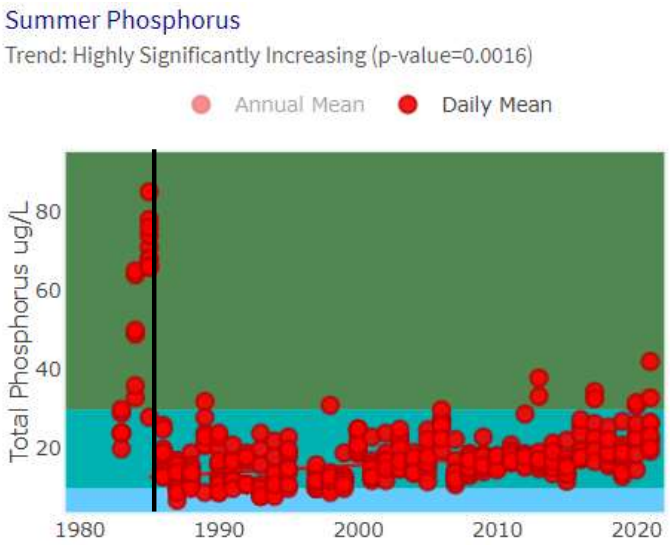


1986: Aluminum Sulfate (Alum) Treatment (1st in VT)

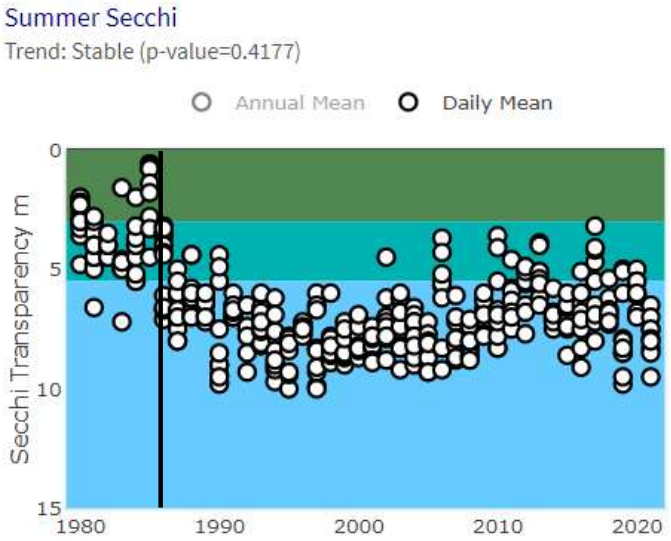


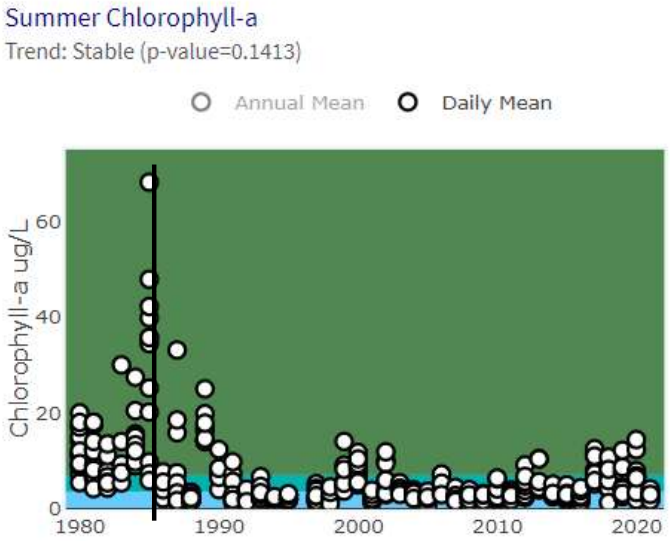






1986: Aluminum Sulfate (Alum) Treatment (1st in VT)



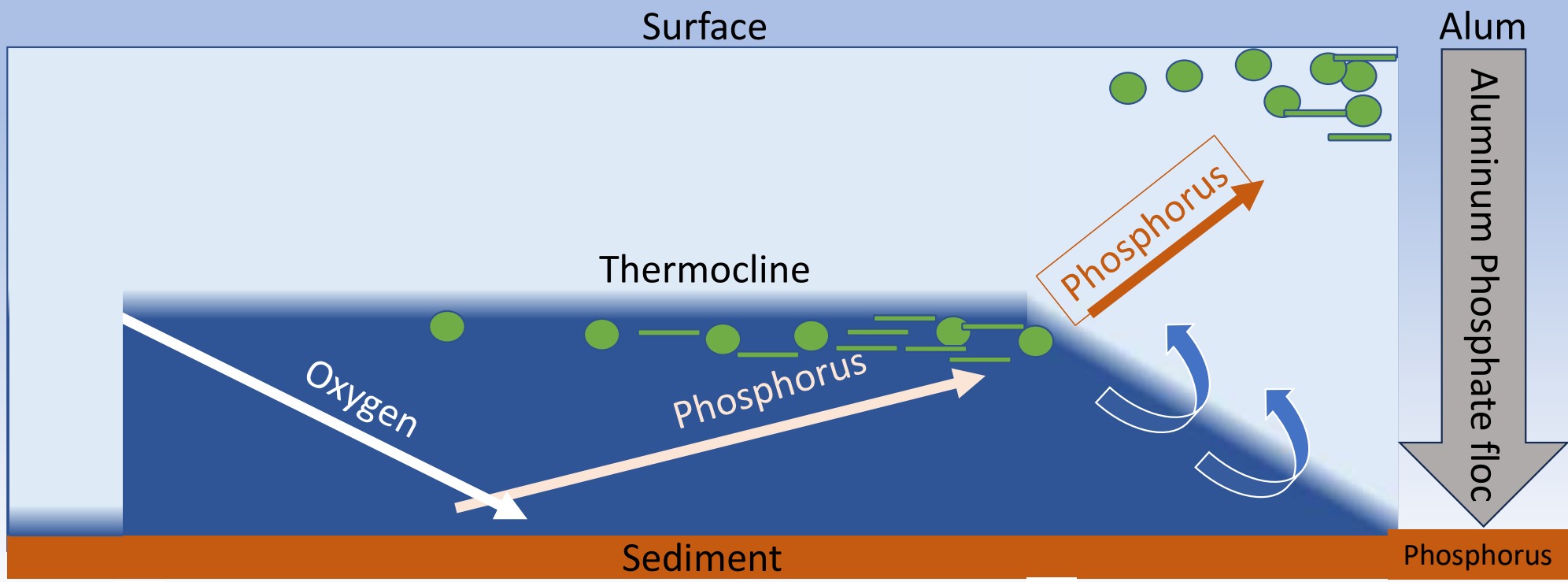


2022 August-October Cyanobacteria Bloom

Before: August 8th

During: September 9th

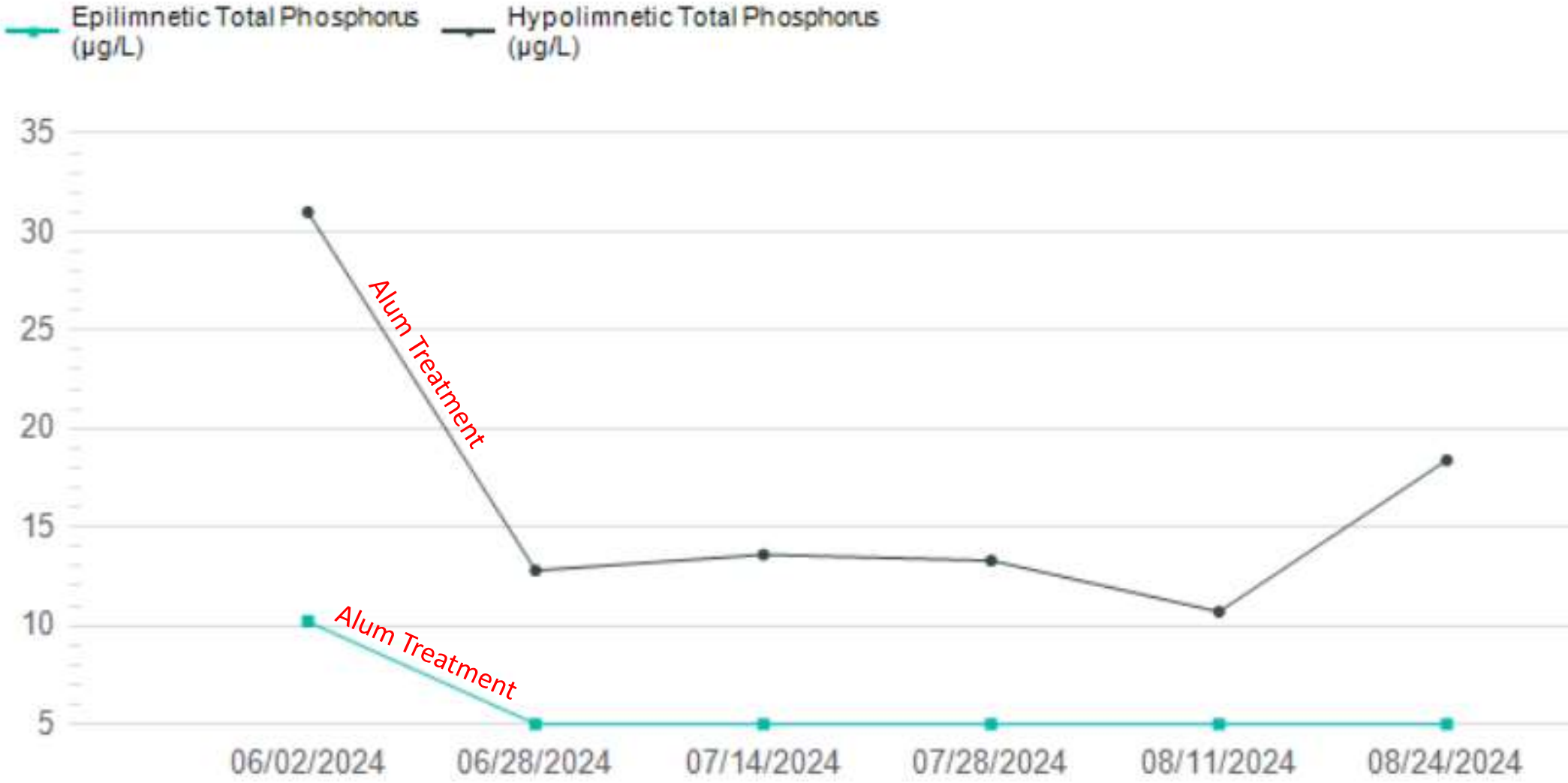
Internal Phosphorus Loading From Anoxic Sediment + Alum



(Image modified from Peter Isles, VT DEC)

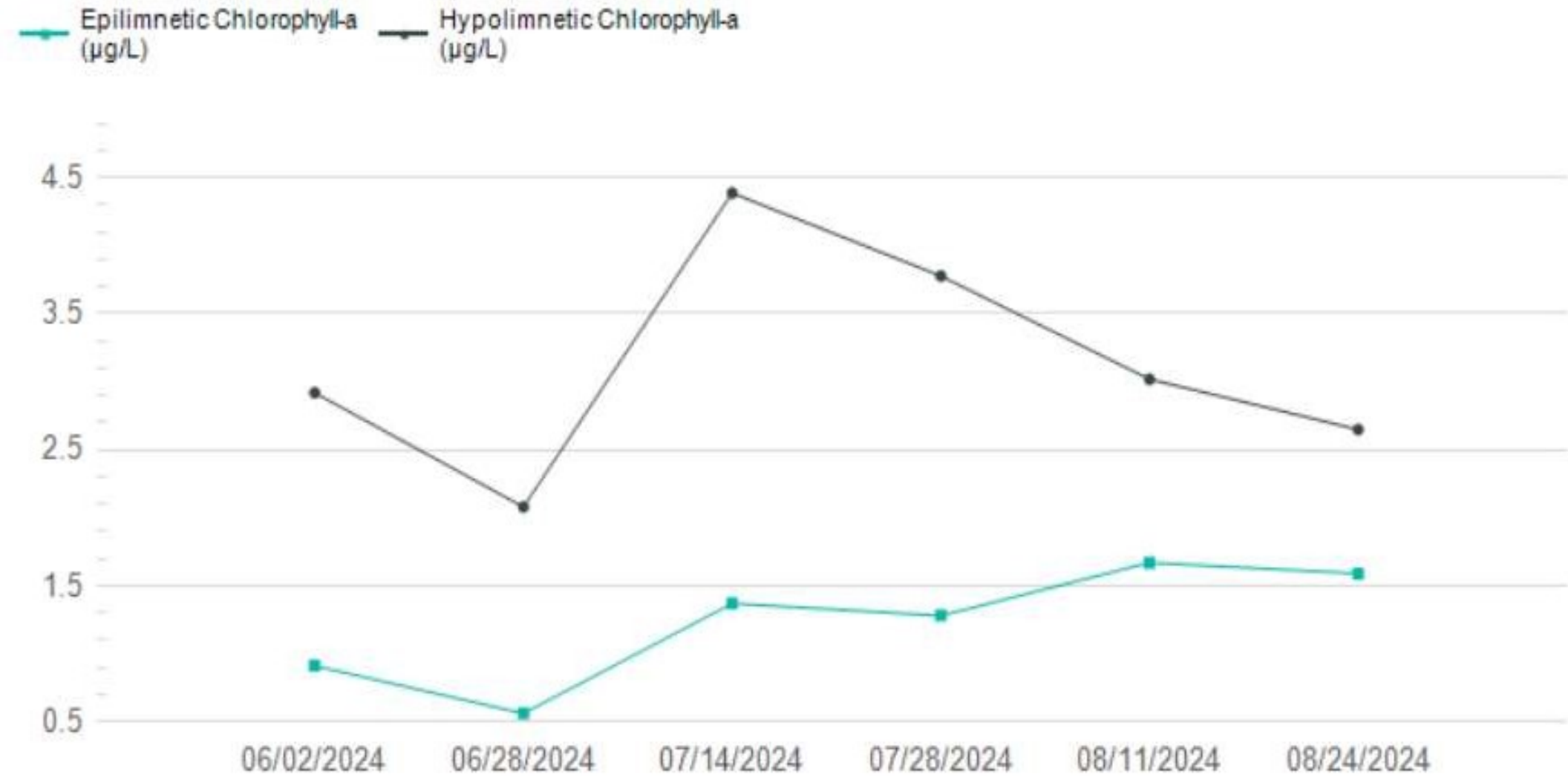
2024 Lay Monitoring Total Phosphorus

https://anrweb.vt.gov/DEC/IWIS/ReportViewer.aspx?Report=LayMonLakeReport&ViewParms=True&LayMonID=MOREY



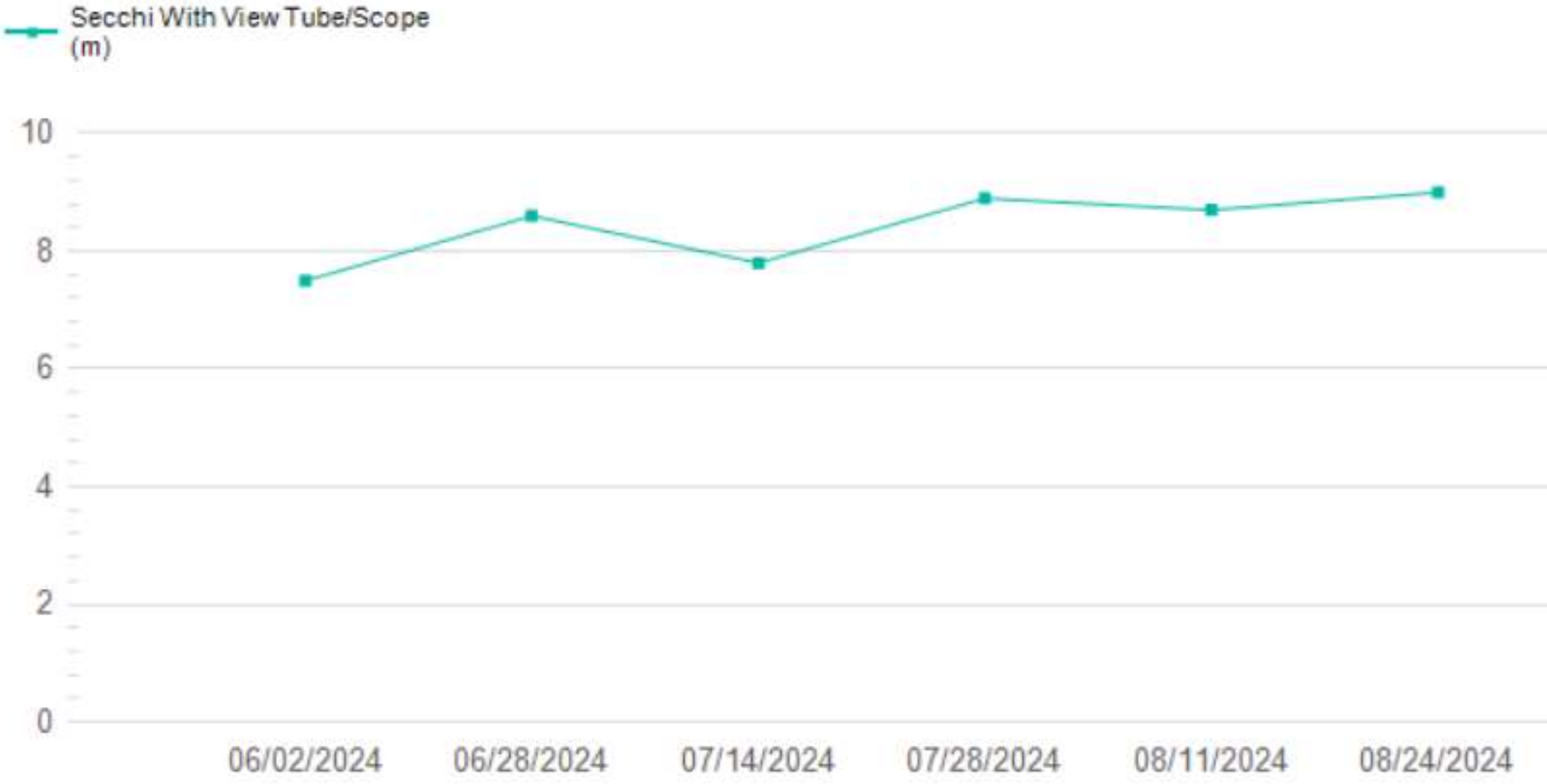
2024 Lay Monitoring Chlorophyl-a

https://anrweb.vt.gov/DEC/IWIS/ReportViewer.aspx?Report=LayMonLakeReport&ViewParms=True&LayMonID=MOREY



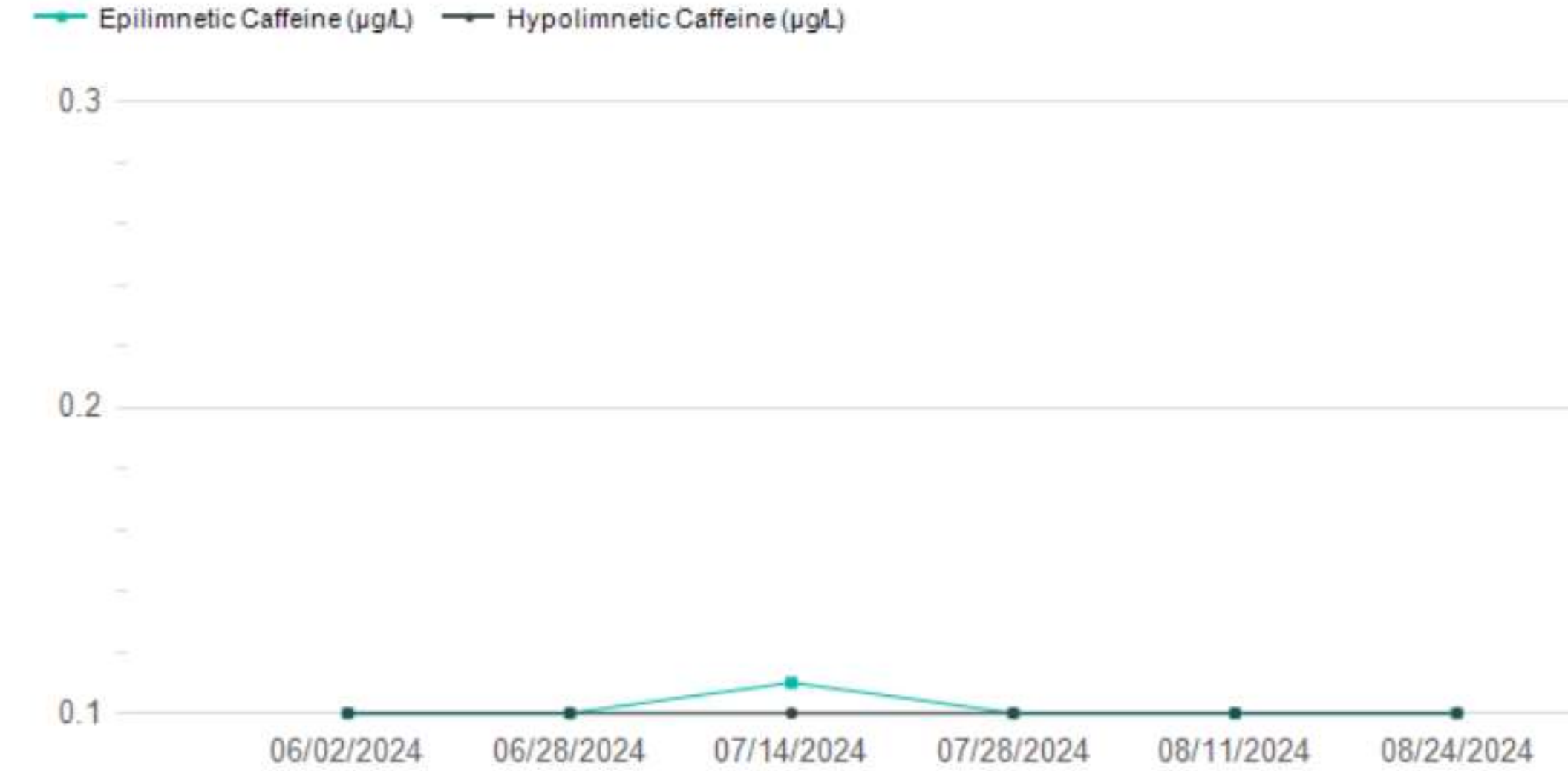
2024 Lay Monitoring Secchi Transparency

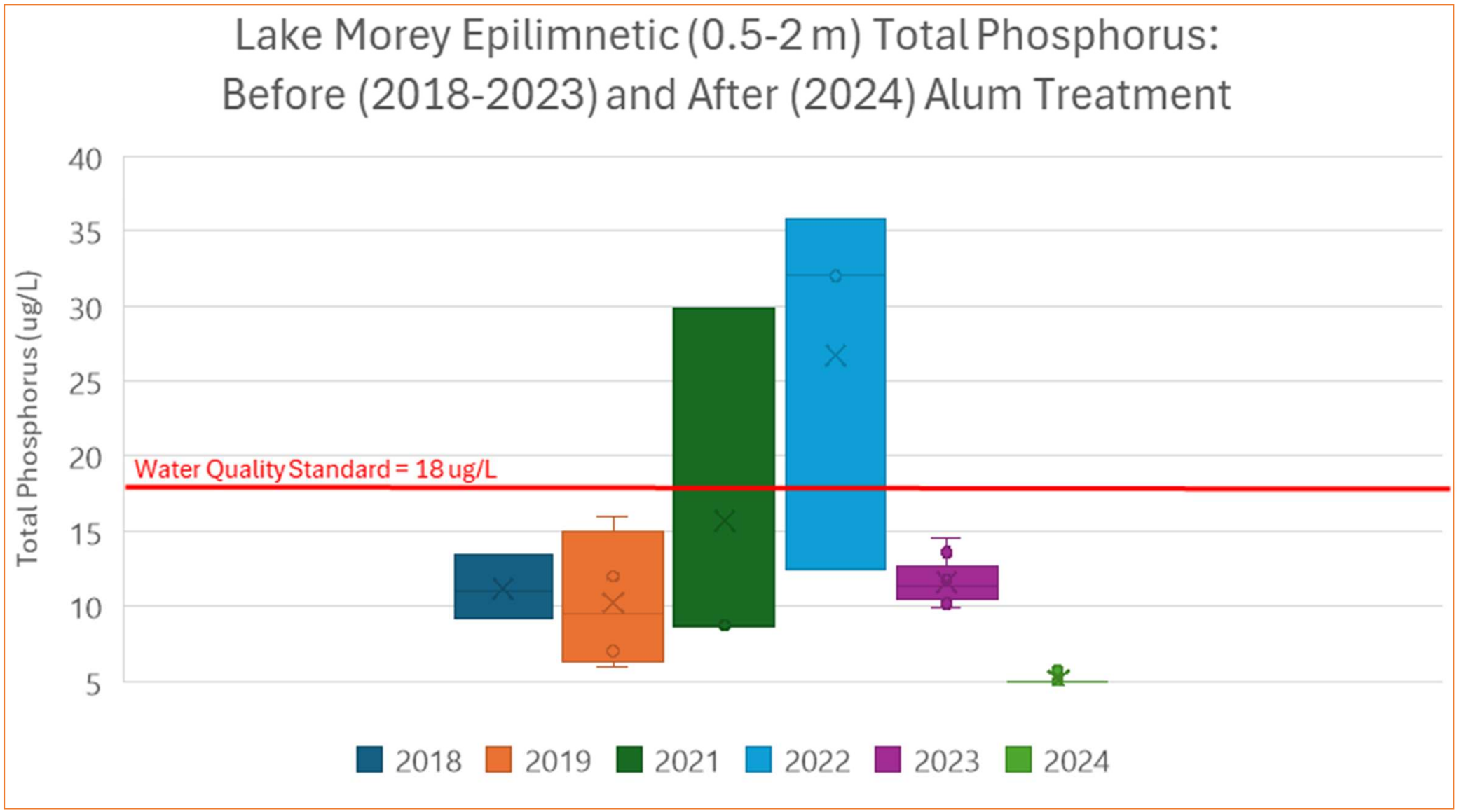
https://anrweb.vt.gov/DEC/IWIS/ReportViewer.aspx?Report=LayMonLakeReport&ViewParms=True&LayMonID=MOREY

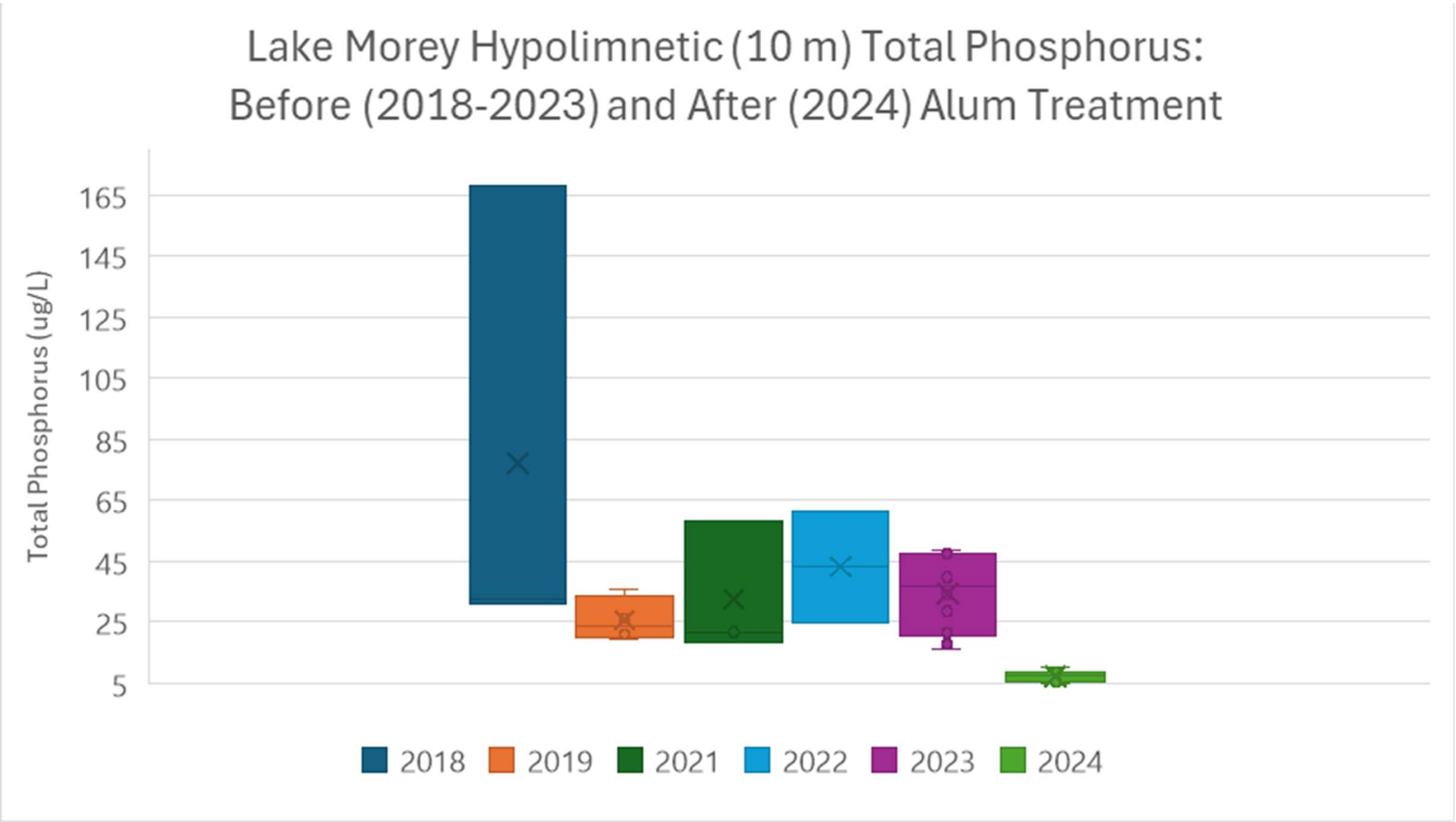


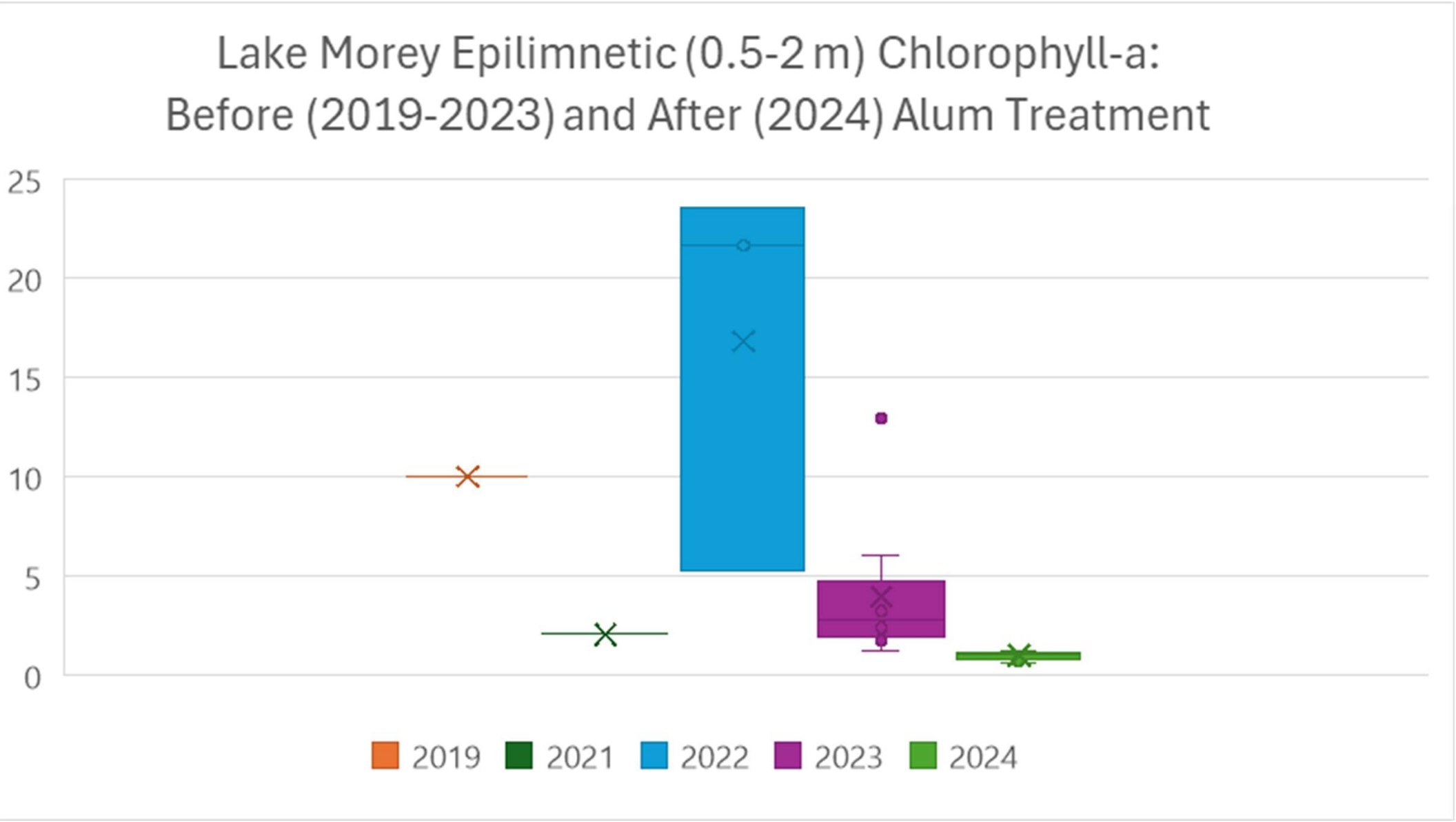
2024 Lay Monitoring Caffeine

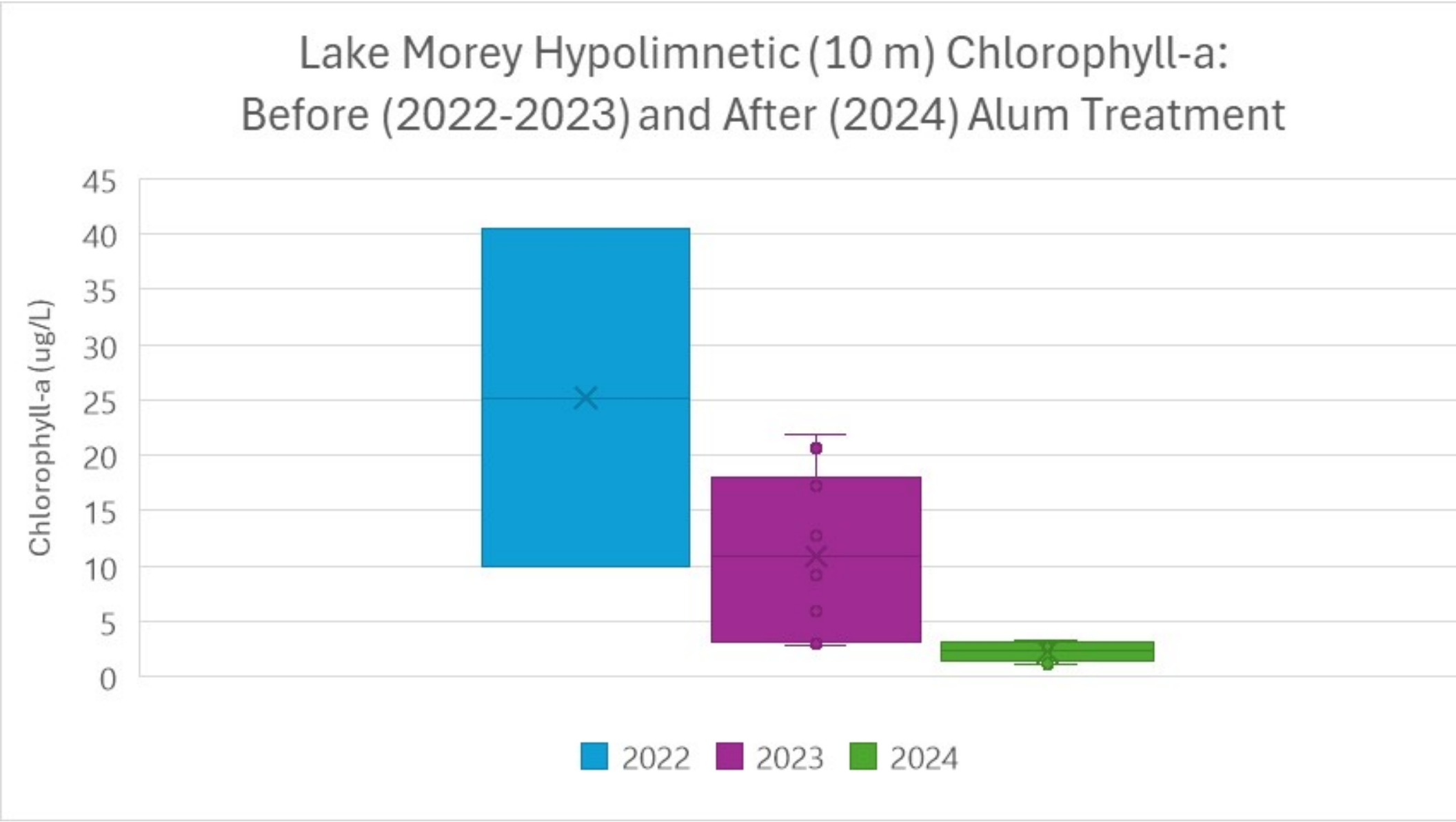
https://anrweb.vt.gov/DEC/IWIS/ReportViewer.aspx?Report=LayMonLakeReport&ViewParms=True&LayMonID=MOREY

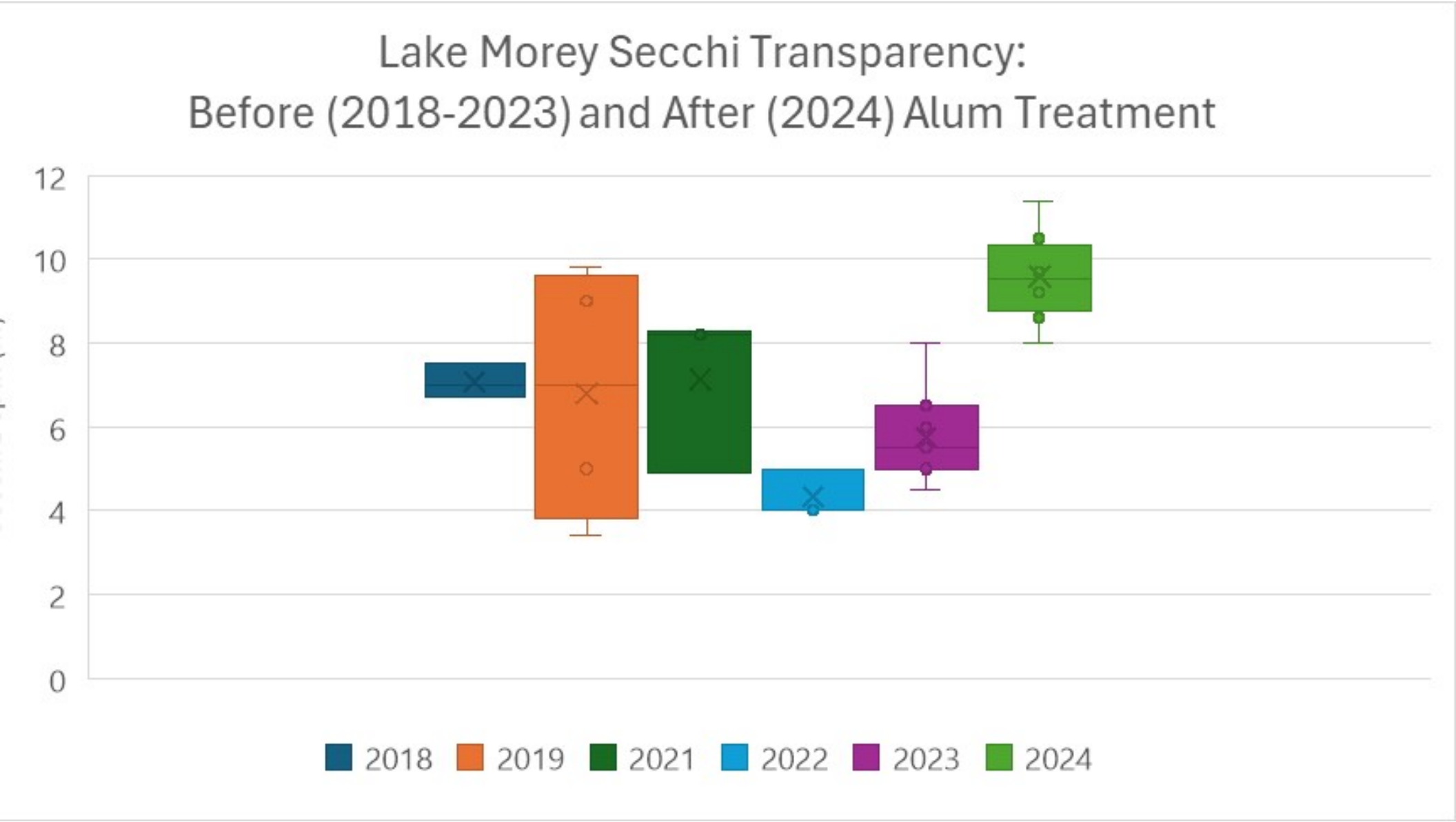


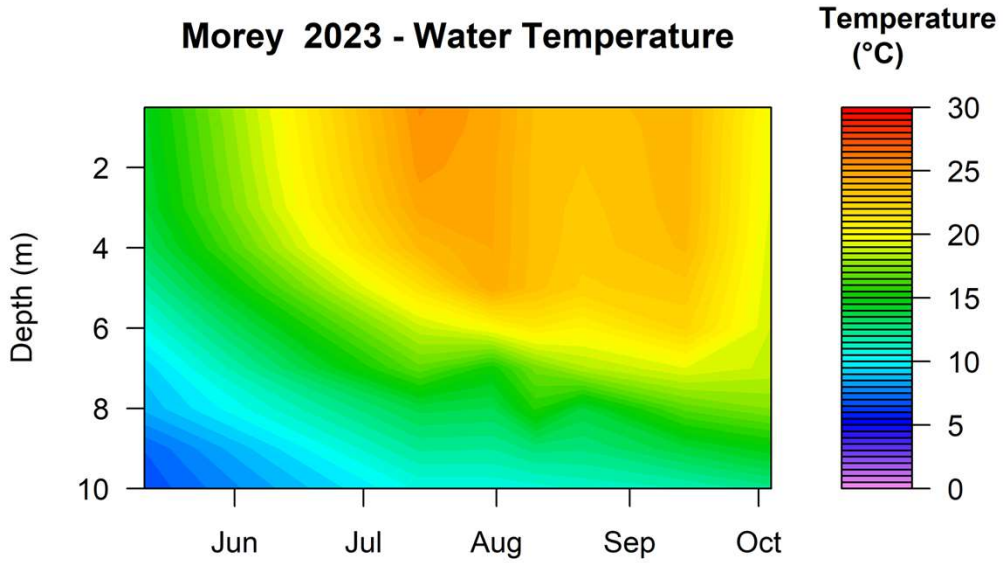

Lake Morey Epilimnetic (0.5-2 m) Total Phosphorus:
Before (2018-2023) and After (2024) Alum Treatment
Total Phosphorus (ug/L)
40
35
30
25
20
15
10
5
Water Quality Standard = 18 ug/L
2018
2019
2021
2022
2023
2024

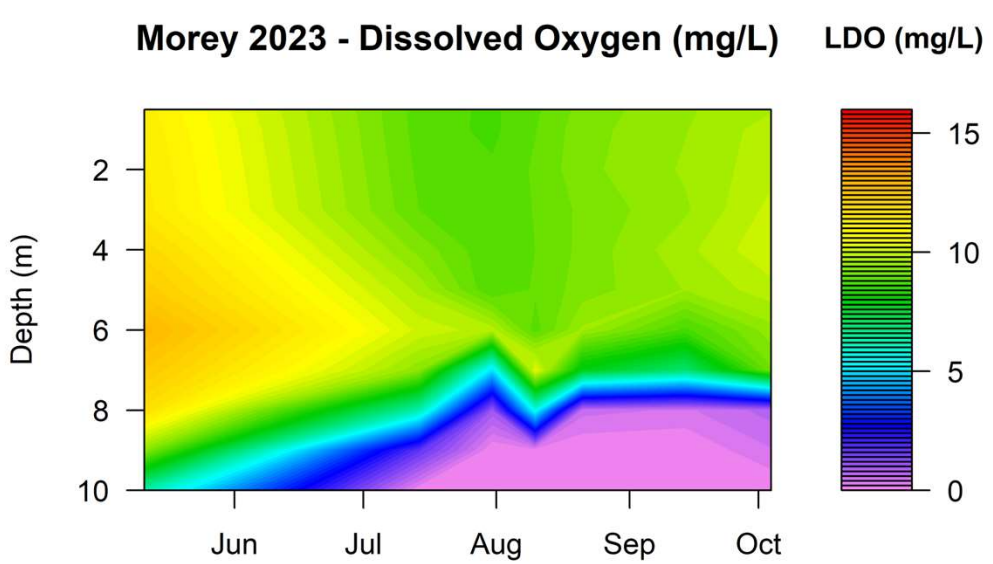

Lake Morey Hypolimnetic (10 m) Total Phosphorus:
Before (2018-2023) and After (2024) Alum Treatment
Total Phosphorus (ug/L)
165
145
125
105
85
65
45
25
5
2018
2019
2021
2022
2023
2024

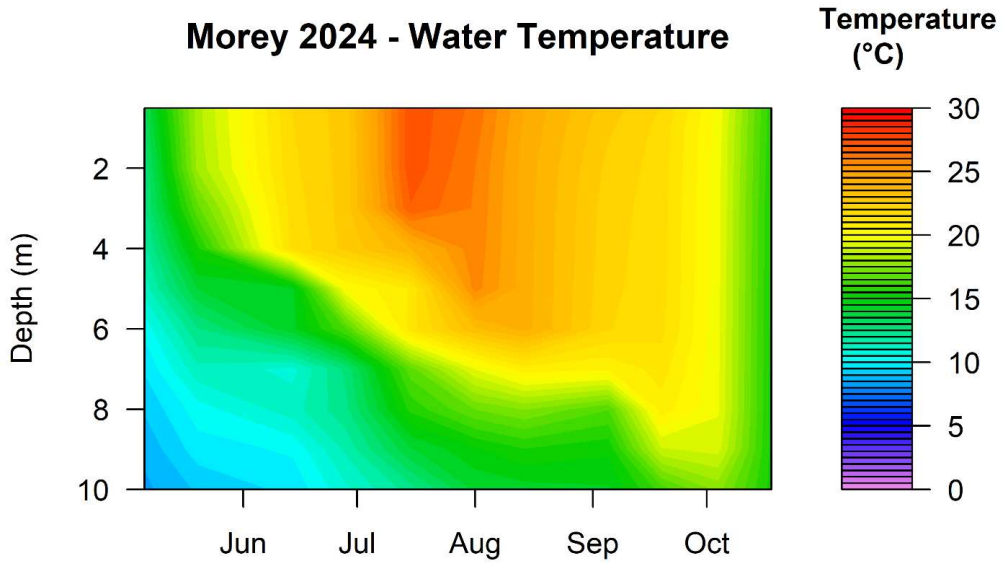

Lake Morey Epilimnetic (0.5-2 m) Chlorophyll-a:
Before (2019-2023) and After (2024) Alum Treatment
25
20
15
10
5
0
2019
2021
2022
2023
2024

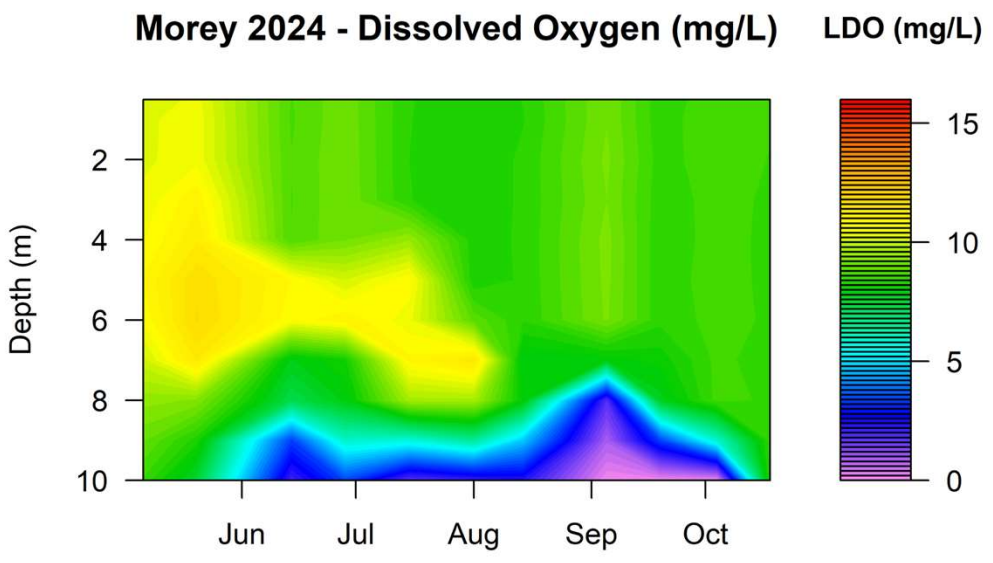

Lake Morey Hypolimnetic (10 m) Chlorophyll-a:
Before (2022-2023) and After (2024) Alum Treatment
Chlorophyll-a (ug/L)
45
40
35
30
25
20
15
10
5
0
2022
2023
2024


Lake Morey Secchi Transparency:
Before (2018-2023) and After (2024) Alum Treatment
12
10
8
6
4
2
0
2018
2019
2021
2022
2023
2024

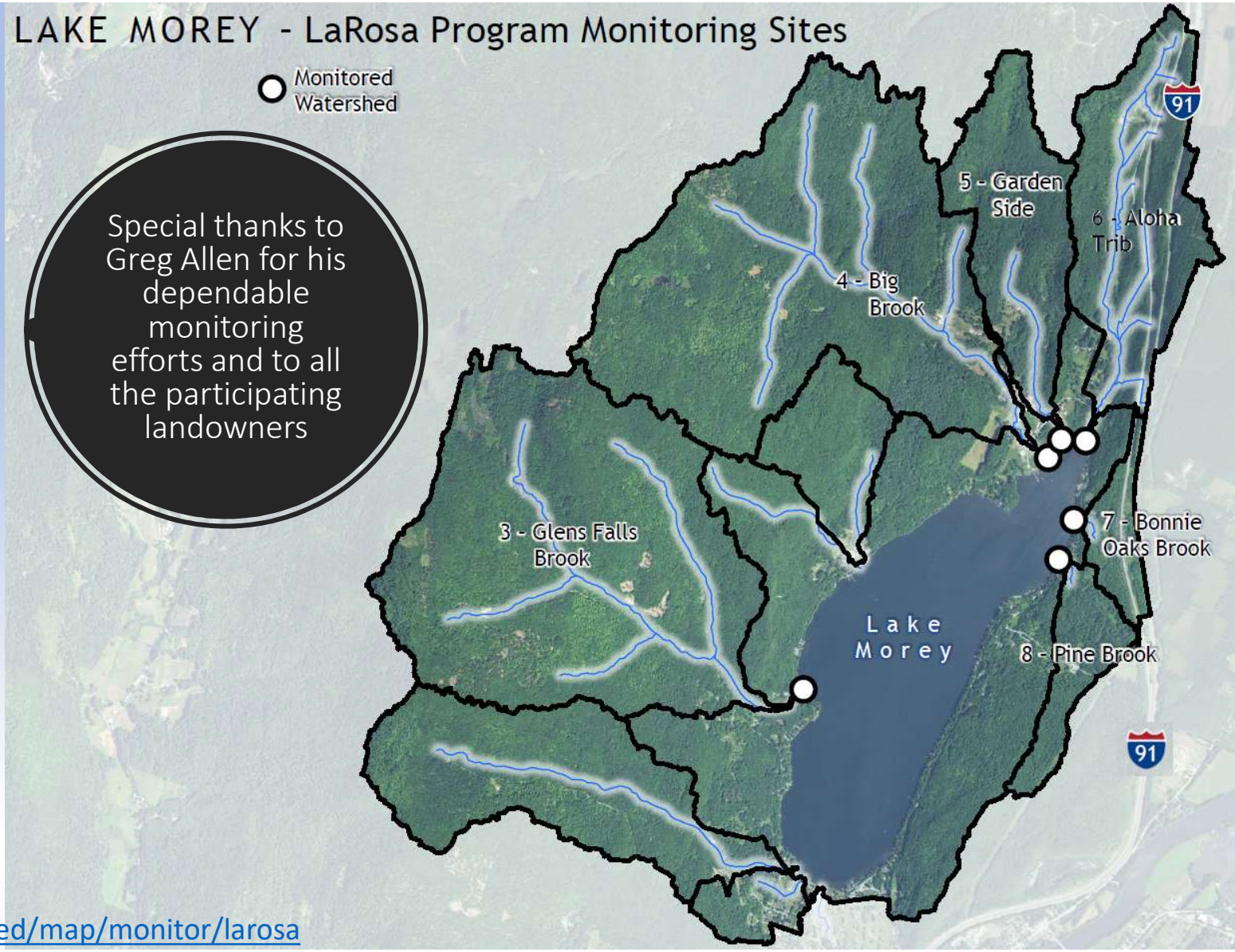

Morey 2023 - Water Temperature
Temperature (°C)
Depth (m)
2
4
6
8
10
Jun
Jul
Aug
Sep
Oct
30
25
20
15
10
5
0


Morey 2023 - Dissolved Oxygen (mg/L)
LDO (mg/L)
Depth (m)
2
4
6
8
10
Jun
Jul
Aug
Sep
Oct
15
10
5
0


Morey 2024 - Water Temperature
Temperature (°C)
Depth (m)
2
4
6
8
10
Jun
Jul
Aug
Sep
Oct
30
25
20
15
10
5
0

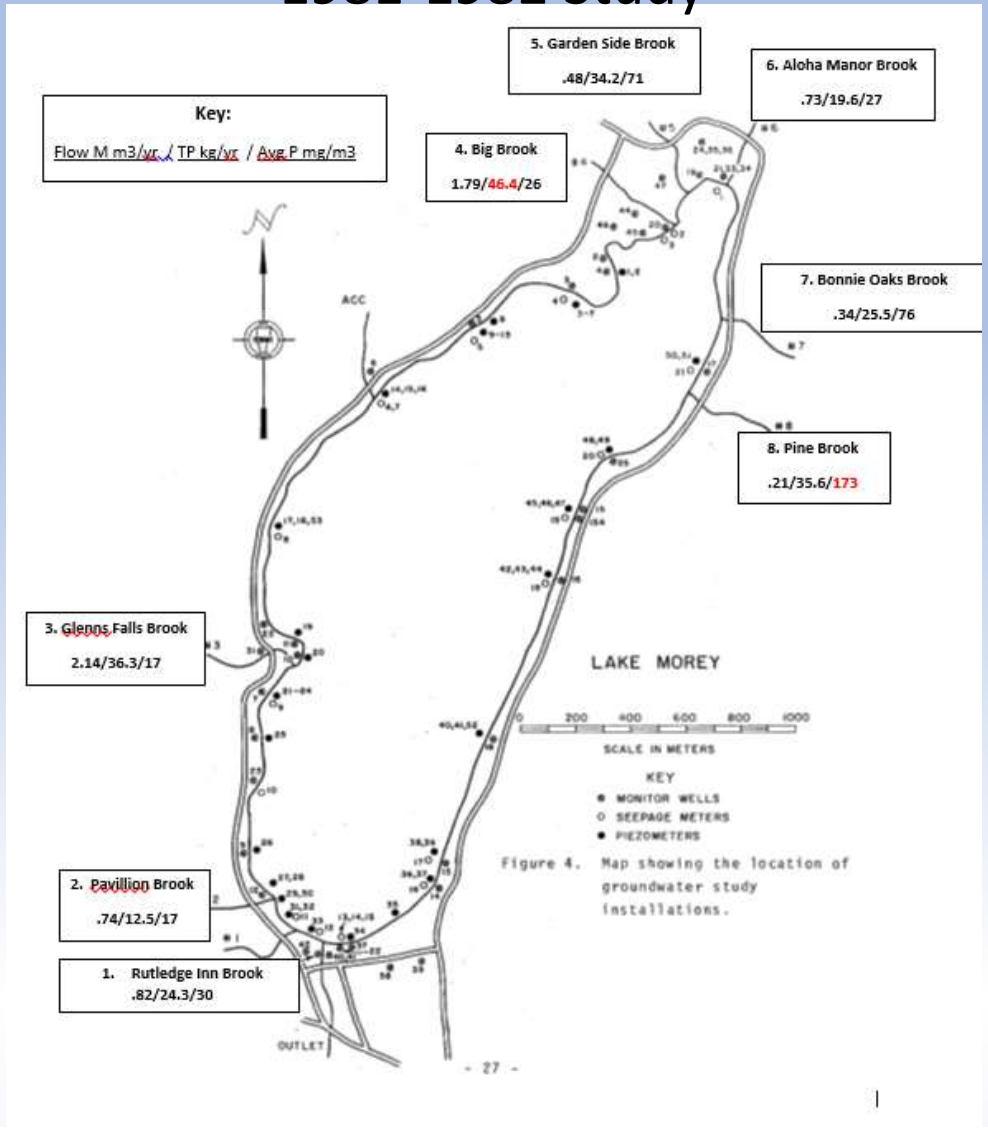

Morey 2024 - Dissolved Oxygen (mg/L)
LDO (mg/L)
Depth (m)
2
4
6
8
10
Jun
Jul
Aug
Sep
Oct
15
10
5
0

- Started monitoring regularly in 2019
- Collected samples from 7 tributary streams (4 in 2022)
- Only total phosphorus and chloride in 2022
- Monitored between April and September (April-July in 2022)
- 2019-2020: monthly
- 2021-2022: biweekly
- Watershed is mostly forested
- Developed area is the densest along the shoreline

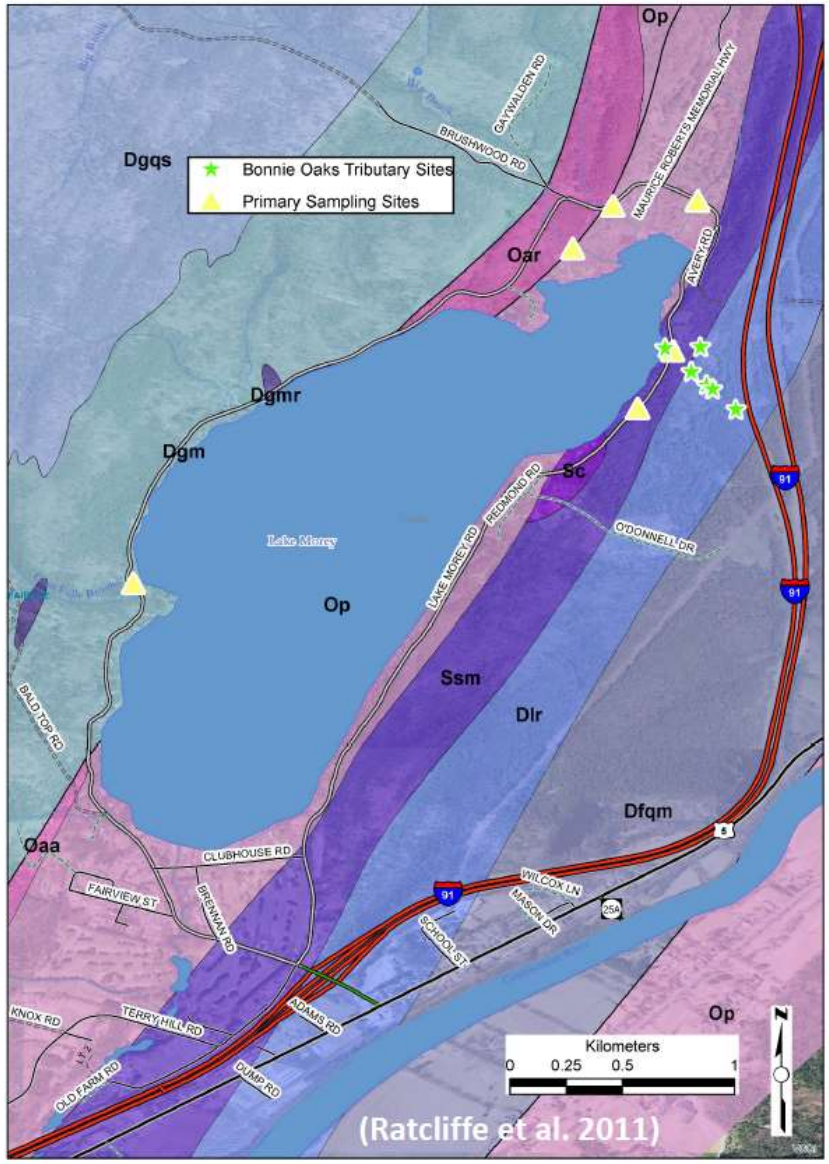


https://dec.vermont.gov/watershed/map/monitor/larosa

1981-1982 Study

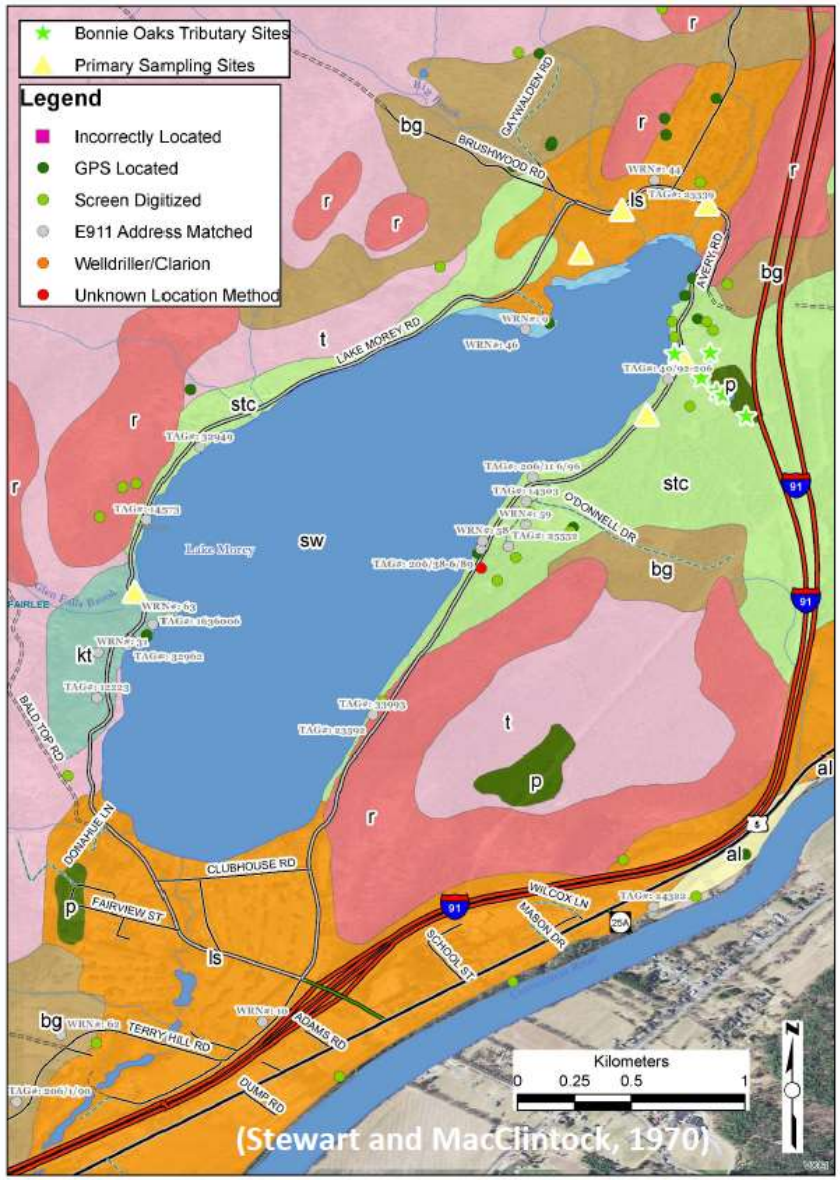


Bedrock Geology



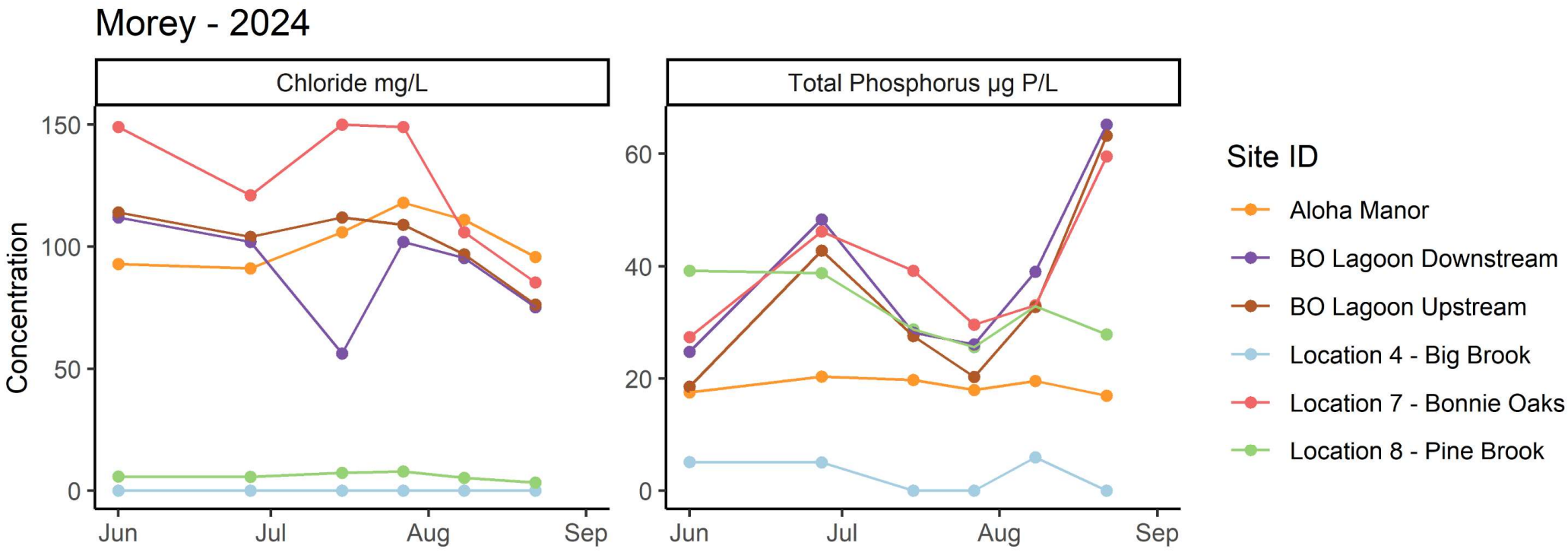
(Ratcliffe et al. 2011)

Surficial Geology + Wells



(Stewart and MacClintock, 1970)

LaRosa Partnership Program Tributary Monitoring



2024 Monitoring Summary & 2025 Next Steps

- Lay Monitoring Program (LMP)
  - 2024 Summary: The alum treatment in mid-June was successful at reducing phosphorus from internal loading and in the water column to well below the water quality standard, which resulted in very low chlorophyll-a (algae) and very high Secchi transparency (clarity). Caffeine was detected, which may indicate failing or outdated septic systems.
  - 2025 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 continues to collect biweekly vertical profile samples.
- LaRosa Partnership Program (LPP)
  - 2024 Summary: Bonnie Oaks and Pine Brook sites continue to have elevated total phosphorus; Bonnie Oaks and Aloha Manor sites continue to have high chloride.
  - 2025 Next Steps: LPP volunteer continues biweekly sampling June through August.