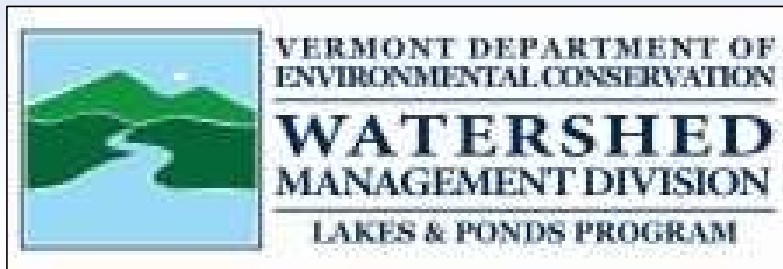


2023 Lake Morey Water Quality Monitoring Results



Mark Mitchell, Lake Monitoring and Community Outreach Coordinator
VT Department of Environmental Conservation, UVM Lake Champlain Sea Grant



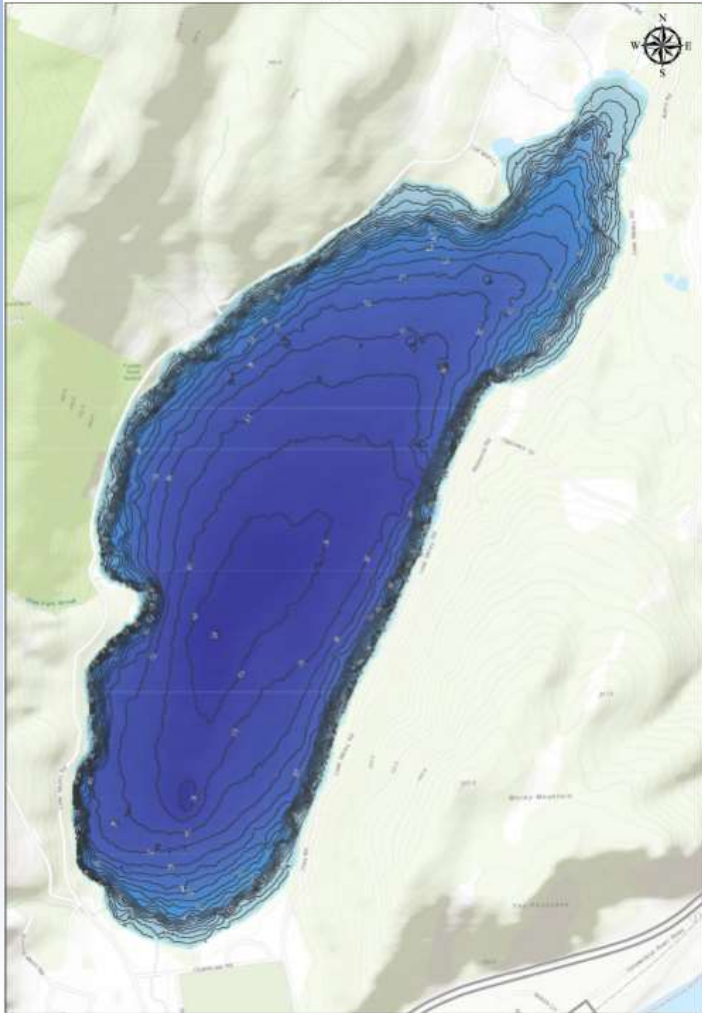


Lay Monitoring Program (LMP) 2023 Lake Sampling Overview

- 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)



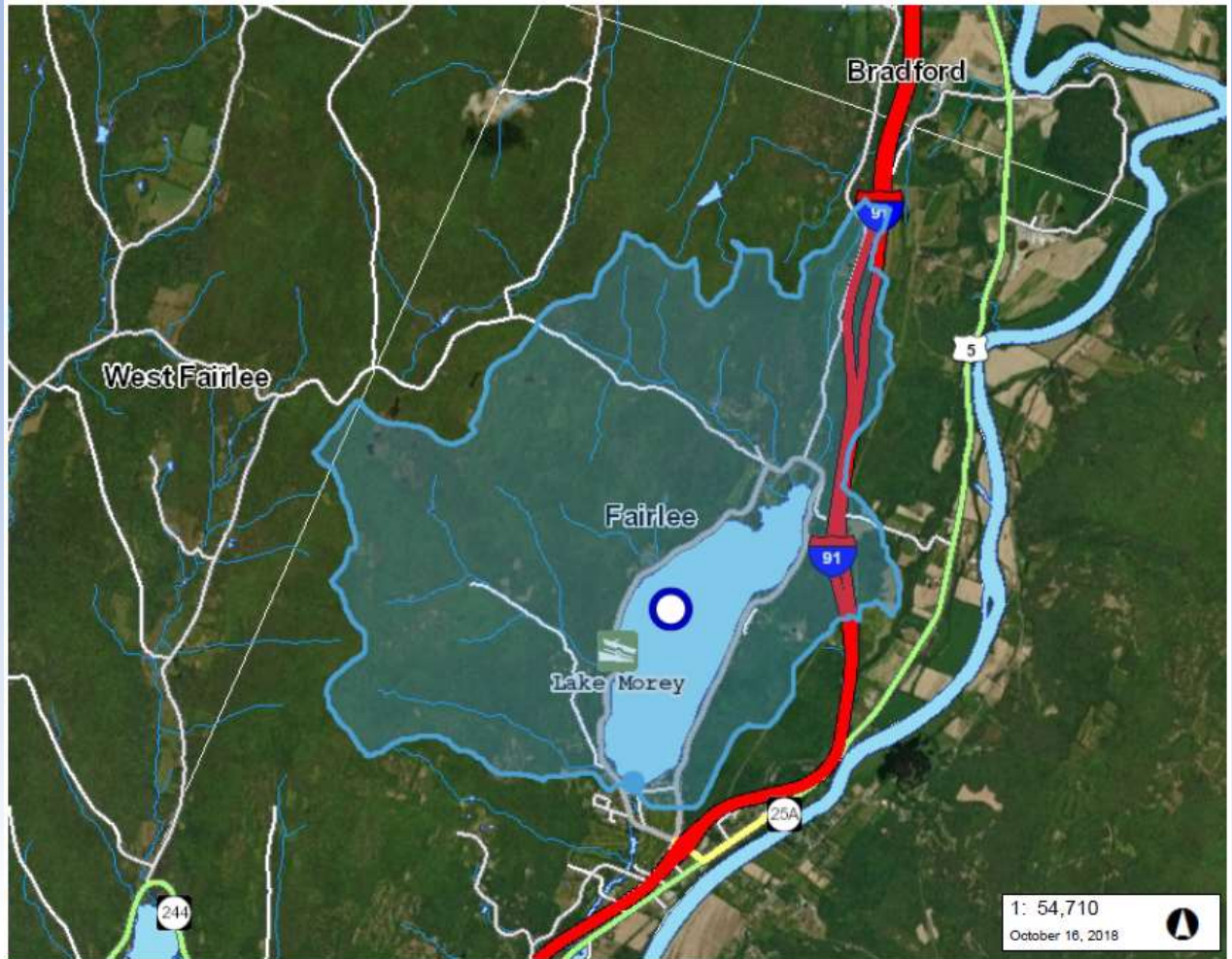
Lake Morey- Fairlee, VT



Lake Morey Monitoring Station 1

Vermont Agency of Natural Resources

vermont.gov



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.

1: 54,710
October 16, 2018

Vermont Lake Score Card

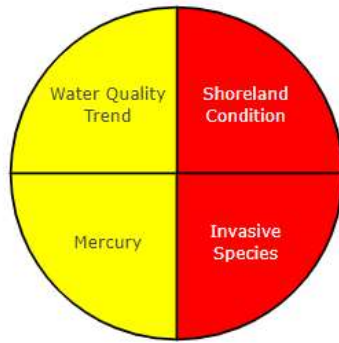
Lake Morey

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

Scores

Water Quality Data

Lake Information



Watershed: **Moderately Disturbed**

WQ Standards: **Stressed**

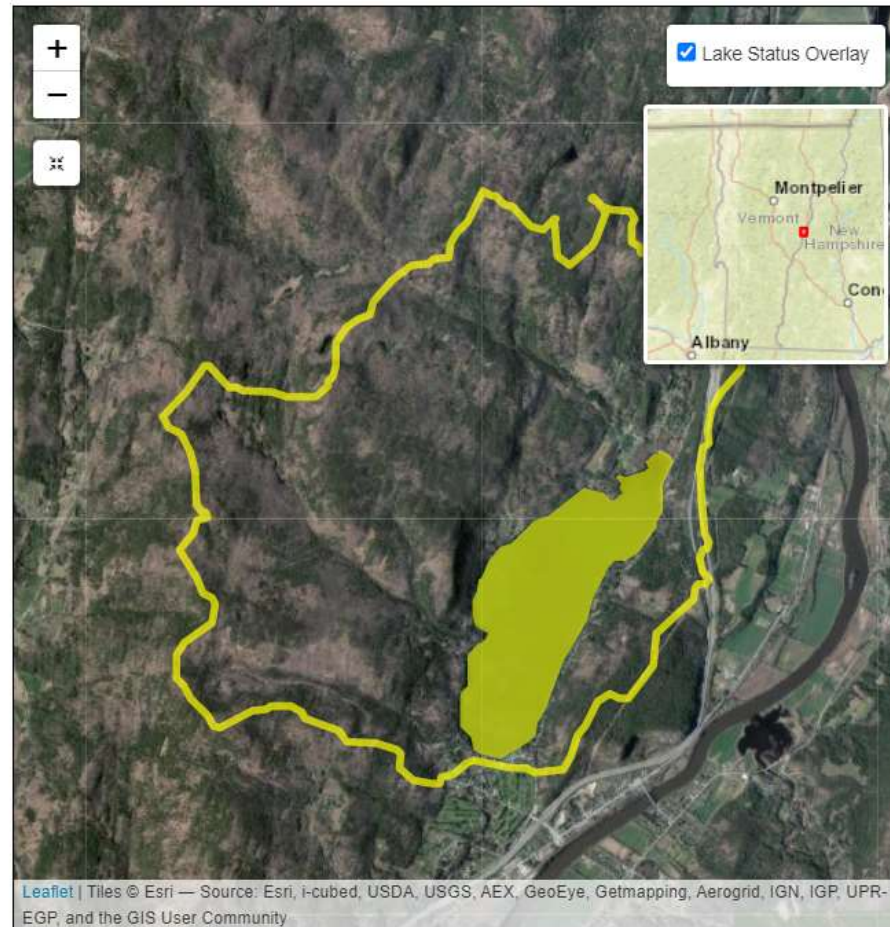
Details

Stressed - Phosphorus

Color Scoring System

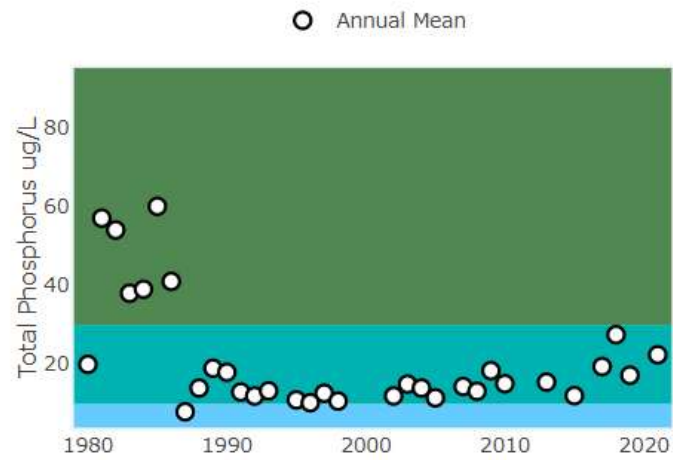
- Good Conditions
- Fair Conditions
- Poor Conditions
- Insufficient Data

[Learn How Lakes Are Scored](#)



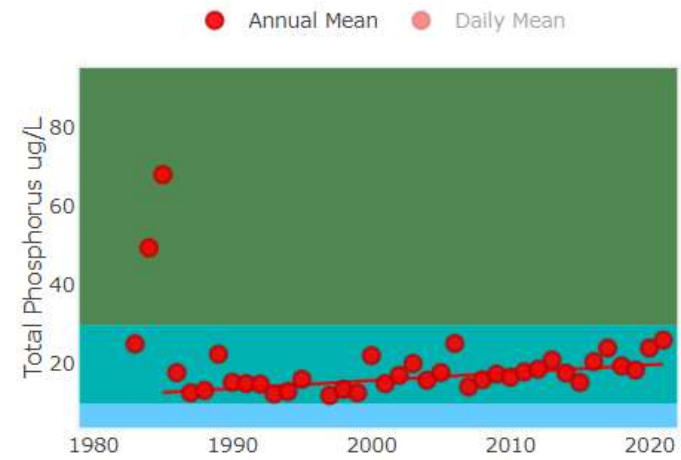
Spring Phosphorus

Trend: Stable (p-value=0.3637)



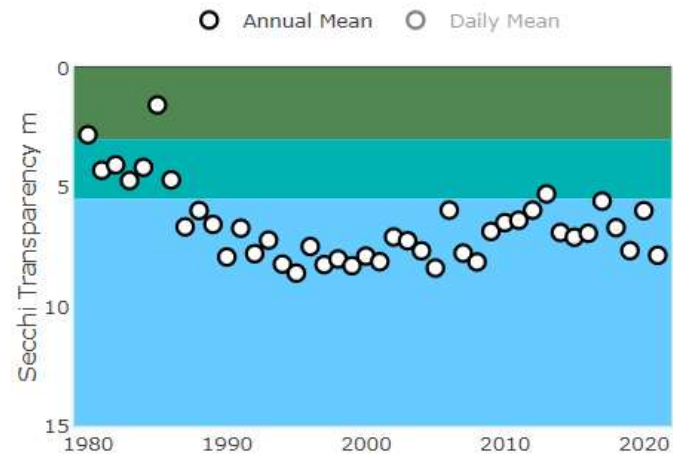
Summer Phosphorus

Trend: Highly Significantly Increasing (p-value=0.0016)



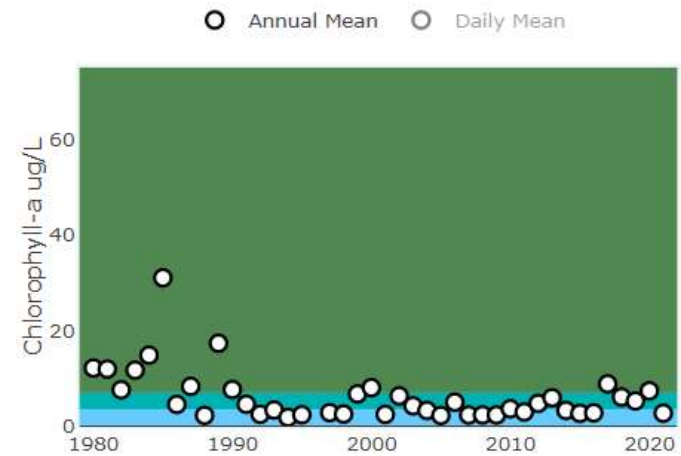
Summer Secchi

Trend: Stable (p-value=0.4177)



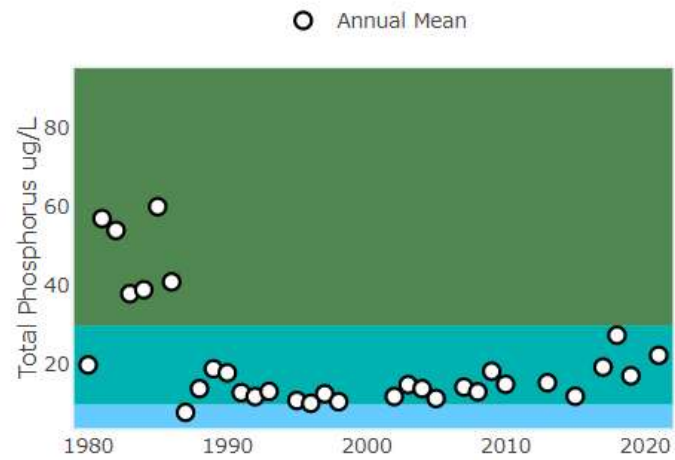
Summer Chlorophyll-a

Trend: Stable (p-value=0.1413)



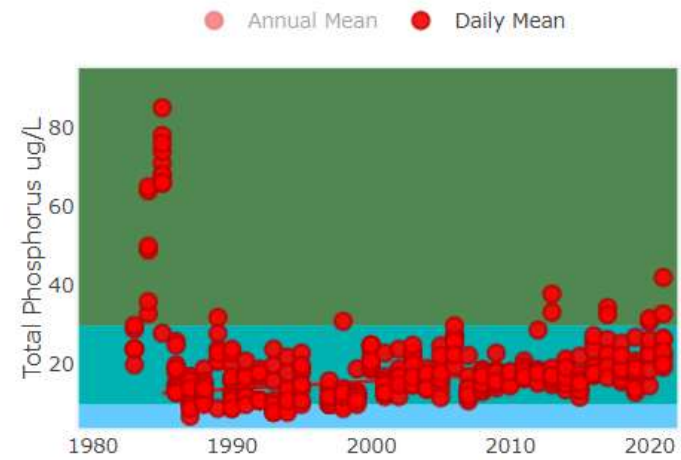
Spring Phosphorus

Trend: Stable (p-value=0.3637)



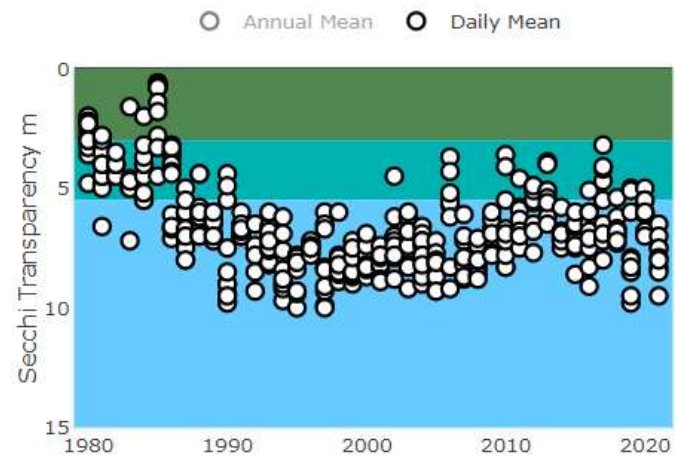
Summer Phosphorus

Trend: Highly Significantly Increasing (p-value=0.0016)



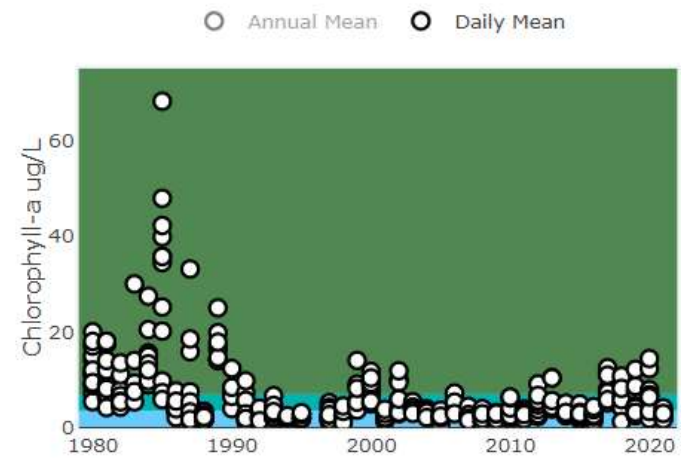
Summer Secchi

Trend: Stable (p-value=0.4177)



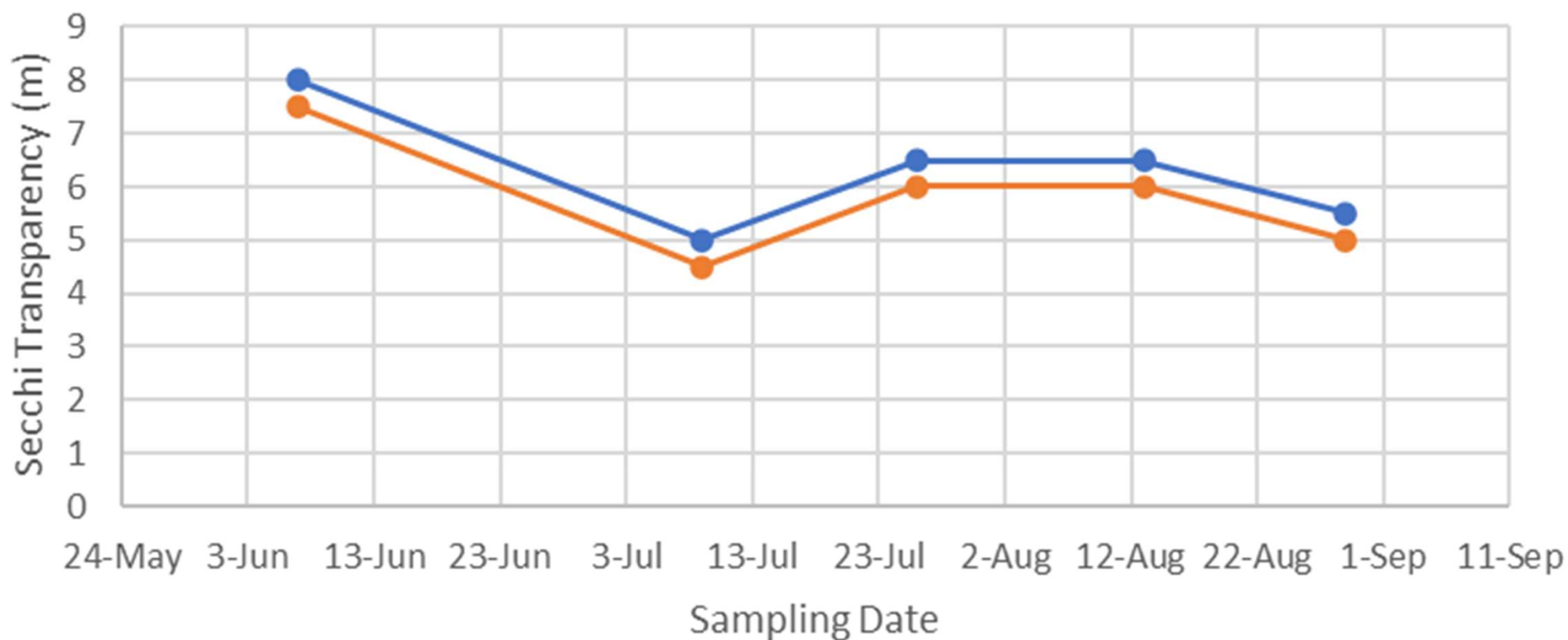
Summer Chlorophyll-a

Trend: Stable (p-value=0.1413)



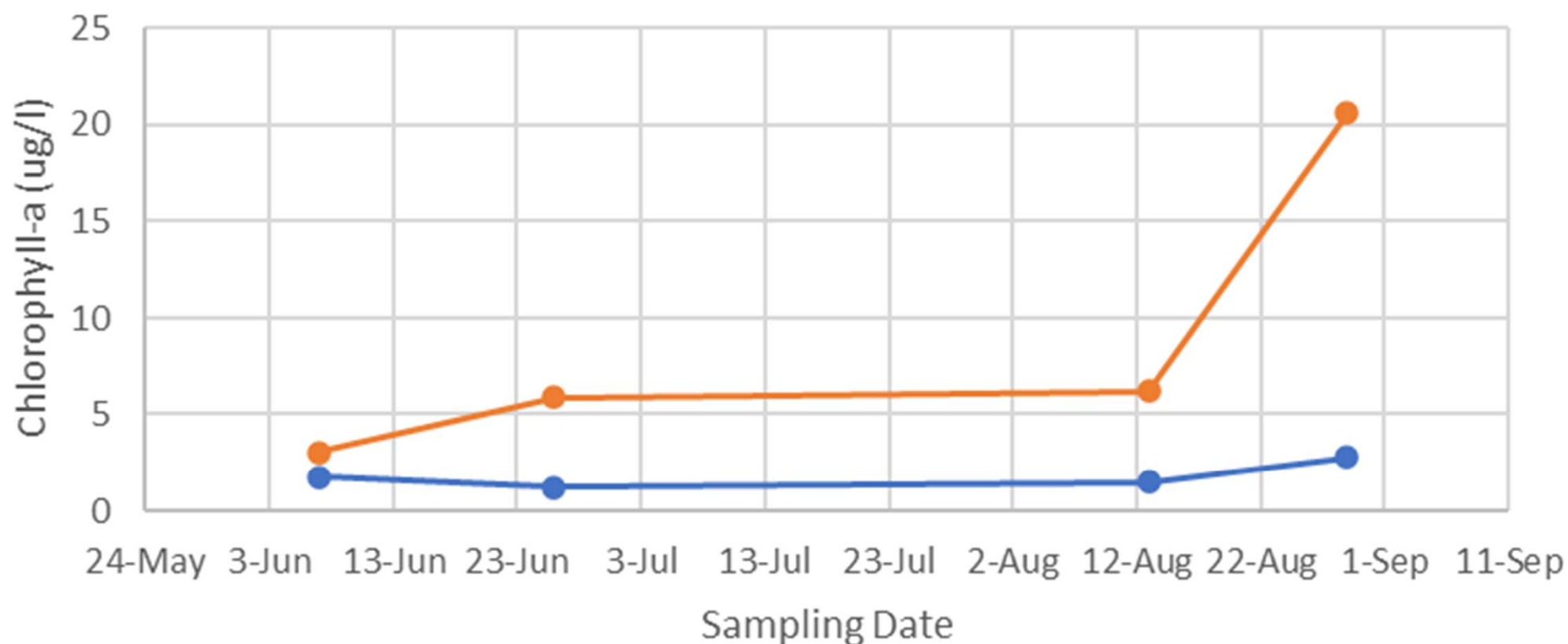
2023 Lake Morey Lay Monitoring Secchi Transparency

With View Tube/Scope Without View Tube/Scope

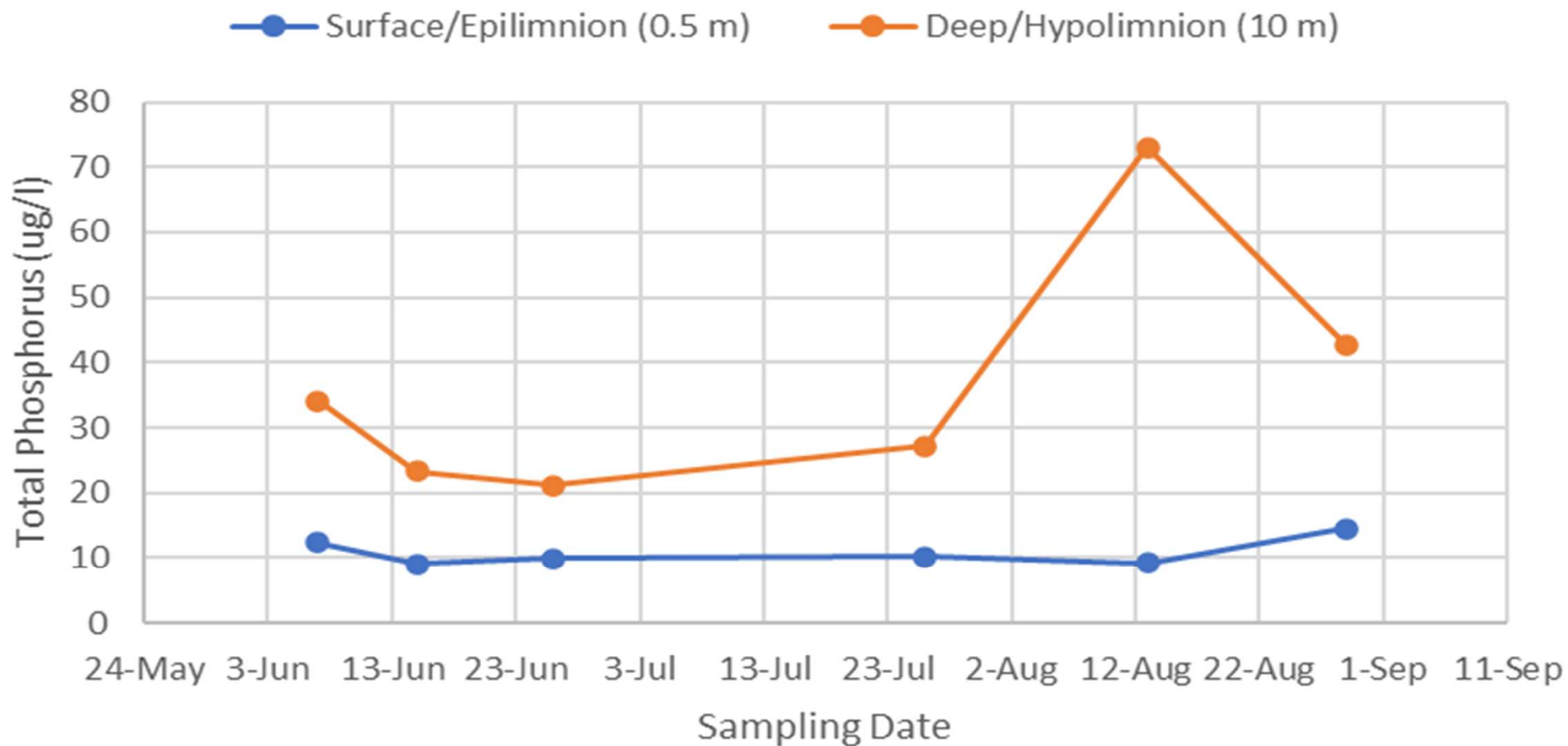


2023 Lake Morey Lay Monitoring Chlorophyll-a

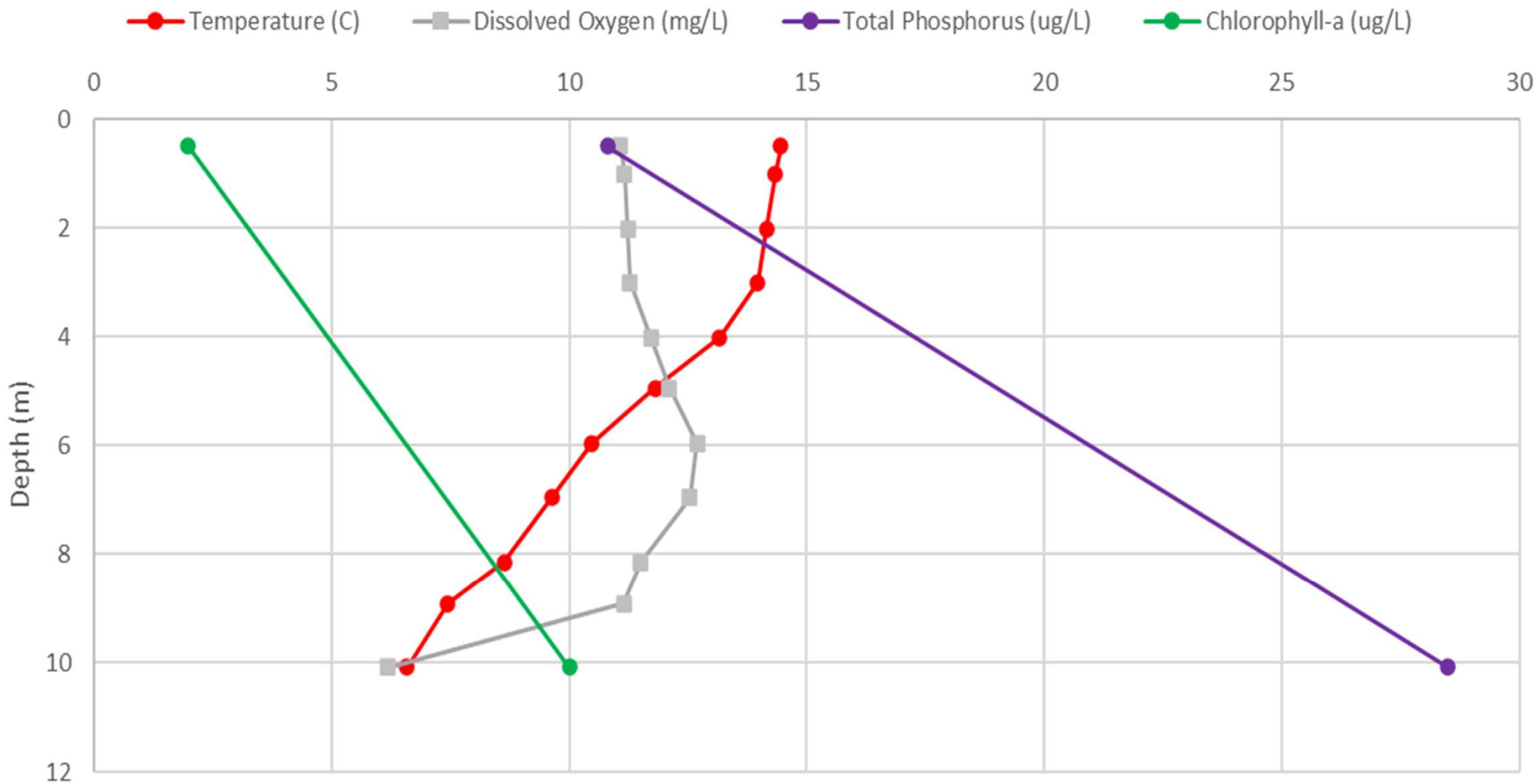
● Surface/Epilimnion (0.5 m) ● Deep/Hypolimnion (10 m)



2023 Lake Morey Lay Monitoring Total Phosphorus

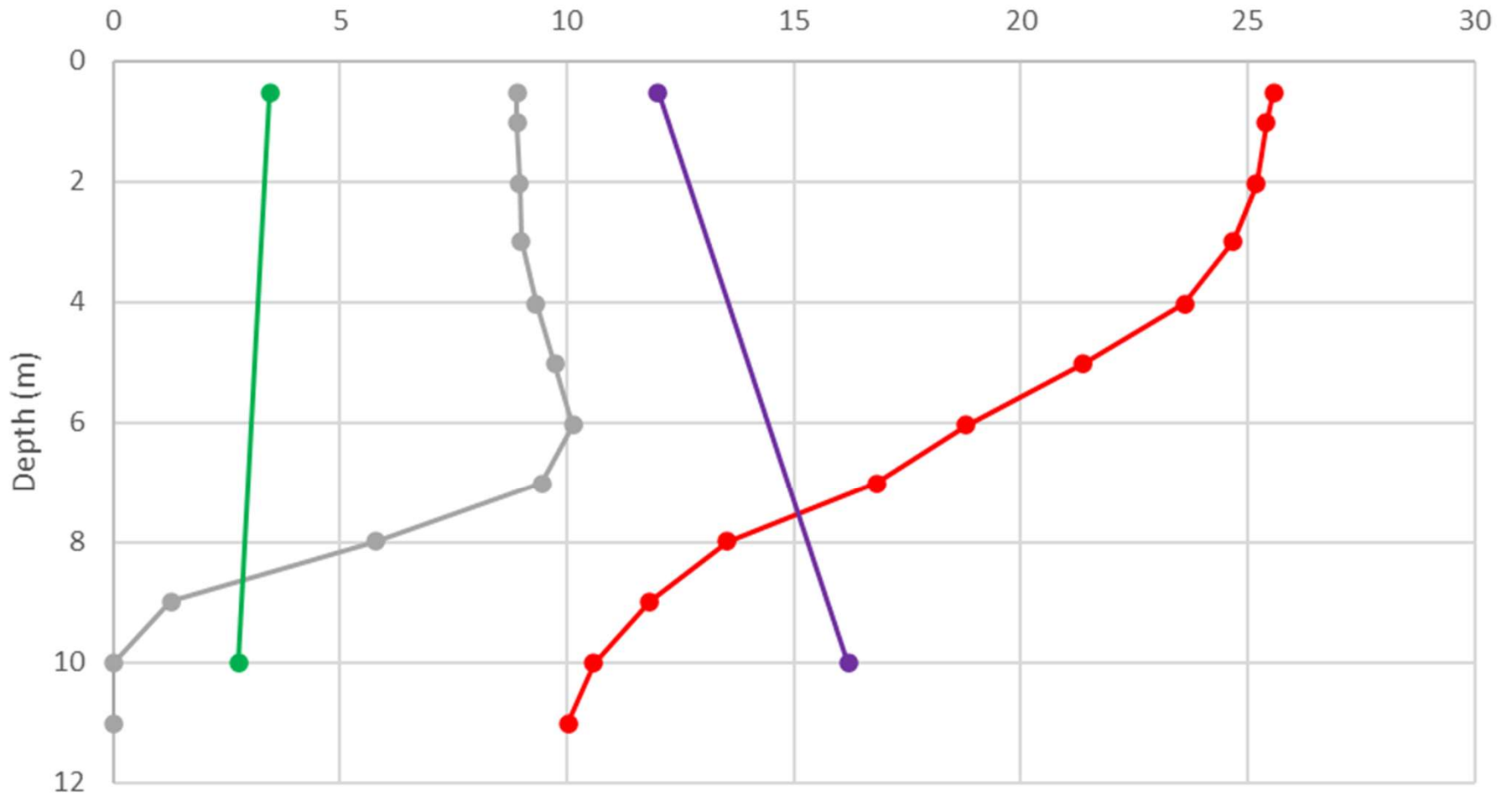


Lake Morey Water Quality Vertical Profile 5/11/2023

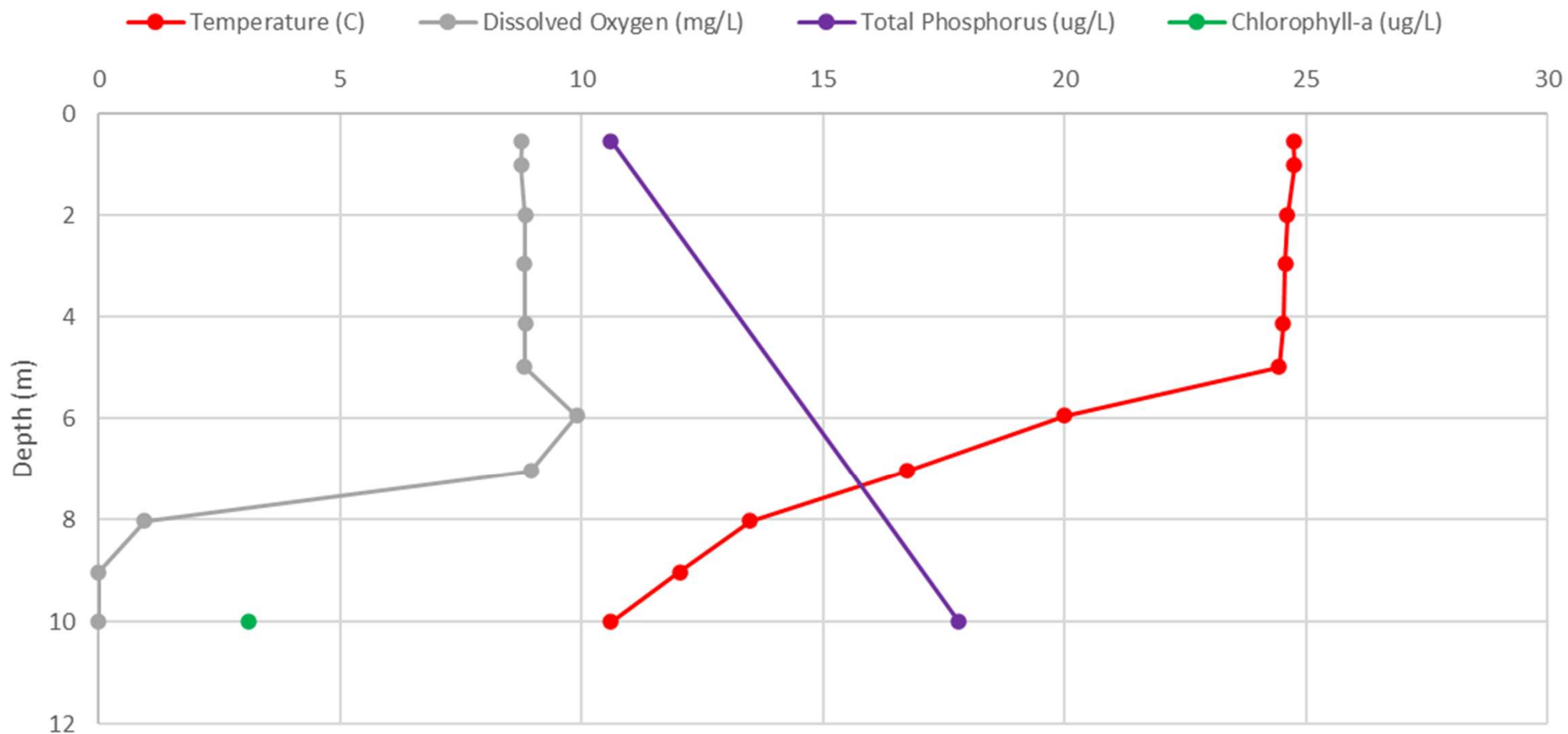


Lake Morey Water Quality Vertical Profile 7/14/2023

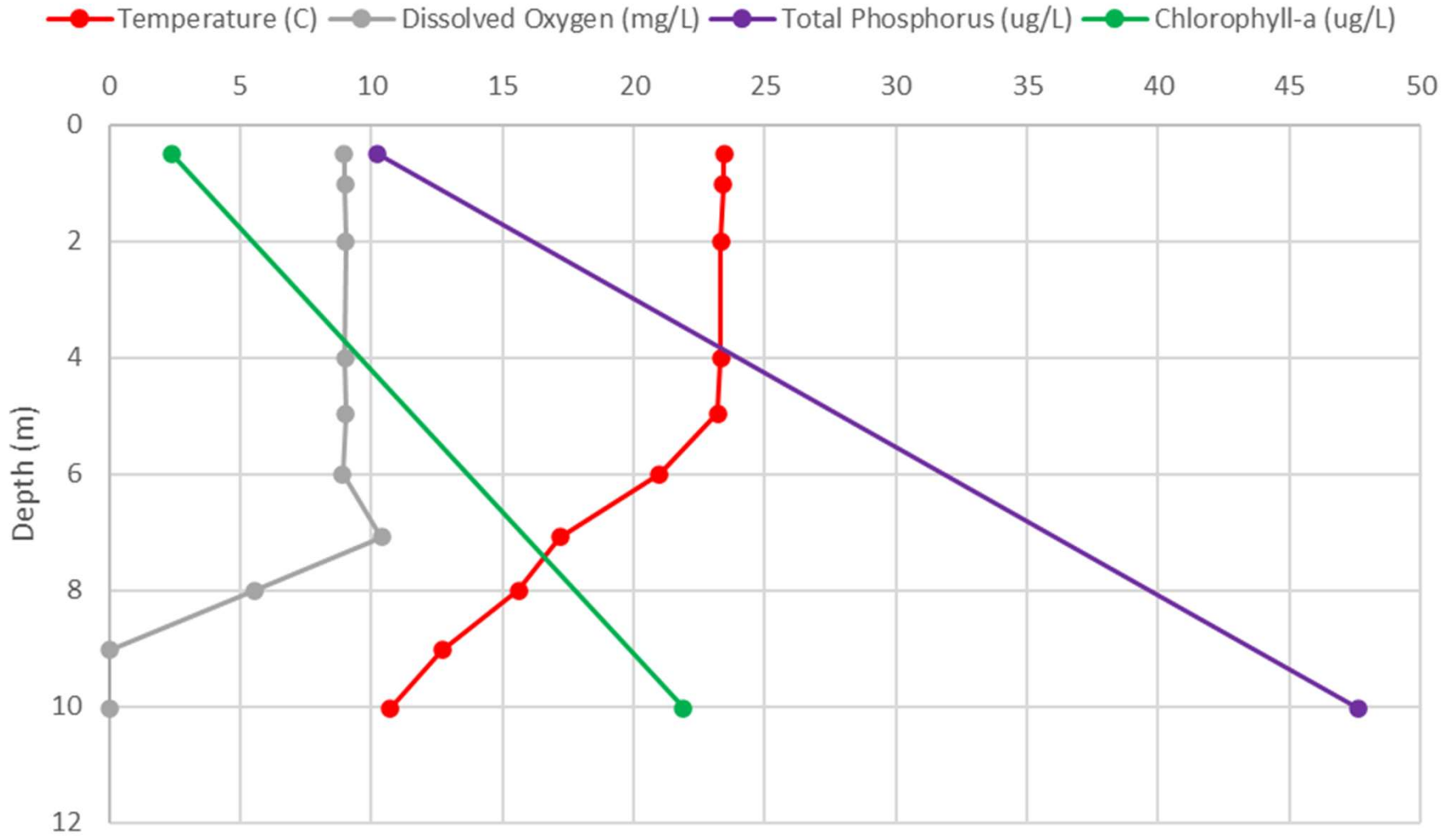
● Temperature (C) ● Dissolved Oxygen (mg/L) ● Total Phosphorus (ug/L) ● Chlorophyll-a (ug/L)



Lake Morey Water Quality Vertical Profile 7/31/2023

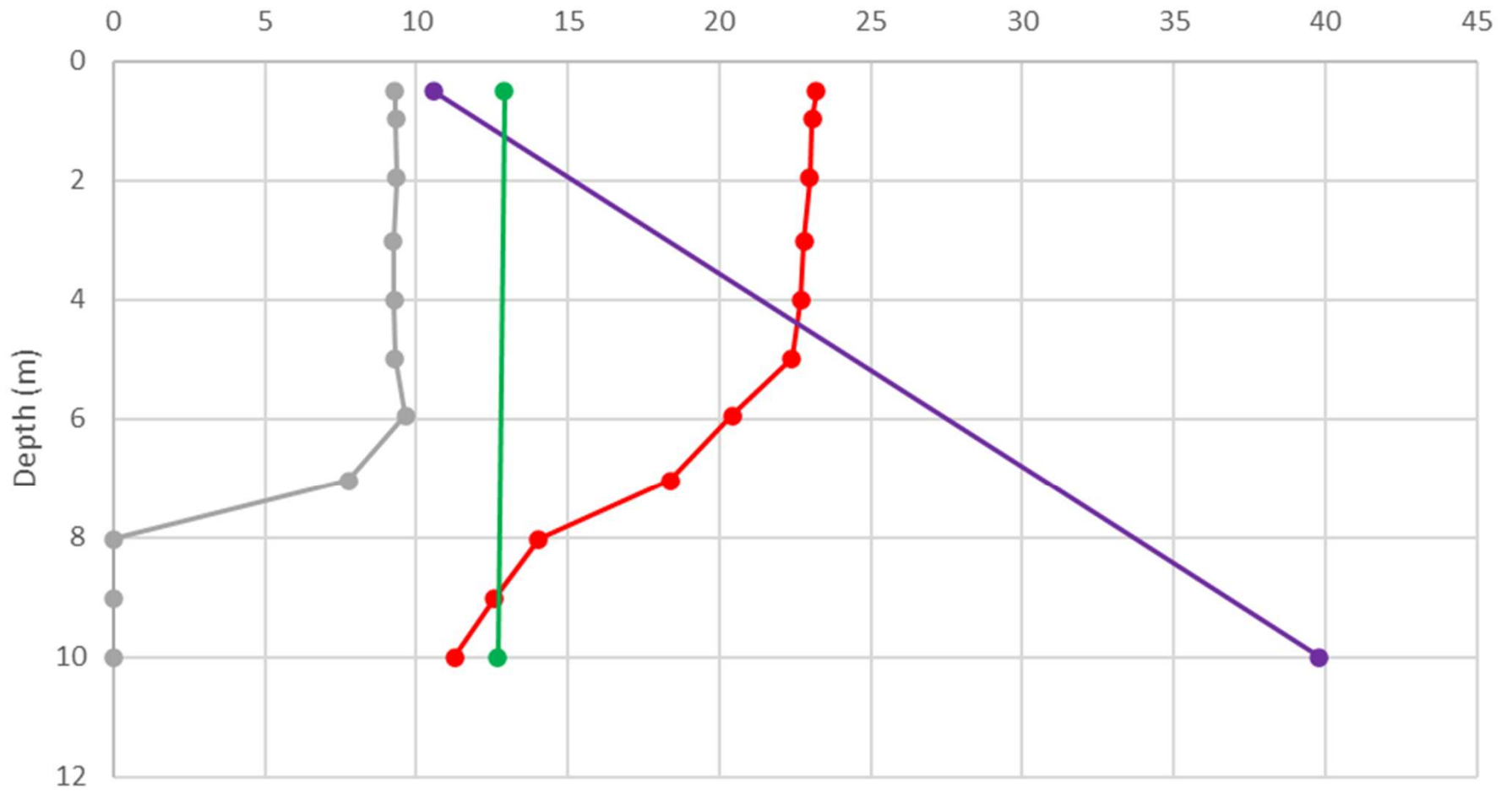


Lake Morey Water Quality Vertical Profile 8/10/2023



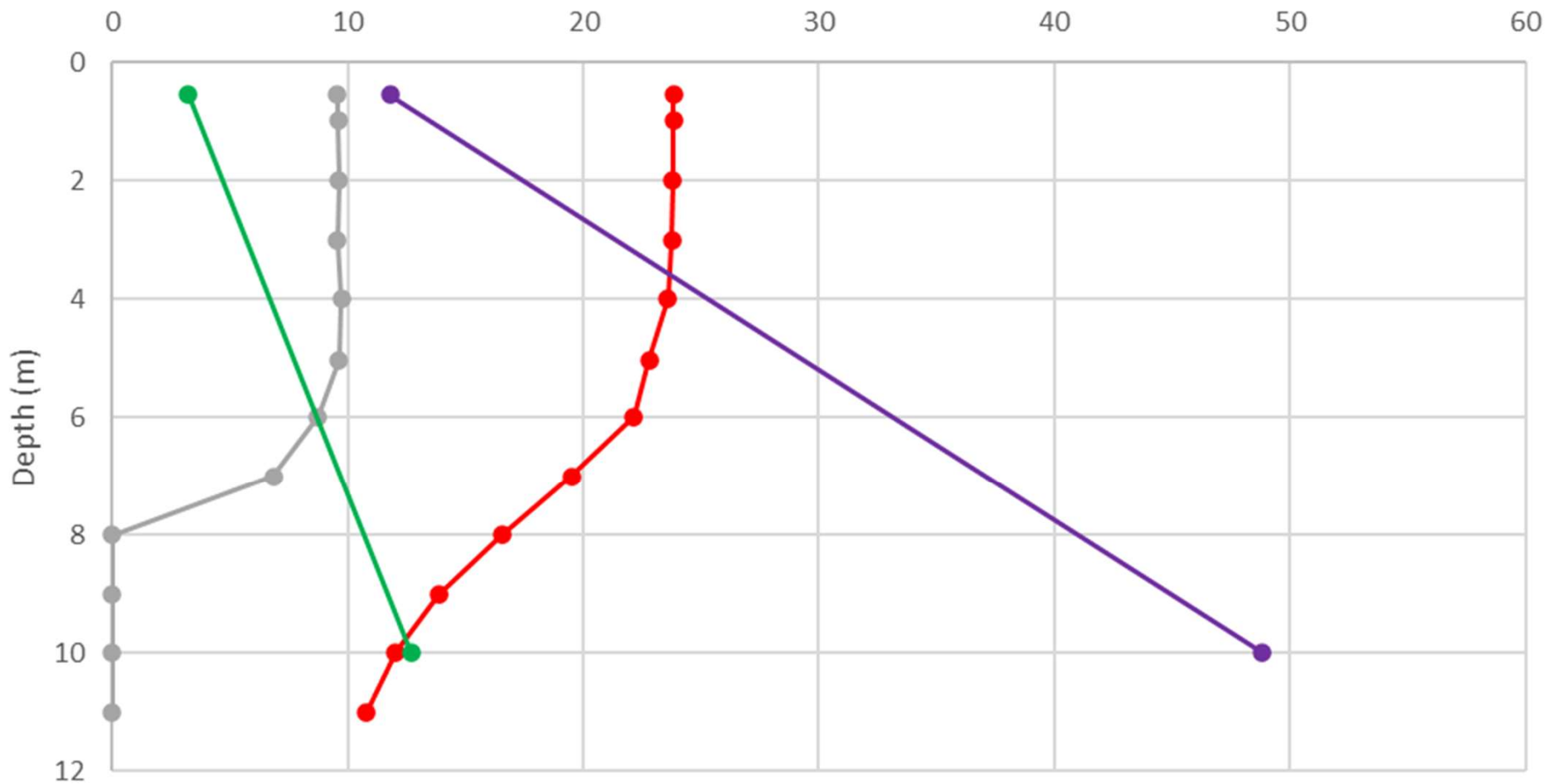
Lake Morey Water Quality Vertical Profile 8/21/2023

● Temperature (C) ● Dissolved Oxygen (mg/L) ● Total Phosphorus (ug/L) ● Chlorophyll-a (ug/L)

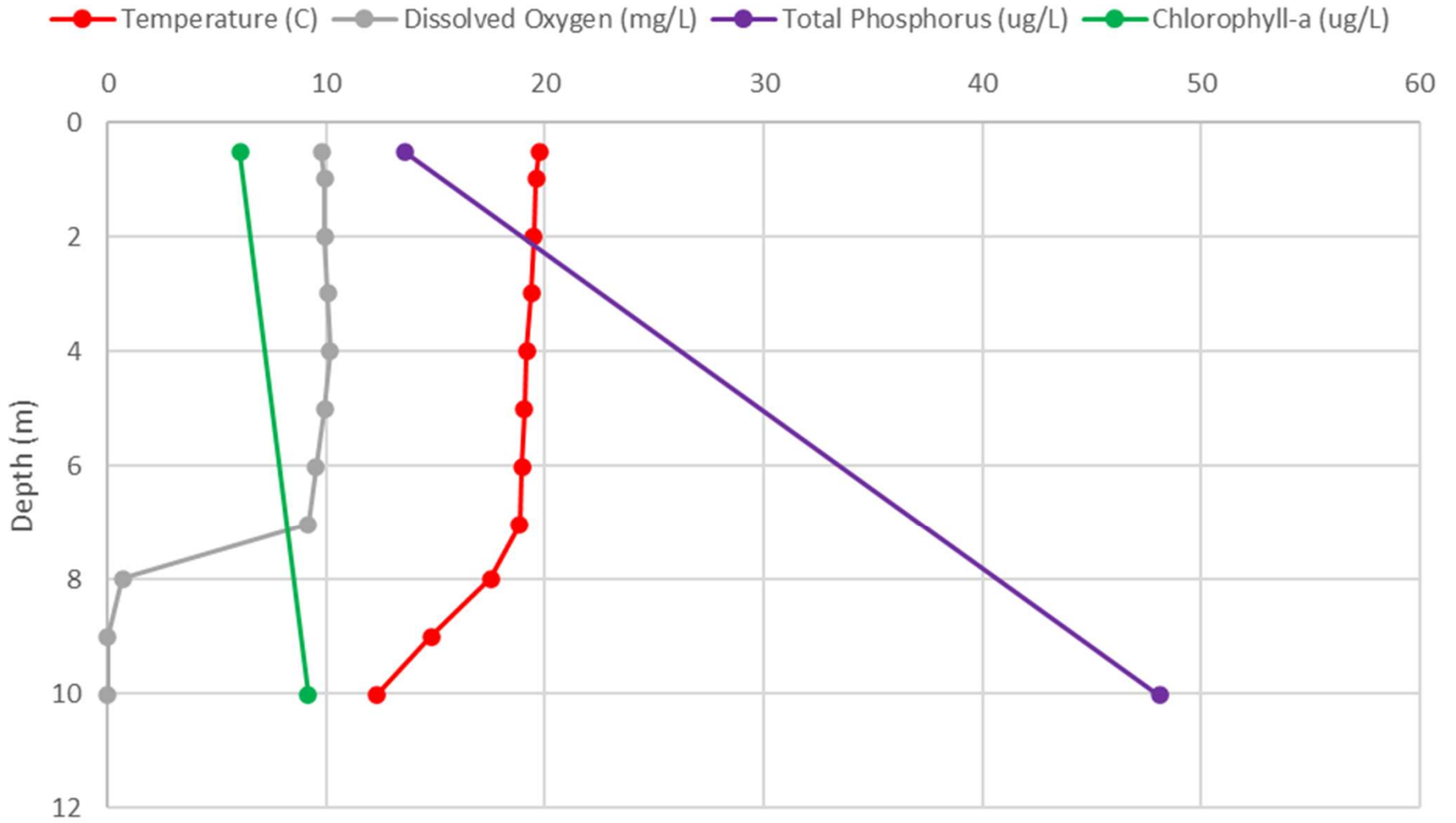


Lake Morey Water Quality Vertical Profile 9/14/2023

● Temperature (C) ● Dissolved Oxygen (mg/L) ● Total Phosphorus (ug/L) ● Chlorophyll-a (ug/L)

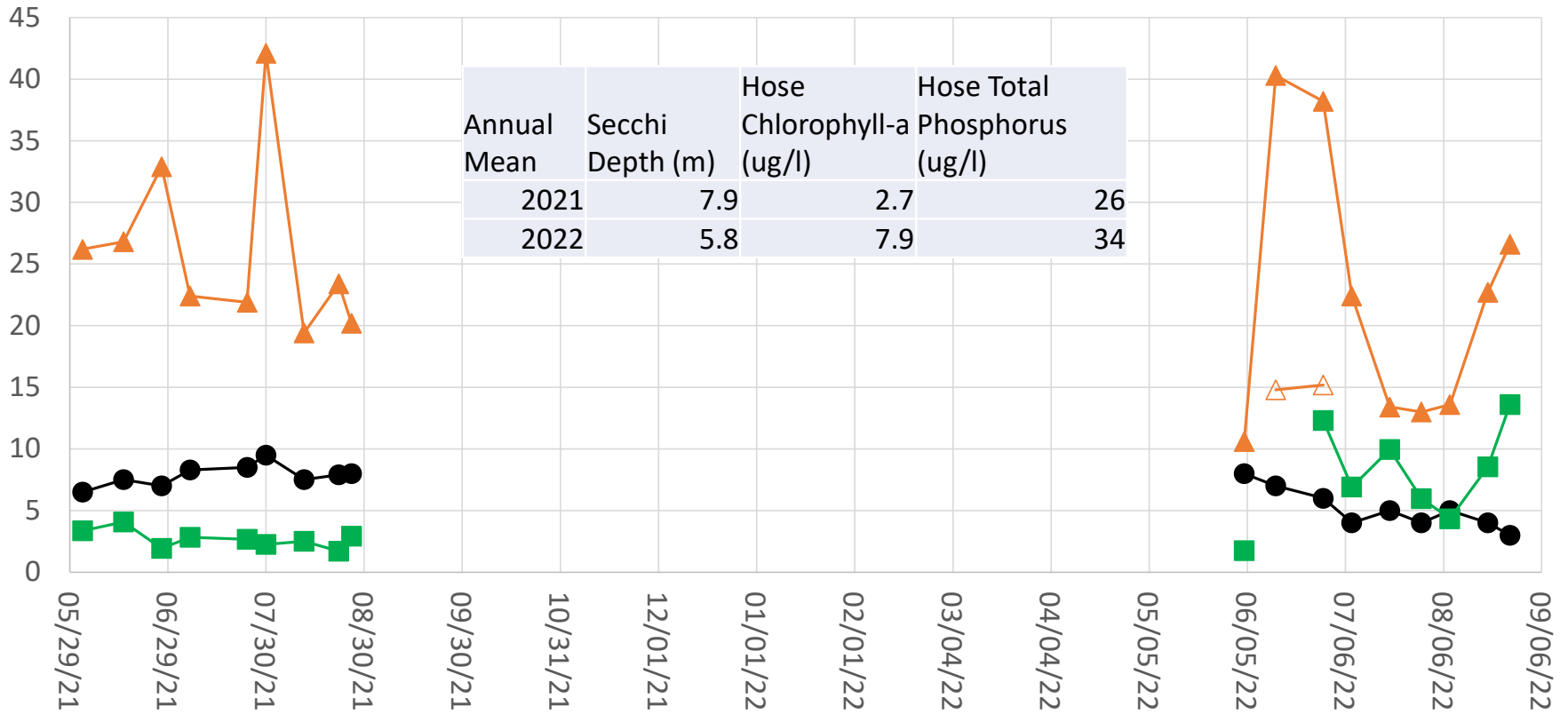


Lake Morey Water Quality Vertical Profile 10/4/2023



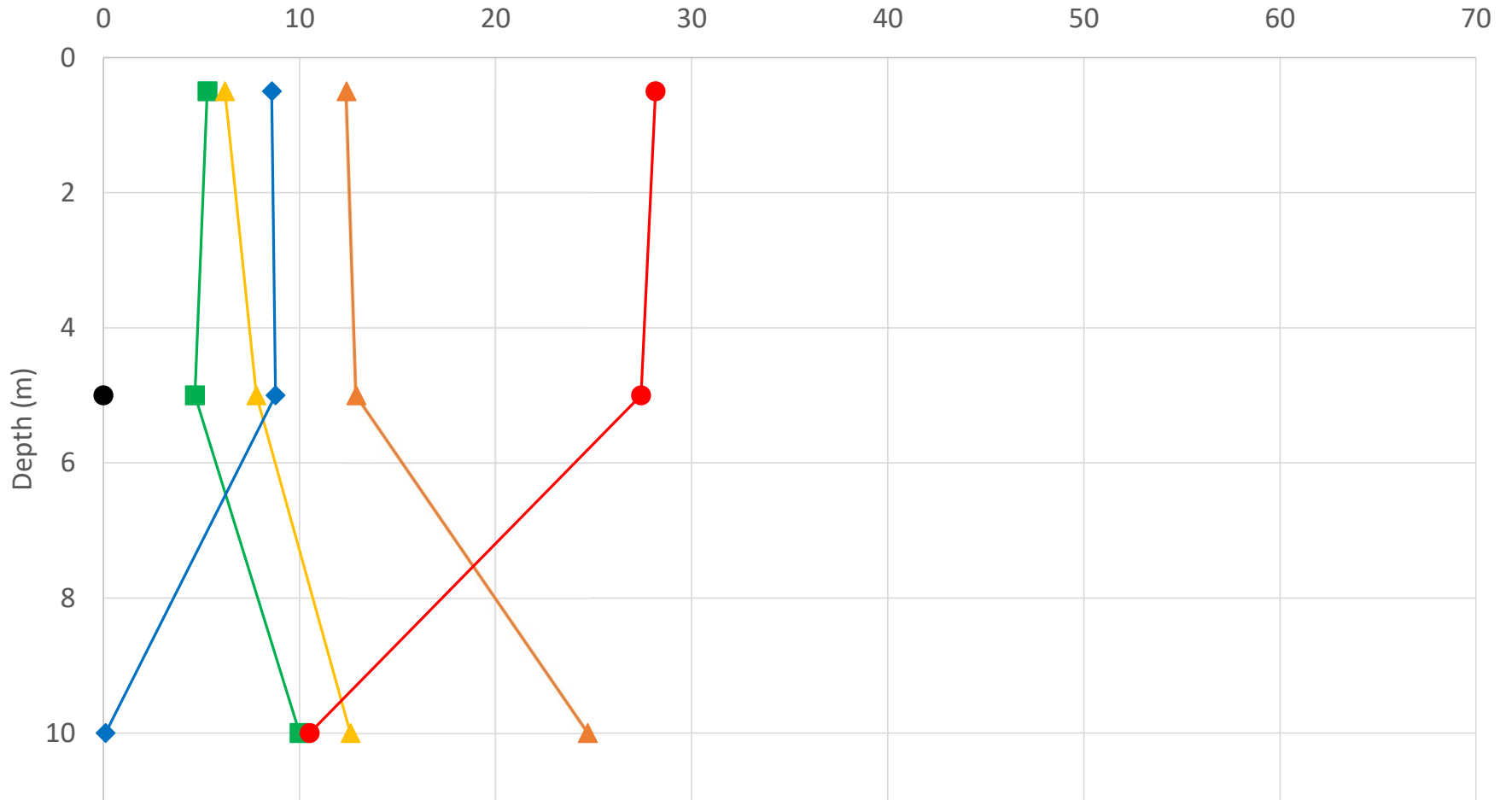
2021-2022 Lake Morey Lay Monitoring Results (Note: Hose Depth = 10 meters)

● Secchi Depth (m)
 ■ Hose Chlorophyll-a (ug/l)
 ▲ Hose Total Phosphorus (ug/l)
 △ Surface Grab TP (ug/l)

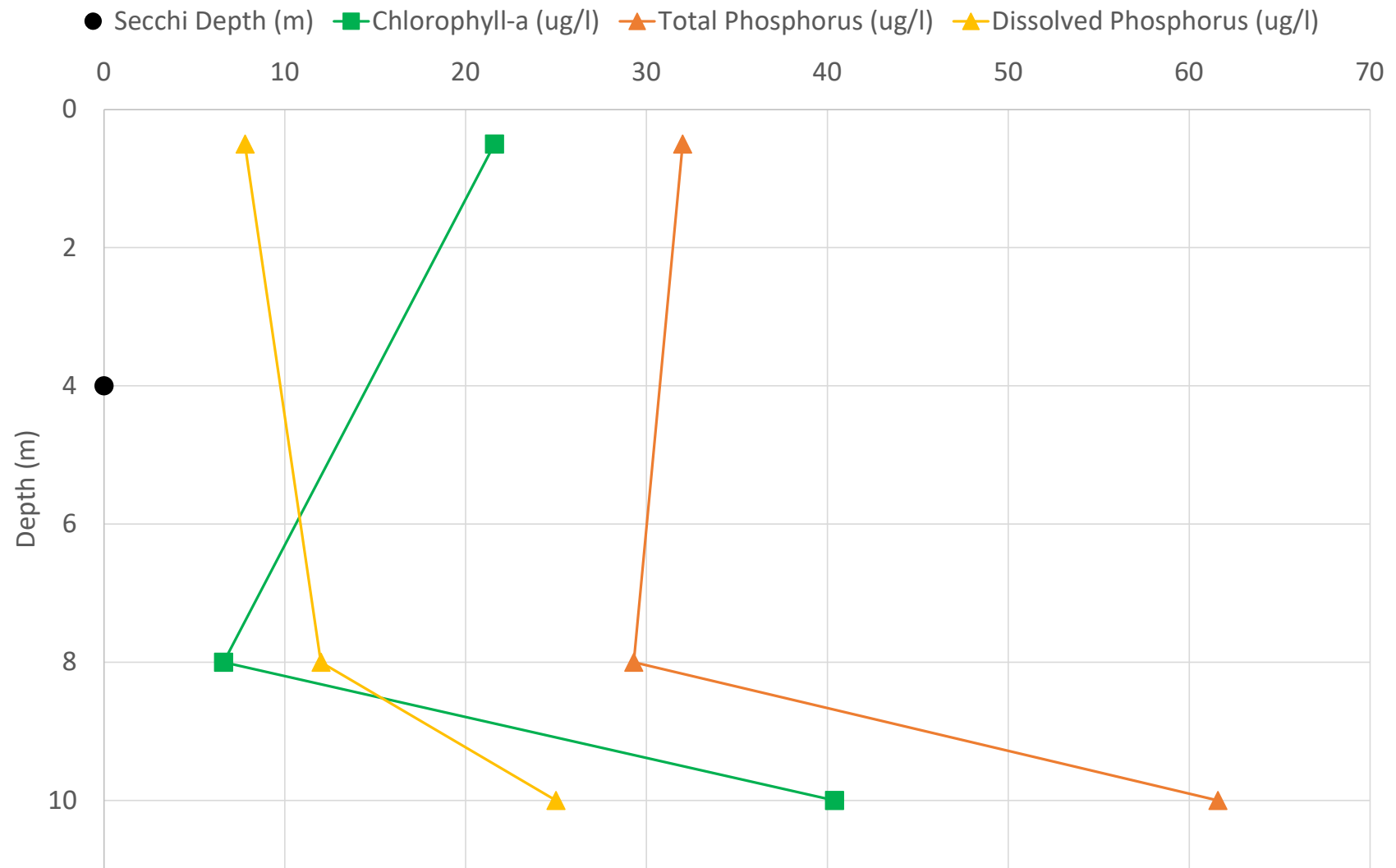


Lake Morey Water Quality Vertical Profile 8/8/2022

- Secchi Depth (m)
- Chlorophyll-a (ug/l)
- ▲ Total Phosphorus (ug/l)
- ▲ Dissolved Phosphorus (ug/l)
- Temperature, C
- ◆ Dissolved Oxygen (ug/l)

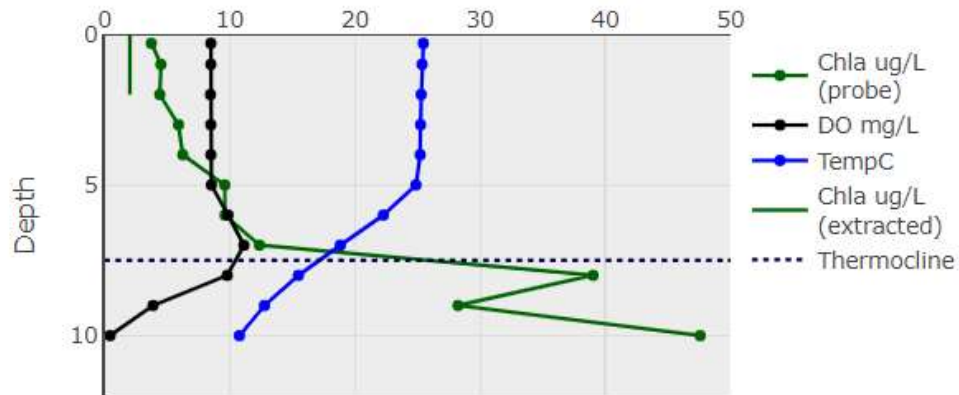


Lake Morey Water Quality Vertical Profile 9/12/2022

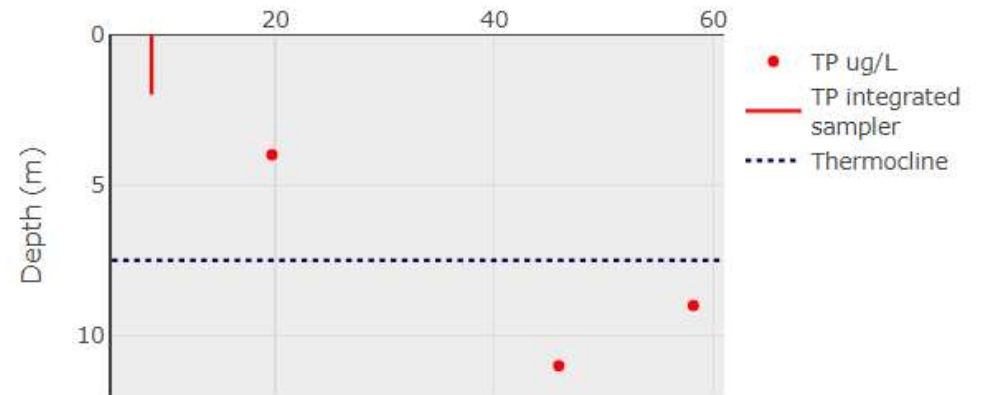


Lake Morey Next Generation Lake Assessment 8/24/2022

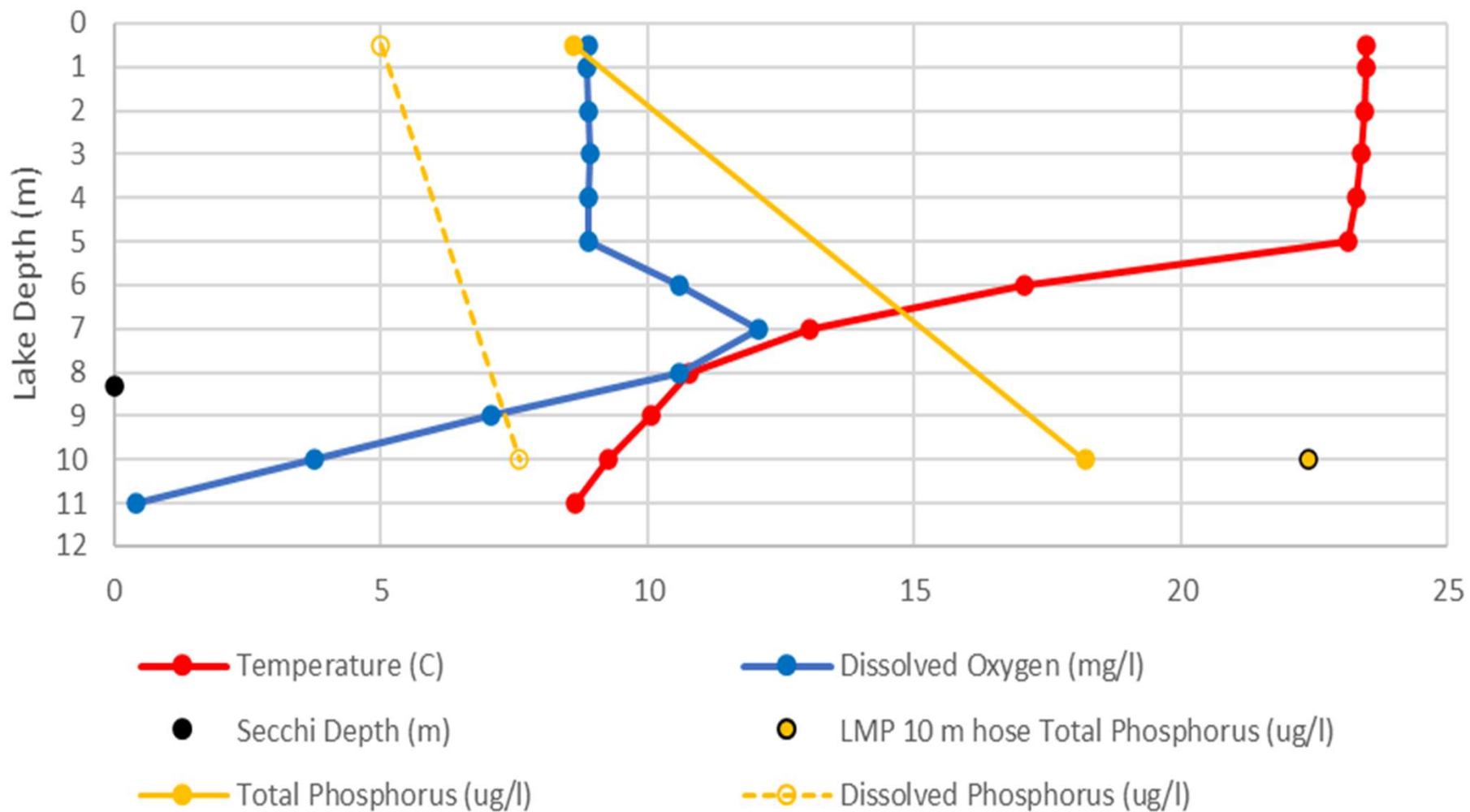
Temperature, Dissolved Oxygen, Chlorophyll-a



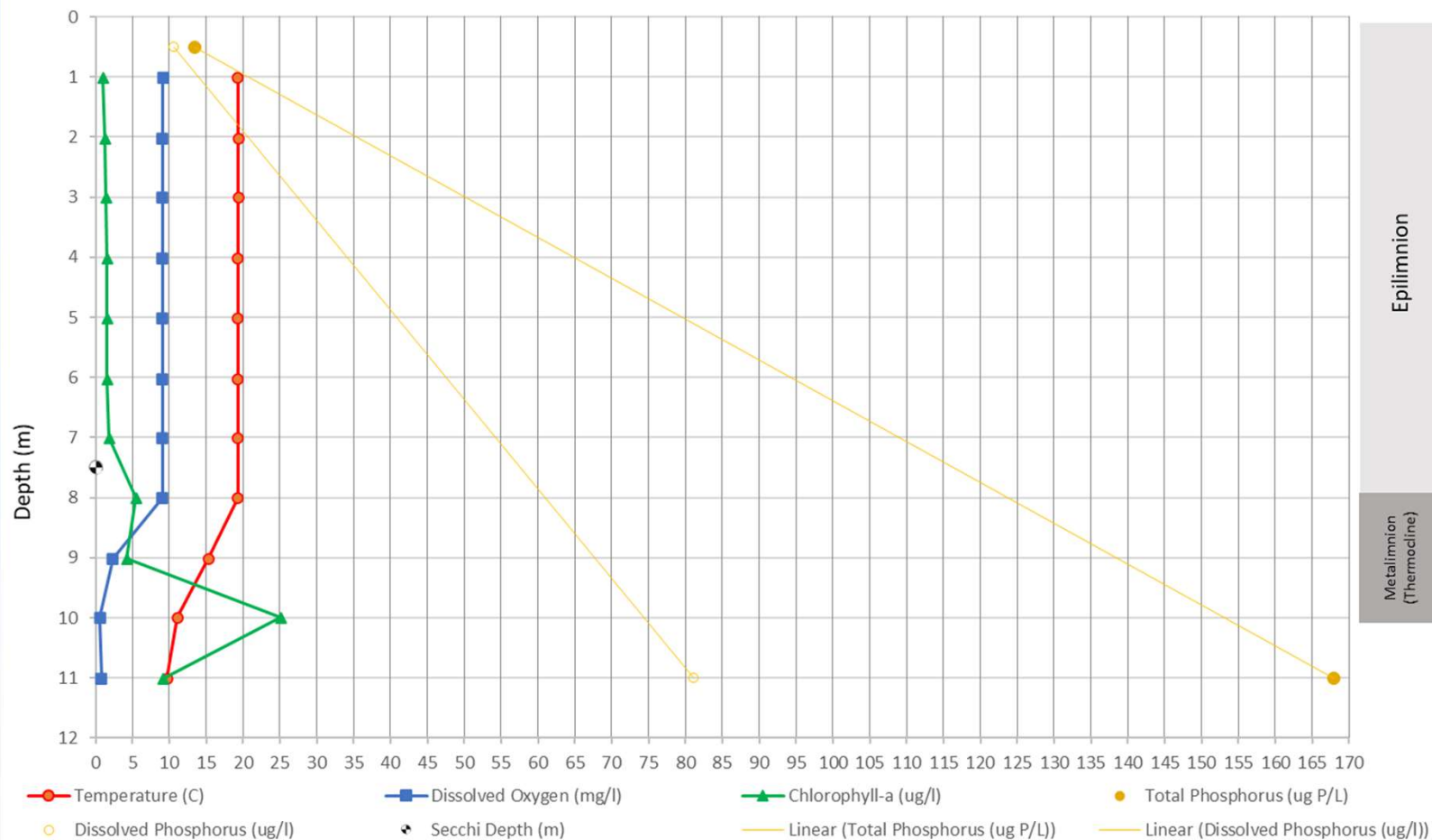
Total Phosphorus



Lake Morey Station 1 Vertical Water Quality Profile 7/6/2021

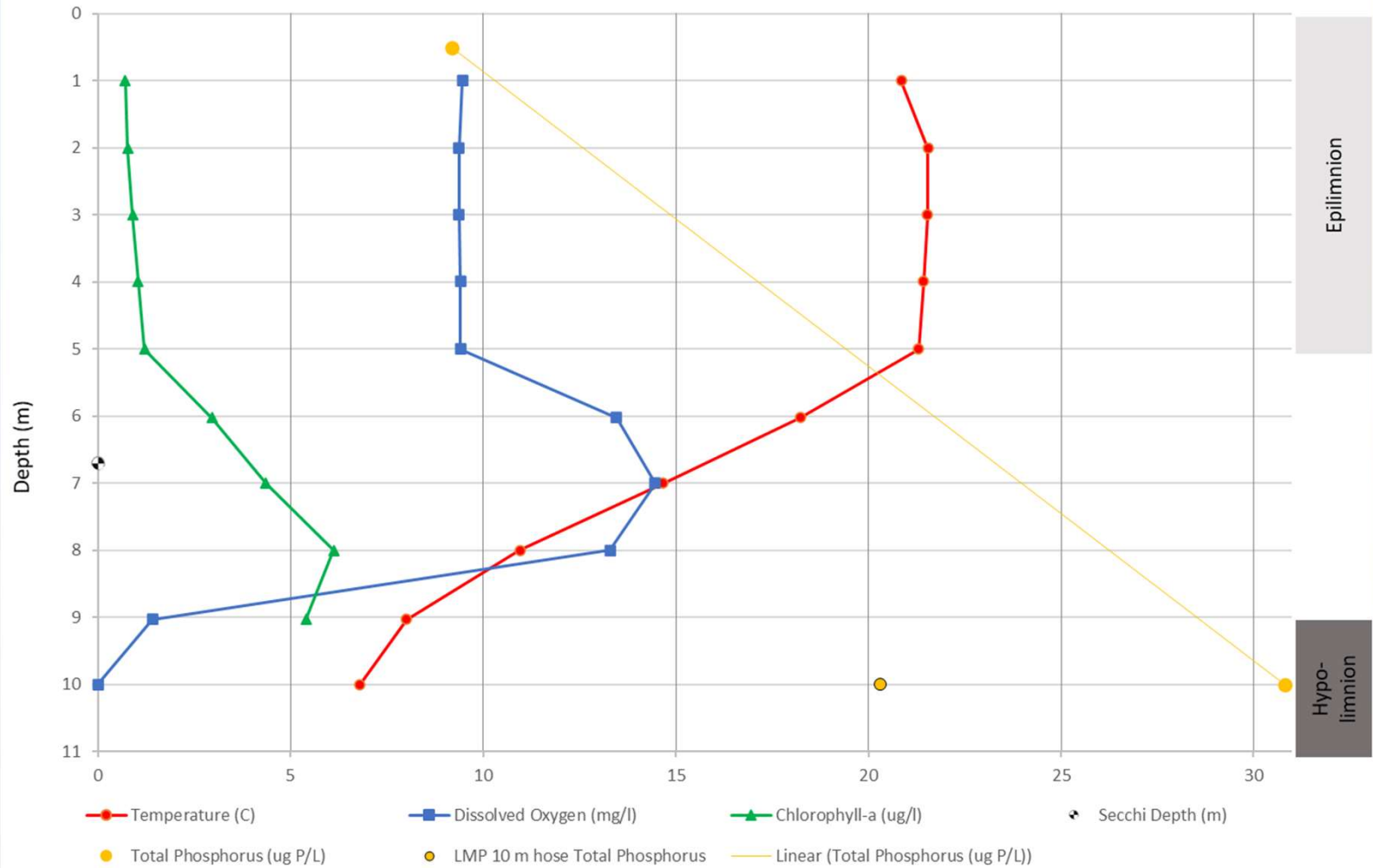


Lake Morey Station 1 Temperature, Dissolved Oxygen, Chlorophyll-a and Phosphorus Vertical Profiles on 9/28/2018

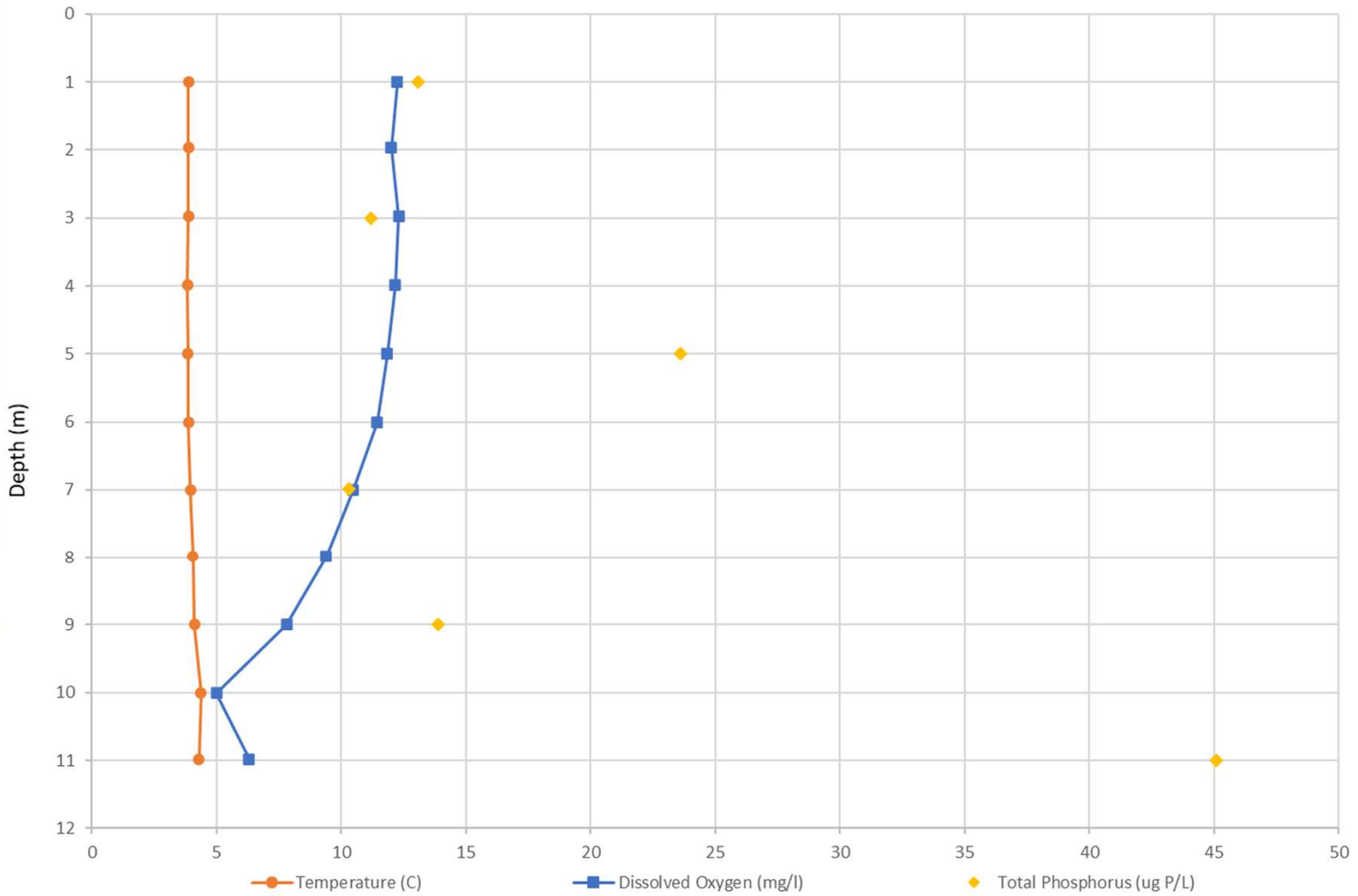


Anoxia in the hypolimnion and large increase in phosphorus concentration from surface (0.5 m) to bottom (1 m above sediment) water indicates internal loading from sediments. Note the chlorophyll-a (algae/cyanobacteria) maximum in the hypolimnion.

Lake Morey Station 1 Temperature, Dissolved Oxygen, Chlorophyll-a and Total Phosphorus Vertical Profiles on 6/27/2018



Lake Morey Station 1 Temperature, Dissolved Oxygen, Total Phosphorus and Total Nitrogen Profiles on 3/5/2018 (Under Ice Cover)



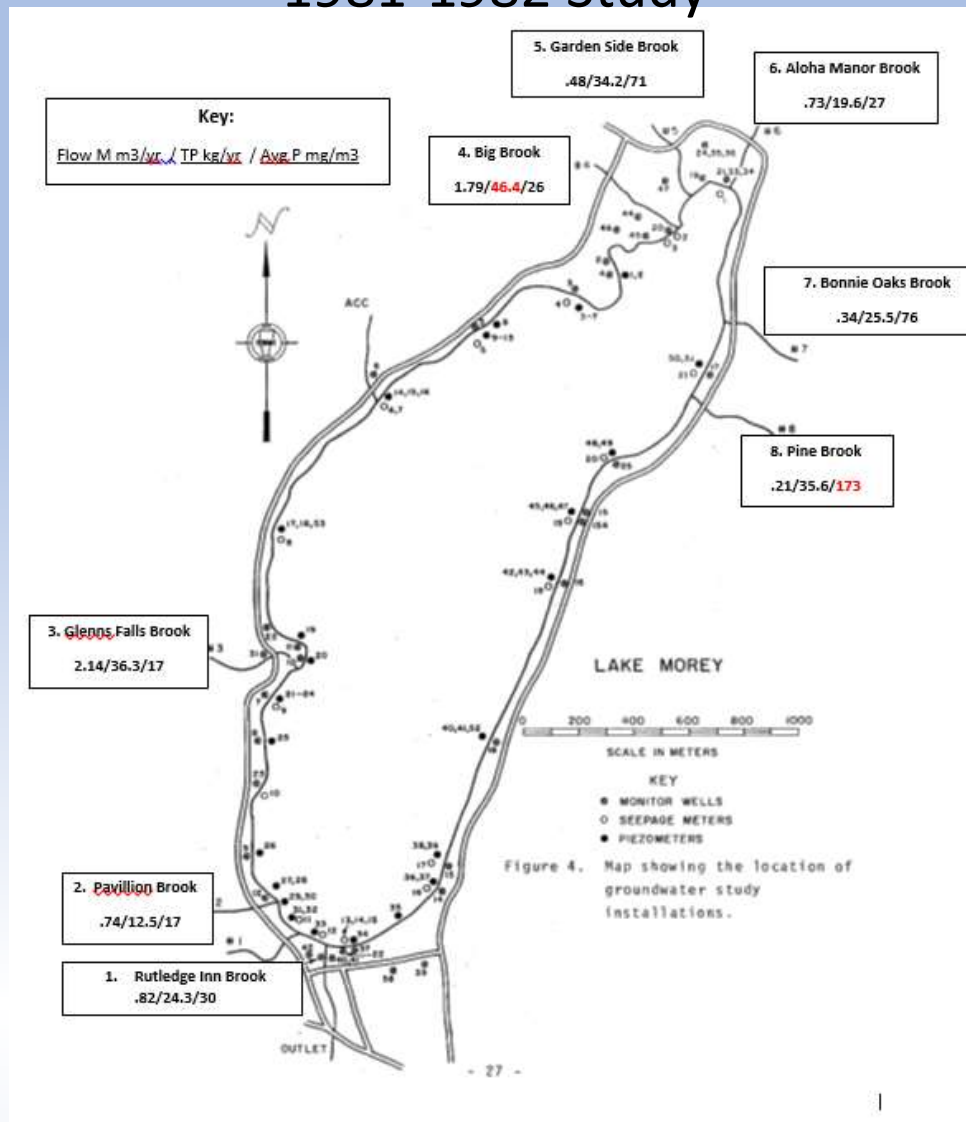
- Started monitoring regularly in 2019
- Collected samples from 7 tributary streams (4 in 2022)
- Only total phosphorus and chloride in 2022
- Monitored between April and September (April-July in 2022)
- 2019-2020: monthly
- 2021-2022: biweekly
- Watershed is mostly forested
- Developed area is the densest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

LAKE MOREY - LaRosa Program Monitoring Sites

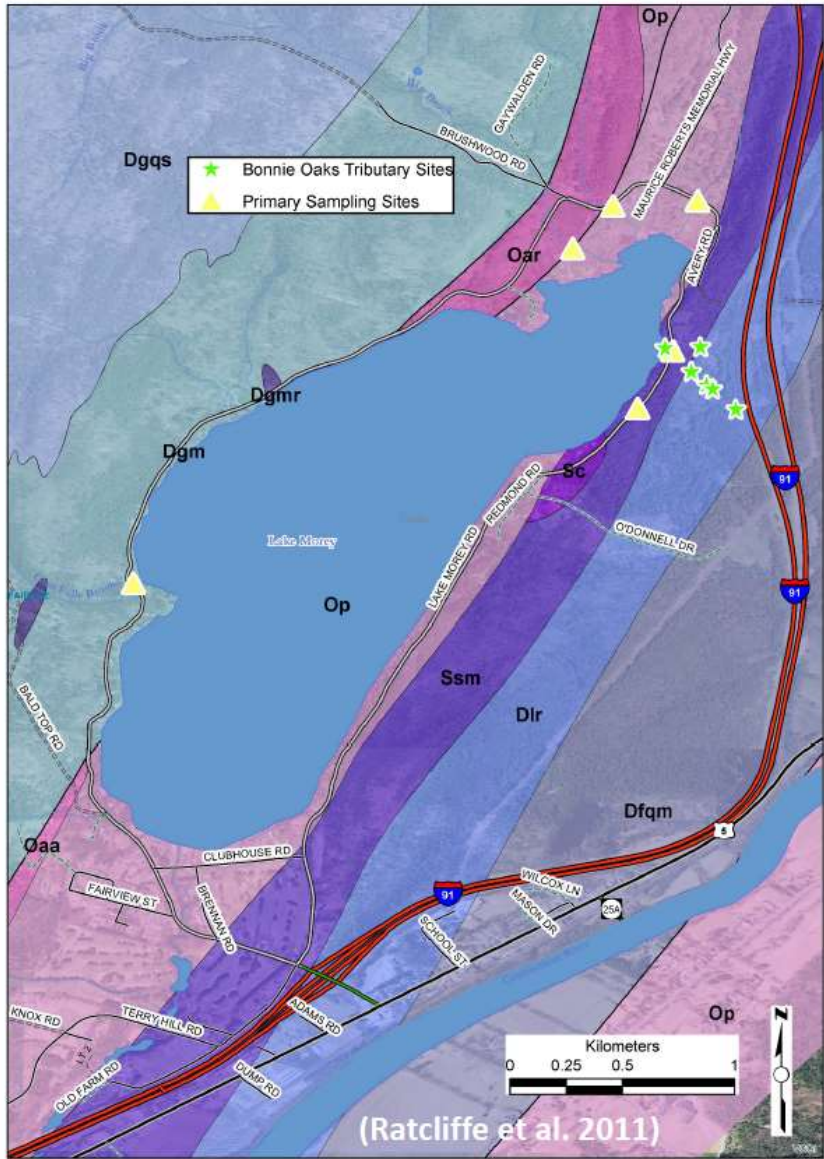


<https://dec.vermont.gov/watershed/map/monitor/larosa>

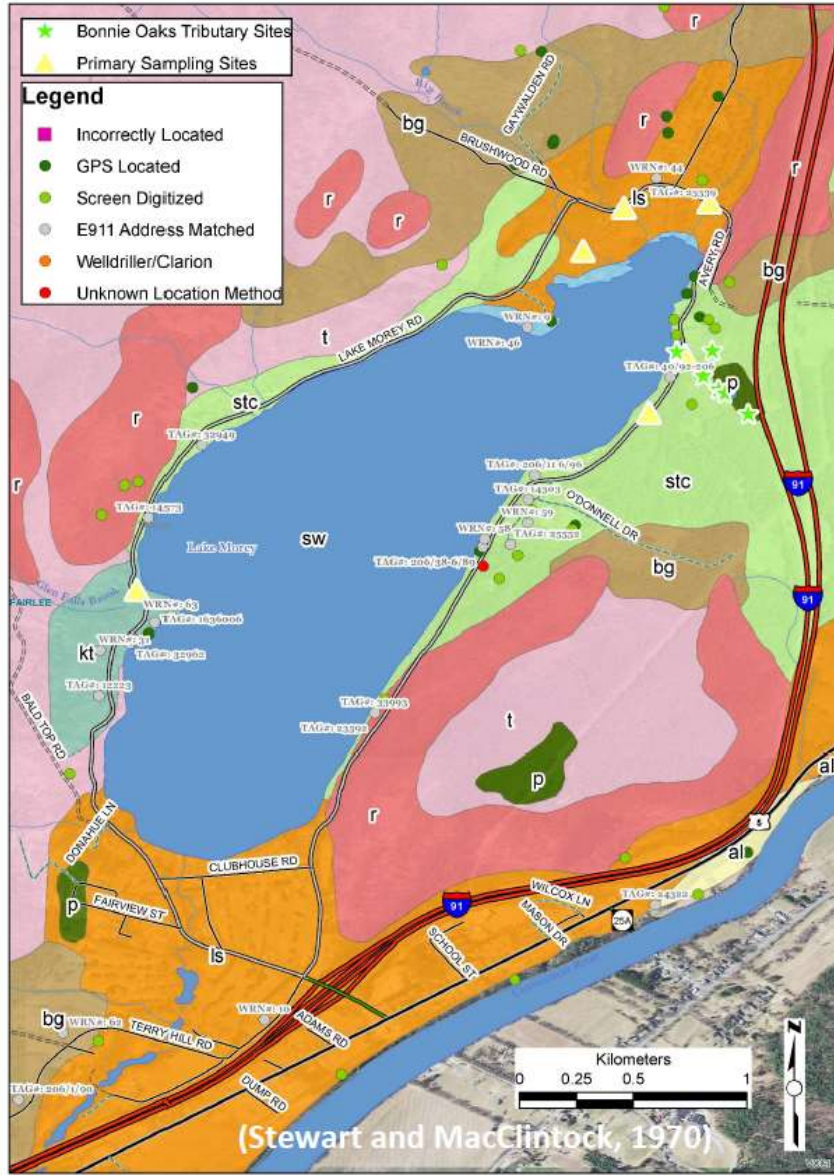
1981-1982 Study



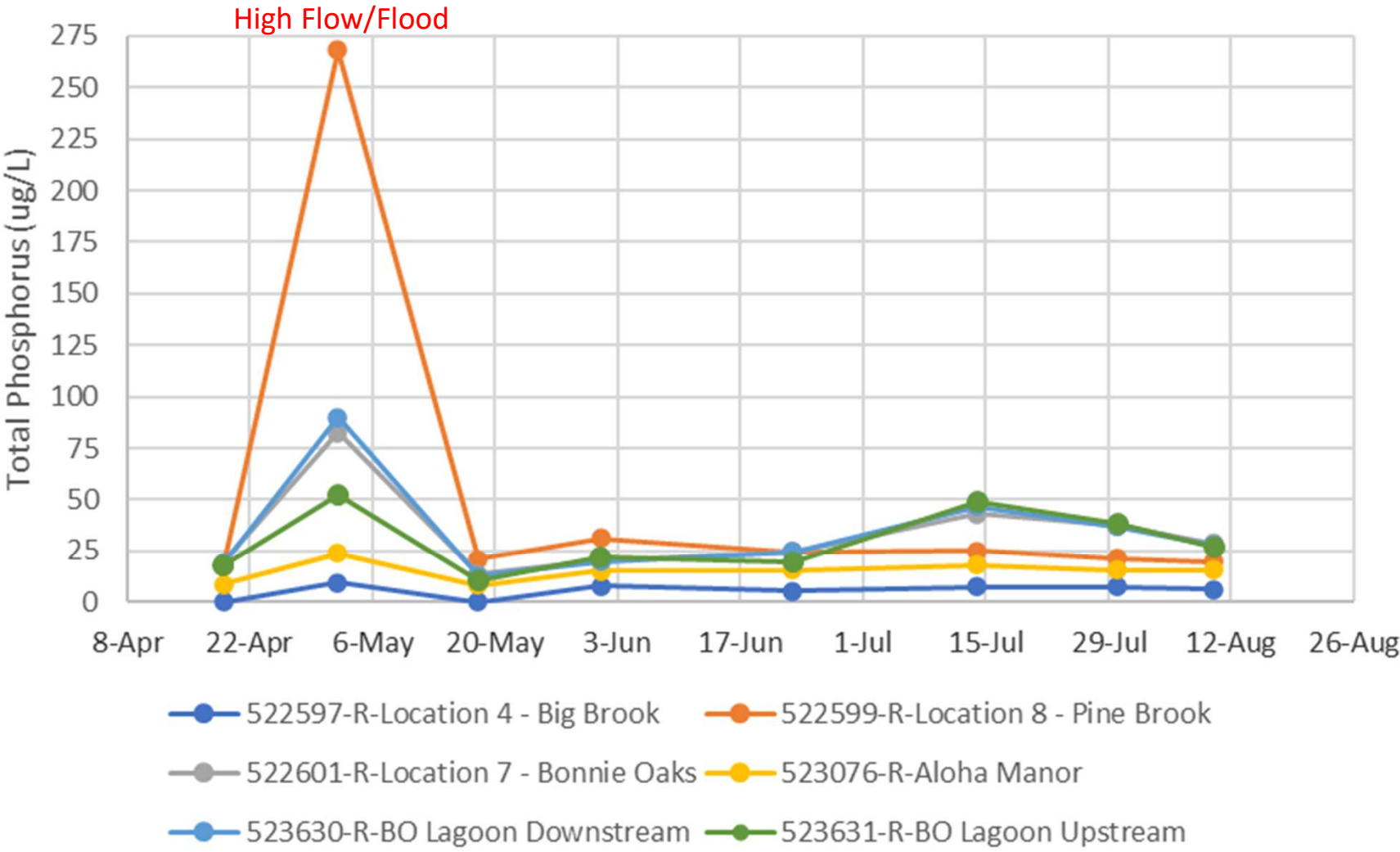
Bedrock Geology



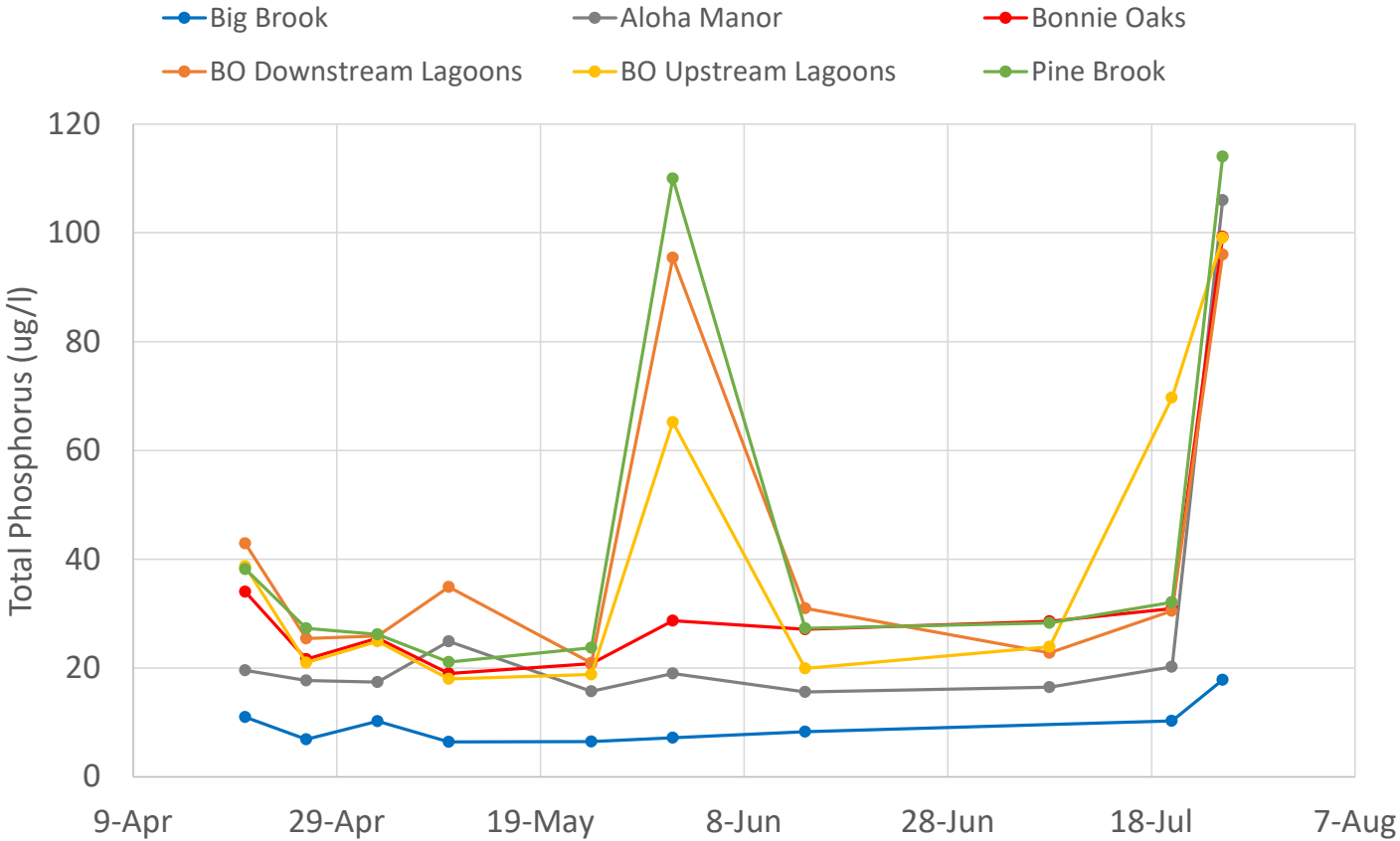
Surficial Geology + Wells



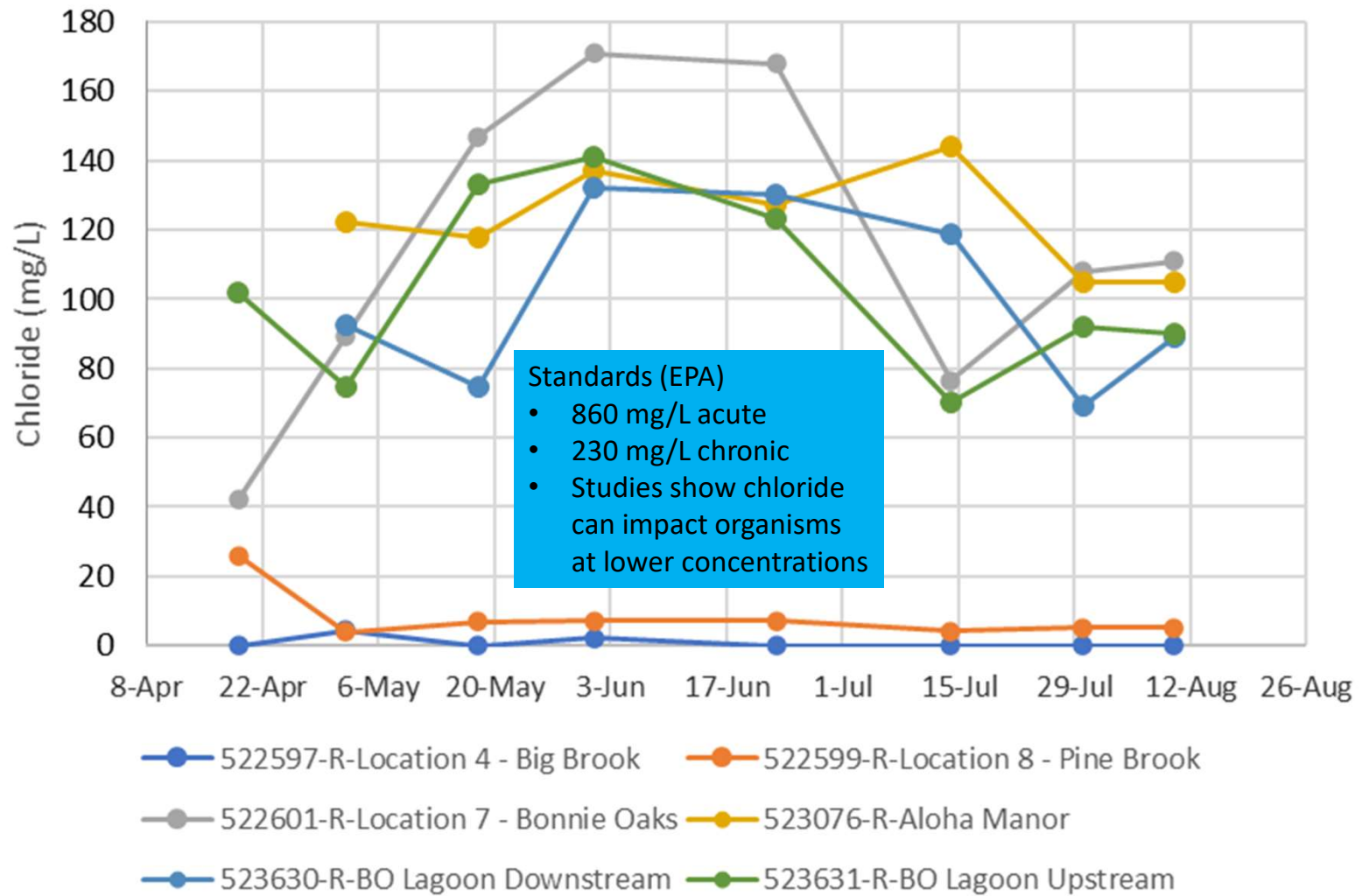
2023 Lake Morey Tributary Total Phosphorus Monitoring



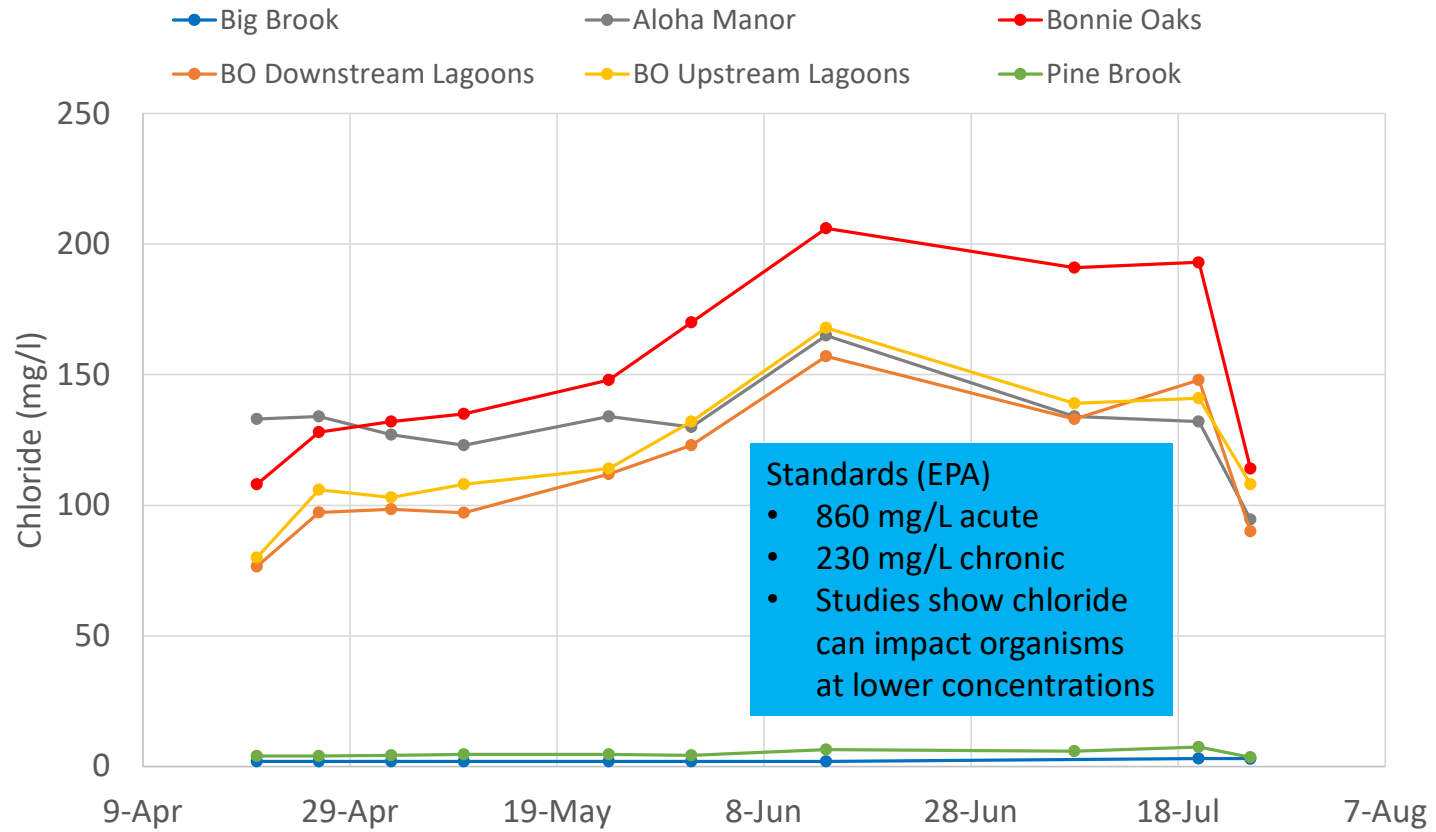
2022 Lake Morey Tributary Total Phosphorus Results



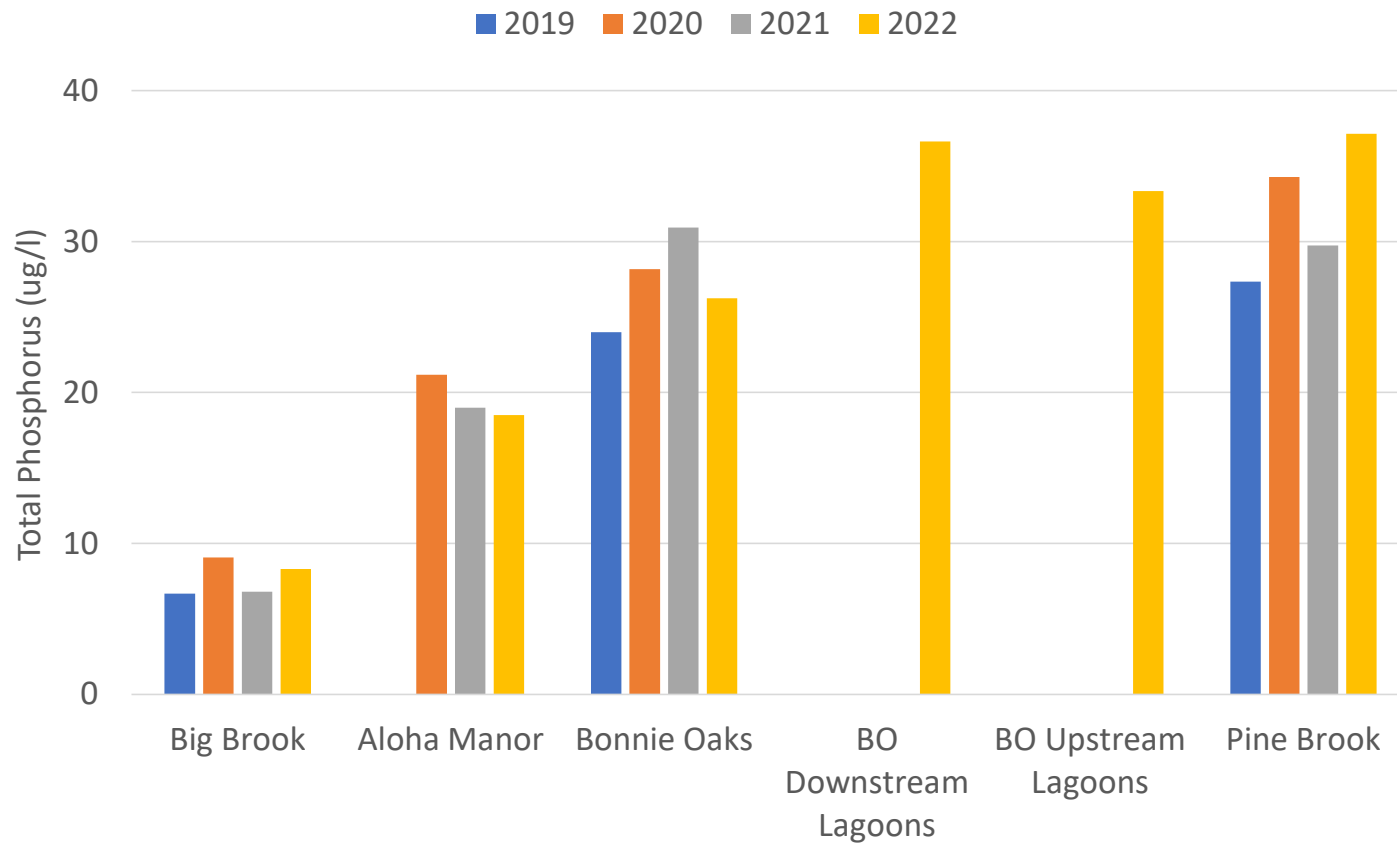
2023 Lake Morey Tributary Chloride Monitoring



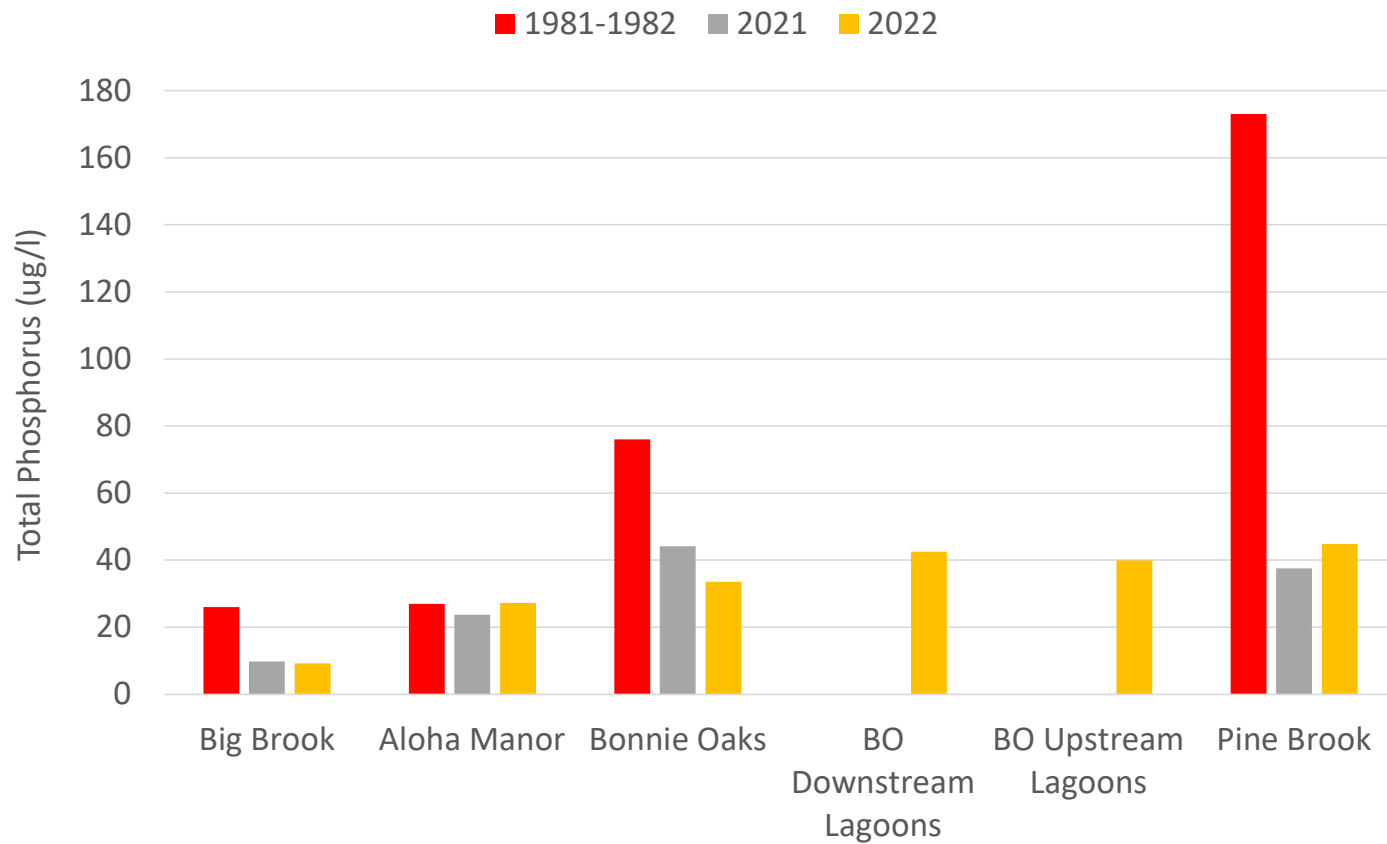
2022 Lake Morey Tributary Chloride Results



2019-2022 Lake Morey Tributary Base Flow Total Phosphorus Annual Means



1981-2022 Lake Morey Tributary Base + High Flow Total Phosphorus Annual Means



2023 Monitoring Summary & 2024 Next Steps

<https://lamotte.com/horizontal-water-sampler-1087>



- Lay Monitoring Program (LMP)
 - 2023 Summary: Secchi transparency started high in early June, decreased in early July, increased in late July, and then decreased again in late August. Total phosphorus and chlorophyll-a concentrations were low in the epilimnion and elevated in the hypolimnion (especially in August) due to internal loading from anoxic sediment.
 - 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: Pine Brook and Bonnie Oaks sites had high total phosphorus during May 2nd high flow/flood; Bonnie Oaks and Aloha Manor sites continue to have high chloride
 - 2024 Next Steps: LPP volunteer continues biweekly sampling June through August (align with LMP)