

# CSLAP and Customized Monitoring: How Additional Data is Helping Sleepy Hollow Lake



**Chris L. Mikolajczyk, CLM**  
President – NALMS; Senior Manager – Aquatics, Princeton Hydro, LLC

**Jesse Smith**  
Staff Scientist – Aquatics, Princeton Hydro, LLC

**Laurel Wolfe**  
Association Manager – Association of Property Owners of Sleepy Hollow Lake, Inc.

# Citizens Statewide Lake Assessment Program (CSLAP) – A brief review

- ✓ Began in 1985 by NYSDEC and NYSFOLA
- ✓ Data collected on a biweekly basis by trained volunteers from lake associations
- ✓ Discrete water samples analyzed by a certified laboratory
- ✓ All resulting data assessed by NYDEC and NYSFOLA
- ✓ Yearly reports provided to Lake Associations and available online



# Sleepy Hollow Lake

- ✓ **Surface area:** 325.8 Acres
- ✓ **Mean Depth:** 7.5 meters (24.5 feet)
- ✓ **Max. Depth:** 21.1 meters (69.1 feet)
- ✓ **Volume:** Over 9,735,000 m<sup>3</sup> (2,572 million gallons)
- ✓ **Watershed Area:** 8,493 acres (13.5 mi<sup>2</sup>)
- ✓ **Flushing Rate:** 2.3 times/yr



2016 orthoimagery obtained from the New York State GIS Clearinghouse: [gis.ny.gov](http://gis.ny.gov)



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# Sleepy Hollow Lake Monitoring History

- ✓ Water Quality Sampling in 2001-2003 by Greene County Soil and Water Conservation District
- ✓ CSLAP beginning in 2009
- ✓ Fisheries Surveys by Cornell University 1987 - 2006
- ✓ Watershed Management Plan by Princeton Hydro in 2017
- ✓ Several SAV surveys by pH 2016 – Present
- ✓ Comprehensive WQ Sampling by pH 2020 – Present
- ✓ Fisheries Surveys by pH in 2016 and 2021

# CSLAP at Sleepy Hollow

- ✓ Bi-monthly Sampling at a single point on the lake June – September
- ✓ Samples from the surface assessed for TP, TDP, TN, TDN, NH<sub>3</sub>, Chl. a, Calcium, and Chloride
- ✓ Deep samples assessed for TP, TDP, NH<sub>3</sub>, and Chloride
- ✓ Other parameters include Secchi depth (clarity), pH, Conductivity, true color, surface temperature, deep temperature, and Chl. a via flurometer



# CSLAP at Sleepy Hollow

- ✓ Samples assessed for algae; additional samples and cyanotoxin samples collected as needed
- ✓ Notes regarding submerged aquatic vegetation, invasive species



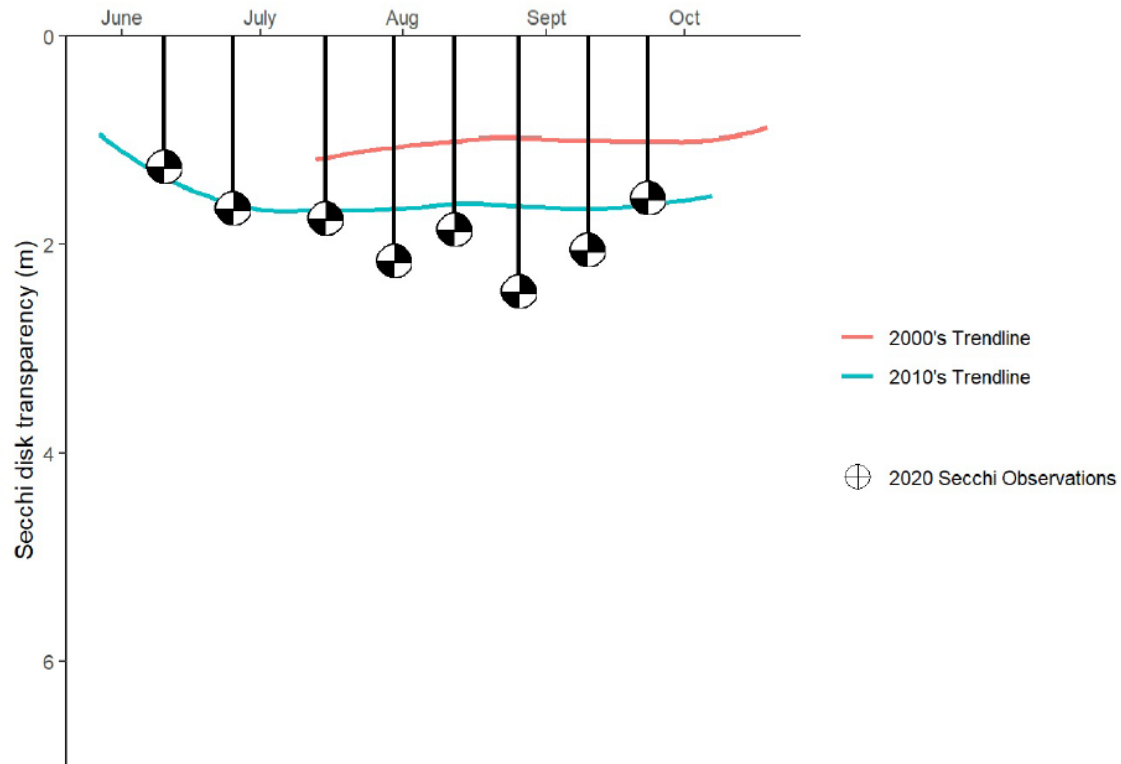
# CSLAP Highlights 2020

- ✓ General downward trend in Surface total Phosphorus and Chl a.
- ✓ Upward trend in water clarity, conductivity, and pH.
- ✓ Mesoeutrophic status
- ✓ Lake is usually slightly phosphorus limited
- ✓ High levels of calcium
- ✓ Susceptible to cyanobacteria blooms



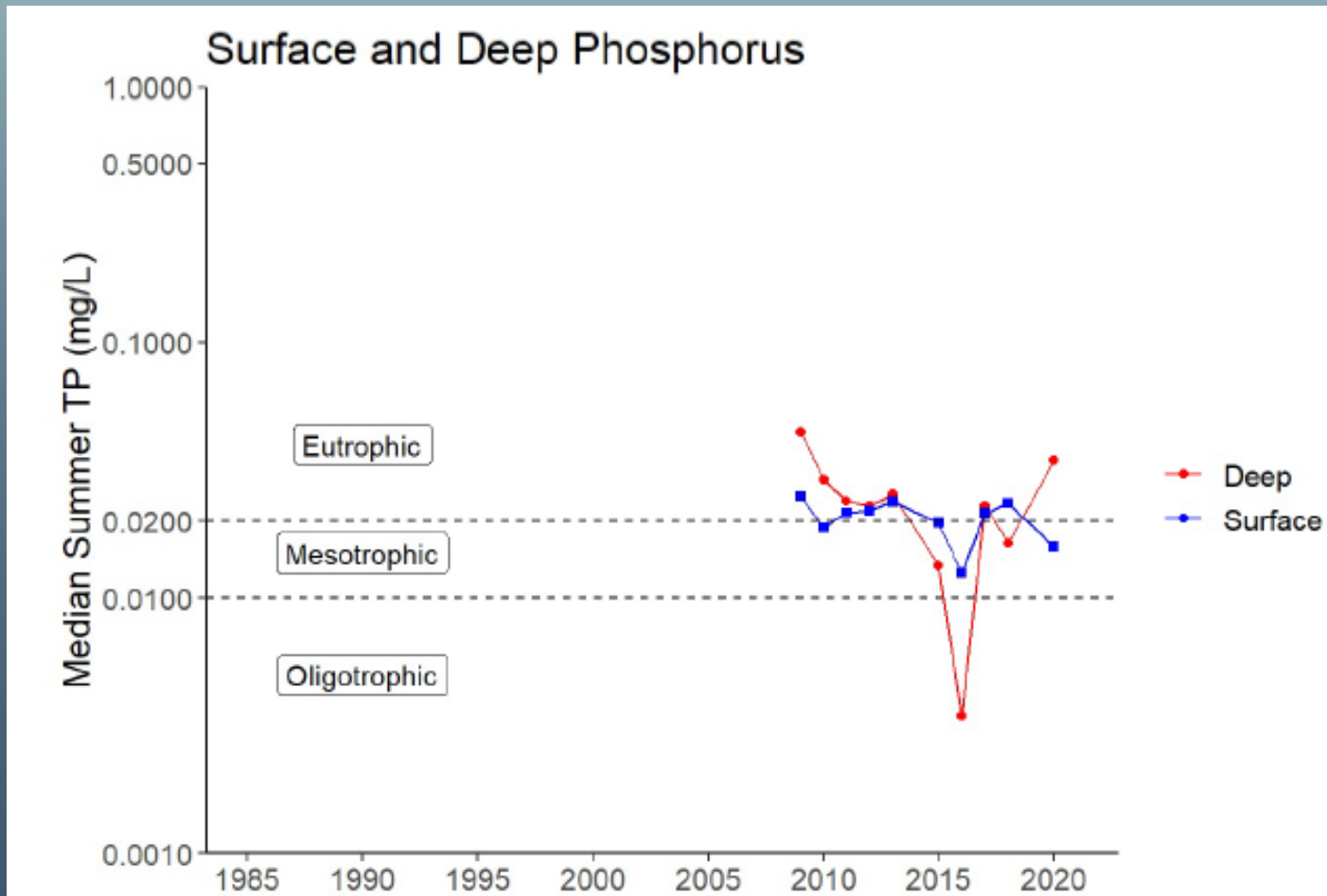
# Sleepy Hollow Lake - In-Season Trend Analysis

## In Season Water Clarity

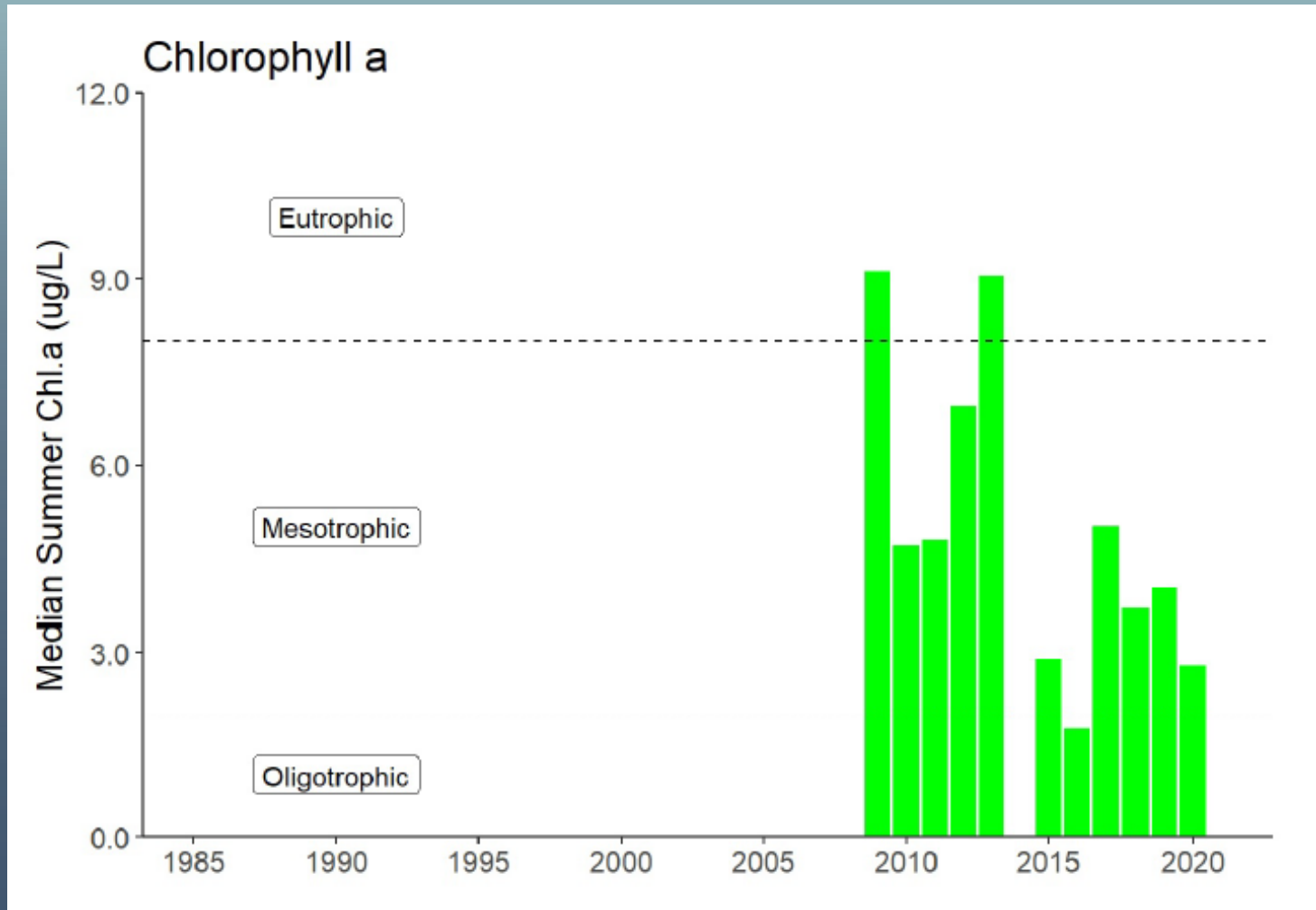


NYDEC – CSLAP Report – Sleepy Hollow Lake, 2020

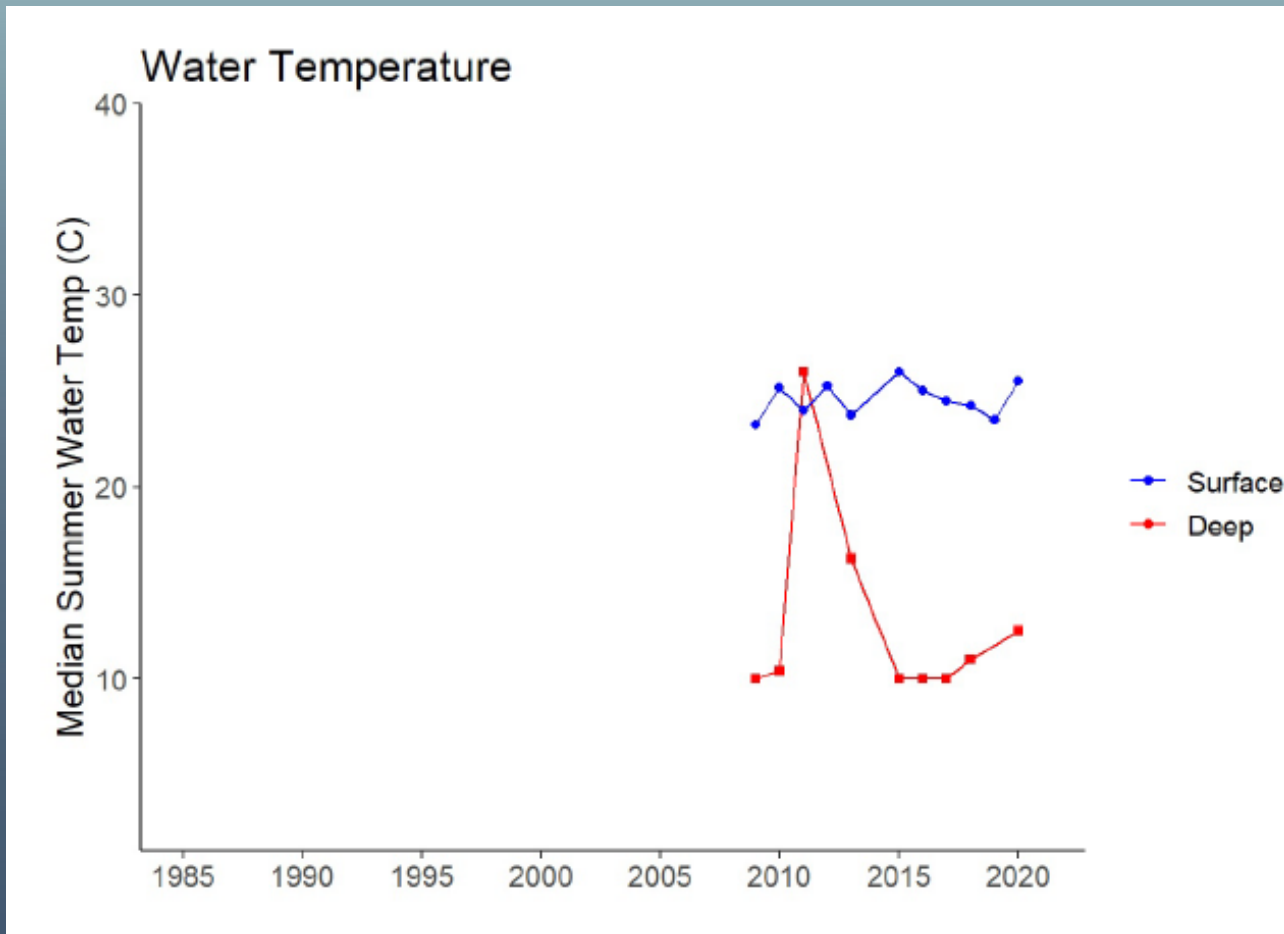




NYDEC – CSLAP Report – Sleepy Hollow Lake, 2020

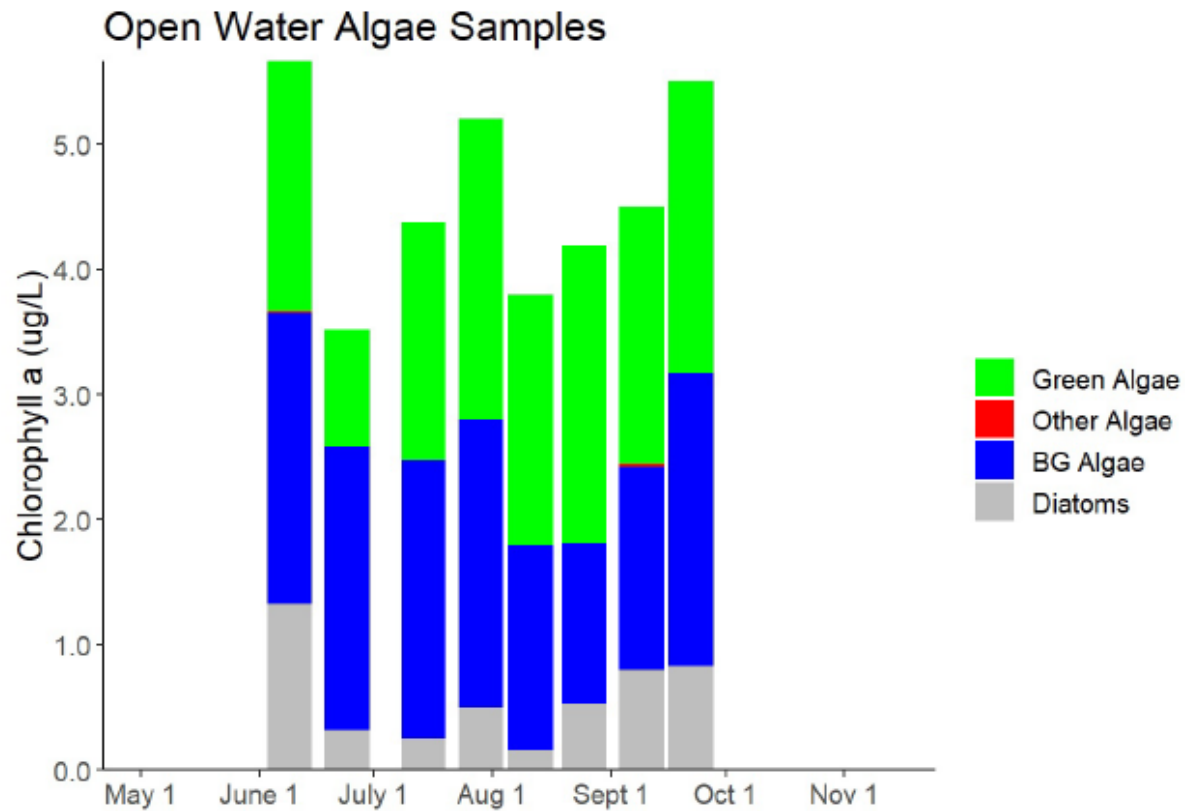


NYDEC – CSLAP Report – Sleepy Hollow Lake, 2020



NYDEC – CSLAP Report – Sleepy Hollow Lake, 2020

# Open Water Algae



# Princeton Hydro at Sleepy Hollow

- ✓ Monthly May - September
- ✓ Three monitoring stations – South, Mid-Lake, North
- ✓ Full profile *In situ* monitoring – Temp., DO, pH, Conductivity
- ✓ Surface and thermocline samples: TP, SRP, Chl. A, TDP, NO<sub>3</sub>, NH<sub>3</sub>, TSS
- ✓ Bottom Samples: TP, SRP, TDP, NO<sub>3</sub>, NH<sub>3</sub>, TSS
- ✓ Phytoplankton and Zooplankton samples – surface and thermocline – counts for both in 2021

# Princeton Hydro at Sleepy Hollow

- ✓ Watershed Management Plan (2016-17)
- ✓ Bathymetry (2016)
- ✓ Zone-based rake-toss SAV survey – occurs during each water quality survey
- ✓ Fish Surveys (2016, 2021)
- ✓ Fish Habitat Assessment (2021)

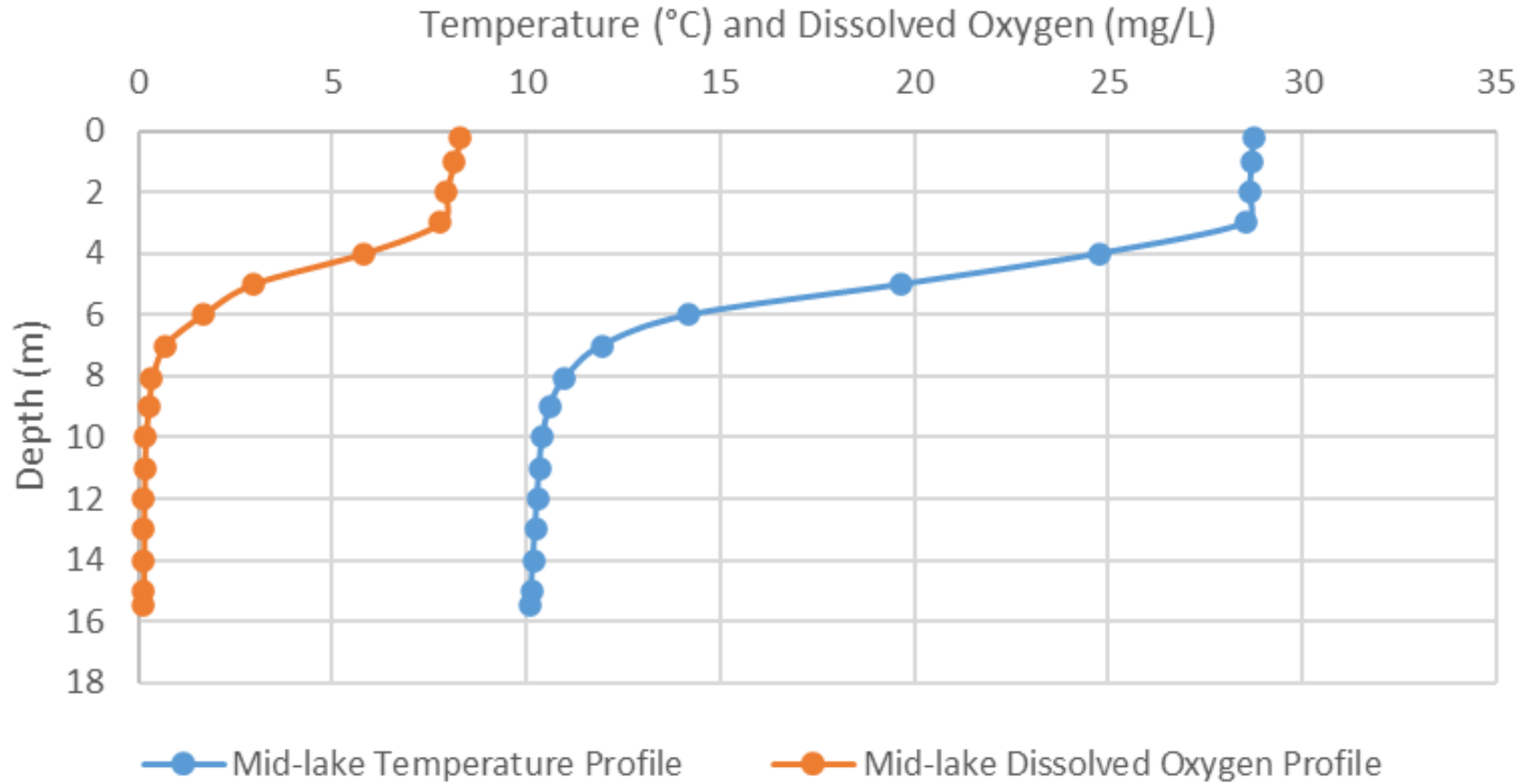


# 2021 Monitoring Notes: WQ

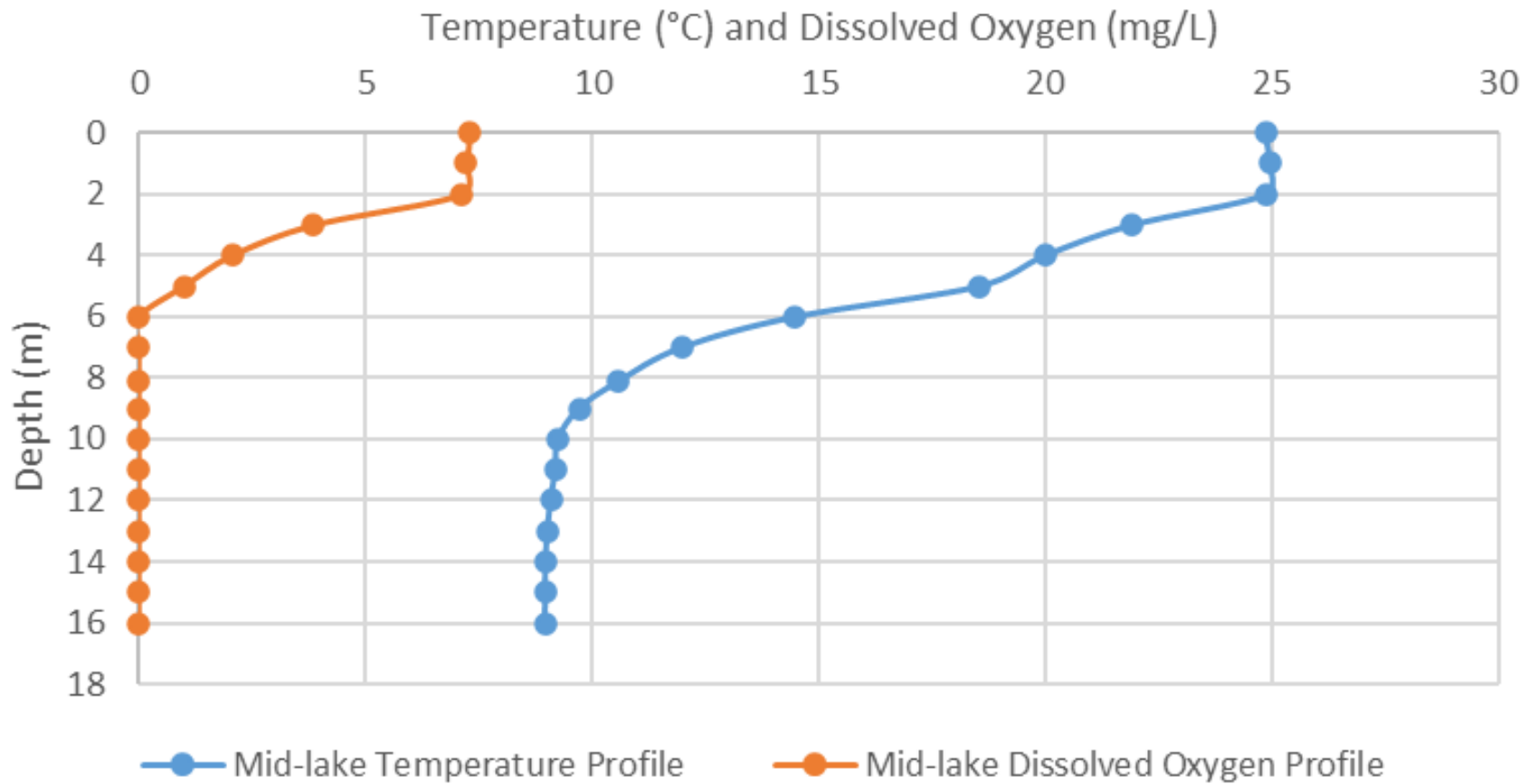
- ✓ Thermal Stratification detected throughout the season
- ✓ Lower Secchi depths than in 2020
- ✓ Anoxic conditions from July – September, spanning a large portion of the water column
- ✓ Phosphorus concentrations found to increase over the course of the season
- ✓ Overall higher cyanobacteria counts than 2020; visible bloom occurring in October
- ✓ Zooplankton community dominated by rotifers; very few large-bodied herbivores.



# Mid-lake 7/27/2020



# Mid-lake 7/19/2021



# TP vs. SRP

- ✓ TP represents ALL of the phosphorus in the water sample
- ✓ SRP represents the amount of phosphorus available for use by algae and cyanobacteria.

# TP vs. SRP

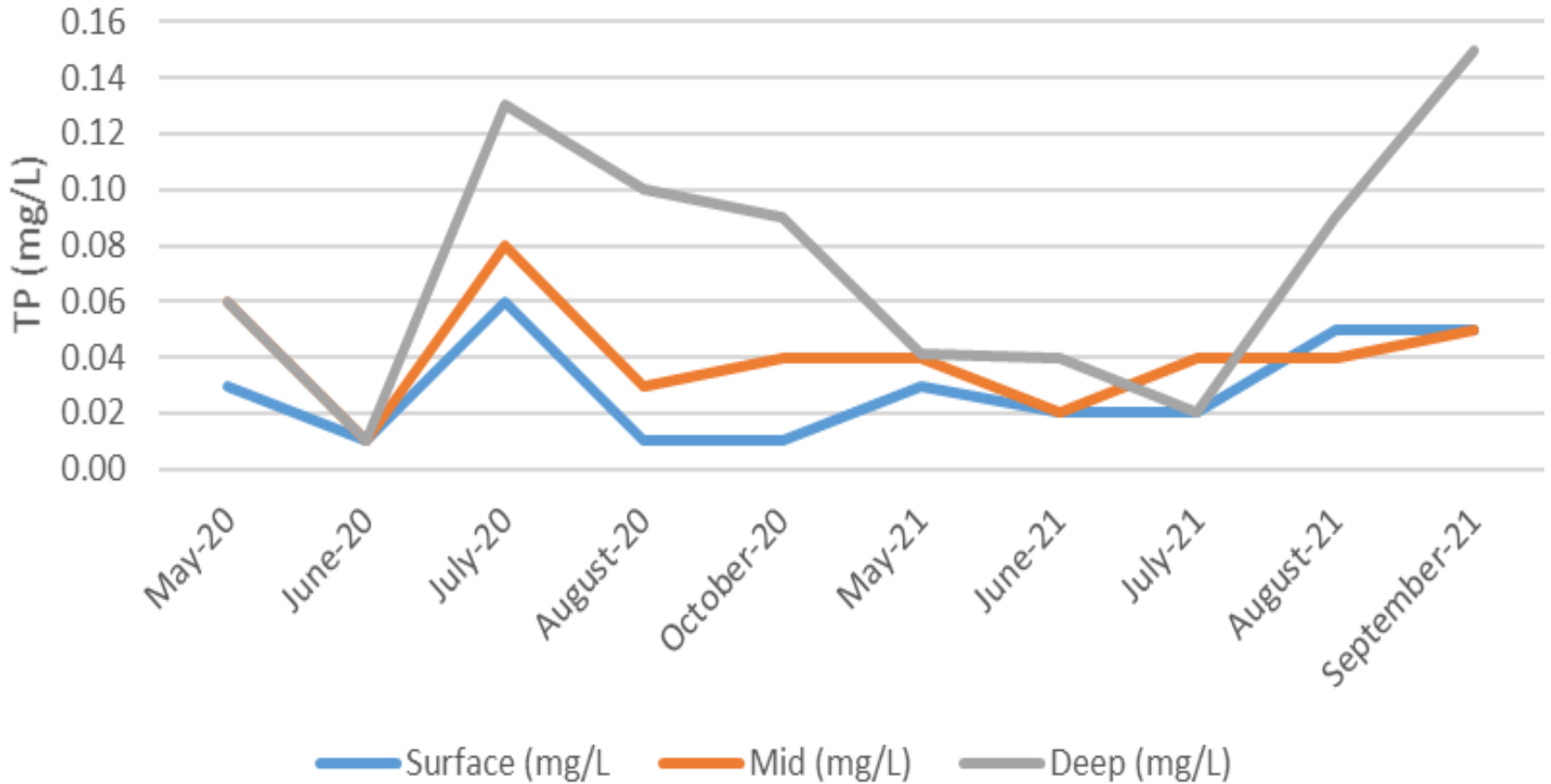
7/27/2020

Sample Depth	TP (mg/L)	SRP (mg/L)
Surface	0.06	ND(<0.002)
Mid	0.08	ND(<0.002)
Deep	0.13	0.002

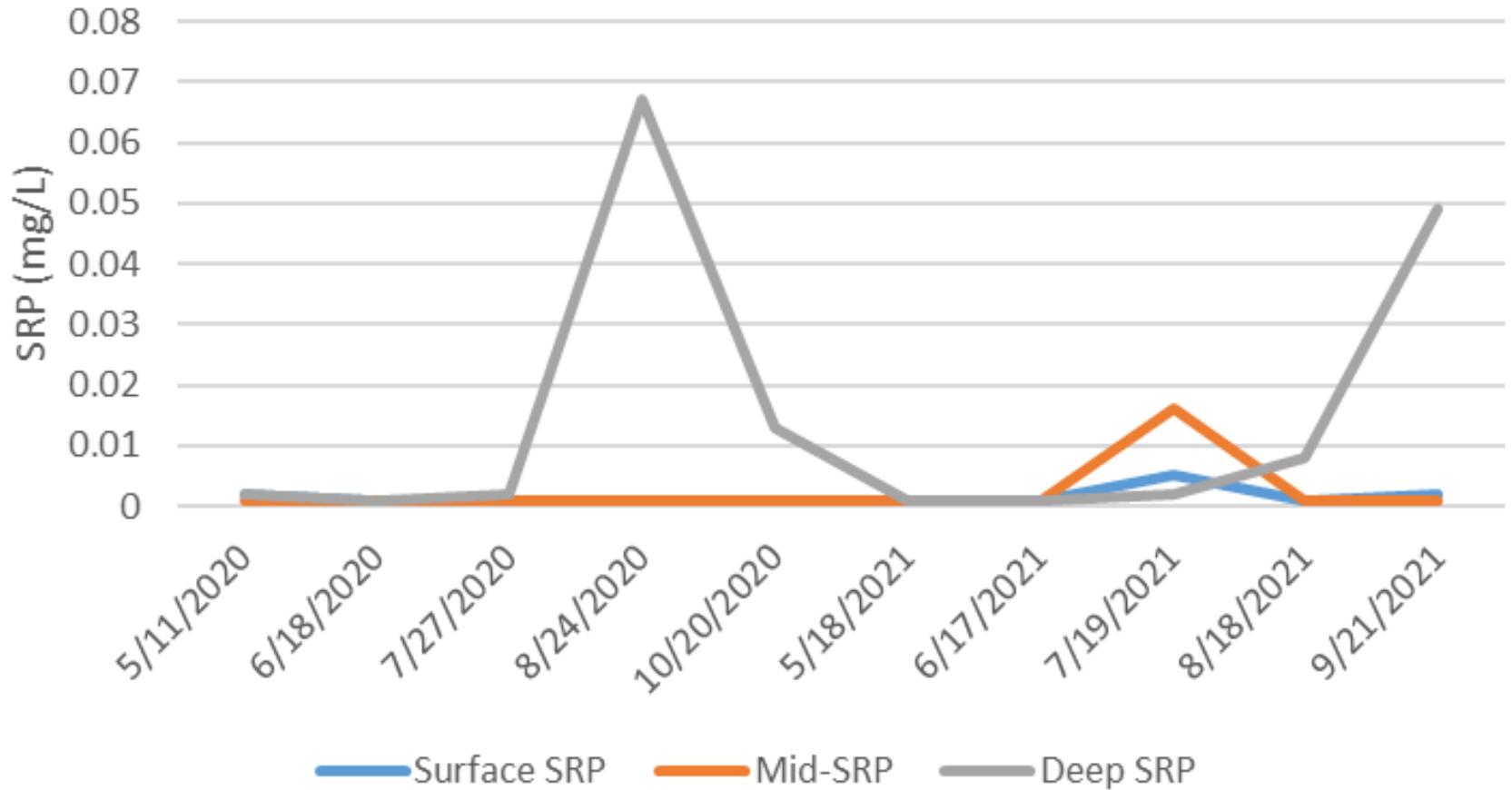
7/19/2021

Sample Depth	TP (mg/L)	SRP (mg/L)
Surface	0.02	0.005
Mid	0.04	0.016
Deep	0.02	0.002

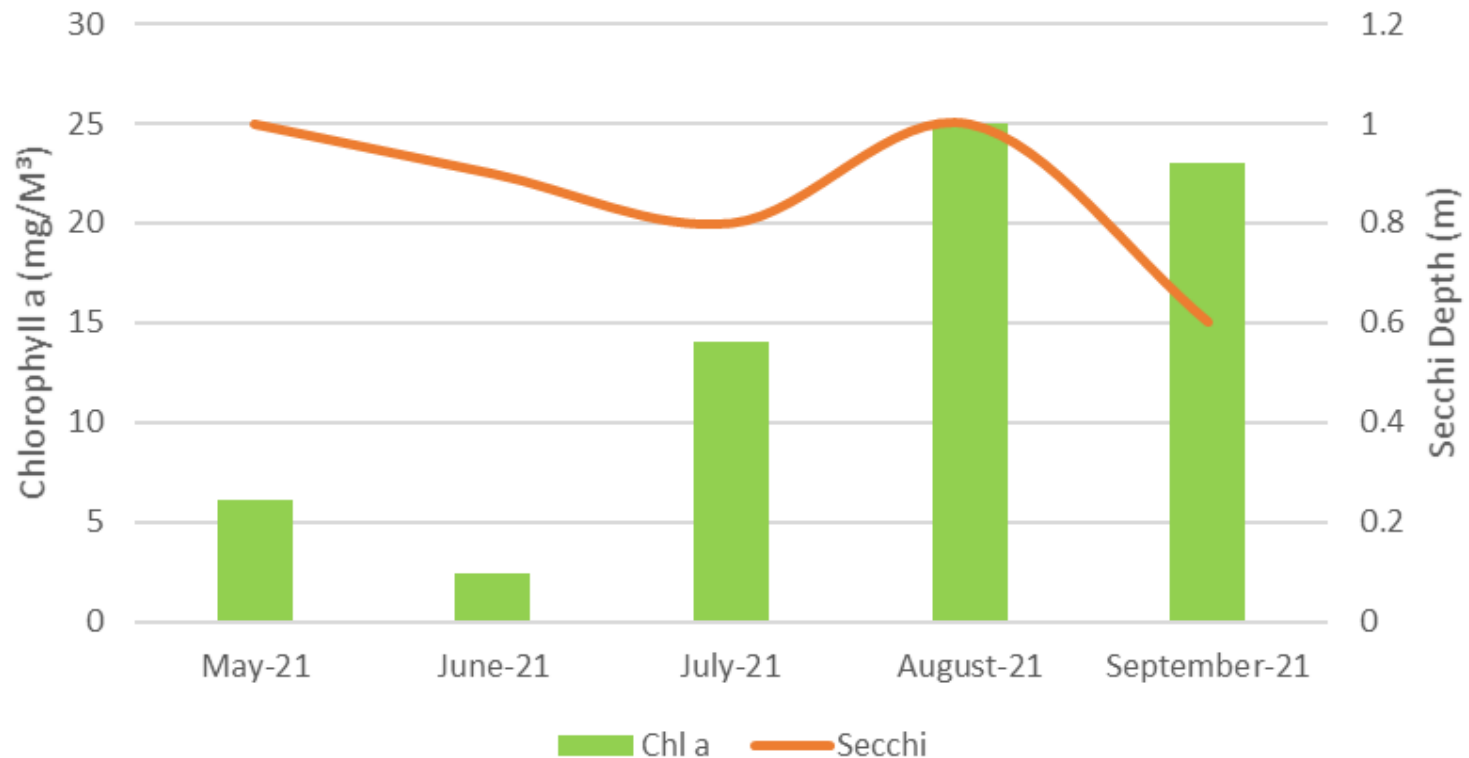
# Midlake TP



# Mid-Lake SRP



## Chlorophyll *a* and Secchi depths in Sleepy Hollow Lake, 2021

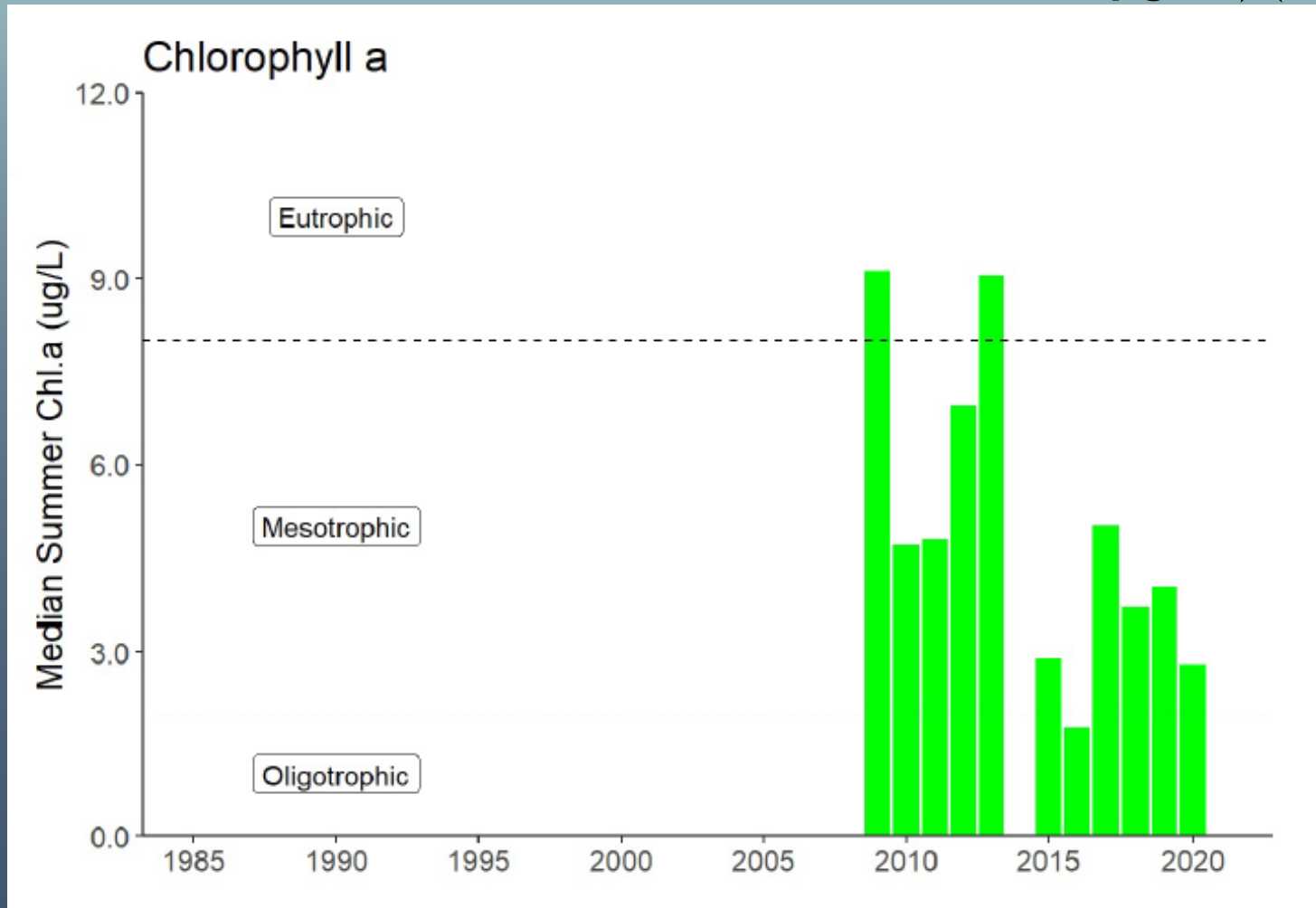


**2021 Seasonal average = 14.1 mg/M<sup>3</sup>**

**2021 Season median = 14 mg/M<sup>3</sup>**



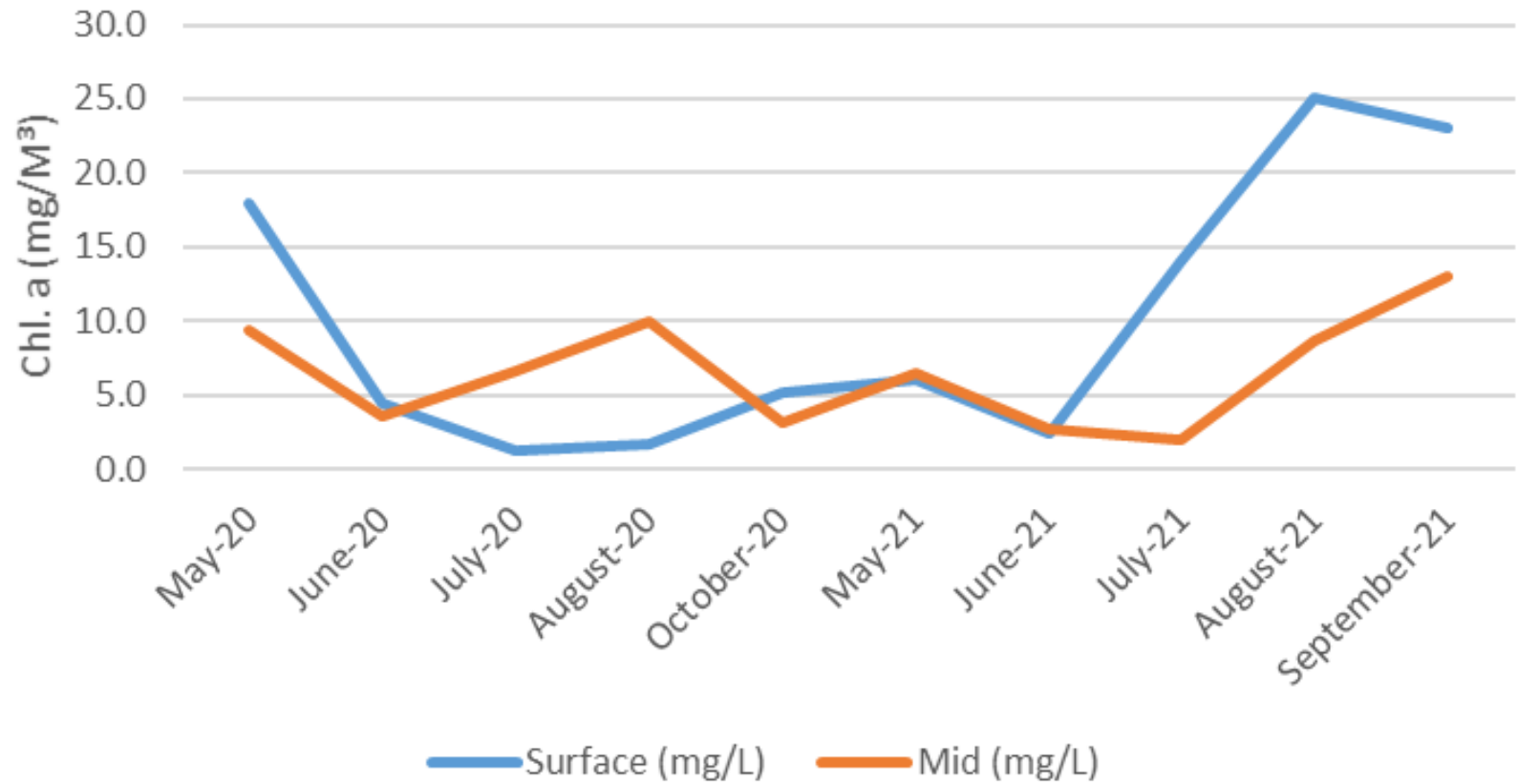
2021: 14  $\mu\text{g/L}$  ★



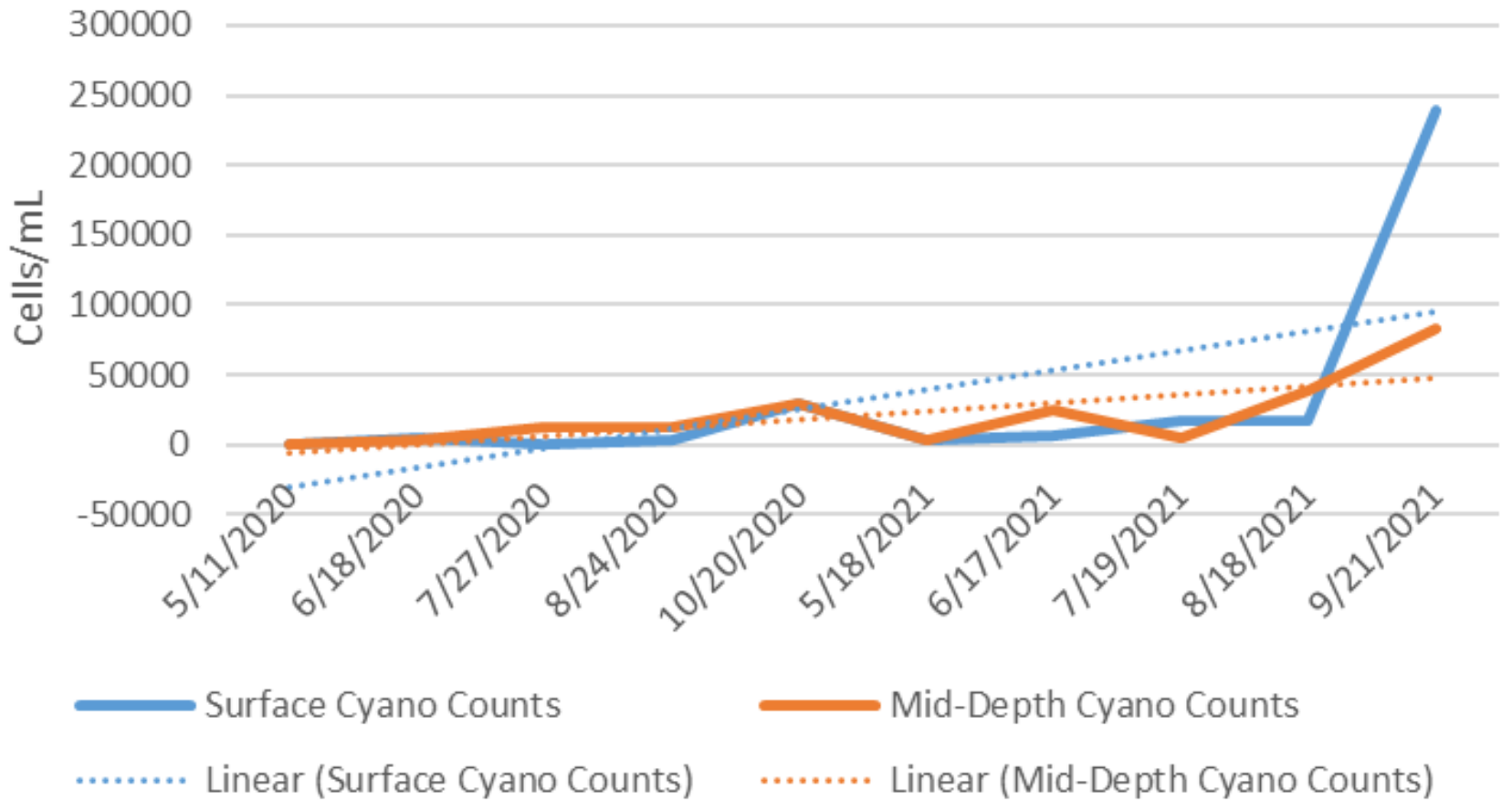
NYDEC – CSLAP Report – Sleepy Hollow Lake, 2020

1  $\mu\text{g/L}$  = 1  $\text{mg/m}^3$

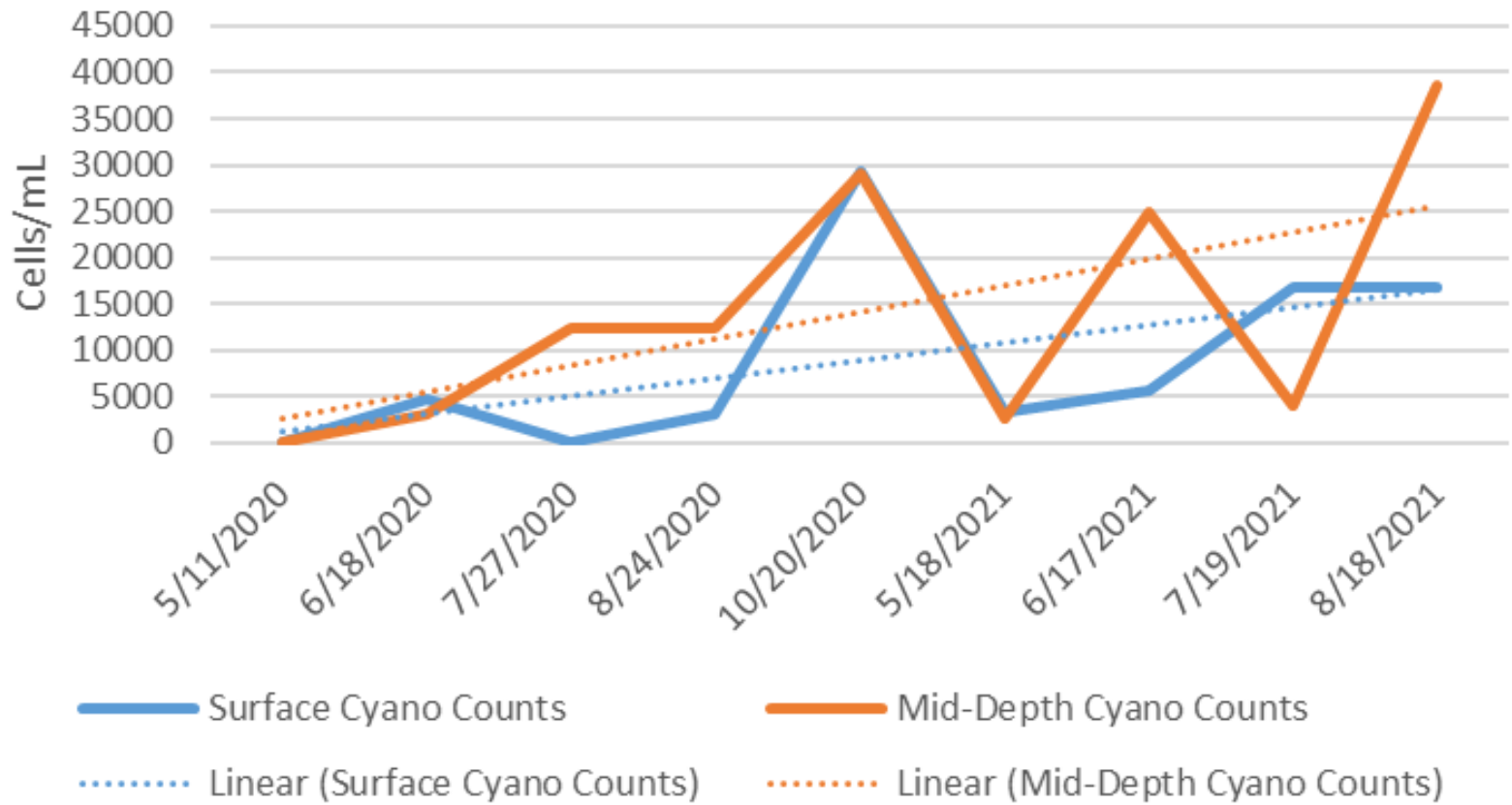
# Midlake Chl. a



# Cyanobacteria Counts over time



# Cyanobacteria Counts over time



# 2021 Monitoring Notes: Plants and Fish

- ✓ Recent concerns involving SAV (Submerged Aquatic Vegetation) treatments and fish habitat
- ✓ Eurasian Watermilfoil populations have remained largely controlled in treatment areas
- ✓ Brittle Naiad is still problematic
- ✓ HSI study results suggest that habitat is overall optimal for largemouth bass, fair for smallmouth bass.
- ✓ Fisheries survey suggests issues with alewife populations and lacking early-to-mid-life bass and crappie size class populations.
- ✓ Zebra Mussels appear to be in “bust” phase – further observation/monitoring may be helpful

# SAV: Submerged Aquatic Vegetation

Native



Nuisance



Invasive



# SAV: Submerged Aquatic Vegetation

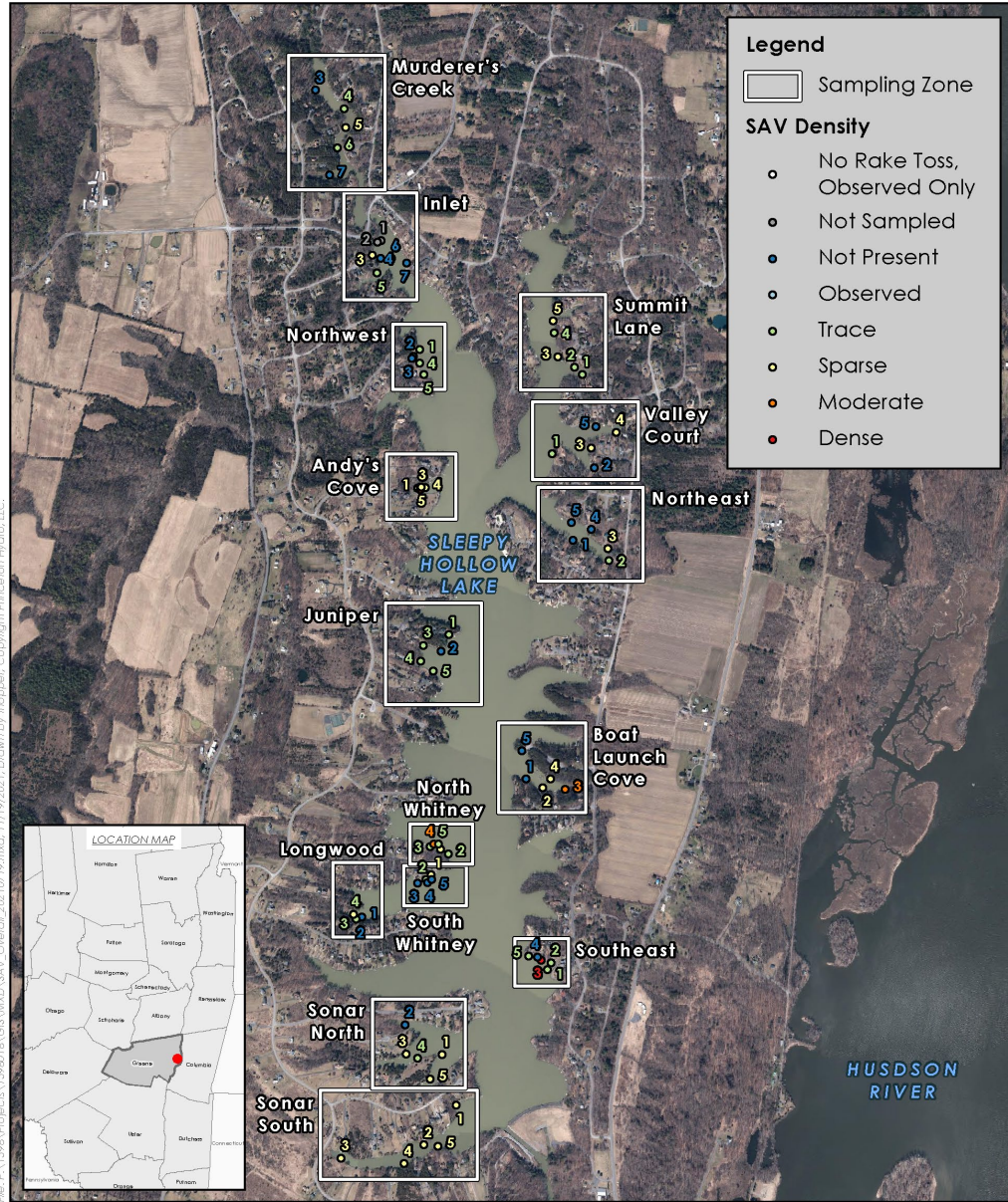
## Native

- ✓ Water Stargrass
- ✓ Sago Pondweed
- ✓ Longleaf Pondweed
- ✓ Tapegrass

## Invasive

- ✓ Eurasian Watermilfoil
- ✓ Brittle Naiad
- ✓ Curlyleaf Pondweed
- ✓ Water Chestnut





File: P:\1598\Projects\1598\GIS\MD3\_SAV\_Overview\_20210719.mxd, 11/19/2021, Created by: R. Hopper, Copyright Princeton Hydro, LLC.

NOTES:  
 1. SAV surveys performed by Princeton Hydro, density point locations are approximate.  
 2. 2016 orthometry obtained from the New York State GIS Clearinghouse: [gis.ny.gov](http://gis.ny.gov)

Map Projection: NAD 1983 StatePlane New York East FIPS 3101 Feet

## SAV DENSITY MAP

### 07/19/21

2021 SAV MAPPING  
 SLEEPY HOLLOW LAKE  
 TOWNS OF ATHENS AND COXSACKIE  
 GREENE COUNTY, NEW YORK



[www.PrincetonHydro.com](http://www.PrincetonHydro.com)



[PRINCETONHYDRO.COM](http://PRINCETONHYDRO.COM)



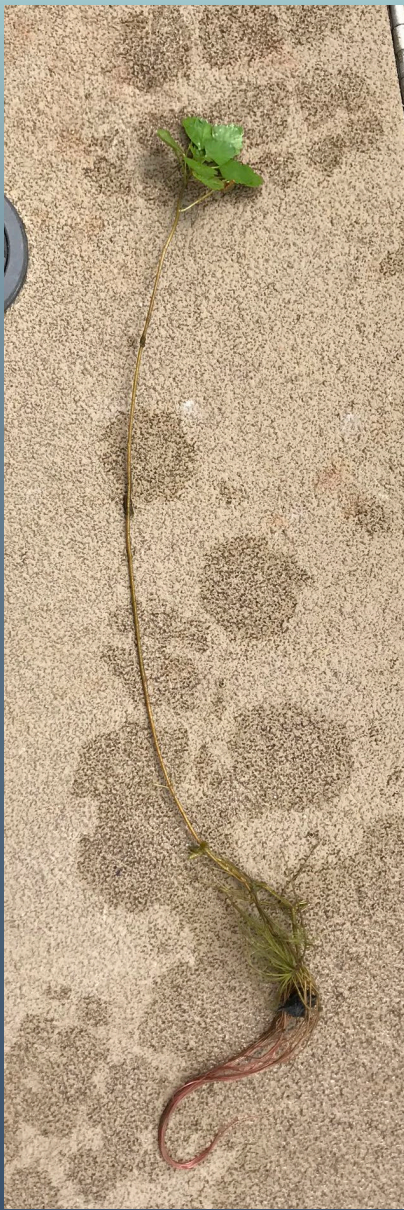


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# Opinions about SAV may vary!

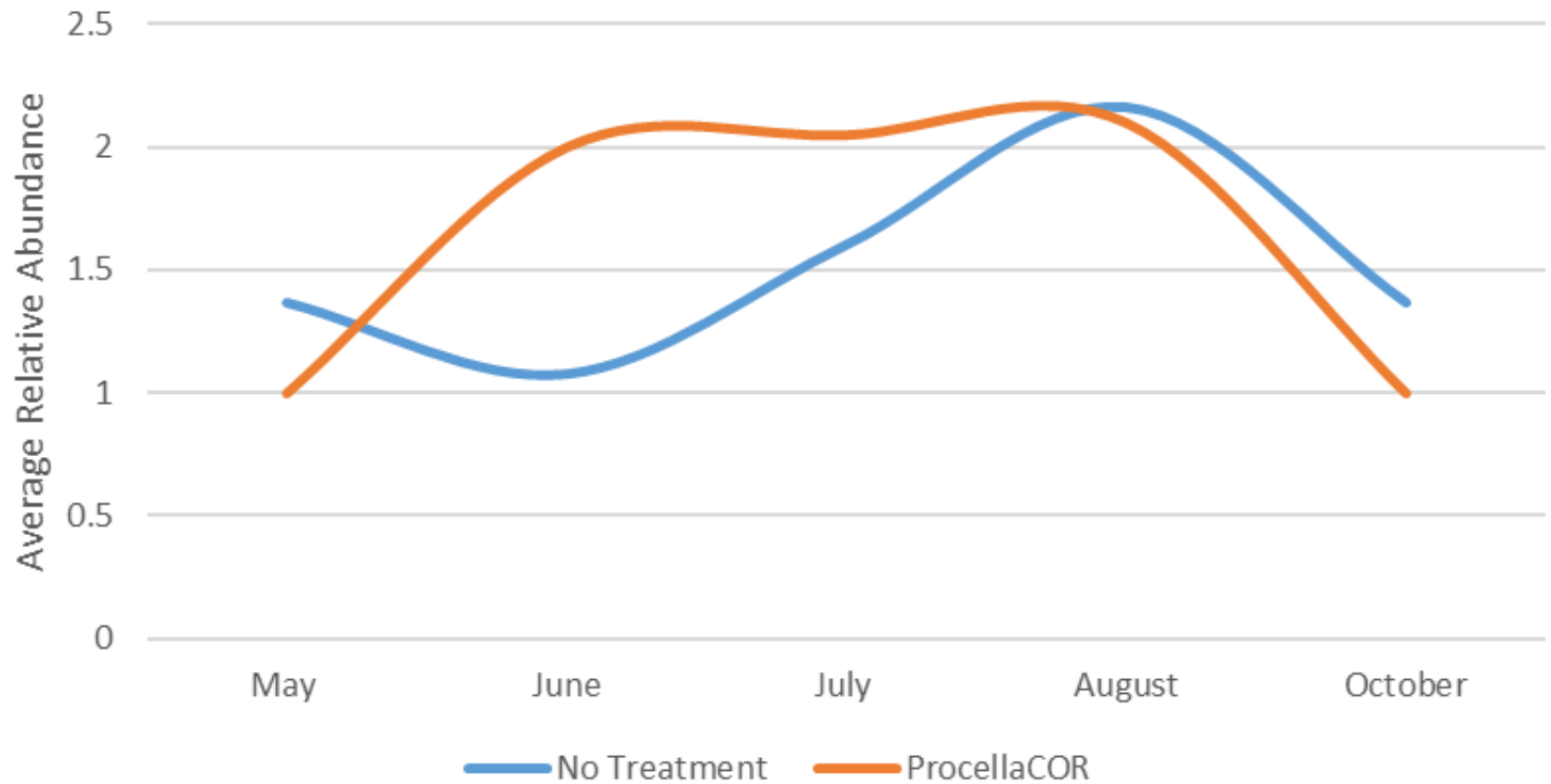
- ✓ Swimmers and boaters typically want them gone
- ✓ Anglers don't want to see them go
- ✓ Every lake community will have its own specific wants and needs, and the solution may be a compromise



# Most lake users probably would agree that this isn't favorable

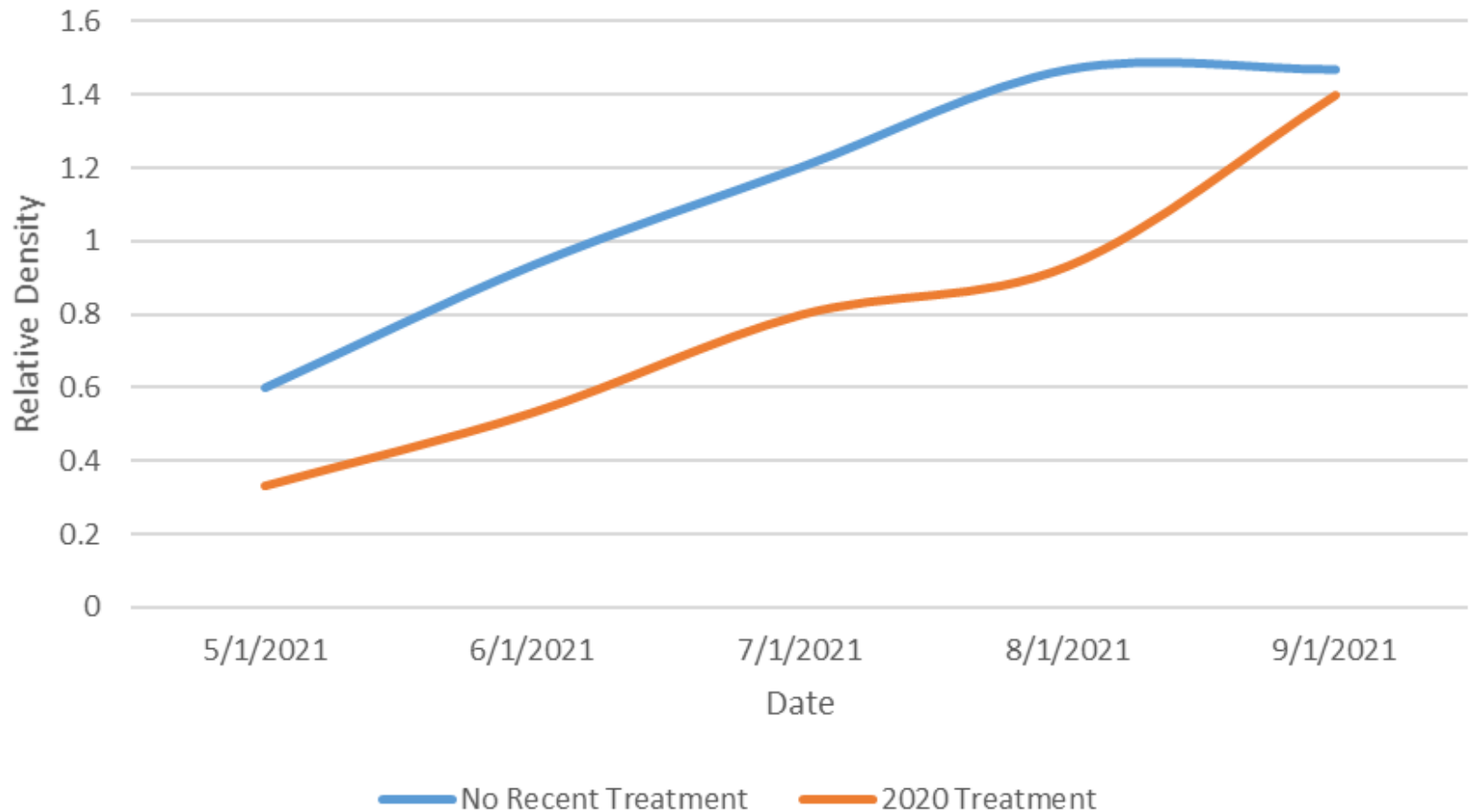


## Relative Abundances of SAV in Treatment and Non-treatment sites, 2020

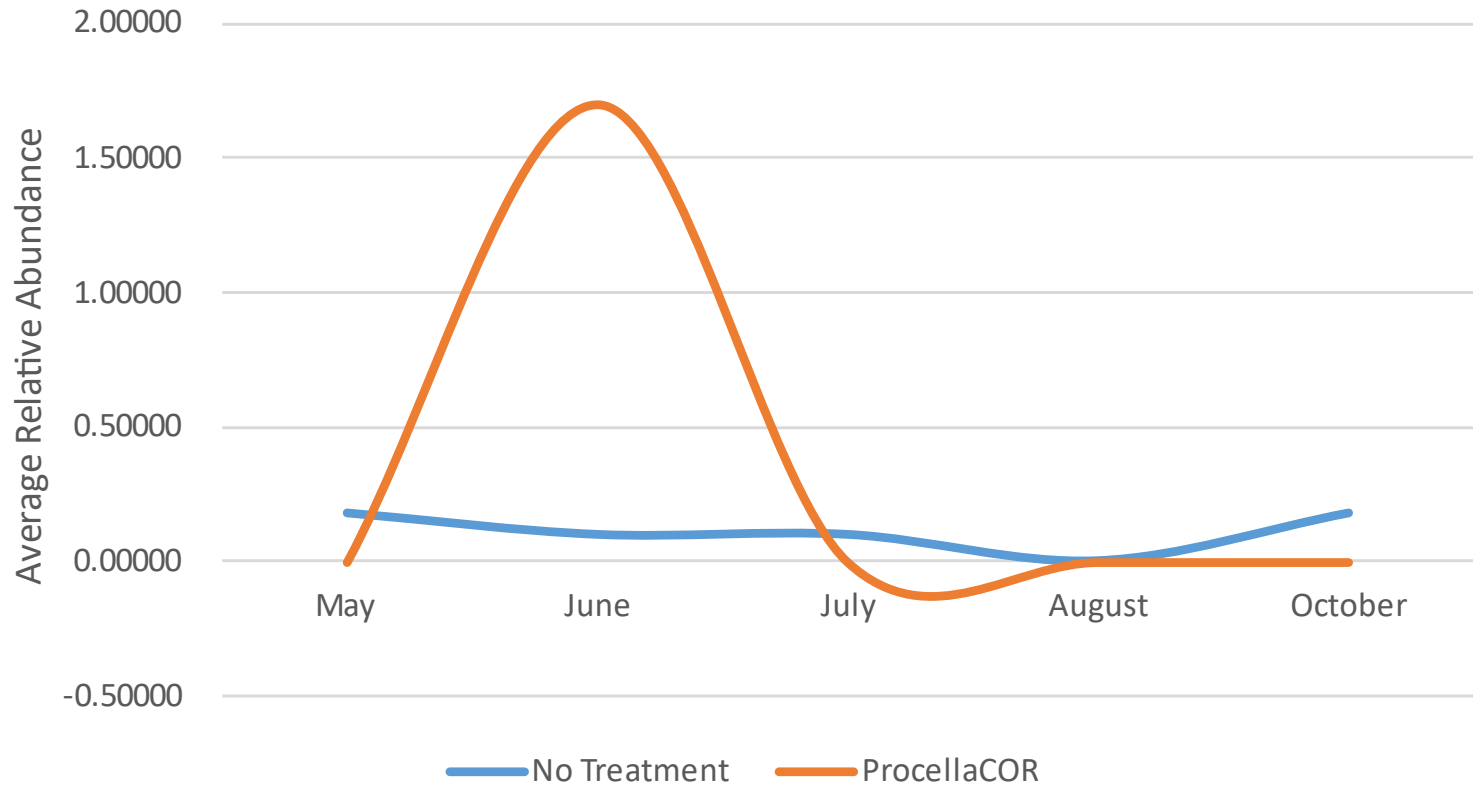




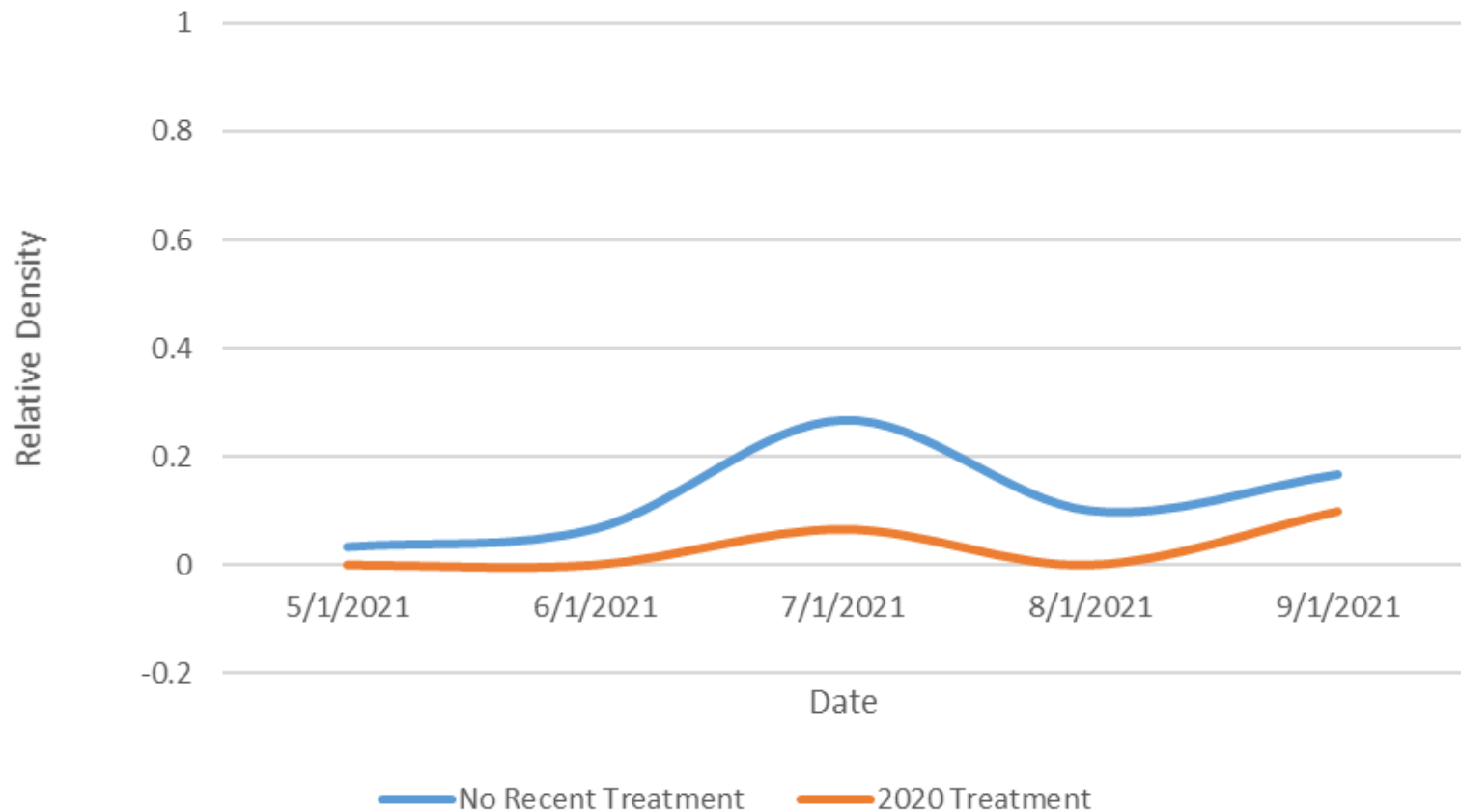
## Relative abundances of all SAV in treatment sites from 2020 and non-treatment sites



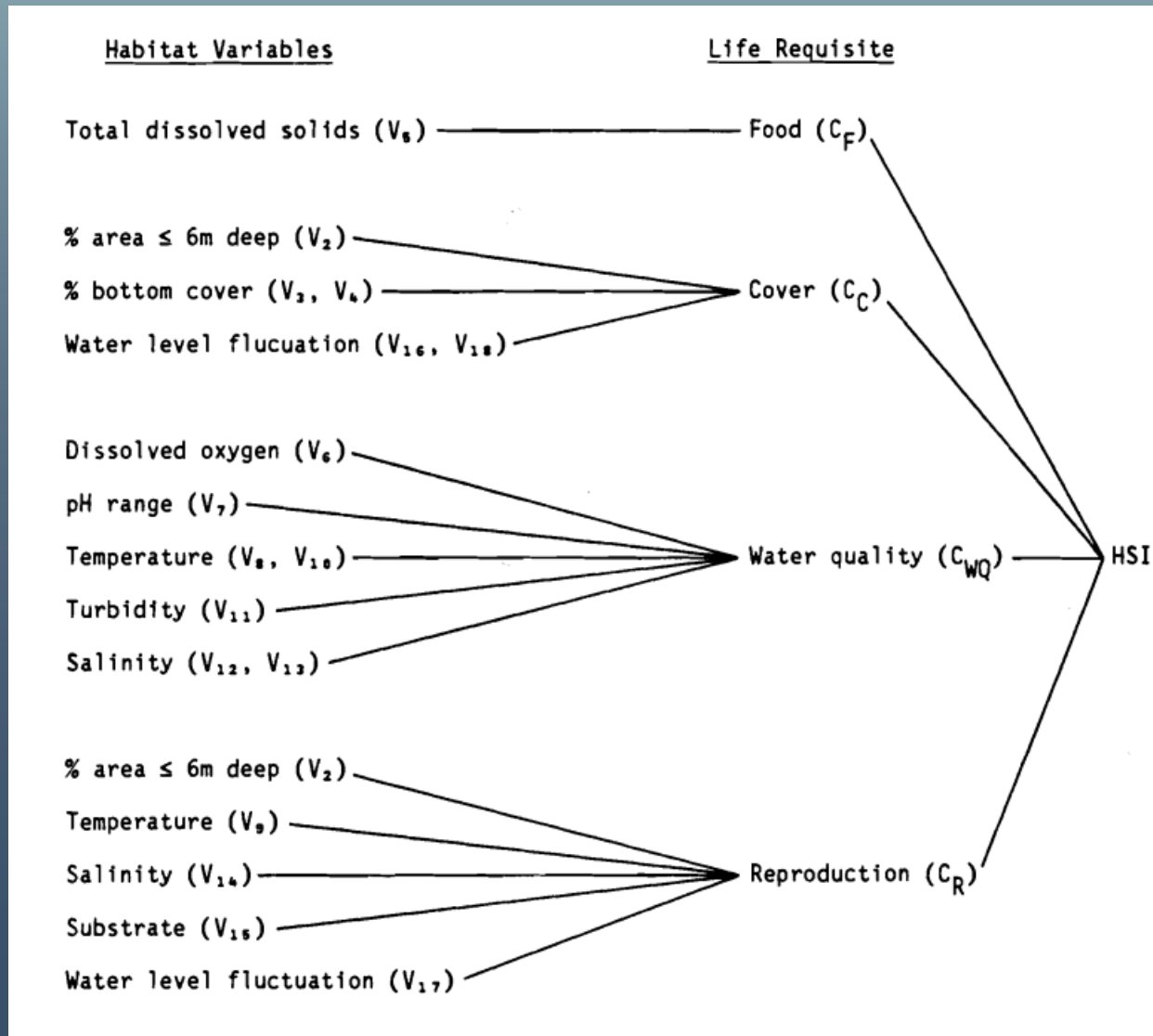
## Relative Abundances of Eurasian Water Milfoil in Treatment and Non-treatment sites, 2020



## 2021 relative average abundances of Eurasian watermilfoil in treatment sites (2020) and non-treatment sites



# Habitat Suitability Index



Stuber, R.J., G. Gebhart, and O.E. Maughn. 1982. Habitat suitability index models: Largemouth bass. U.S. Dept. Int. Fish Wildl. Serv. FWS/OBS-82/10.16. 32 pp.

### HSI results for Sleepy Hollow Lake, 2021

Quadrat	Previous SAV Treatment	Largemouth Bass HSI Result	Smallmouth Bass HSI Result
Northwest	ProcellaCOR®, 2020	0.92	0.69
Northeast	ProcellaCOR®, 2020	0.92	0.70
Southwest	Sonar®, 2018	0.92	0.70
Southeast	None	0.92	0.70
Full Lake	-	0.86	0.49

Edwards, E.A., G. Gebhart, and O.E. Maughan. 1983. Habitat suitability information: Smallmouth bass. U.S. Dept. Int., Fish Wildl. Serv. FWS/OBS-82/10.36. 47 pp.

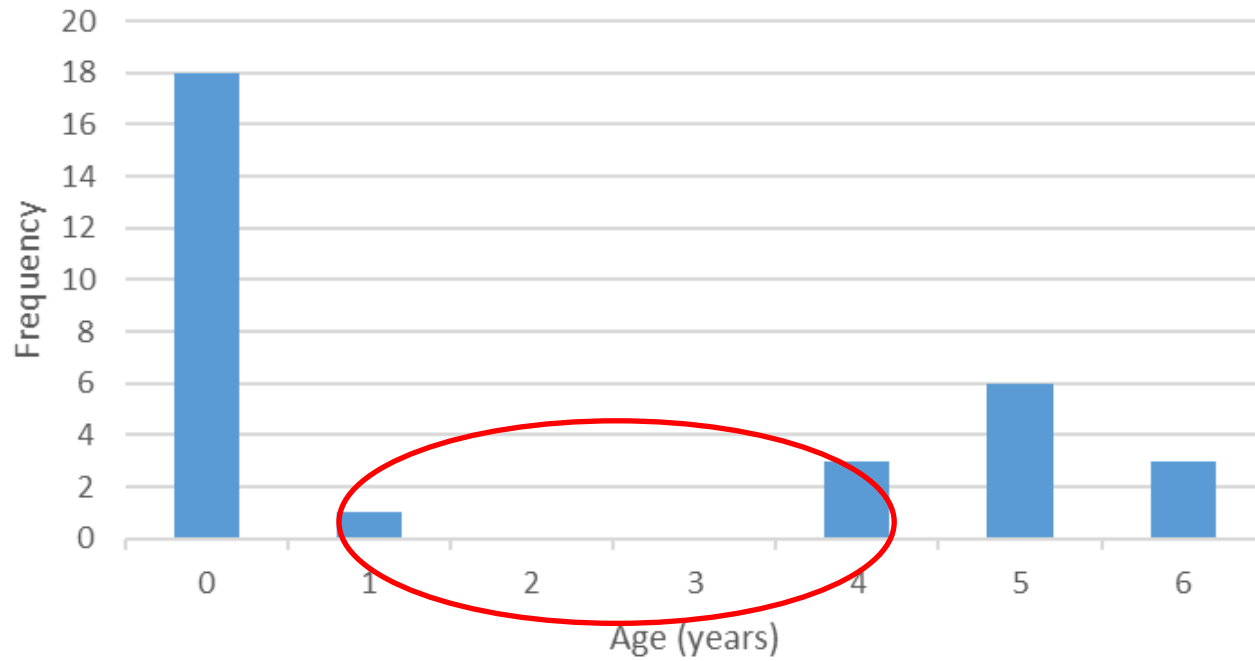


# 2021 Fisheries Survey



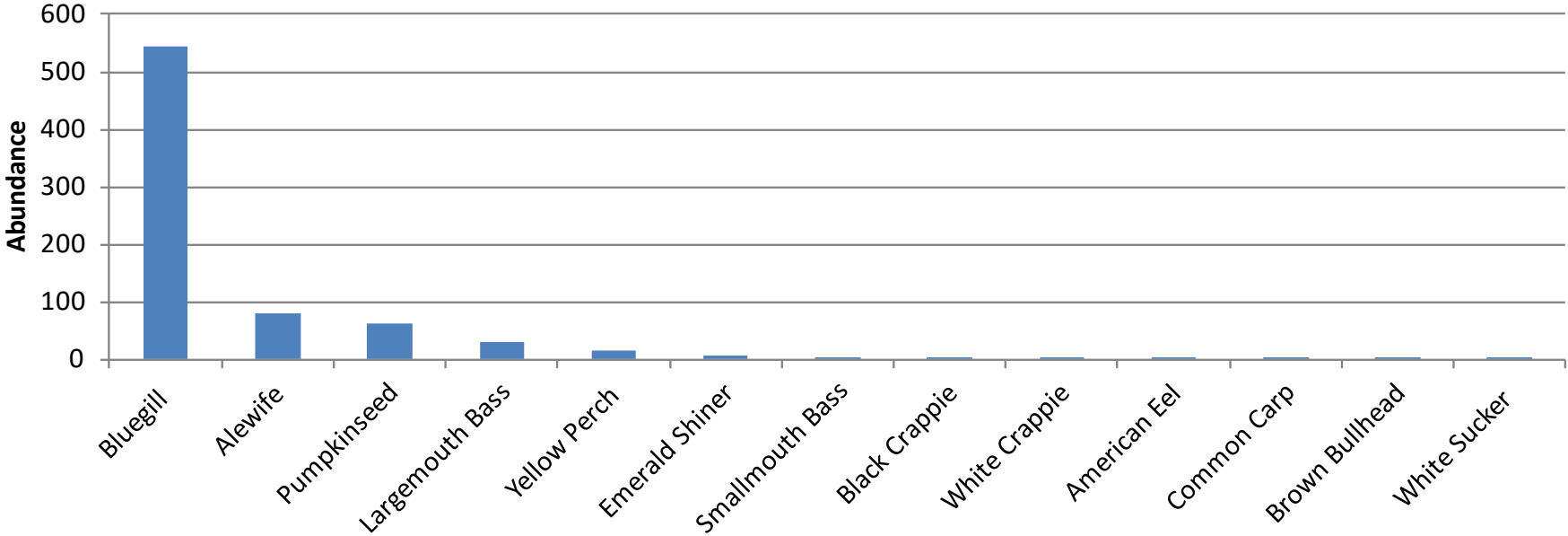


## Age Frequencies of Largemouth Bass



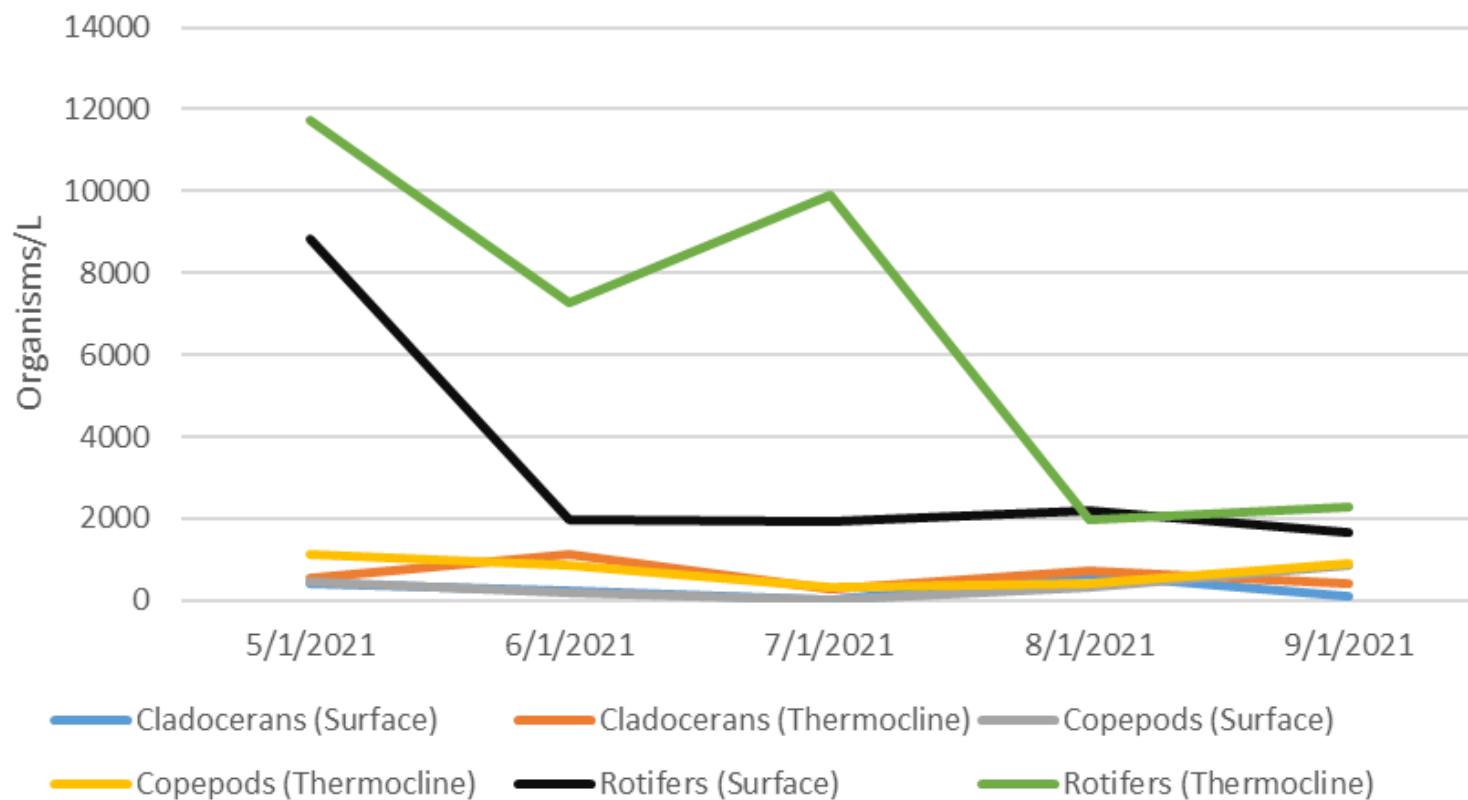
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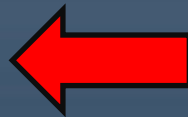
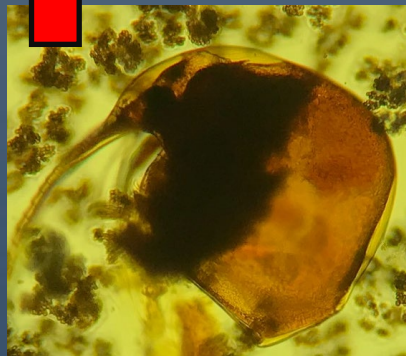
# Abundance by Species





## Mid-Lake Zooplankton





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# What's Next?

- ✓ Continued WQ and SAV monitoring - 2022 growing season
- ✓ Fish Stocking – Early Summer 2022
- ✓ Herbicide Treatments by Solitude – 2022 growing season
- ✓ Continued assessment of angler data

# Other Recommendations

- ✓ Fishery Survey 2025-26 –potentially including a diet study?
- ✓ Habitat Improvement
- ✓ Zebra Mussel Survey
- ✓ Community Plant ID Workshop
- ✓ Macrophyte/Fishery Management Zones
- ✓ Aeration System

# QUESTIONS?



**Chris L. Mikolajczyk, CLM**

**Jesse Smith**

Princeton Hydro, LLC

[cmiko@princetonhydro.com](mailto:cmiko@princetonhydro.com)

[jsmith@princetonhydro.com](mailto:jsmith@princetonhydro.com)

908-507-3999 (Cell)

THANK  
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