The Value of Volunteer Data and the State of Craine Lake

Derek Shea and Dan Stich

State University of New York at Oneonta

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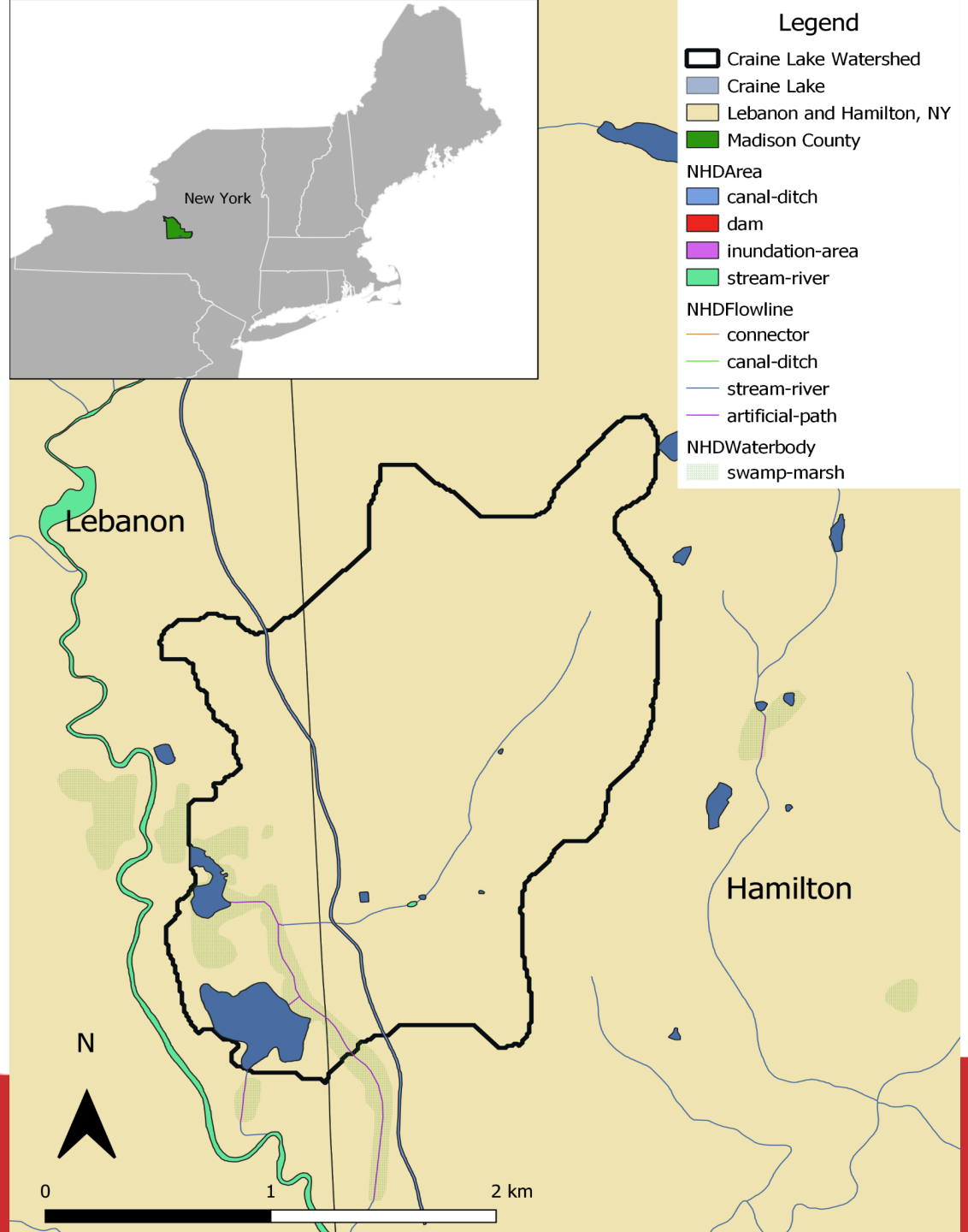
Craine Lake Background

- 26-acre glacial lake in Madison County, NY
- Water level controlled by manmade dam
- Dimictic with spring and fall turnover
- History of aquatic plant management and HABs



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Management History

- **1993**: AquaKleen (2,4-D) application
- **1995**: Triploid grass carp stocking
- **~2006**: Zebra mussels enter Craine Lake
- **2007**: First documented HAB (*Microcystis aeruginosa*)
- **2008**: Craine Lake used as a test site for NYSDEC HAB reporting program
- **2009**: Featured as a case study in the book, *Diet for a Small Lake*
- **2010-2019**: Mechanical harvesting

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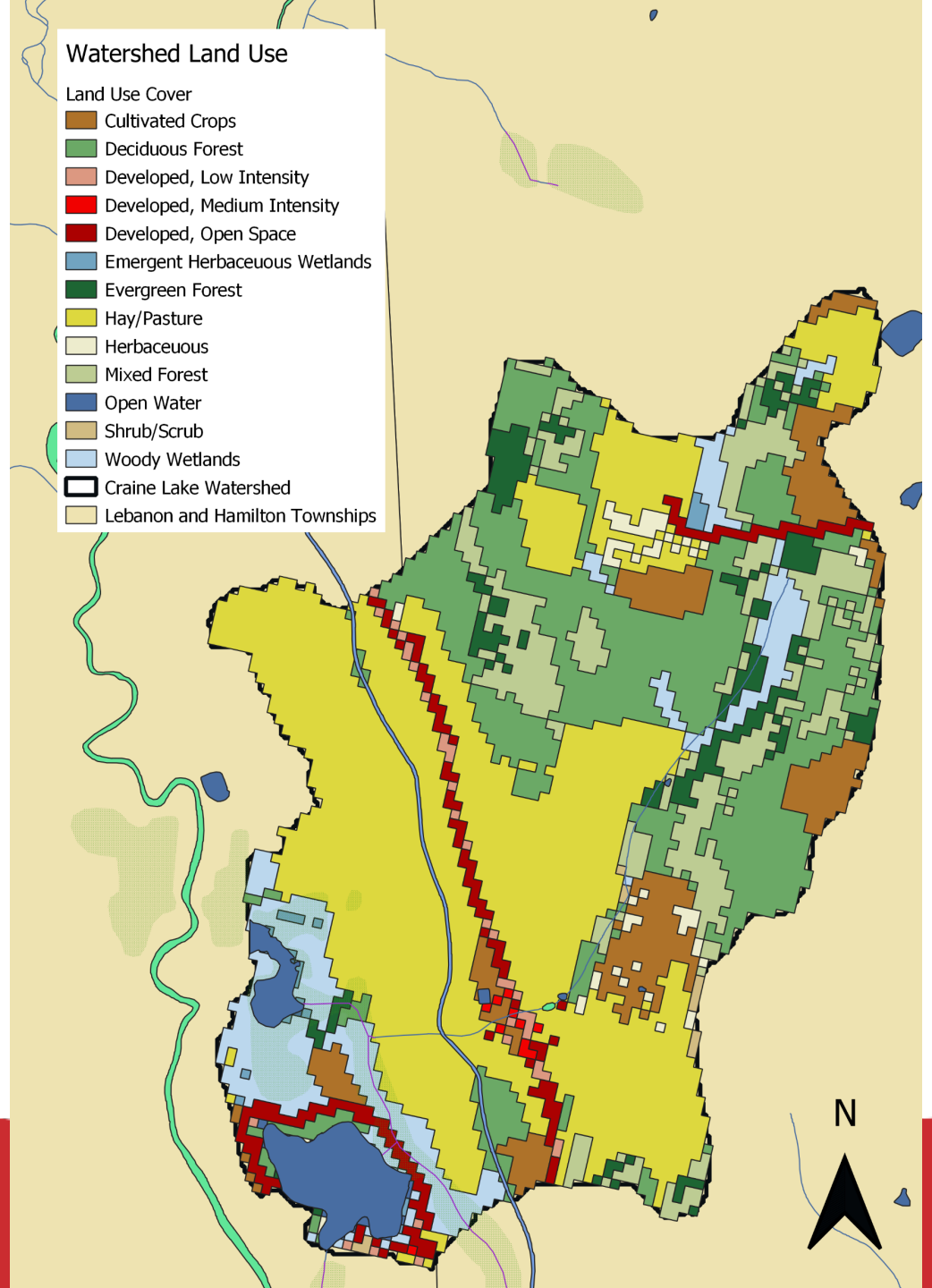
Land Use Coverage

- 37:1 watershed to lake ratio
- 47.5% agricultural, 33% forested, 9% wetland, and 4.3% developed



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Sample Collection Methods

- CSLAP = Citizens Statewide Lake Assessment Program
- Volunteers collect water samples to be sent to NYSDEC approved labs
- **35 years** since Craine Lake started participating in the program!

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Water Quality Parameters

- Water temperature
- Surface nitrogen
- Surface phosphorus
- Specific conductance
- Chlorophyll-*a*
- Secchi depth

```
# Total phosphorus ----
# ... Filter the data ----
phoslap <- craineslap %>%
  filter(characteristic_name == "PHOSPHORUS, TOTAL" &
           information_type %in% c("Epilimnion_Sample")
         )
#, "Bottom_Sample"

glimpse(phoslap)

# Change the name of the result value column
# to the desired water quality parameter so it's easy
phoslap$tp <- phoslap$rslt_result_value

# ... Analysis ----
null_mod <- lm(log(tp) ~ 1, data = phoslap)
month_mod <- lm(log(tp) ~ month, data = phoslap)
year_mod <- lm(log(tp) ~ year, data = phoslap)
month_plus_year_mod <- lm(log(tp) ~ month + year, data = phoslap)
month_int_year_mod <- lm(log(tp) ~ month * year, data = phoslap)
```

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Statistical Analysis Methods

- Extracted Craine CSLAP file from NYSDEC as a .csv file and read it into the open-source program, *R Studio*
- Models were created for each water quality parameter
  - **Null mod** = no correlation
  - **Month mod** = seasonal trend
  - **Year mod** = yearly trend
  - **Month plus year mod** = separate trends of year & month
  - **Month and year interactive mod** = seasonal & yearly trends

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Model Selection

- The best model was selected based on AIC selection
- Observed data was plotted against model predictions

	K	AICc	Δ AICc	AICcWt	Cum.Wt	LL
Month + Year	8	-257.96	0	0.99	0.99	137.4
Month*Year	13	-248.53	9.43	0.01	1	138.34
Year	3	-219.5	38.47	0	1	112.82
Month	7	-204.44	53.52	0	1	109.54
Null	2	-190.52	67.45	0	1	97.29

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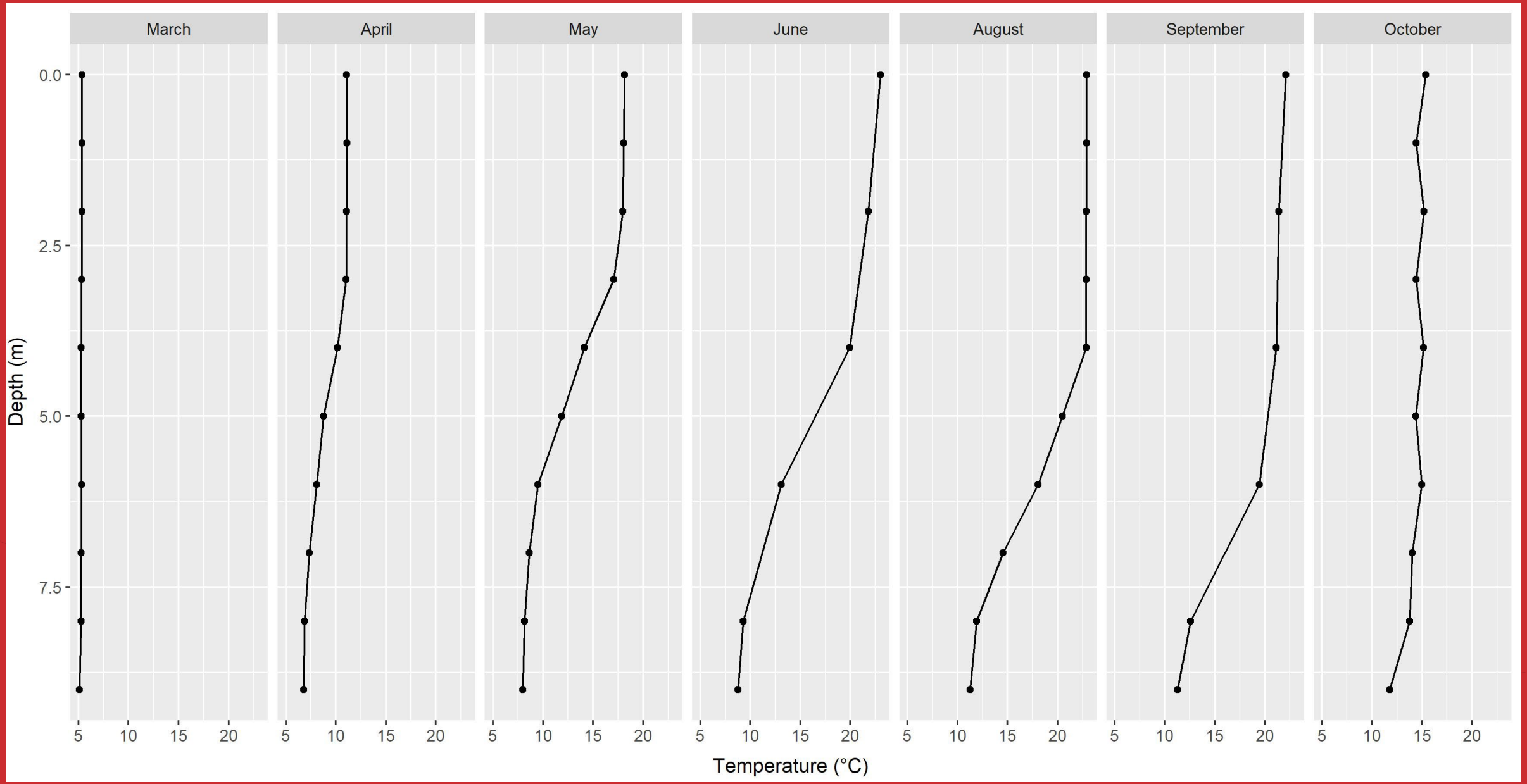
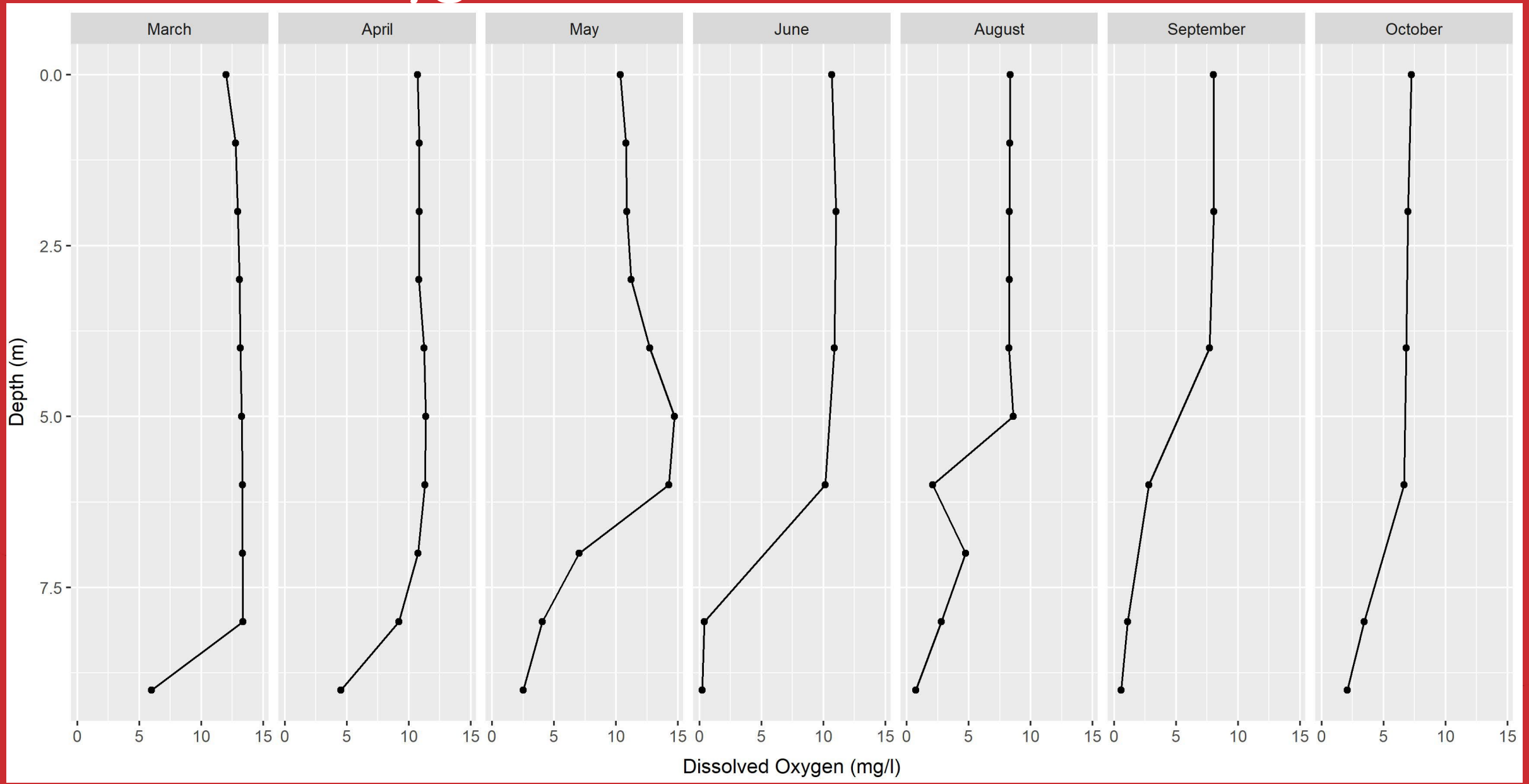
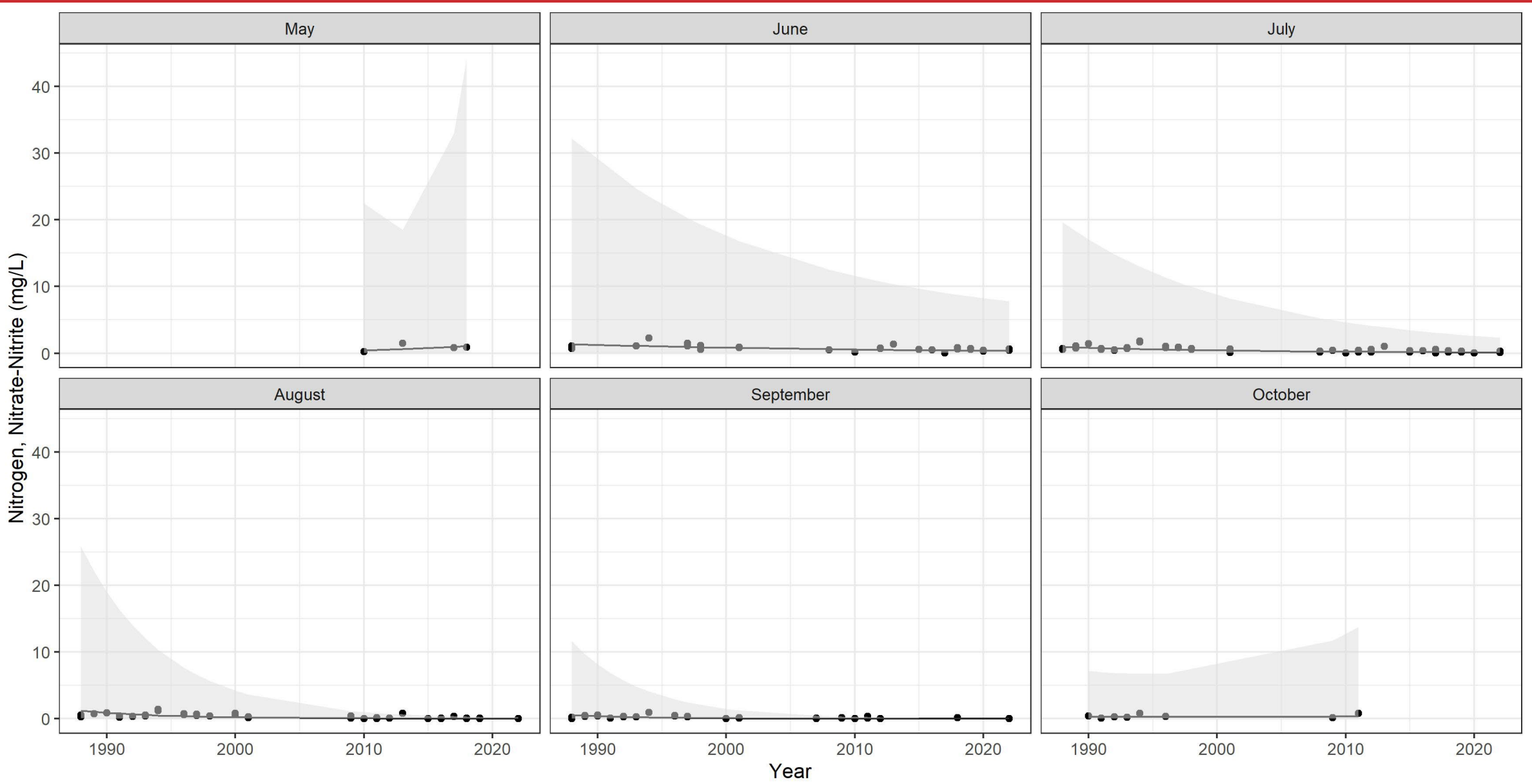
A Year on Craine Lake



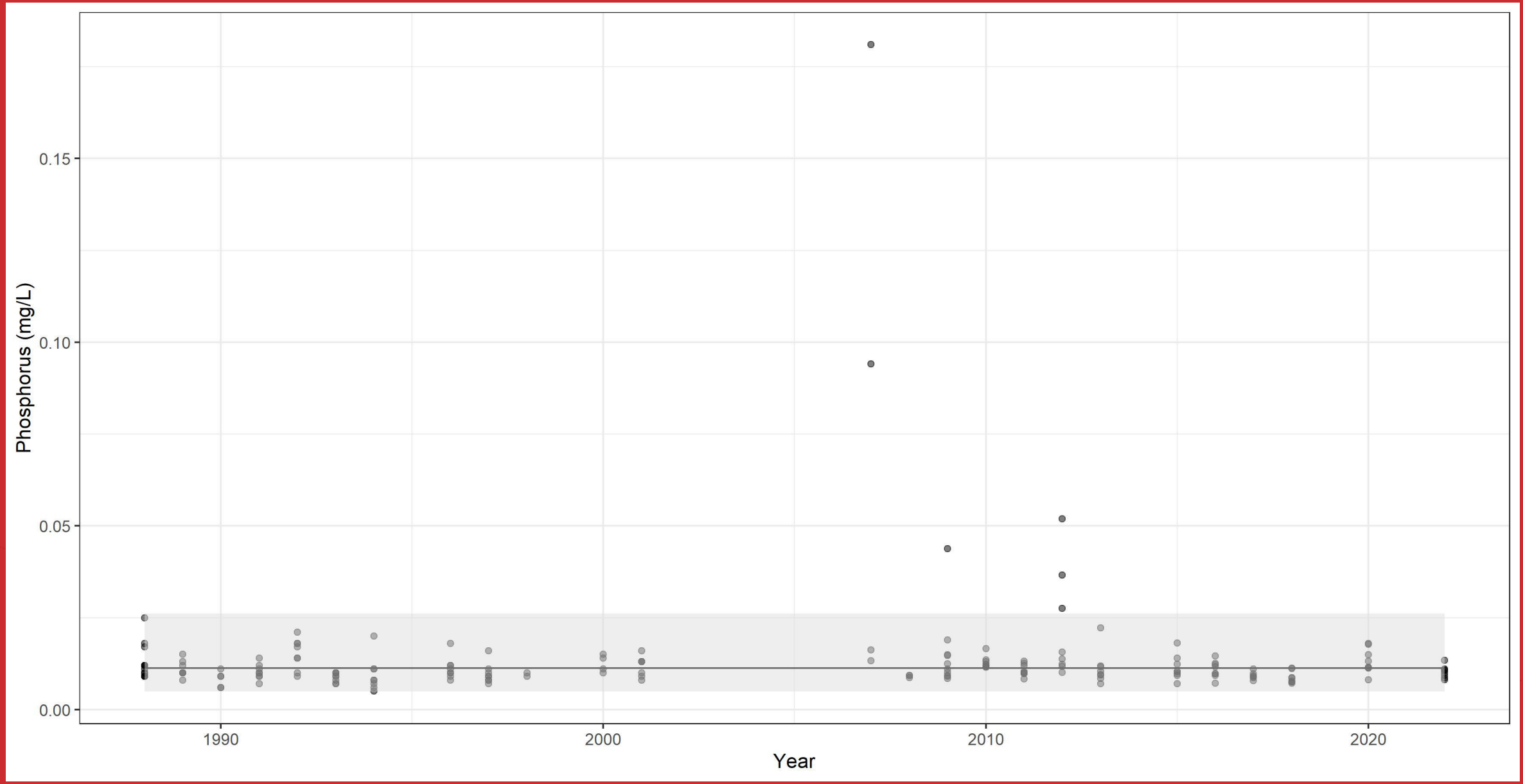
Dissolved Oxygen



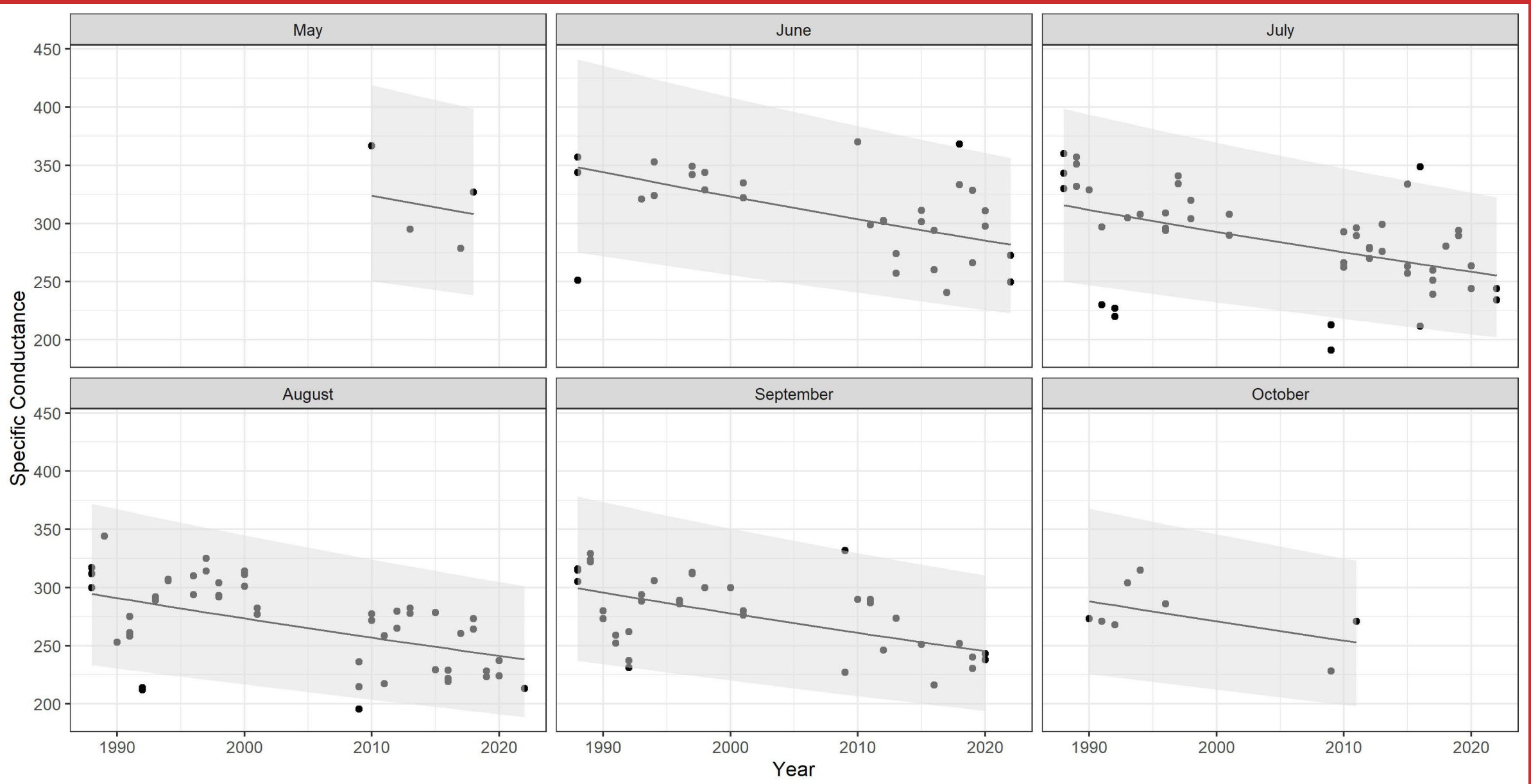
Surface Nitrogen, Nitrate-Nitrite



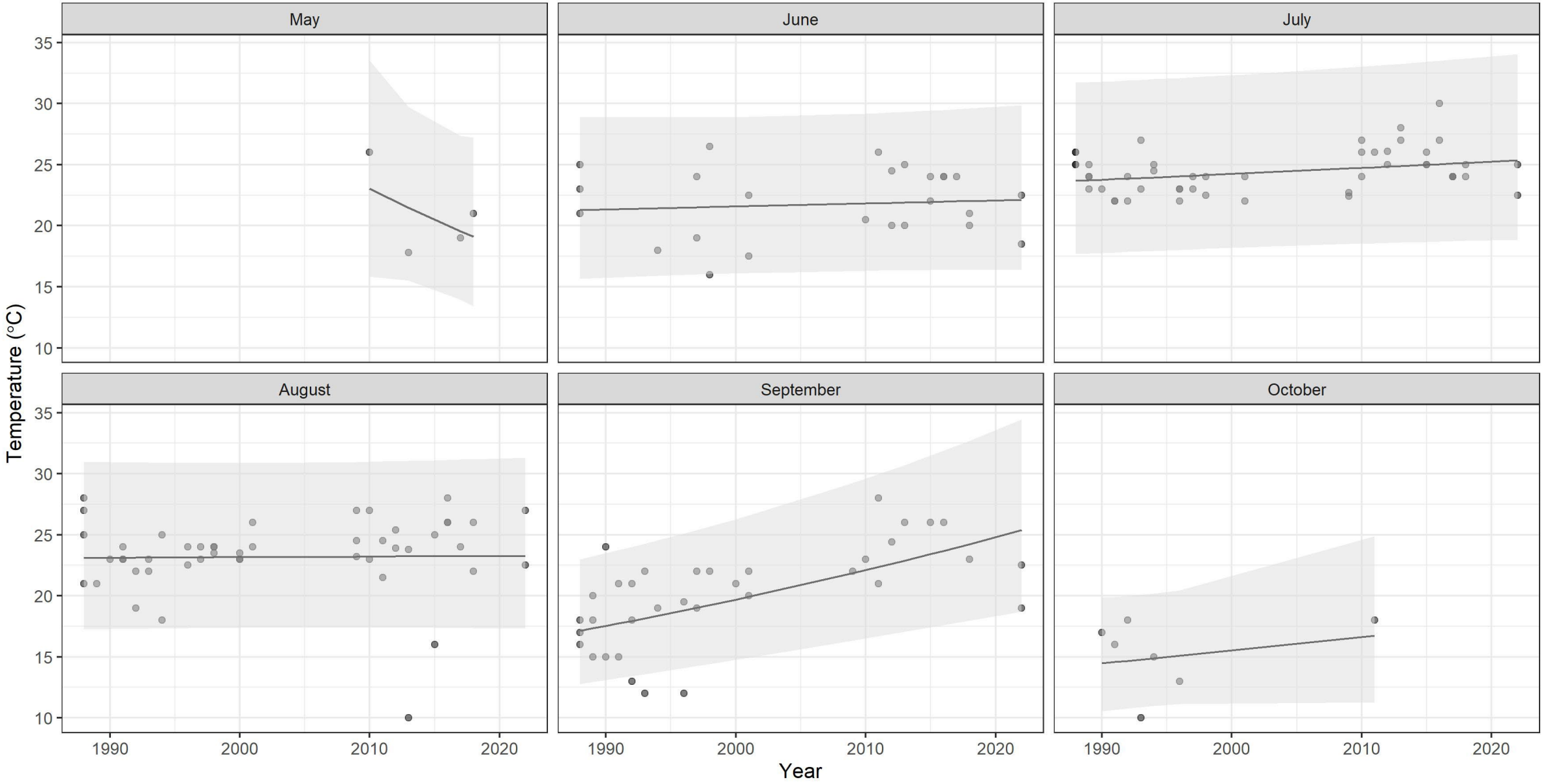
Surface Phosphorus



Specific Conductance



Surface Water Temperature

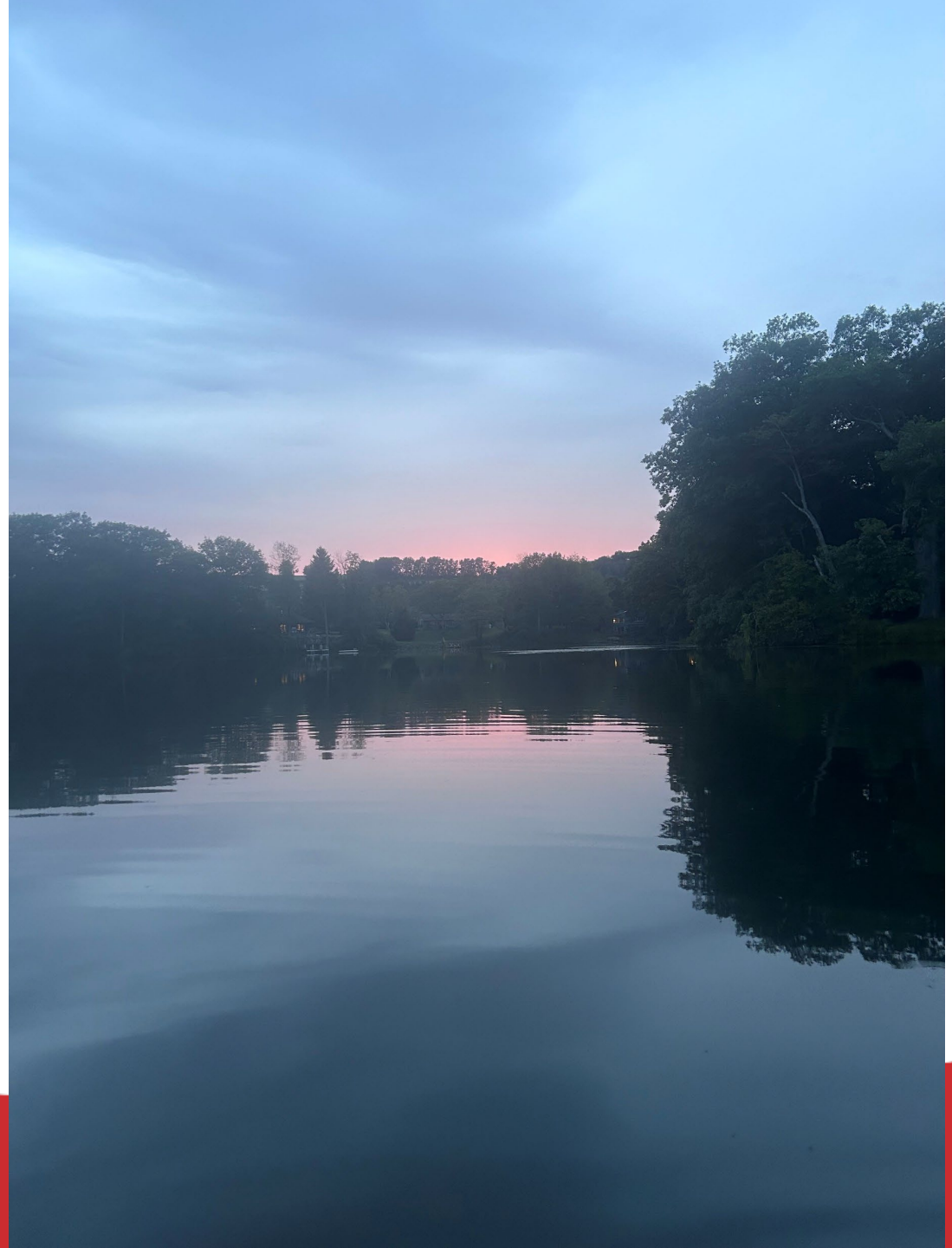


Trophic Status Index (TSI)

- Indicators of system productivity in aquatic environments

- Standardizes water quality parameters into a scale that classifies the state of the lake

- Oligotrophic: <30
- Mesotrophic: >30 but <50
- Eutrophic: >50



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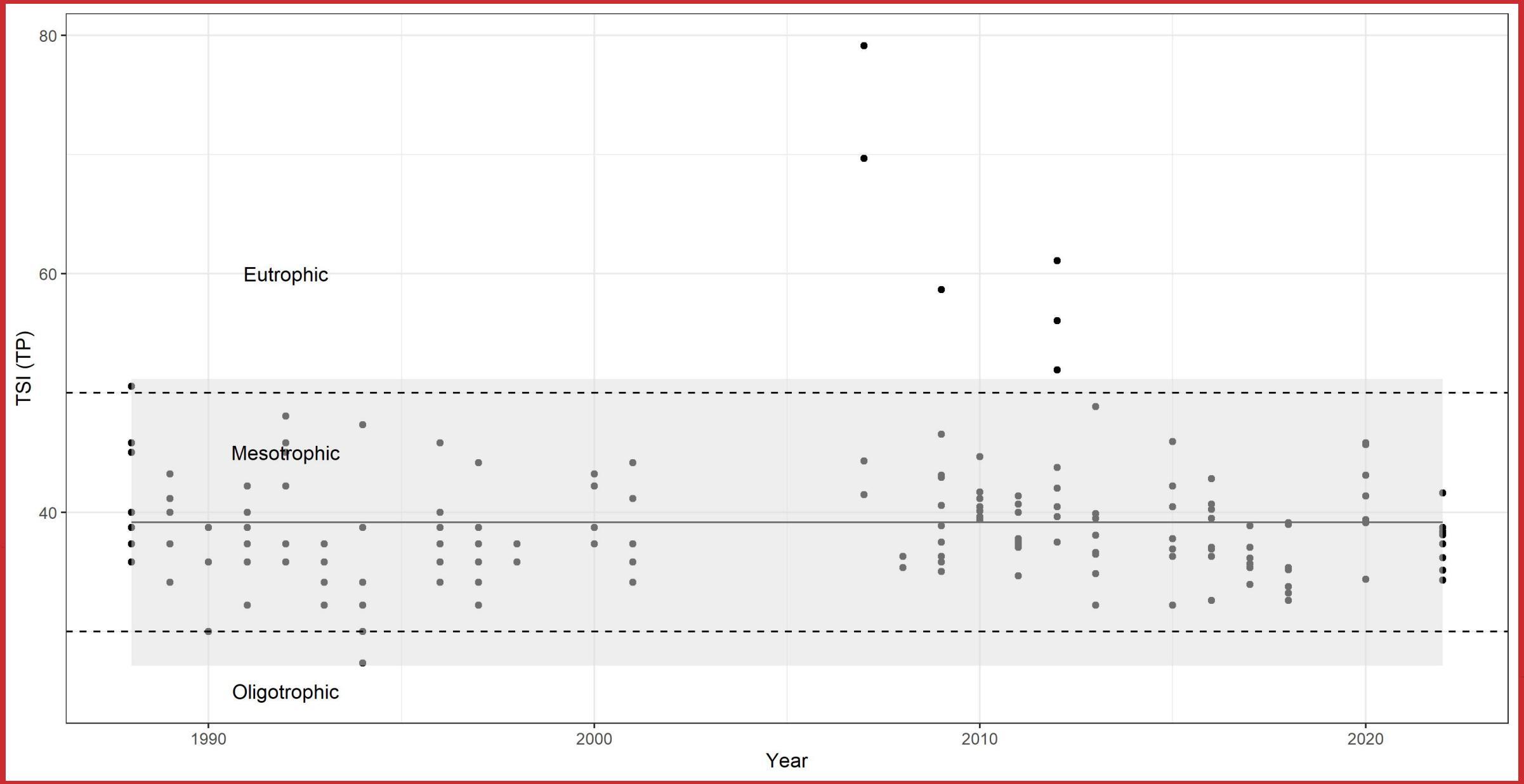
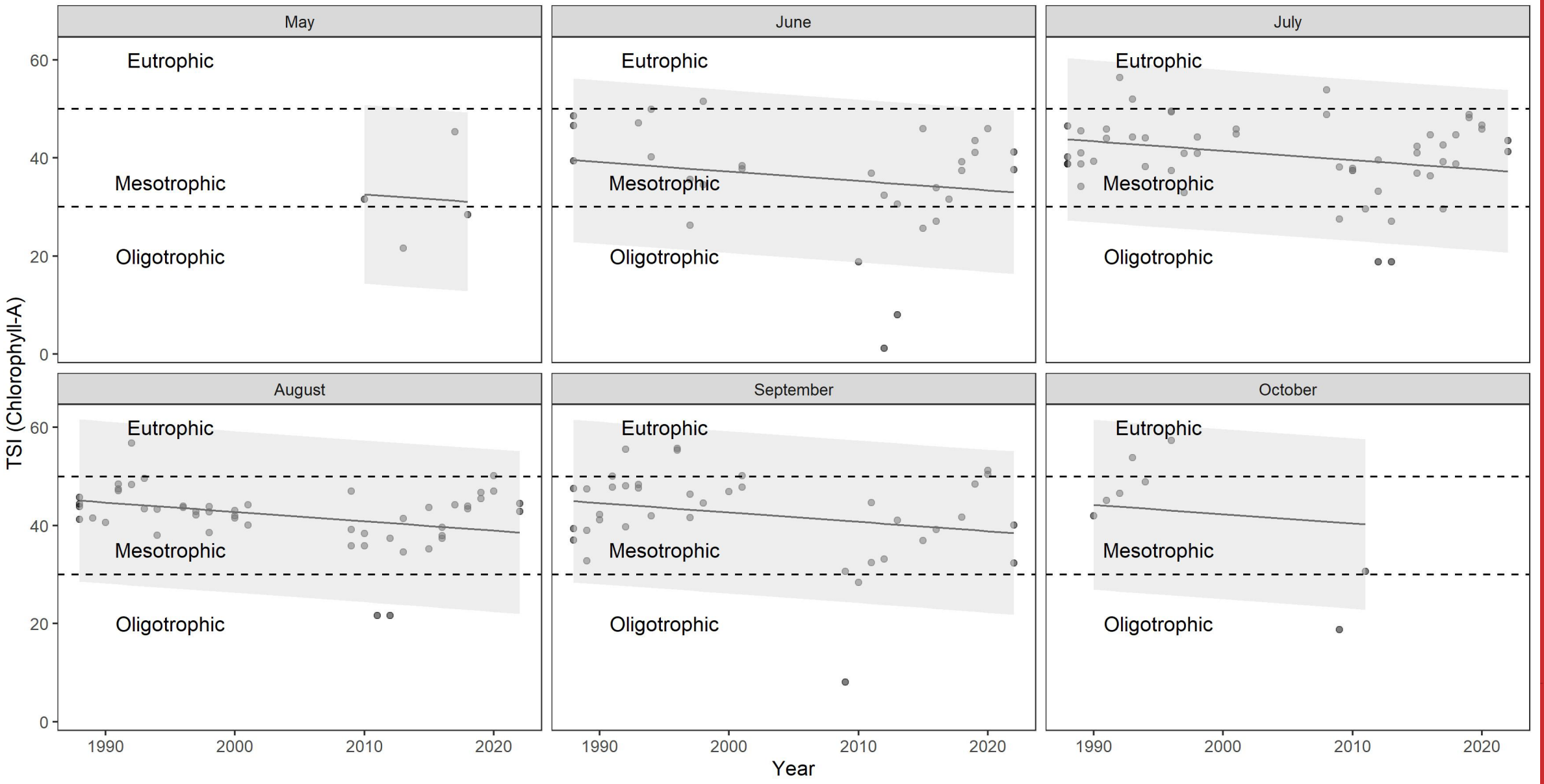
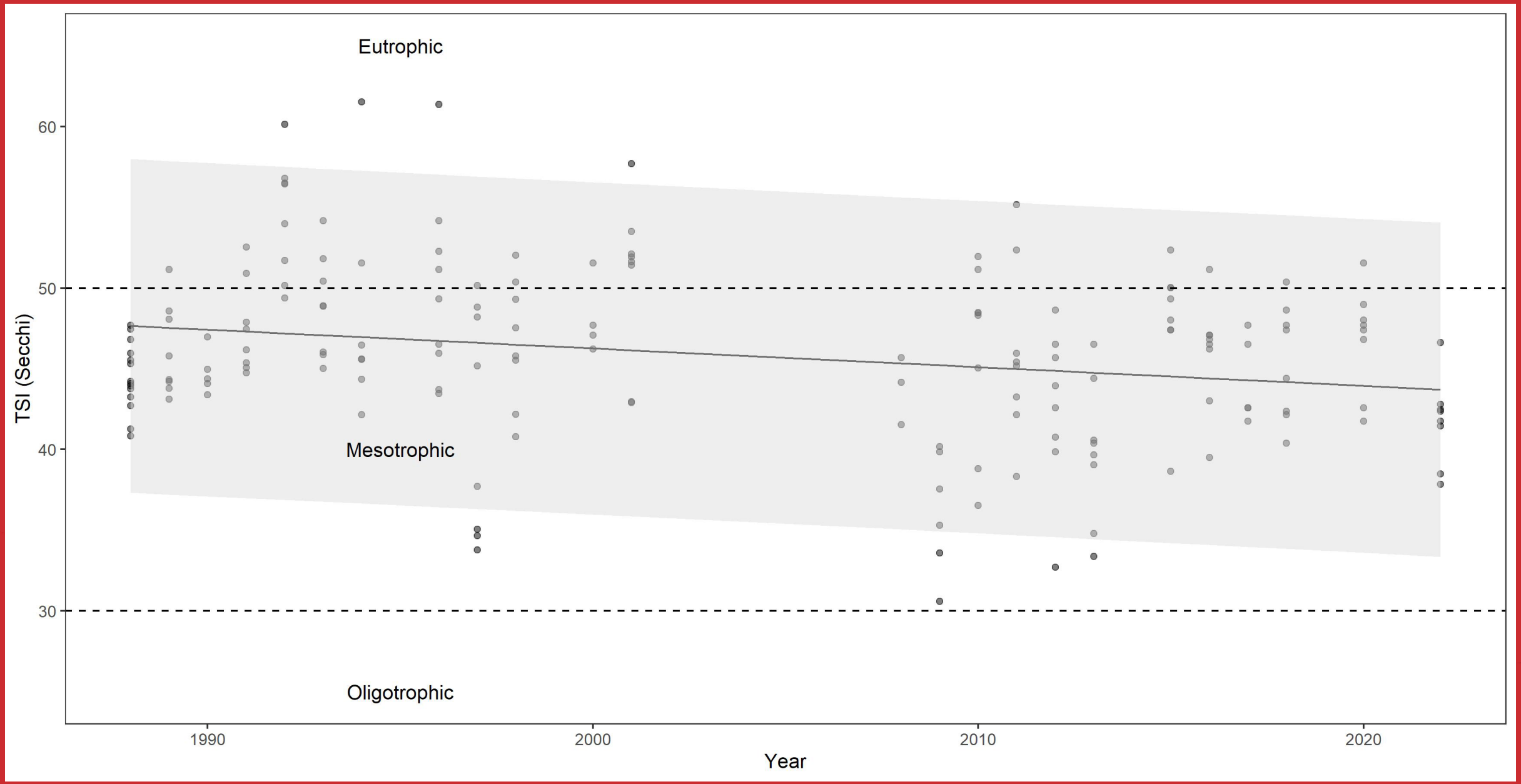
TSI: Phosphorus



TSI: Chlorophyll-*a*



TSI: Secchi Depth



Potential Causes

- Triploid grass carp stocking led to changes in aquatic macrophyte community
- Zebra mussels increasing the filtration of water could impact specific conductance and nitrogen in water column

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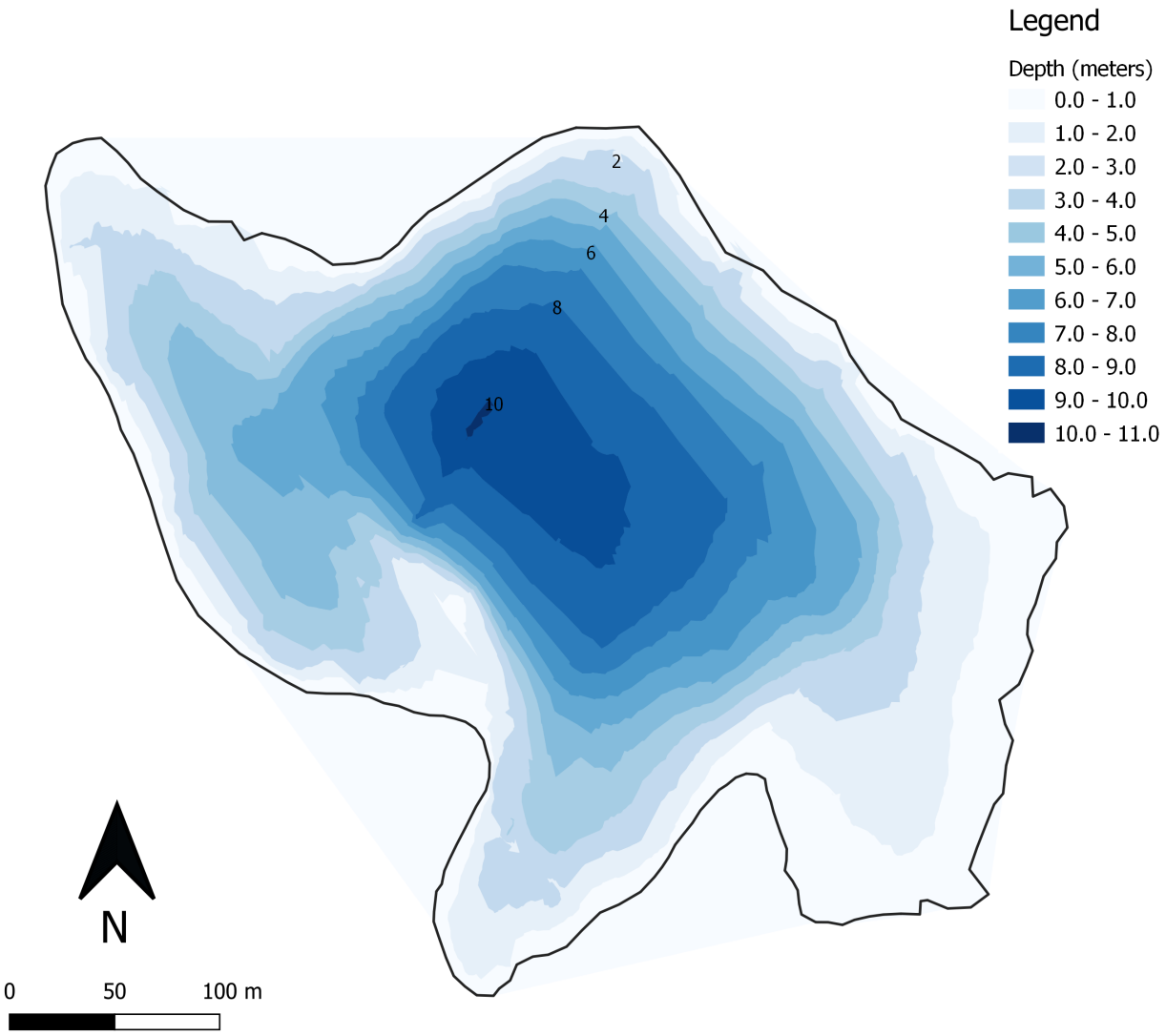
Bathymetric mapping

- Last bathymetry map was made in 1983
- Little signs of significant sedimentation over this period



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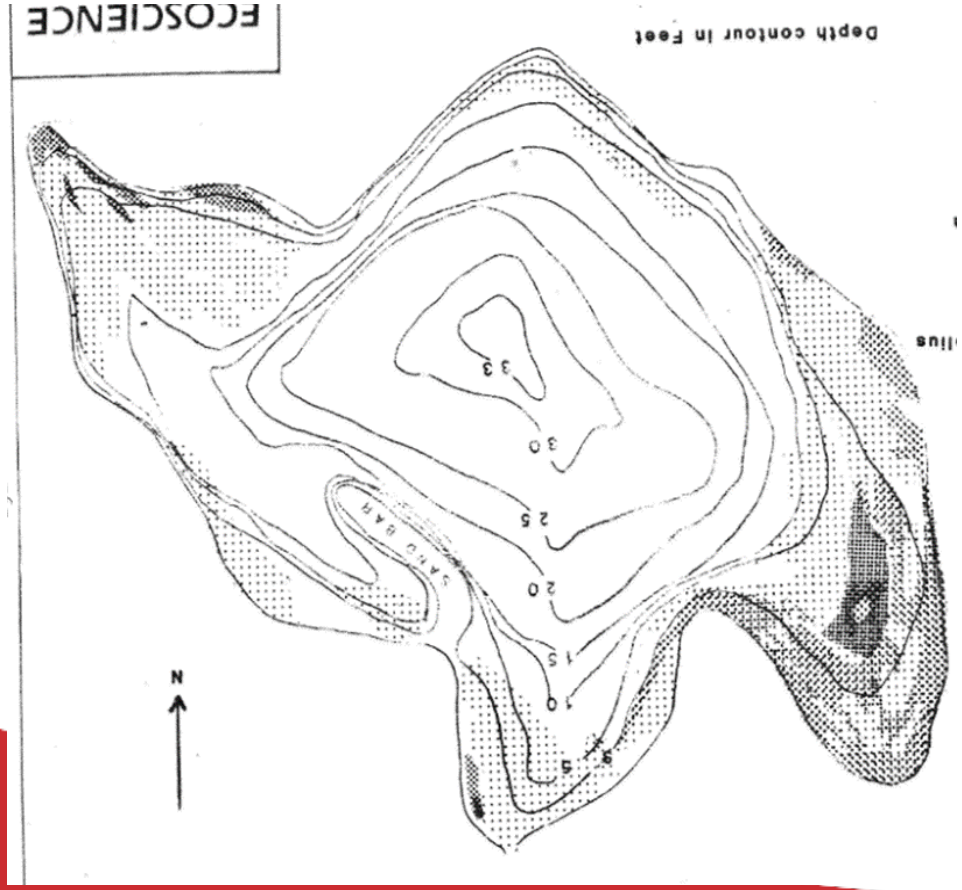
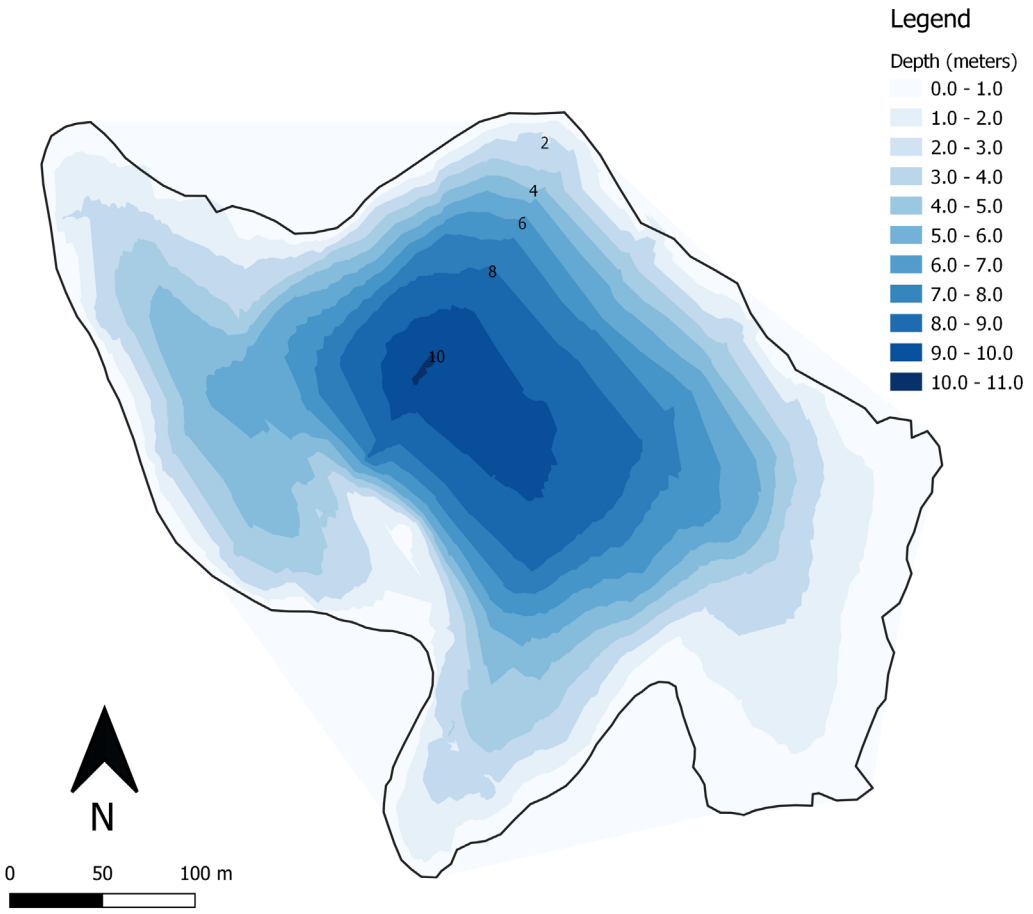
Past vs. Present





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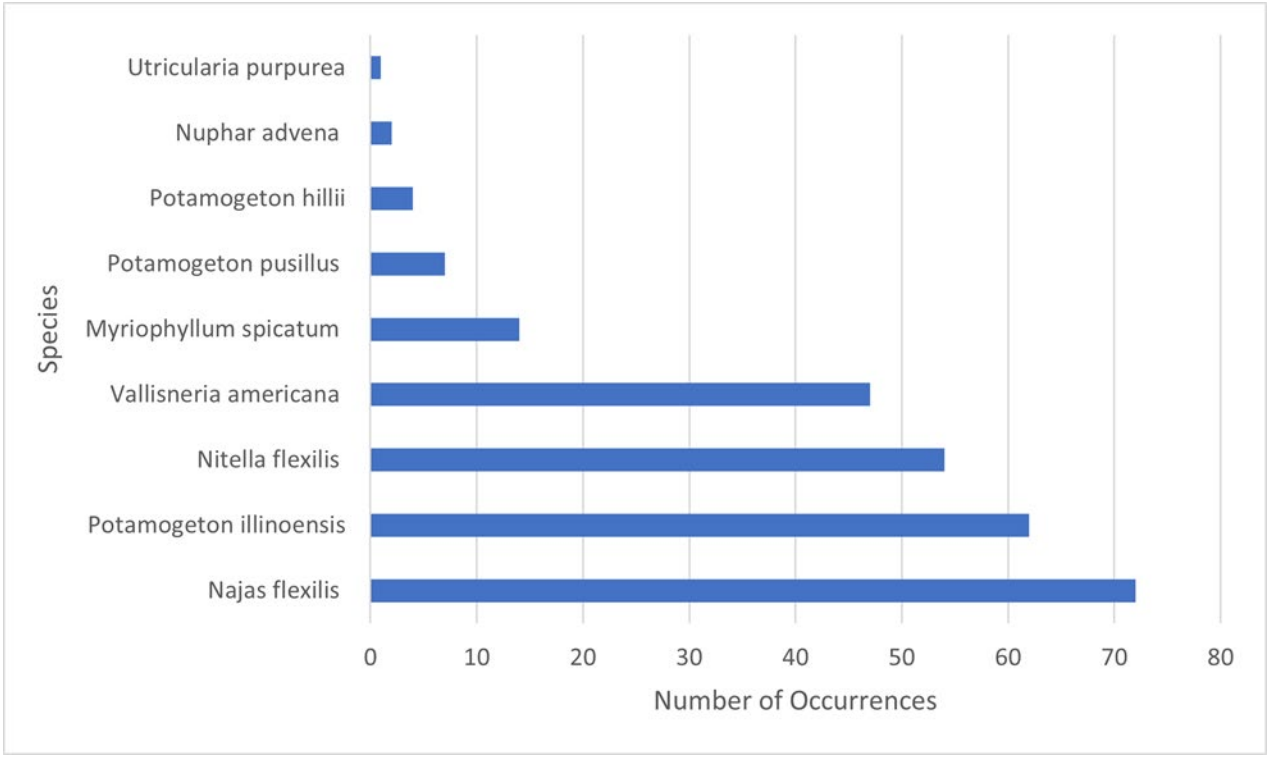
Aquatic macrophyte survey

- Point intercept rake toss relative abundance method (PIRTRAM)
- Important to determine management strategies & identify invasives species



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Native macrophytes

- Eight native macrophyte species
- Made up 95 percent of all occurrences
- No sites were identified as Dense at the time of survey

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Nonnative

- One nonnative macrophyte, Eurasian watermilfoil
- Made up five percent of all occurrances
- Found at 10 of 85 sites

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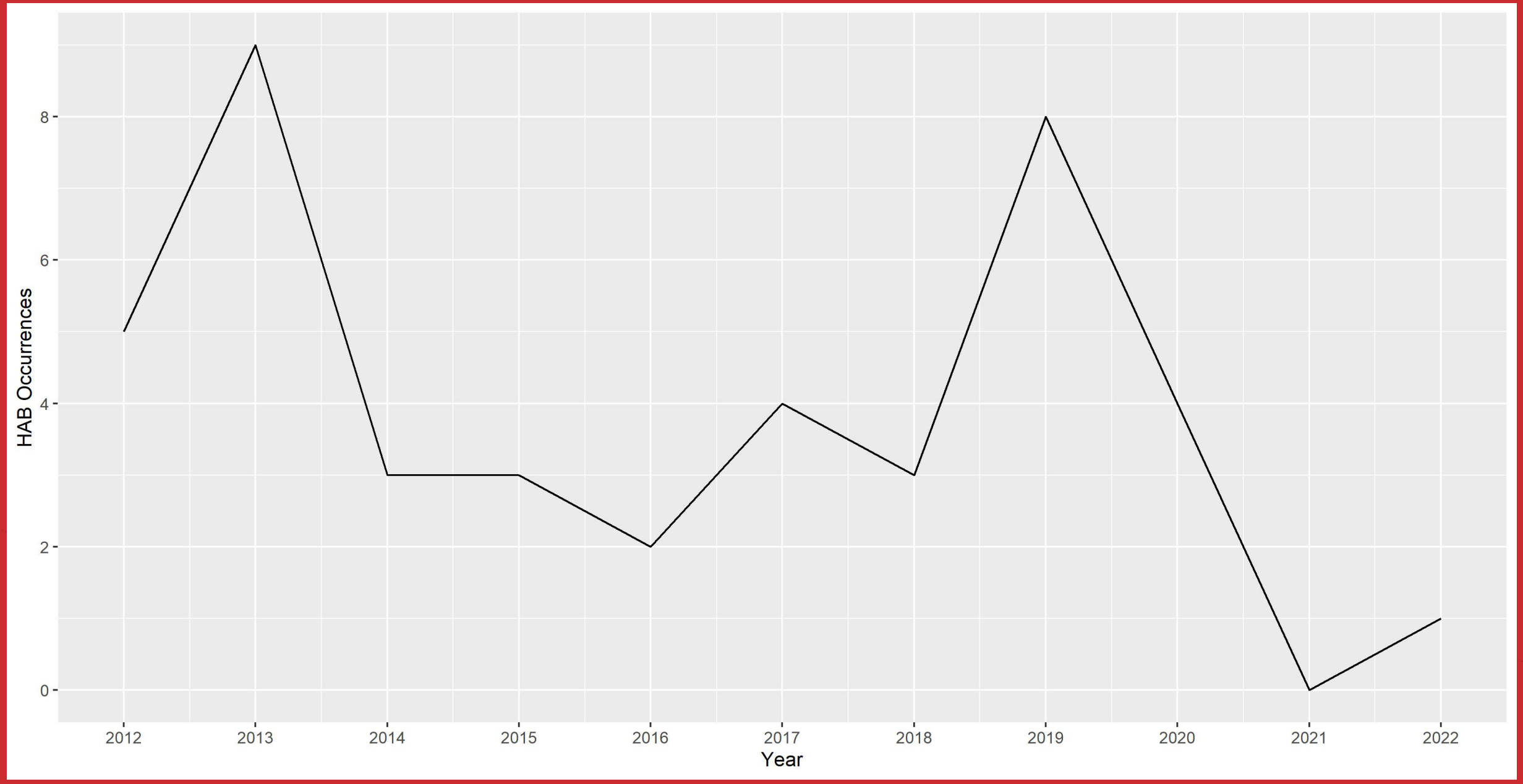
HABs: 2012 - 2022



Key Takeaways

- Surface phosphorus unchanged
- Secchi depth increasing
- Little signs of sedimentation
- Native plant community!
- HABs decreasing over the last ten years (?)

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Future Management

- Control what you can control!
- Possibility to eradicate or contain EWM
- Best management is not always big management

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Acknowledgements

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- All my **friends** and **cohort members** who have helped me along the way!

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Questions?

Feel free to email me at

shead896@oneonta.edu

or

dshea30ss@gmail.com

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