Suozzo, Doty & Associates
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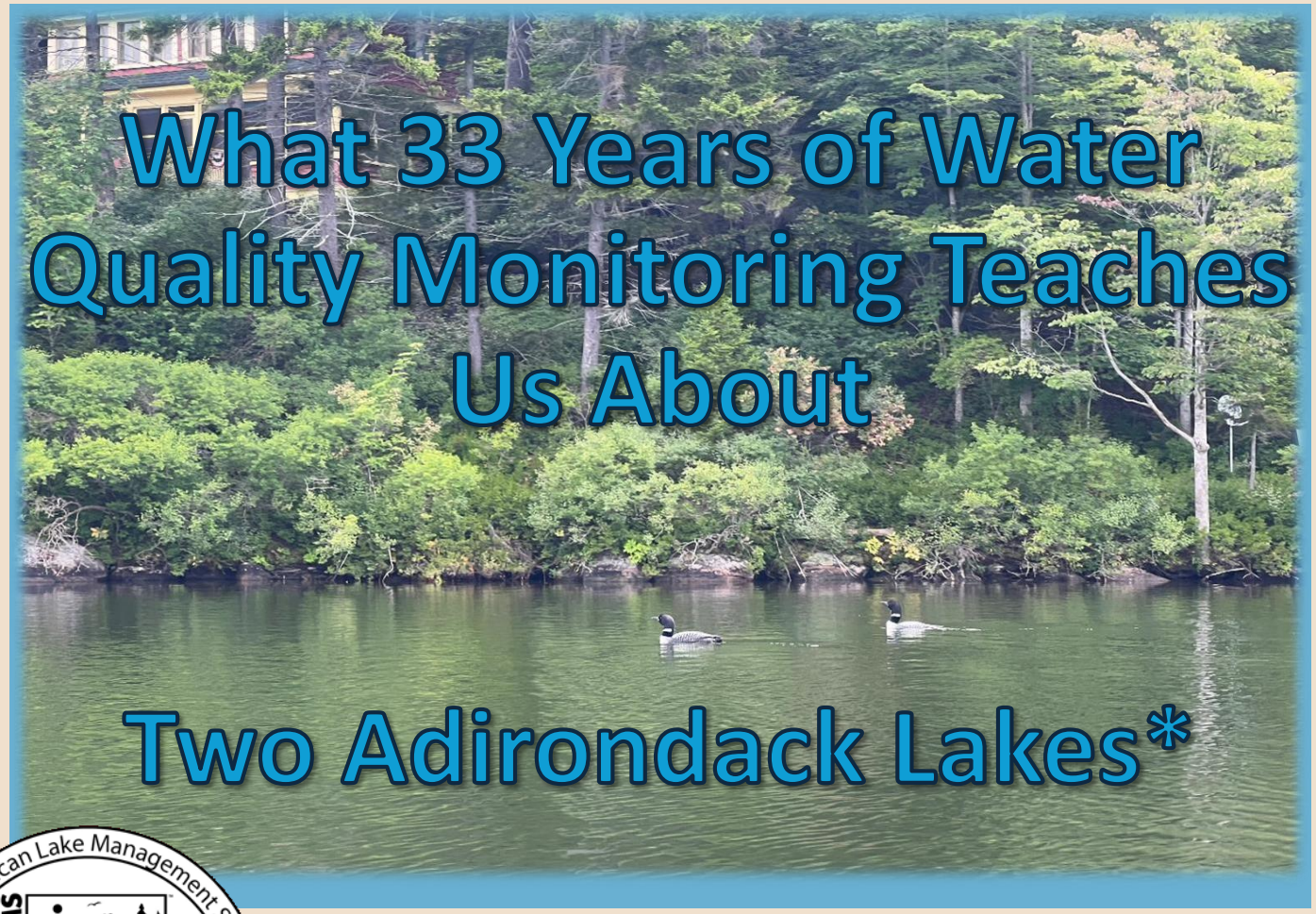
With offices in Lake Placid and Bolton Landing

2025 NYSFOLA Annual Conference
May 2-3, 2025



What 33 Years of Water Quality Monitoring Teaches Us About Two Adirondack Lakes*

Michael R. Martin, CLM
Senior Environmental Scientist

*and perhaps lakes in general

Presentation Outline

- Introduction to the study lakes
- Impacts of land use
  - Septic systems
  - Forestry
  - Road salt
- Impact of extreme climate events
- Impact of climate change on temperature
- Trends in dissolved oxygen
  - Stratification
  - Extent of anoxia & hypoxia
- Invasive species
  - Annual volunteer monitoring
  - Periodic professional monitoring
  - Controls in place to prevent introduction

Dedicated to all the wonderful people at Mount Arab Preserve Association with whom I have had the pleasure of working for 33 years.

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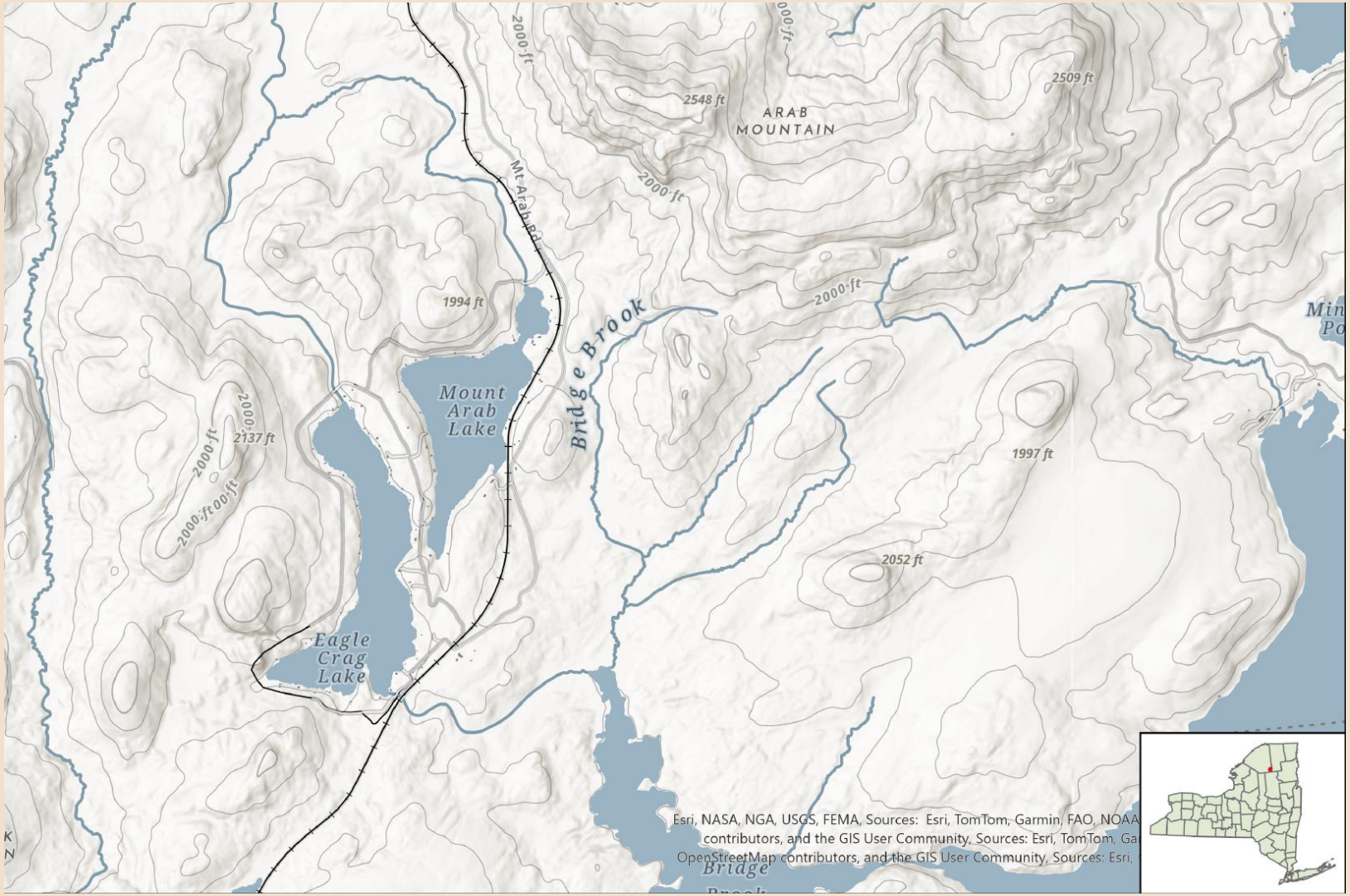
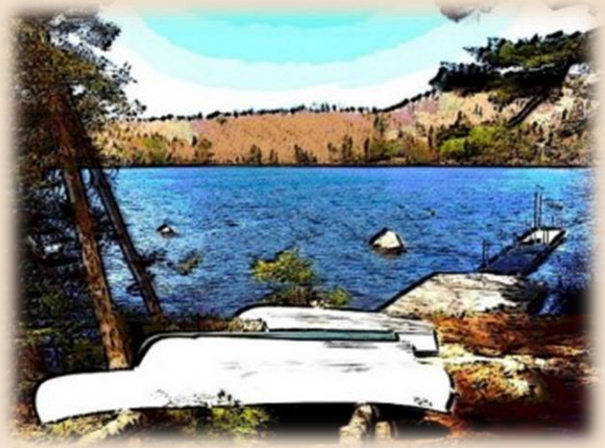
Meet the Lakes





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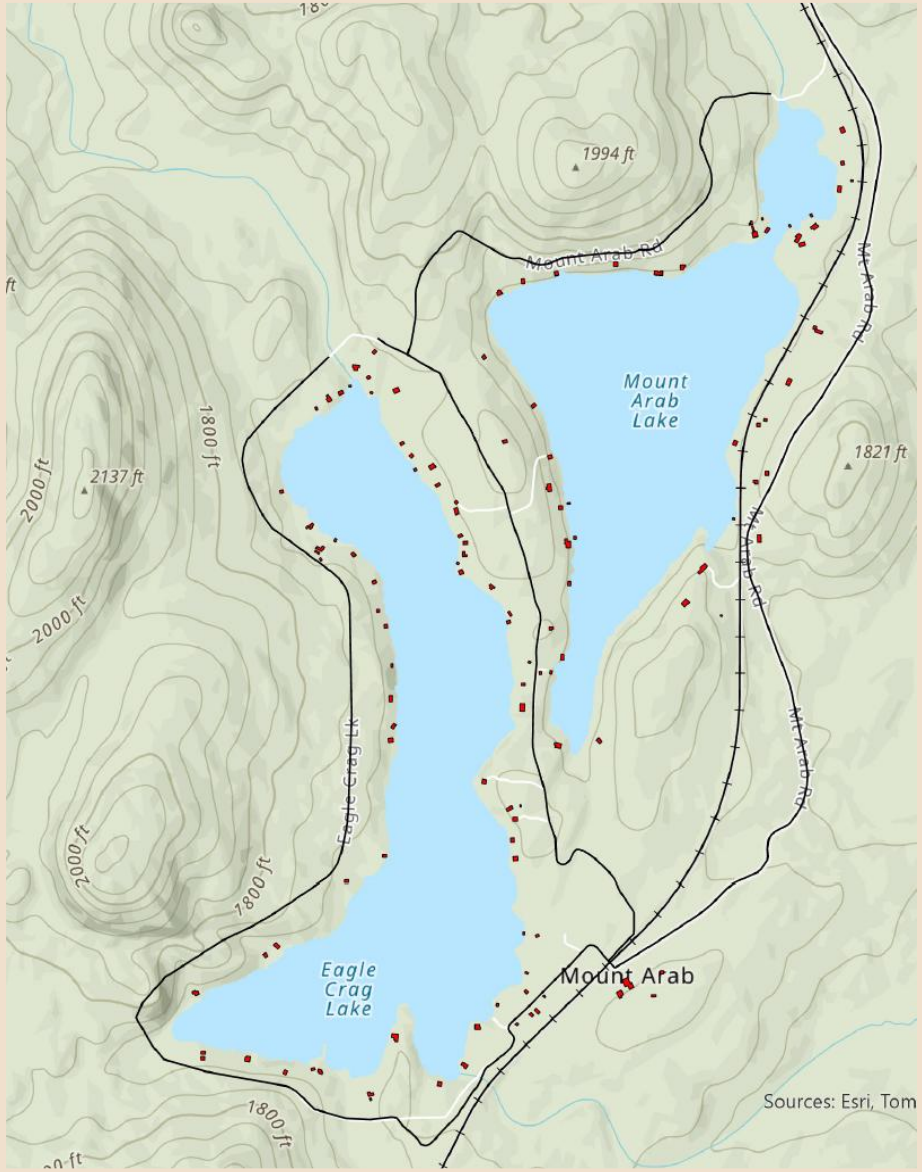
Meet the Lakes



Mount Arab Lake

- Surface Area: 115 acres
- Lake Elevation: 1,659 feet
- Maximum Depth: 60 feet (18 meters)
- Number of Camps: 70±

Eagle Crag Lake

- Surface Area: 149 acres
- Lake Elevation: 1,683 feet
- Maximum Depth: 50 feet (15 meters)
- Number of Camps: 48±

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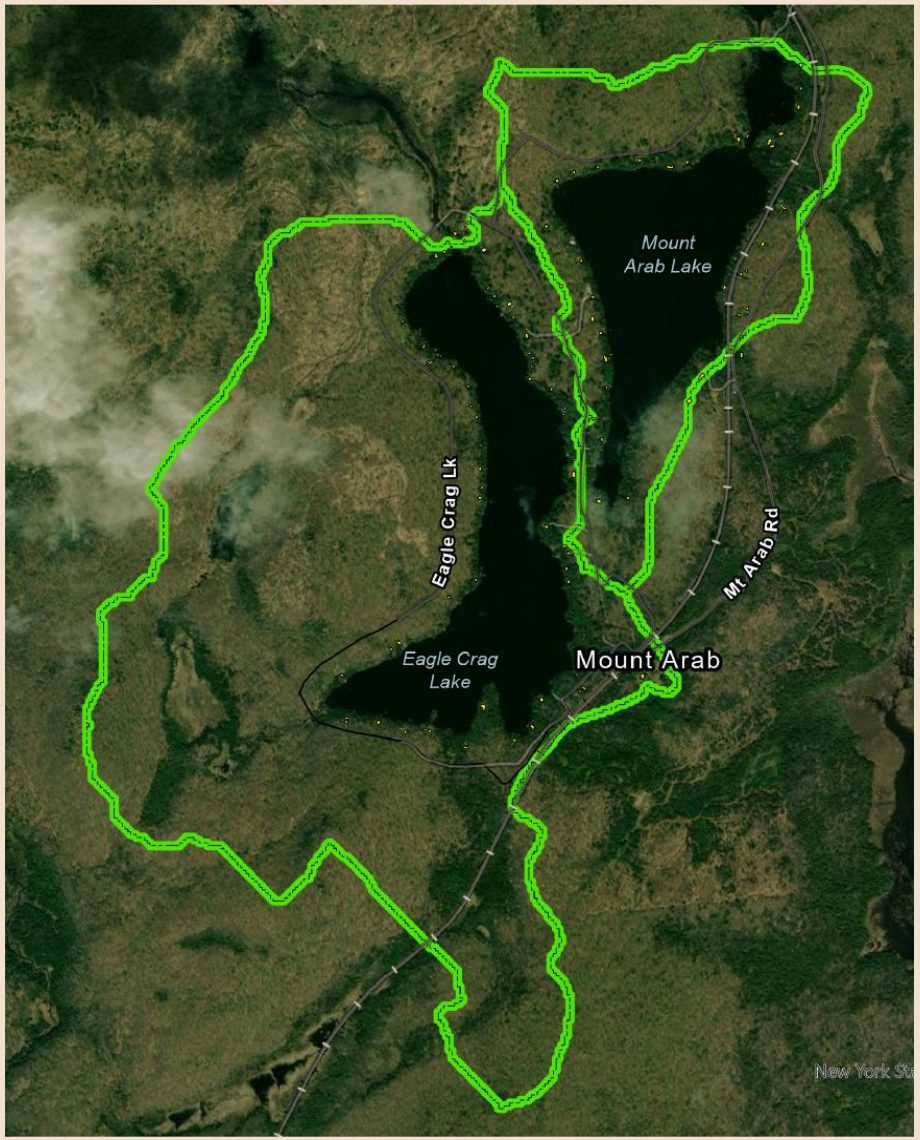
Meet the Lakes



Mount Arab Lake

- Watershed Area: 474 acres
- Watershed to Surface Area Ratio: 4.1 to 1
- Percent Forest: 73.8
- Percent Water/Wetlands: 25.6
- Mean Slope of Watershed: 919 feet per mile
- Annual Precipitation: 41.0 inches
- Annual Runoff: 25.1 inches

Eagle Crag Lake

- Watershed Area: 954 acres
- Watershed to Surface Area Ratio: 6.1 to 1
- Percent Forest: 82.4
- Percent Water/Wetlands: 17.2
- Mean Slope of Watershed: 838 feet per mile
- Annual Precipitation: 41.3 inches
- Annual Runoff: 25.4 inches

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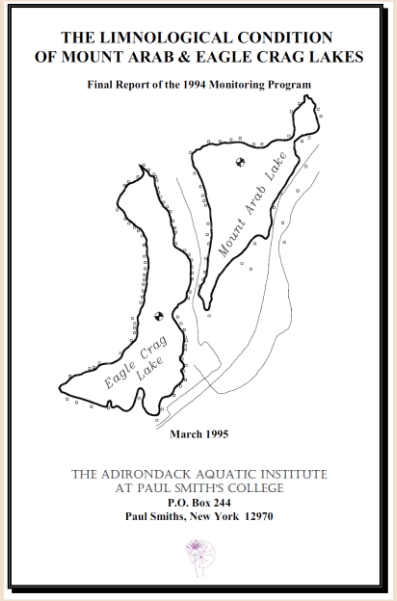
Monitoring History

- 1986-1990: CSLAP, Eagle Crag Lake only
- 1992-1999: Adirondack Aquatic Institute*
- 2000-2001: F. X Browne, Inc*
- 2002-2014 : Cedar Eden Environmental, LLC*
- 2015-2016: Princeton Hydro, LLC*
- 2017-2018: Cedar Eden Environmental, LLC*
- 2019-2021: Cedarwood Engineering Services, PLLC*
- 2022-2023: AES Northeast*
- 2024-present: Suozzo, Doty & Associates, PLLC*
  - 2025 will be 34th year


THE LIMNOLOGICAL CONDITION
OF MOUNT ARAB & EAGLE CRAG LAKES

Final Report of the 1994 Monitoring Program

Mount Arab Lake

Eagle Crag Lake

March 1995

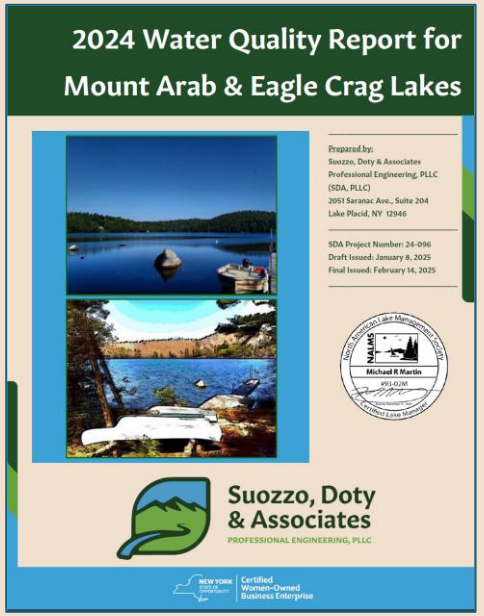
THE ADIRONDACK AQUATIC INSTITUTE
AT PAUL SMITH'S COLLEGE
P.O. Box 244
Paul Smiths, New York 12970


Mount Arab & Eagle Crag Lakes
2017 Water Quality Monitoring Report
Piercefield, St. Lawrence County, NY

Prepared for:
Mount Arab Preserve Association
Attn: Terry Silvester, Water Quality Chair
18 Mount Arab Lake
Tupper Lake, NY 12986

Prepared by:
Cedar Eden Environmental, LLC
1519 State Route 86
Saranac Lake, NY 12983
518.304.3697 • mmartin@cedareden.com
http://cedareden.com
Established 2001

March 29, 2018


2024 Water Quality Report for
Mount Arab & Eagle Crag Lakes

Prepared by:
Suozzo, Doty & Associates
Professional Engineering, PLLC
(SDA, PLLC)
2051 Saranac Ave., Suite 204
Lake Placid, NY 12946

SDA Project Number: 24-096
Draft Issued: January 8, 2025
Final Issued: February 14, 2025

NALMS
Michael R Martin

Suozzo, Doty
& Associates
PROFESSIONAL ENGINEERING, PLLC

NEW YORK STATE
Certified
Women-Owned
Business Enterprise

** Conducted by Michael R. Martin, CLM*

Suozzo, Doty
& Associates
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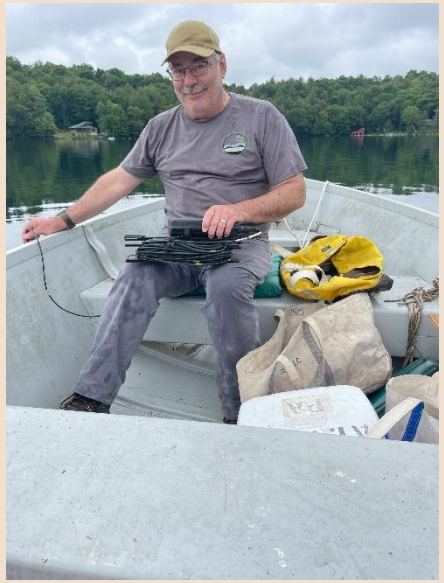
Monitoring Program

- Once per month: June, July & August
- Deepest point of each lake
- Two depths
  - Epilimnion (1.5 meters below surface)
  - Hypolimnion (1.5 meters above sediments)
- pH, Alkalinity, Conductivity, Chloride
- Total phosphorus, Nitrate/Nitrite
- Chlorophyll-*a*
- Transparency
- Dissolved oxygen & temperature profiles



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Land Use & Extreme Climate Events Impacts

- **Early TP monitoring**
- **Septic system replacement**
- Silviculture
  - March 1996 Eagle Crag Watershed
  - Spring 2008 Eagle Crag Watershed
  - Winter 2003/2004 Eagle Crag Watershed
- Extreme climate events
  - 6/10/2008 Microburst
  - 7/1/2009 Extreme rain (6.5 inches in 2.4 hours)
  - Spring 2011 Extreme spring runoff before ice out
- Road salt

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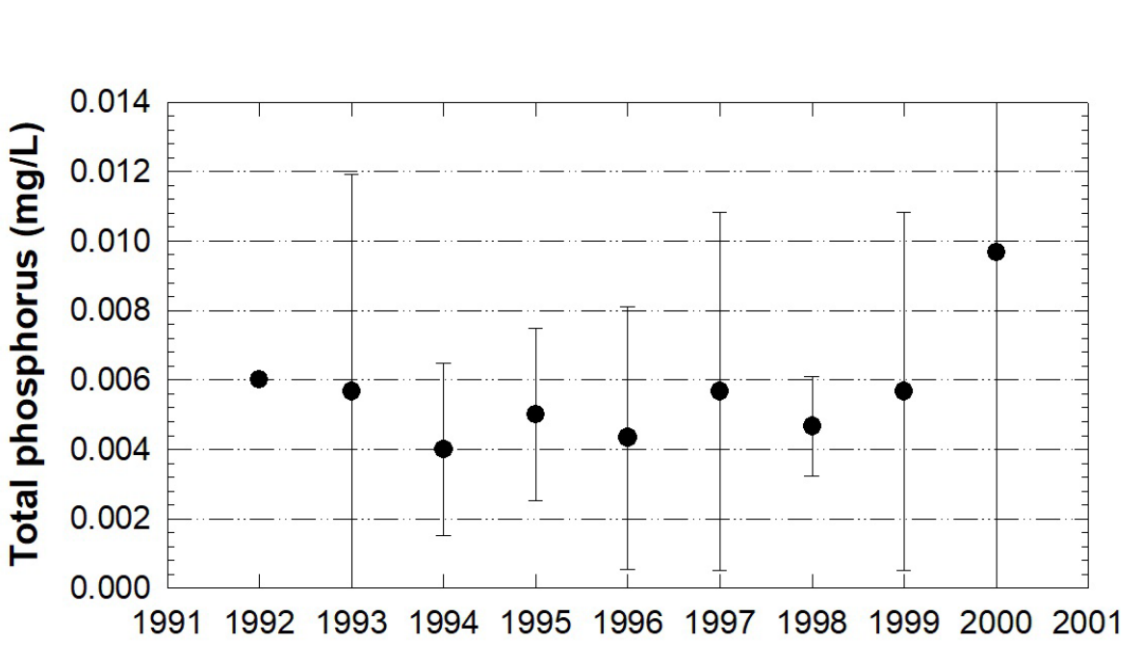
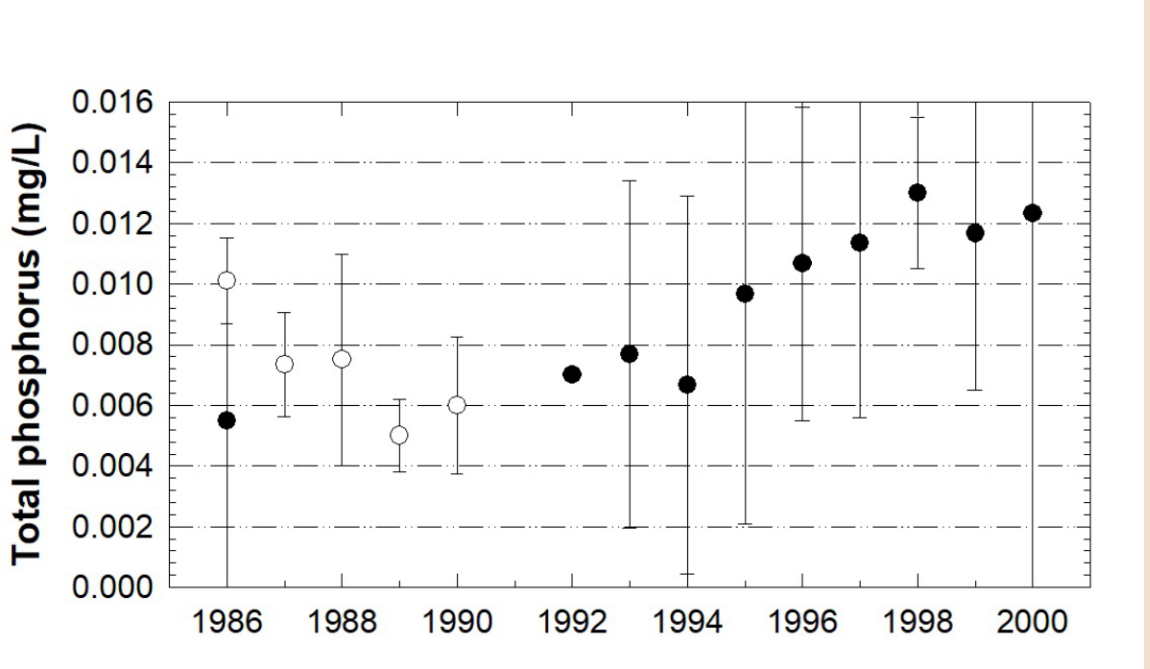
Septic Systems – Total Phosphorus

Mount Arab Lake



Eagle Crag Lake



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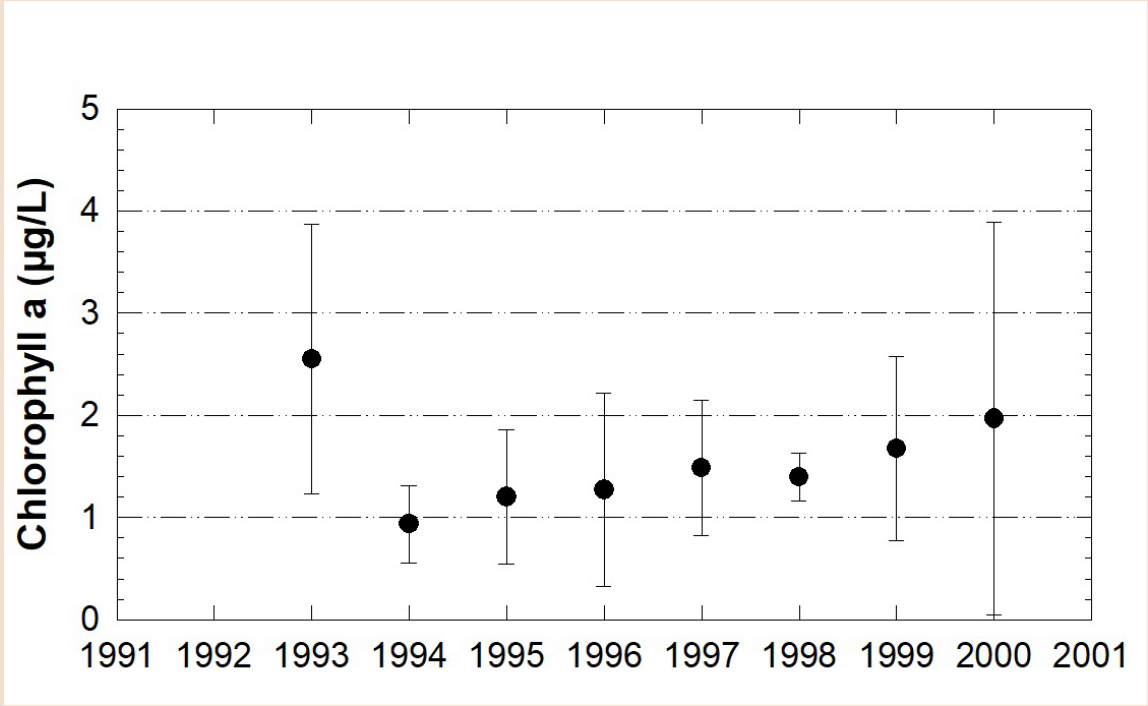
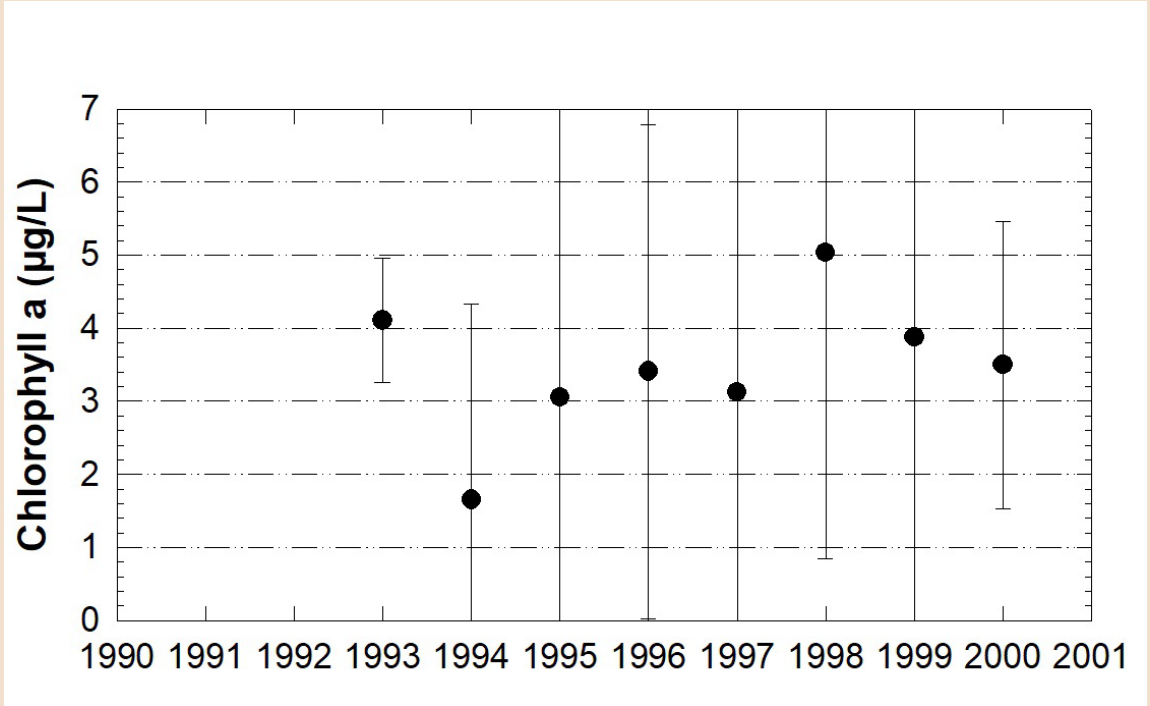
Septic Systems – Chlorophyll-*a*

Mount Arab Lake



Eagle Crag Lake



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- Road salt

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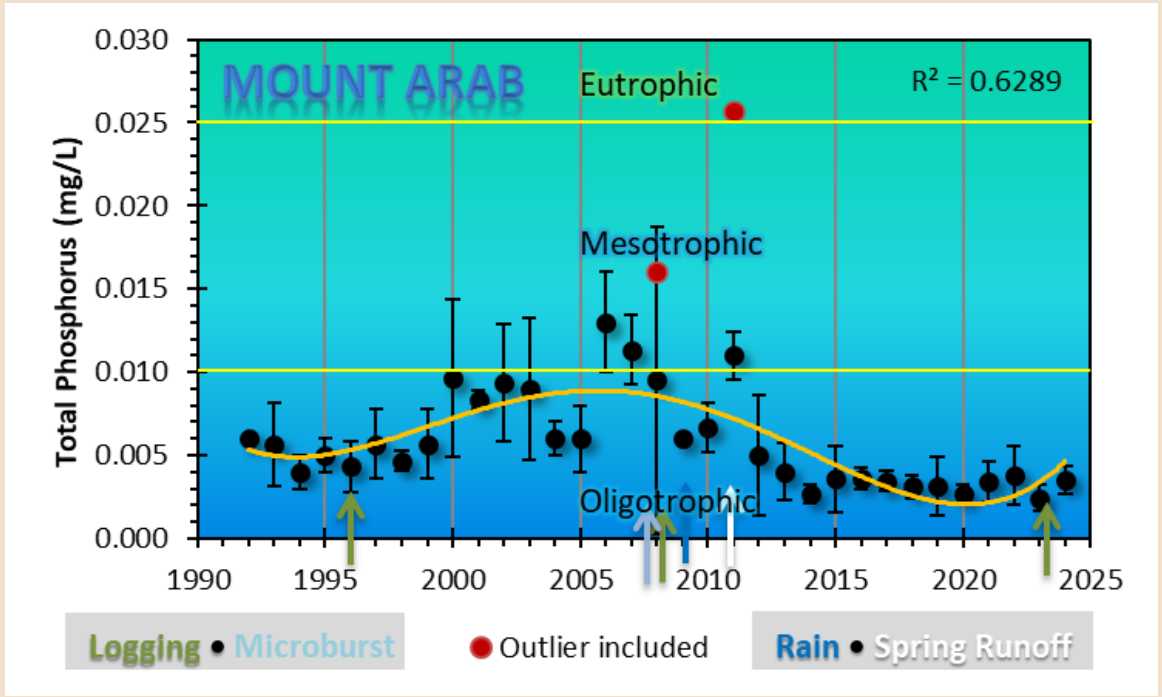
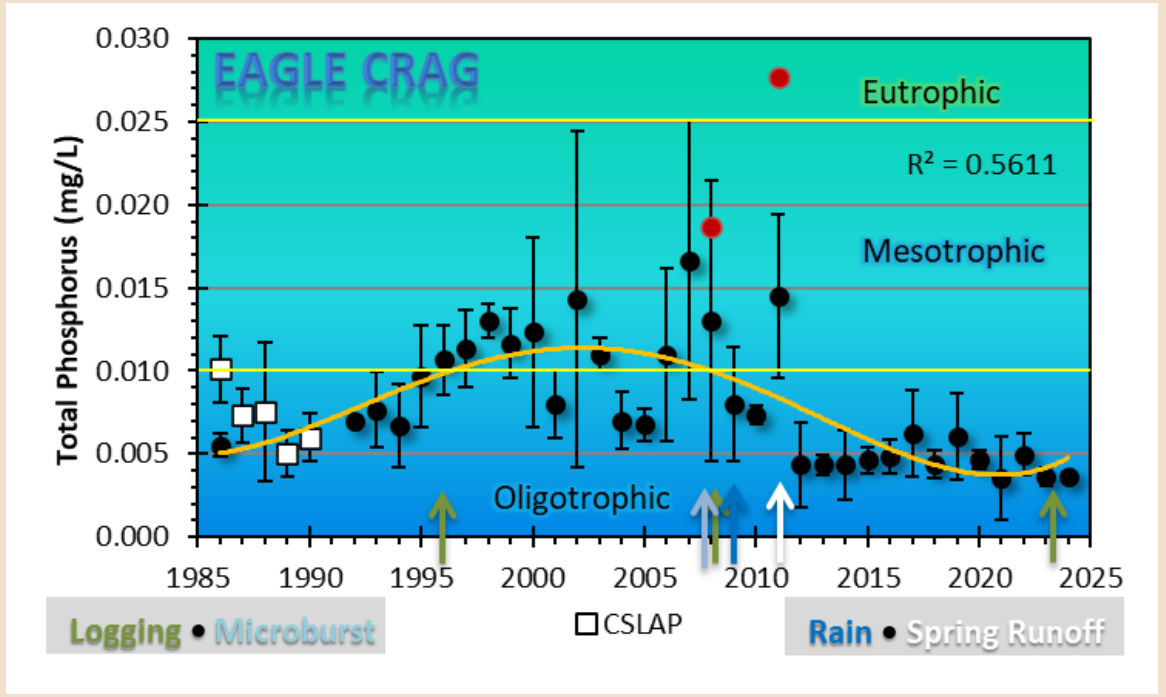
Epilimnetic Total Phosphorus Trends





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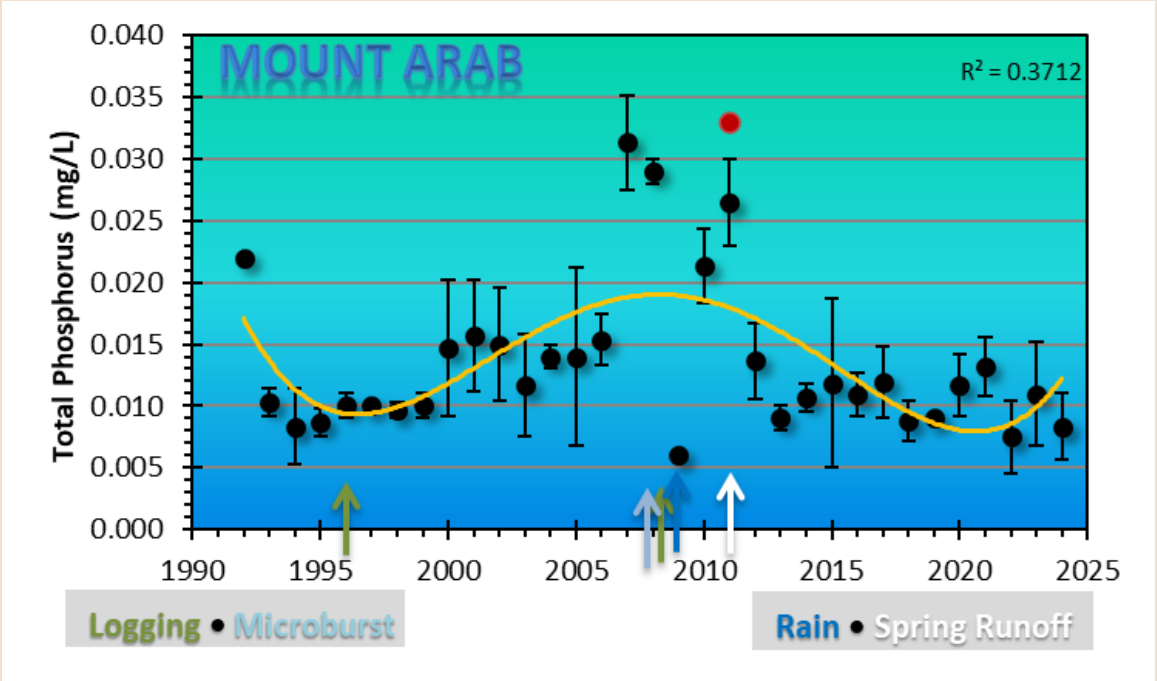
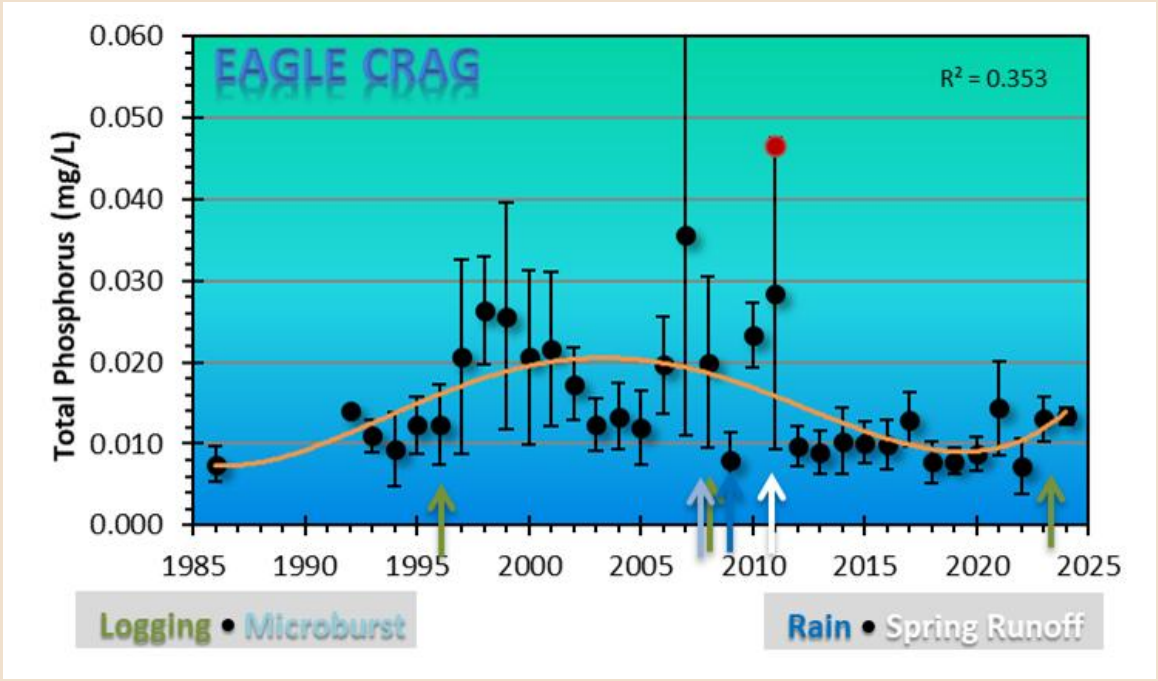
Hypolimnetic Total Phosphorus Trends





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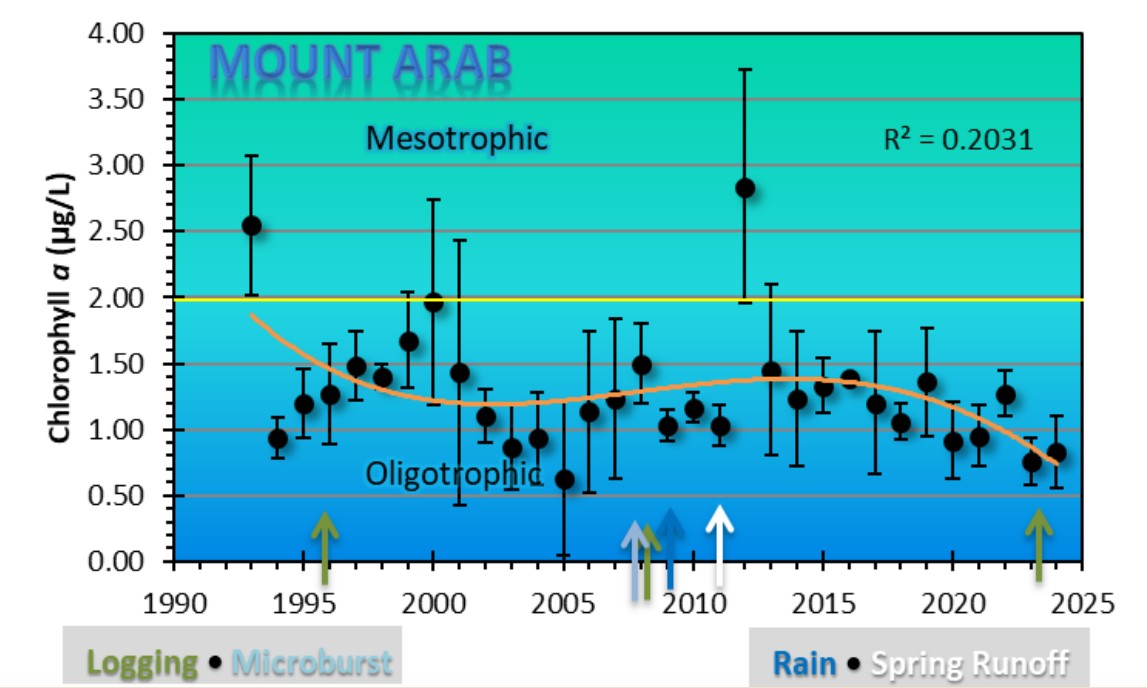
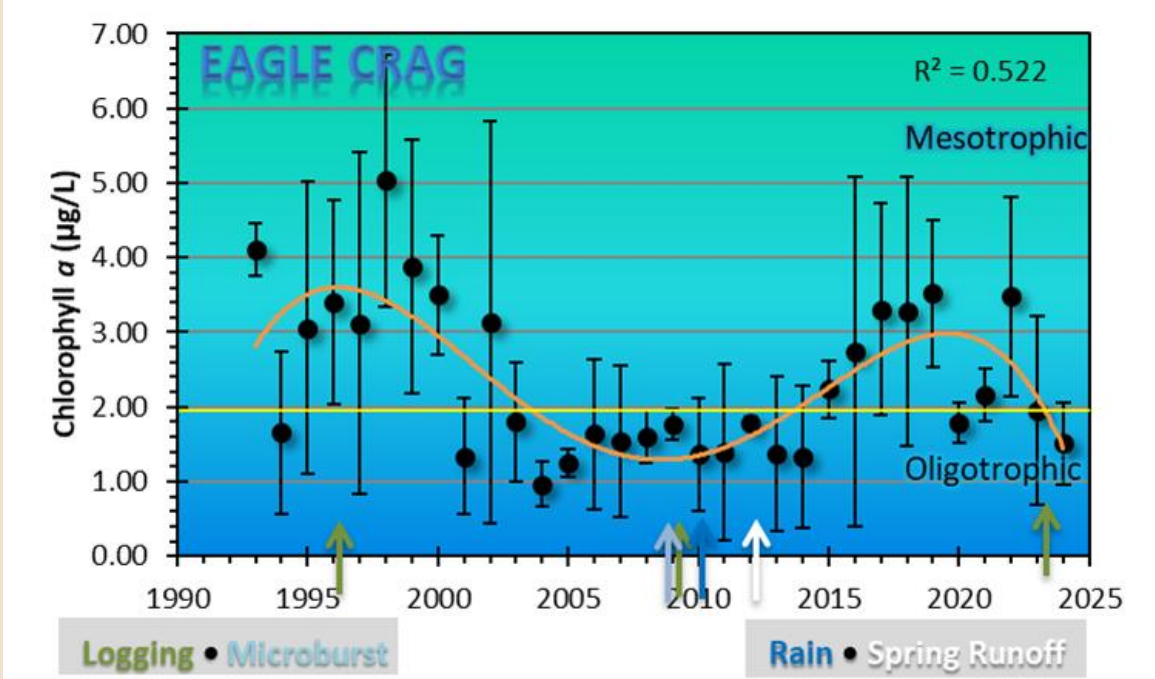
Chlorophyll-*a* Trends





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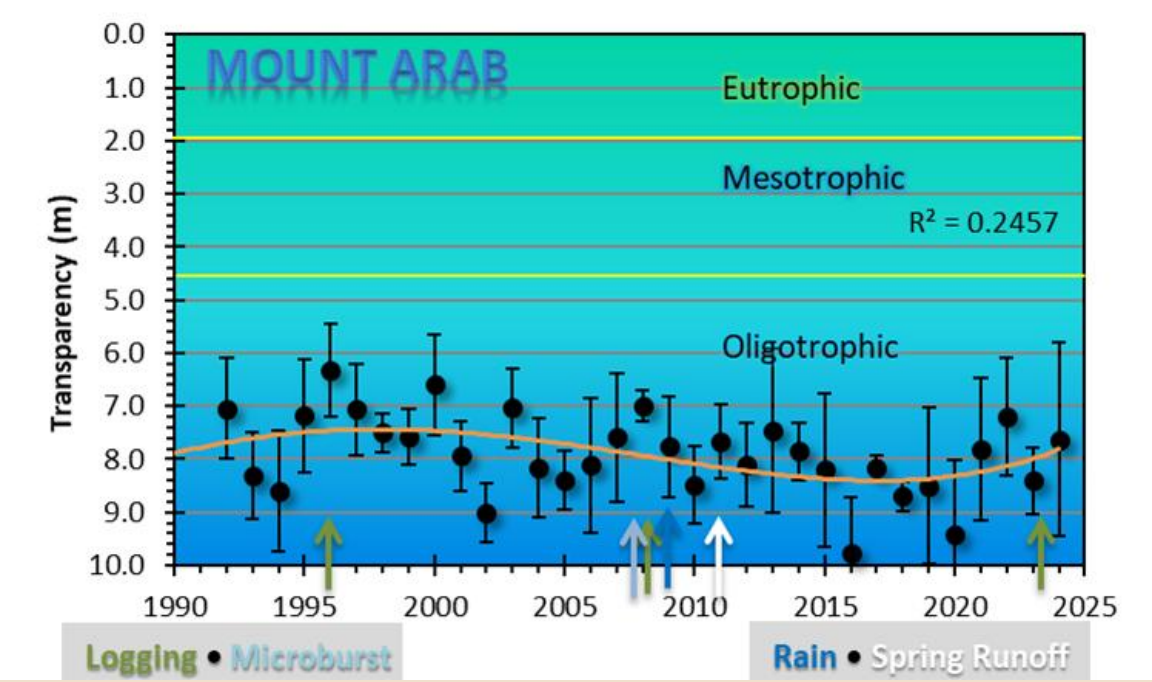
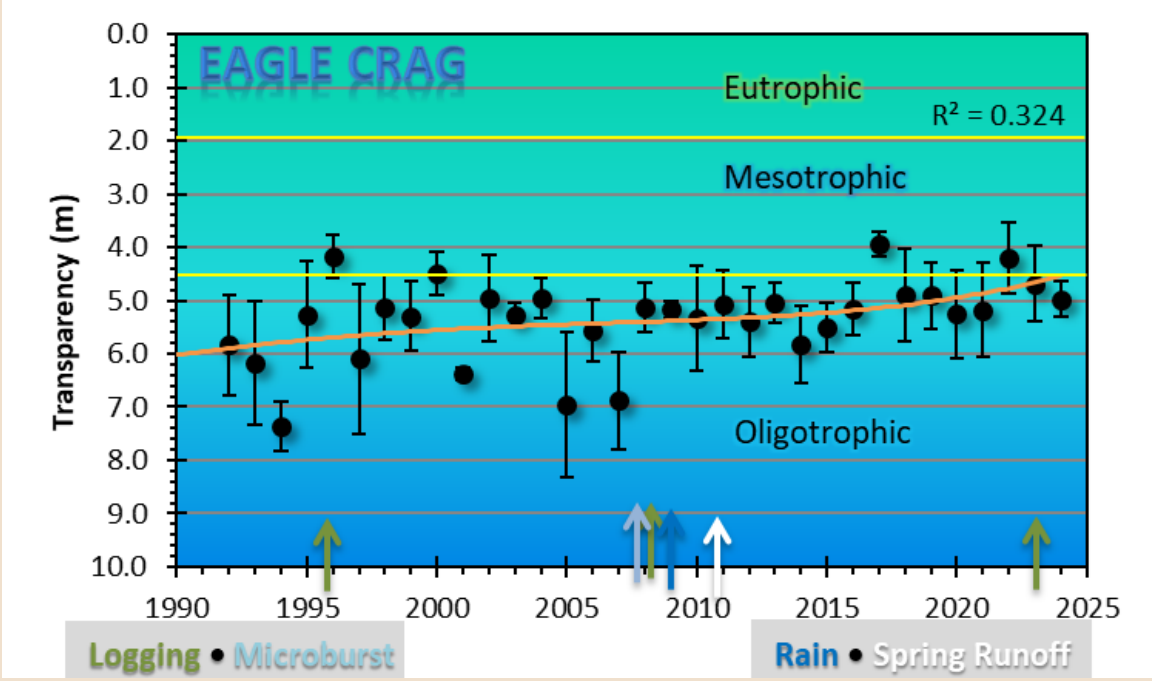
Secchi Disk Transparency Trends





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- **Road salt**

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Salted roads adjacent to the MAPA Lakes

- Red road segments drain to Mount Arab Lake.
- Yellow road segments do not drain to Mount Arab Lake.
- White road segments are not salted or do not drain to either lake.

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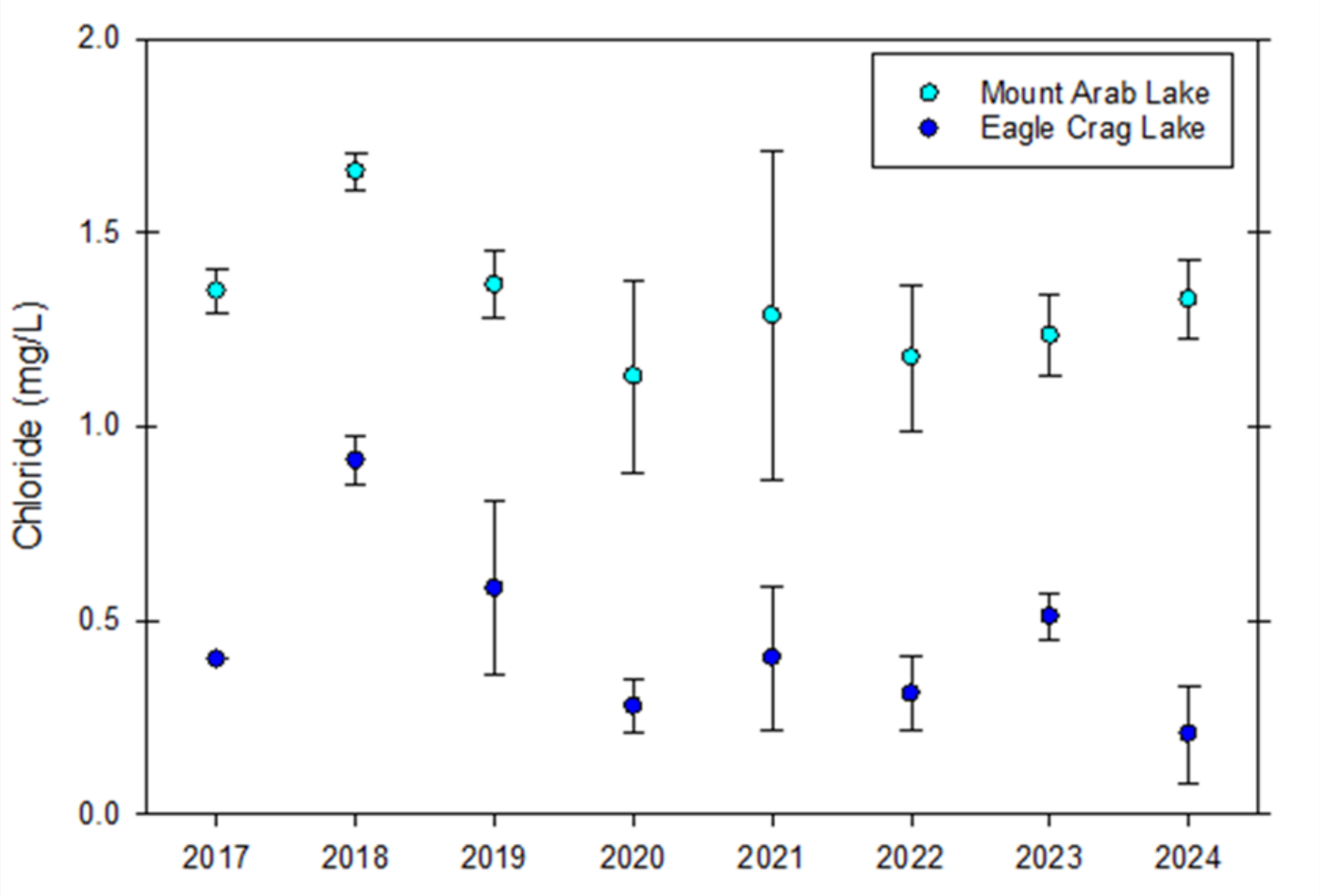
Chloride Trends



- Average chloride concentrations in Adirondack lakes in watersheds with unpaved roads is 0.24 mg/L
- Average chloride concentrations in Adirondack lakes in watersheds with paved roads is 7.22 mg/L

(Kelting, et al., 2012)

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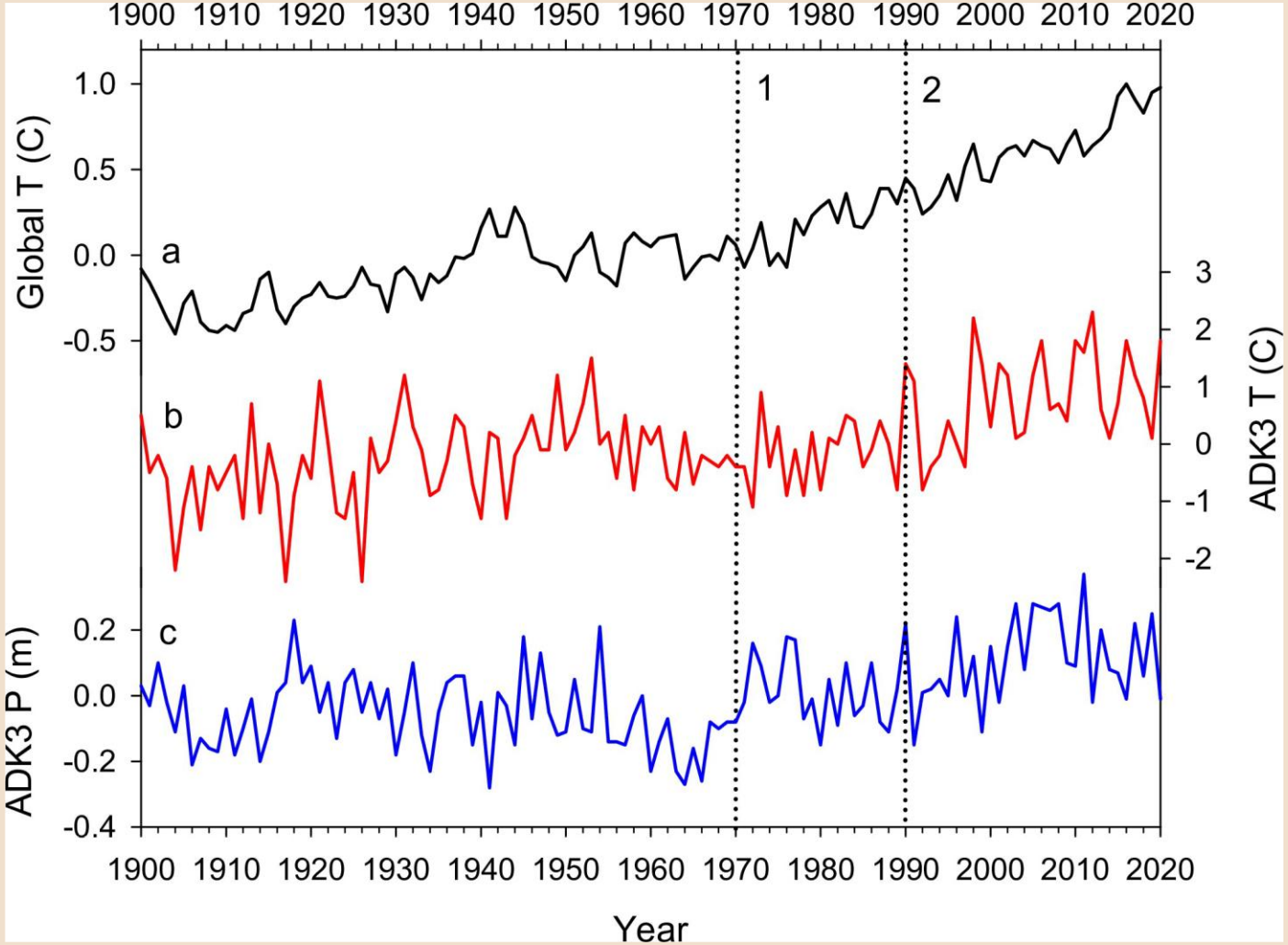
Climate Impacts - Temperature Effects

- Impact of climate change on temperature
  - Lake surface temperature
  - Anoxia and hypoxia in deeper waters

Adirondack Climate v Global Climate



Global Temperature Anomalies

Adirondack Temperature Anomalies

Adirondack Precipitation Anomalies

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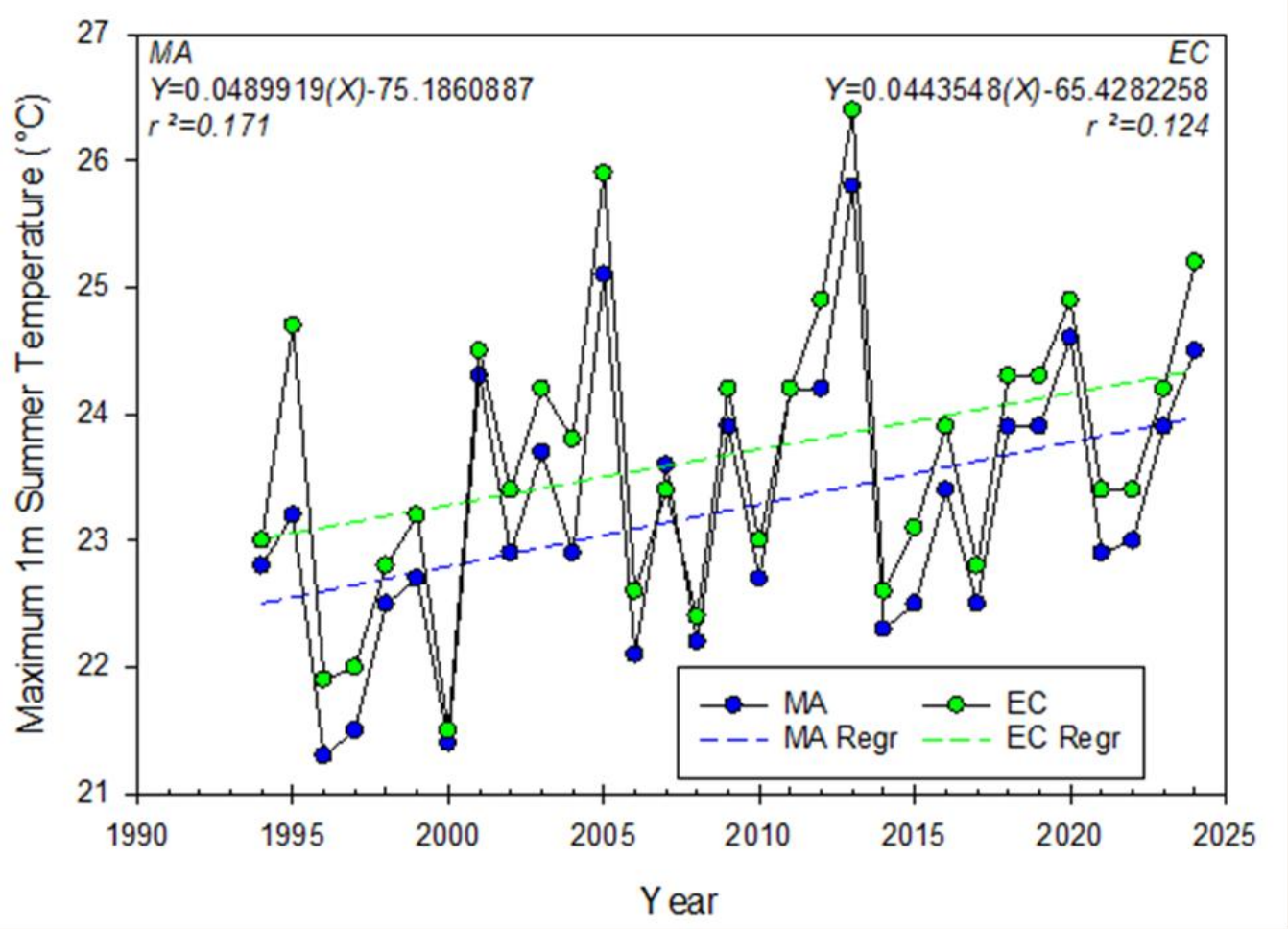
Stager JC, Wiltse B, Murphy S (2022) Once and future changes in climate and phenology within the Adirondack uplands (New York, USA). PLOS Clim 1(9): e0000047. https://doi.org/10.1371/journal.pclm.0000047

Maximum Summer Temperature (1 meter depth)



Mount Arab Lake

- 1.7°C (3.1°F) in 31 years
- 1.0°F per decade

Eagle Crag Lake

- 2.2°C (4.0°F) in 31 years
- 1.3°F per decade

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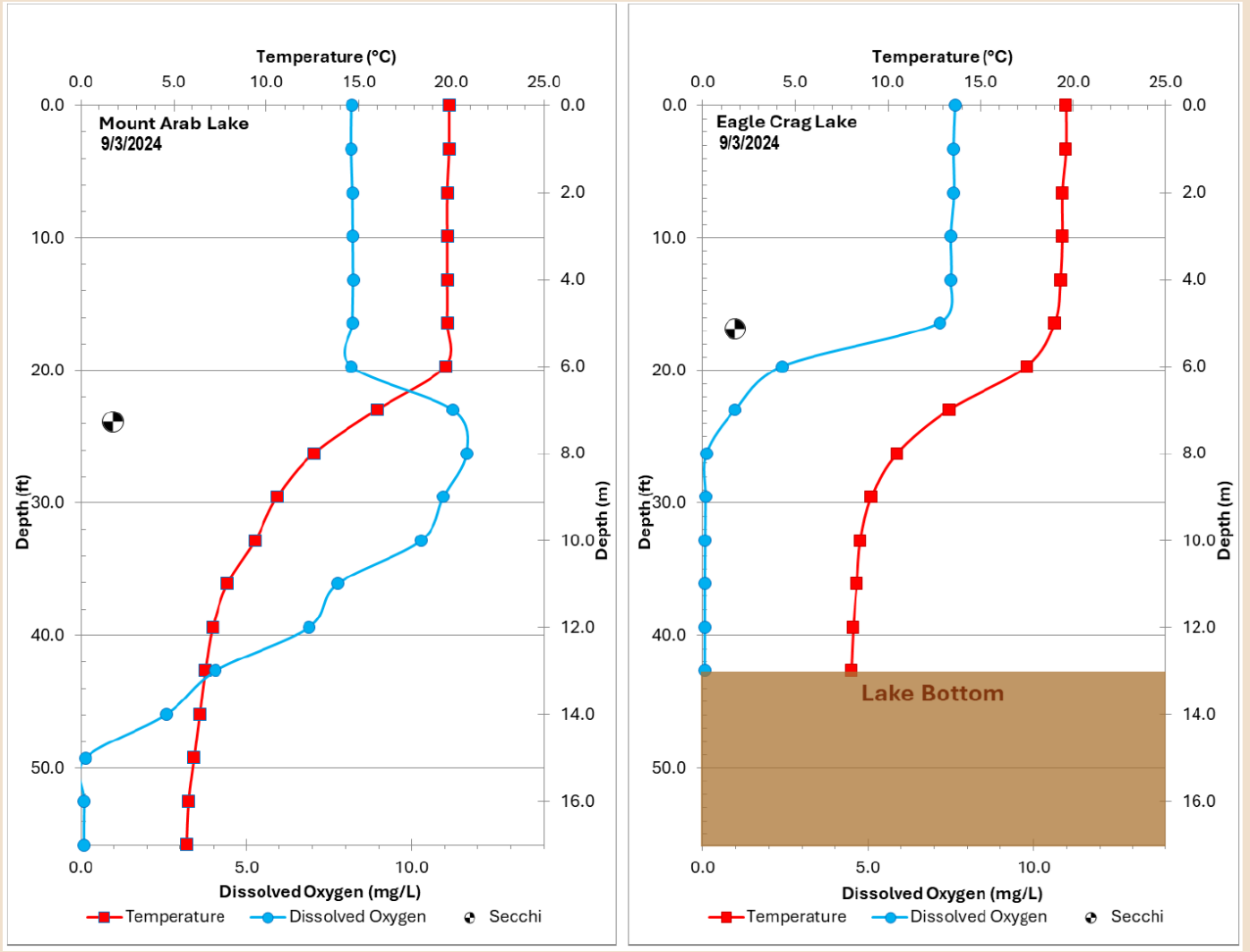
Trends in Dissolved Oxygen

- Why DO matters
- Extent of Anoxia/Hypoxia



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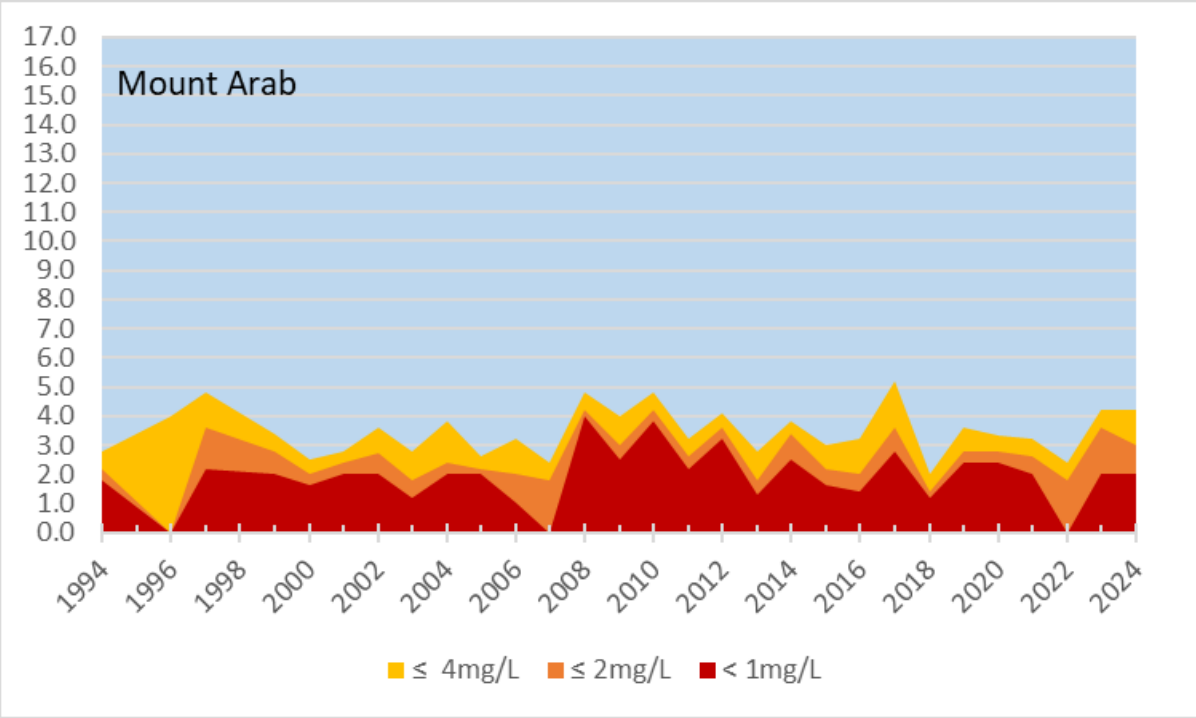
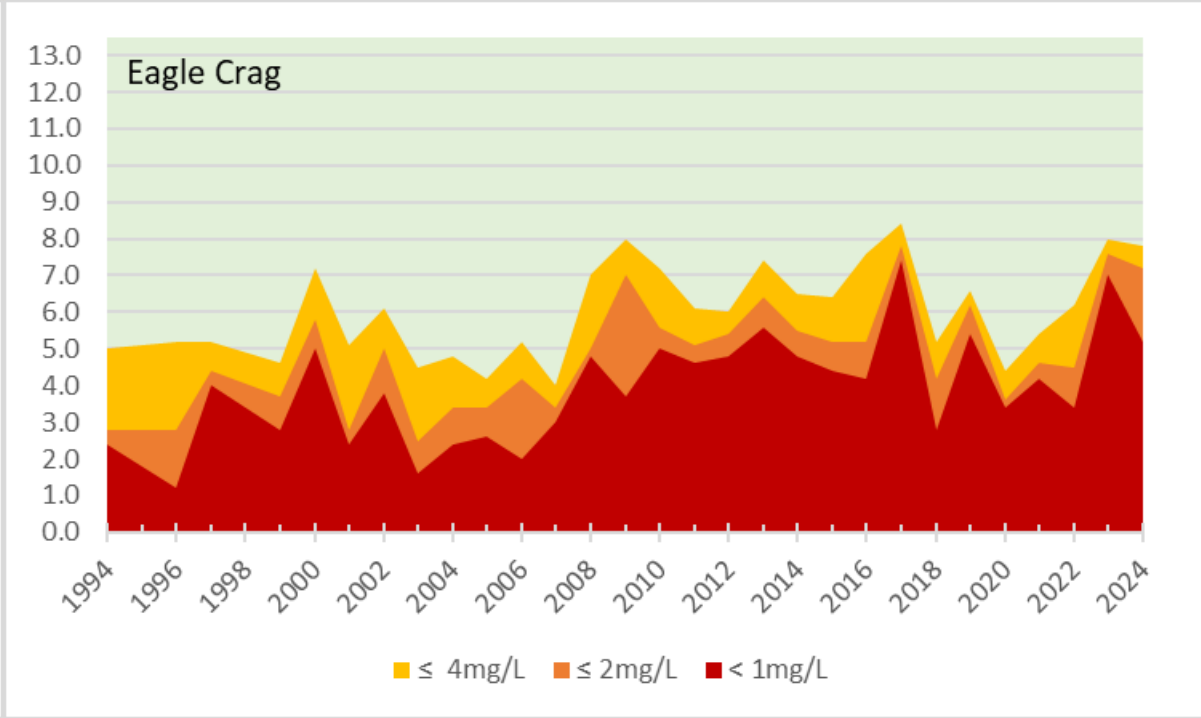
Anoxia & Hypoxia Trends





** Showing distance from lake bottom*

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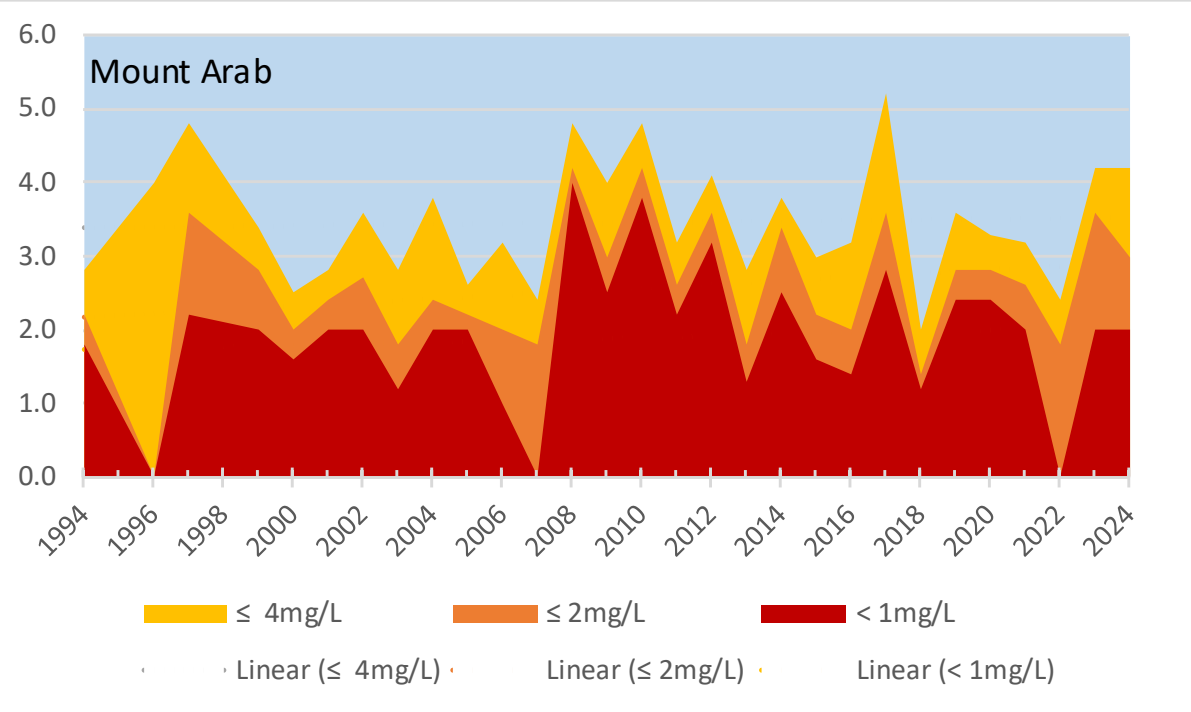
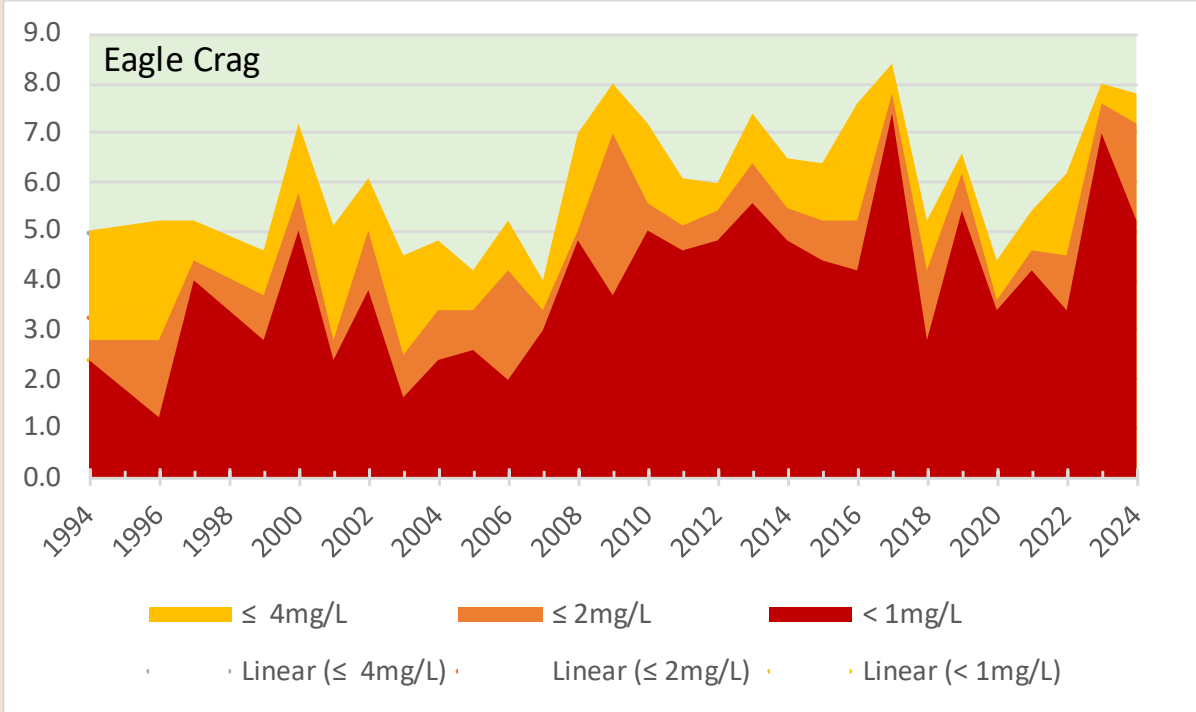
Anoxia & Hypoxia Trends





** Showing distance from lake bottom*

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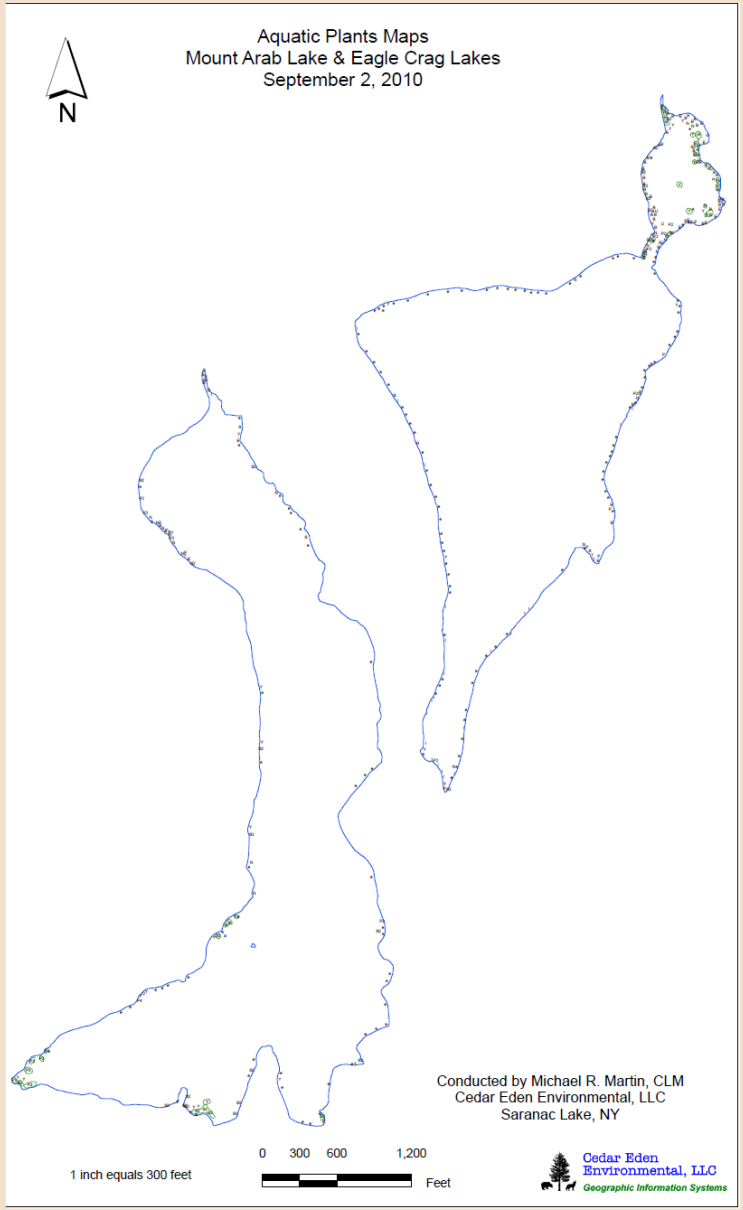
Invasive Species

- No invasive species in the lakes
- Focus is on prevention
  - Annual volunteer monitoring
  - Periodic professional monitoring
  - Controls in place to prevent introduction

Common Name	Scientific Name
Bassweed	*Potamogeton amplifolius*
Watershield	*Brasenia schreberi*
Spike rush	*Eleocharis spp.*
Pipewort	*Eriocaulon septangulare*
Iris	*Iris spp.*
White water lily	*Nypmhaea oderata*
Quillwort	*Isoetes sp.*
Oake's pondweed	*Potamogeton oakesianus*
Floating-leafed pondweed	*Potamogeton natans*
leafy pondweed	*P. tennesseensis/P. epihydrous*
Bur-reed	*Sparganium americanum* (likely)
Bur-reed	*Sparganium angustifolium*
Cattail	*Typha spp.*
Bladderwort	*Utricularia spp.*
Yellow water lily	*Nuphar variegatum*



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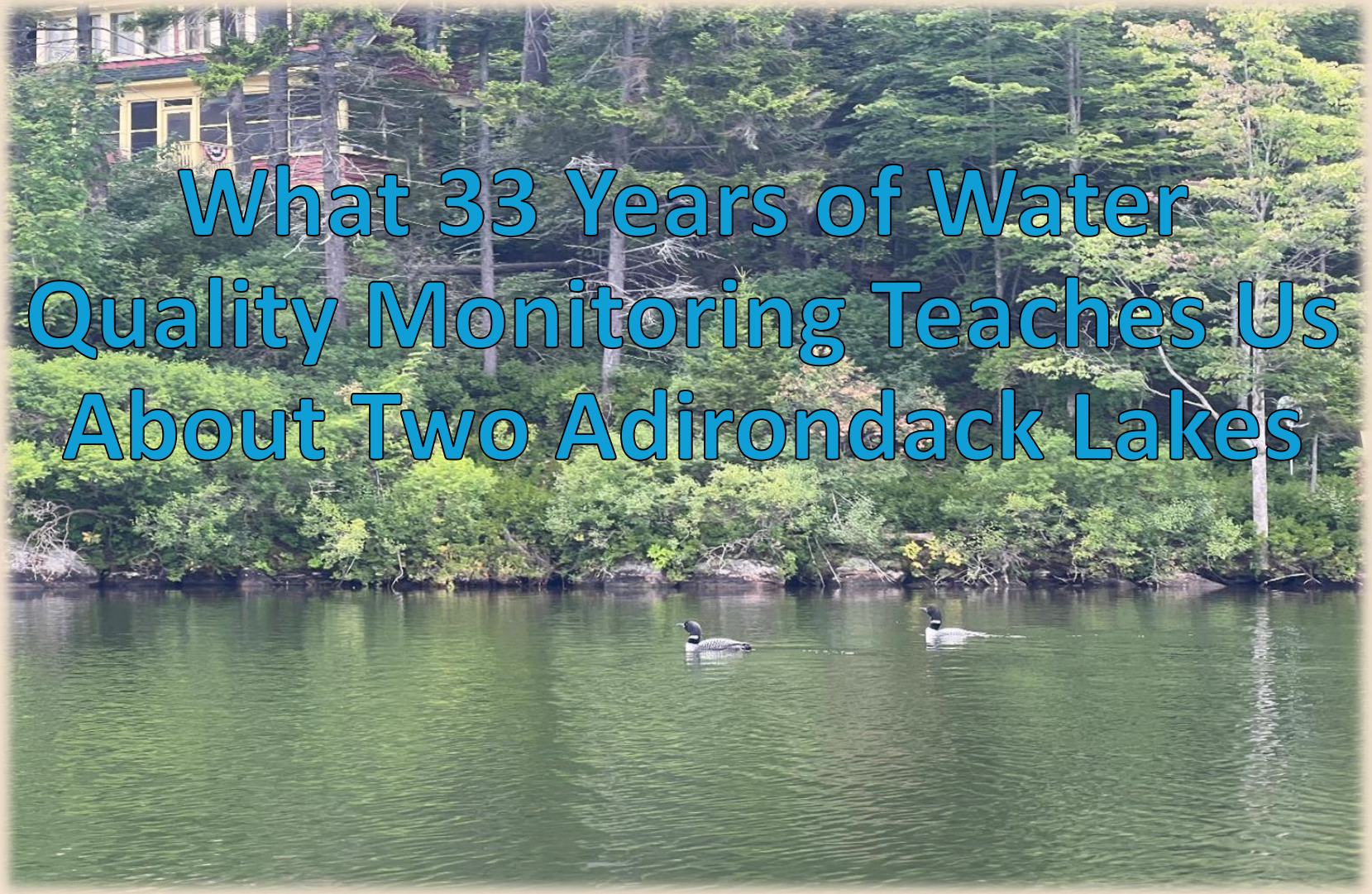
Conclusions
What 33 Years of Water Quality Monitoring Teaches Us About Two Adirondack Lakes (and lakes in general)

- Good land use practices protect lake water quality
- Old septic systems can negatively impact water quality
  - Replacing them can positively impact water quality
- Road salt can impact lakes
  - Depends on the number of roads in the watershed
- Extreme climate events can negatively impact water quality
  - This is usually only temporary
- Climate change negatively impact water quality
  - Our lakes are warming
  - Warmer lakes cause loss of dissolve oxygen
- Strong invasive species measures can protect lakes

Questions



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mmartin@sdapllc.com

North American Lake Management Society
NALMS
Michael R Martin
#93-02M
Expires December 31, 2025
Certified Lake Manager

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