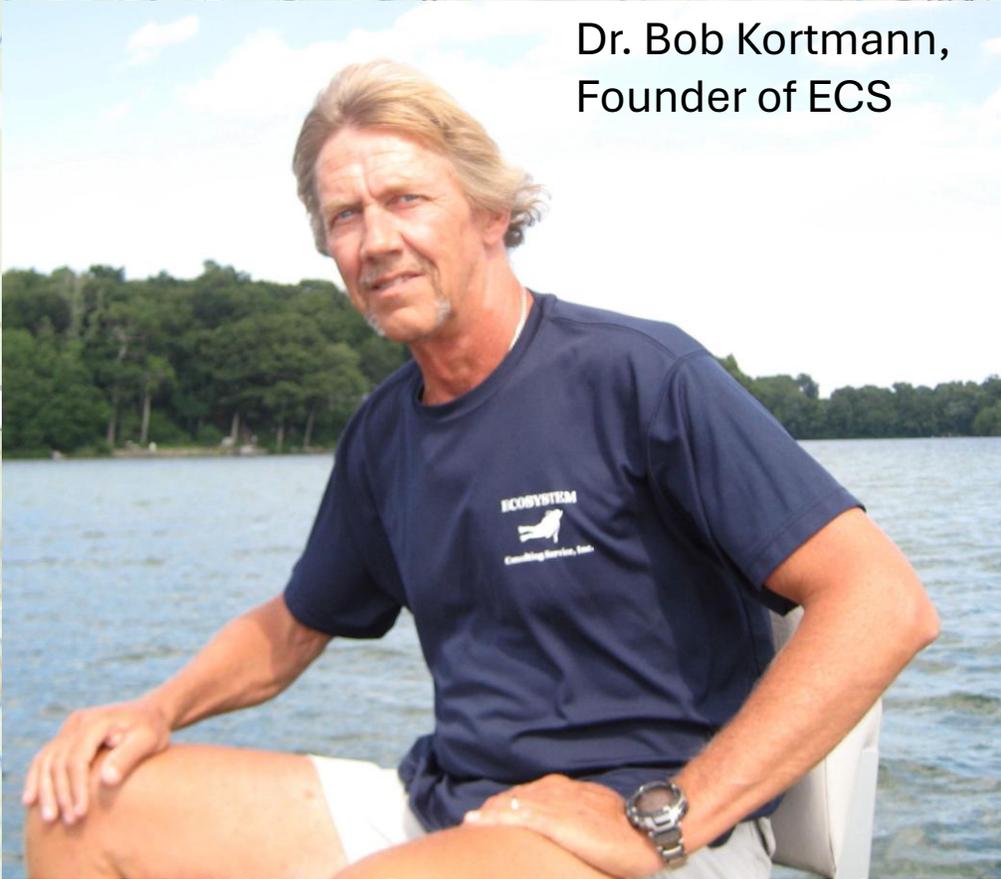
A photograph of a sunrise over a lake. The sky is filled with vibrant colors of pink, orange, and purple. The sun is low on the horizon, creating a bright glow. The water reflects the colors of the sky. In the foreground, there is a dark silhouette of a tree on the right and a concrete pier or dock on the left. The overall scene is peaceful and scenic.

Coventry / Wamgumbaug Lake

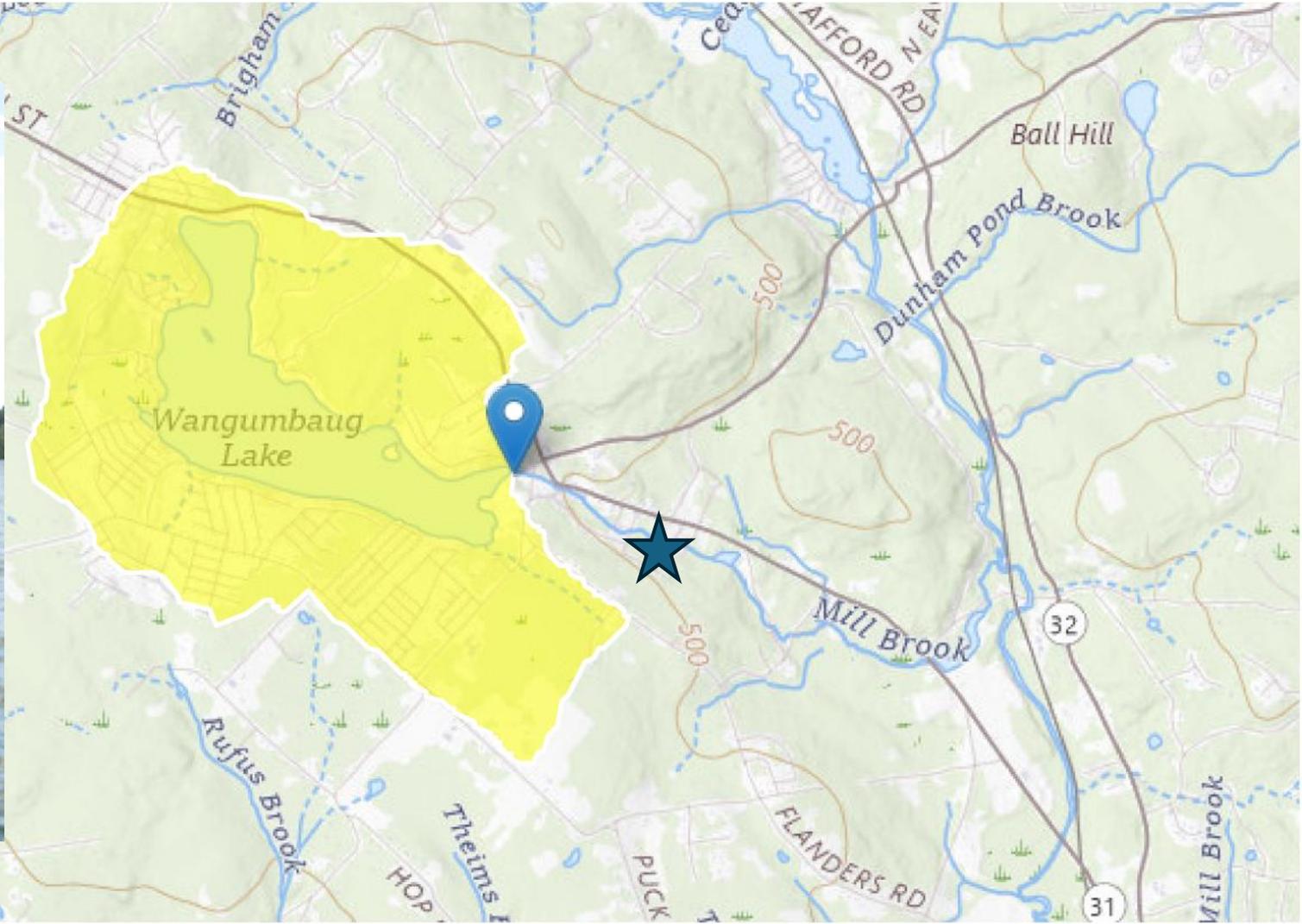
“A Tale of Two Lakes”

Ben Burpee, PhD, CLM

September 16, 2025



Dr. Bob Kortmann,
Founder of ECS

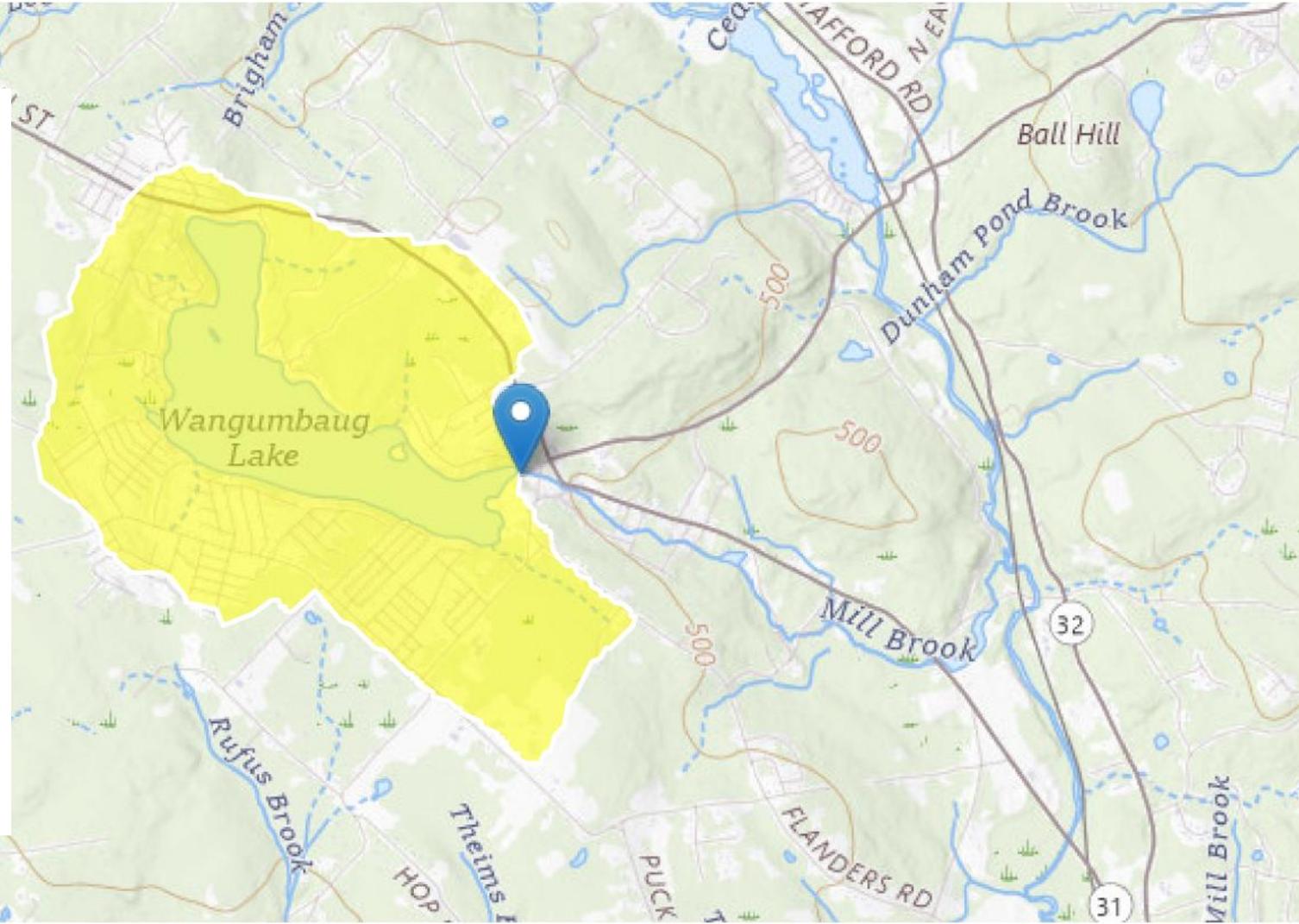


What are lakes and reservoirs?

Integrators

- of their total environment
- of broad-scale environmental changes

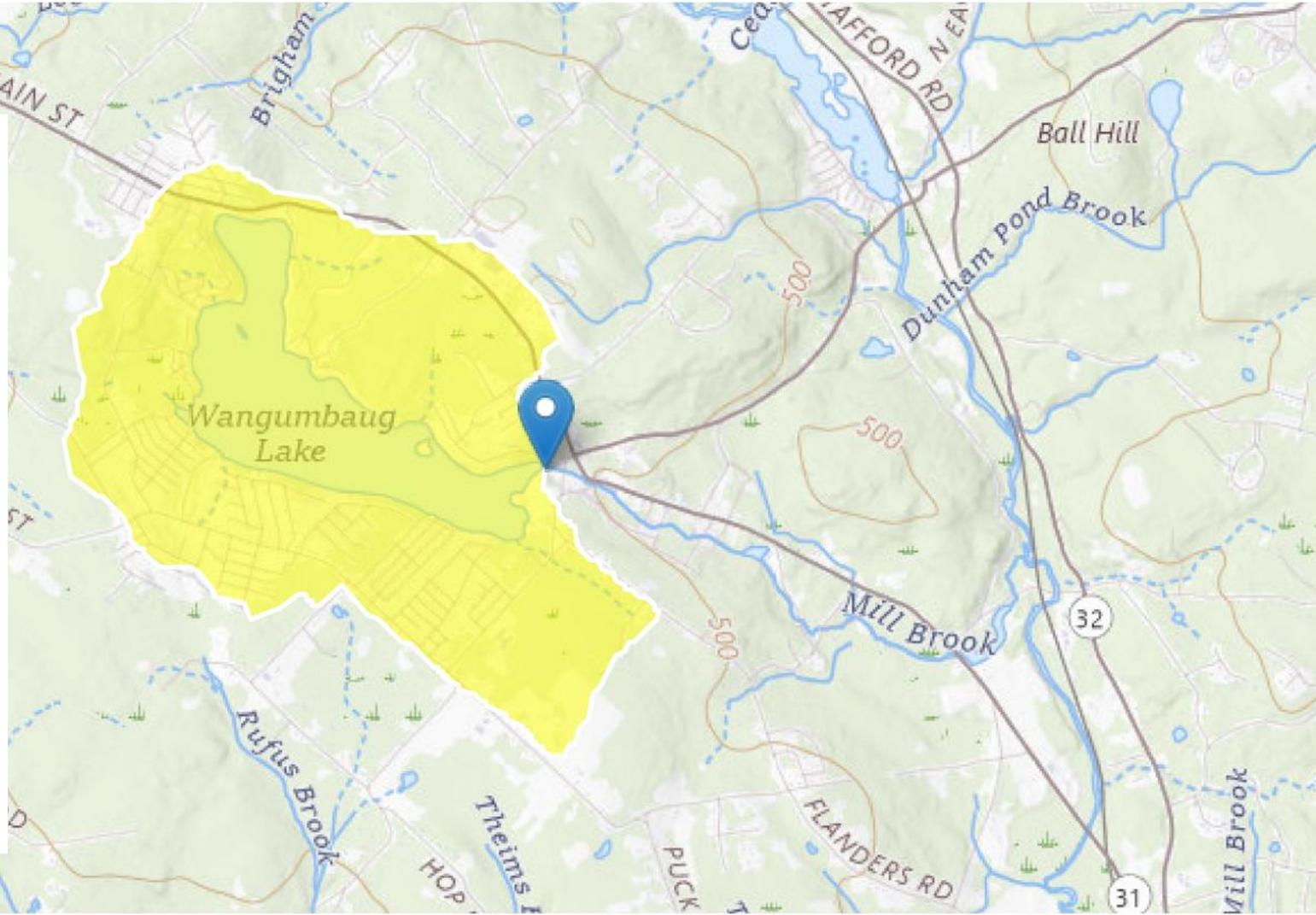
Hence, they are rather sensitive ecosystems, 'sentinels of change'



- Coventry, CT
- Lake area **0.6 mi²**
- Maximum depth of **11 meters**
- Mean depth of **4 meters**
- Watershed **3 mi²**
- **WA:LA 6**

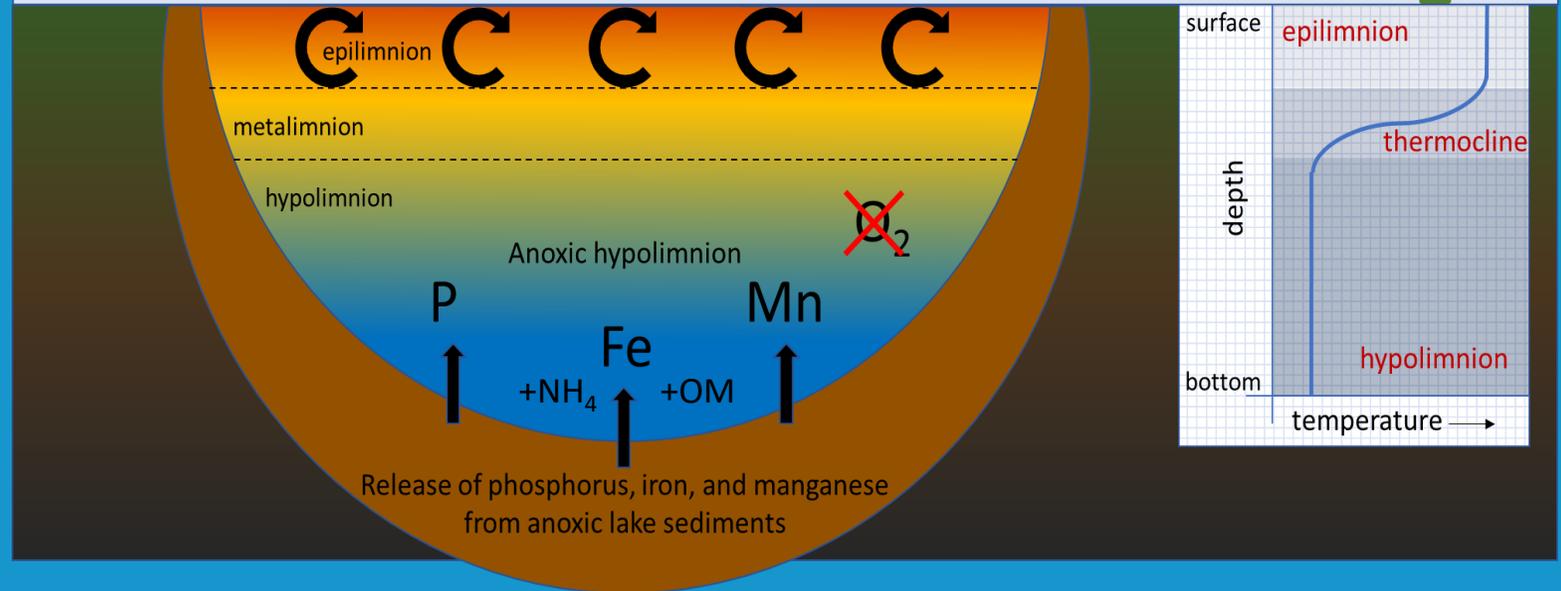
- Residence time: 1.9 years
- Flushing rate: 0.52 vol / year

- Regular monitoring since mid '80s



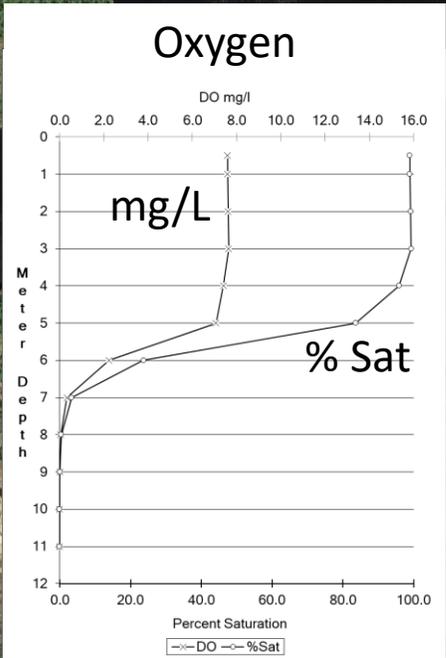
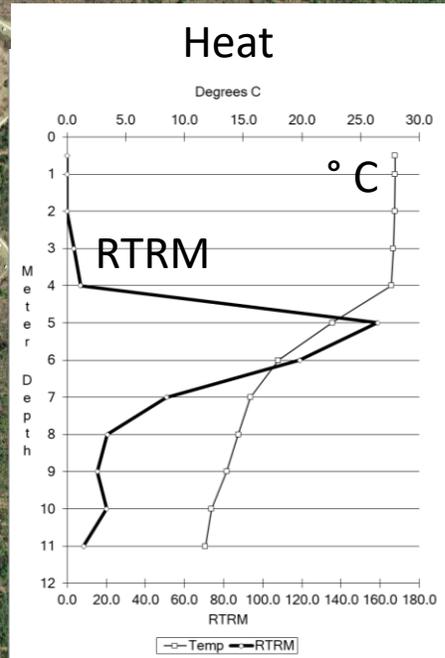
Some Background: Limnology 101

Anatomy of summer thermal stratification in a lake



Heat

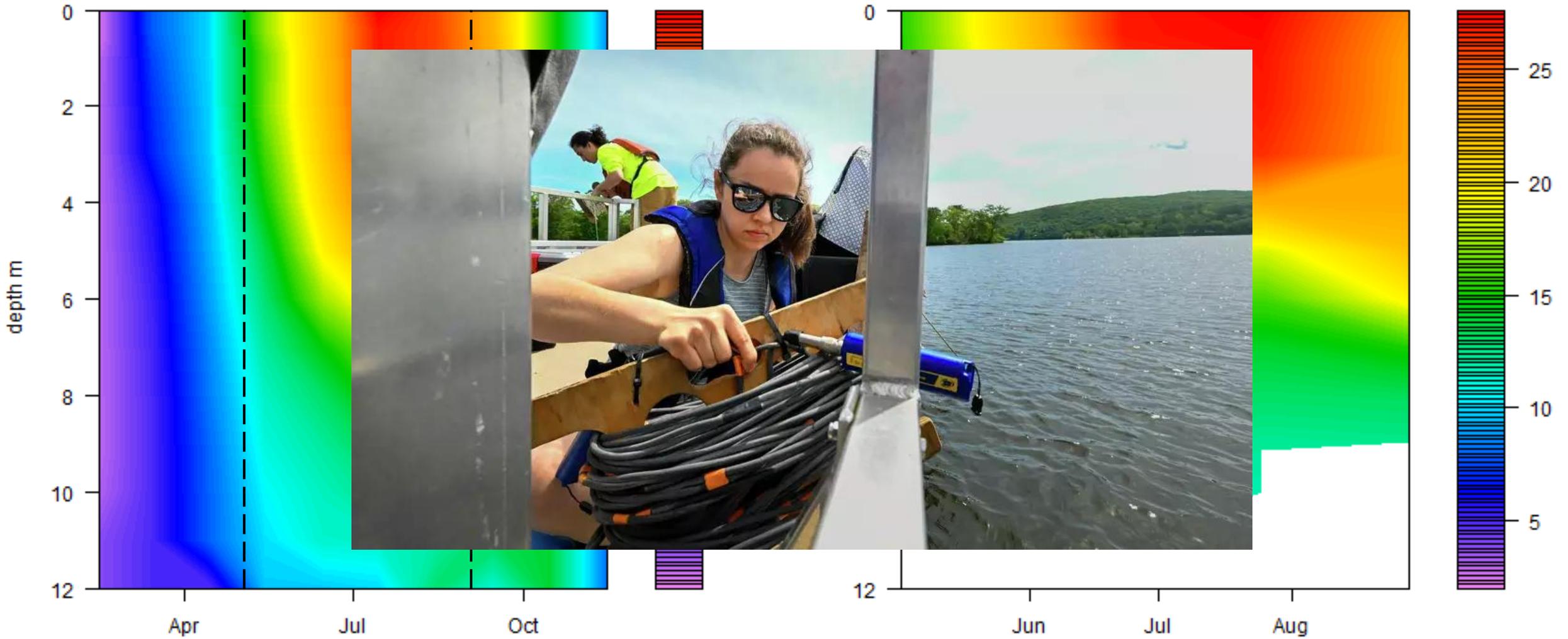
Oxygen



INSTRUMENTAL DATA - Temperature

2000-2024 Coventry Temperature C

2025 Coventry Temperature C

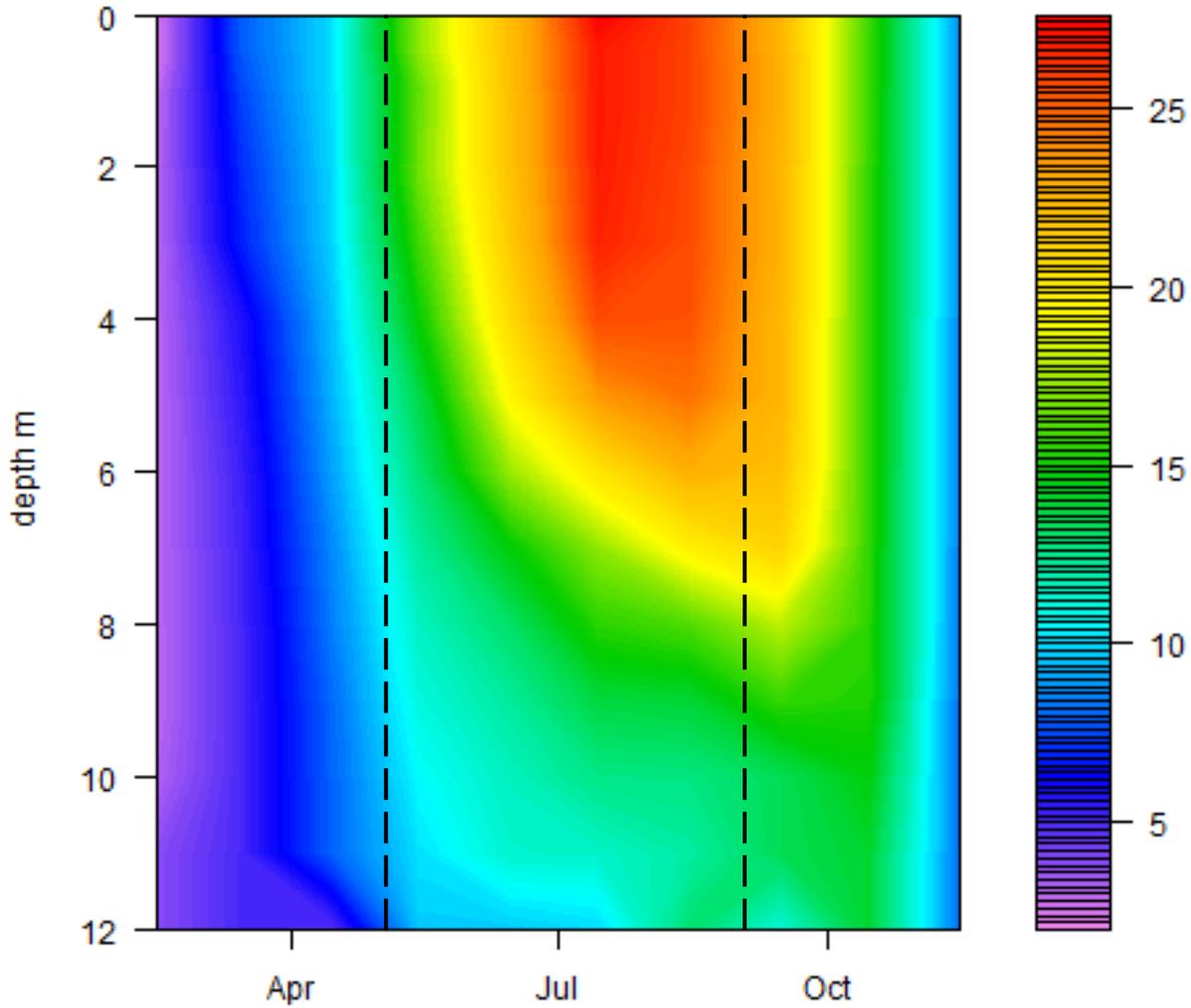


Historical

2025

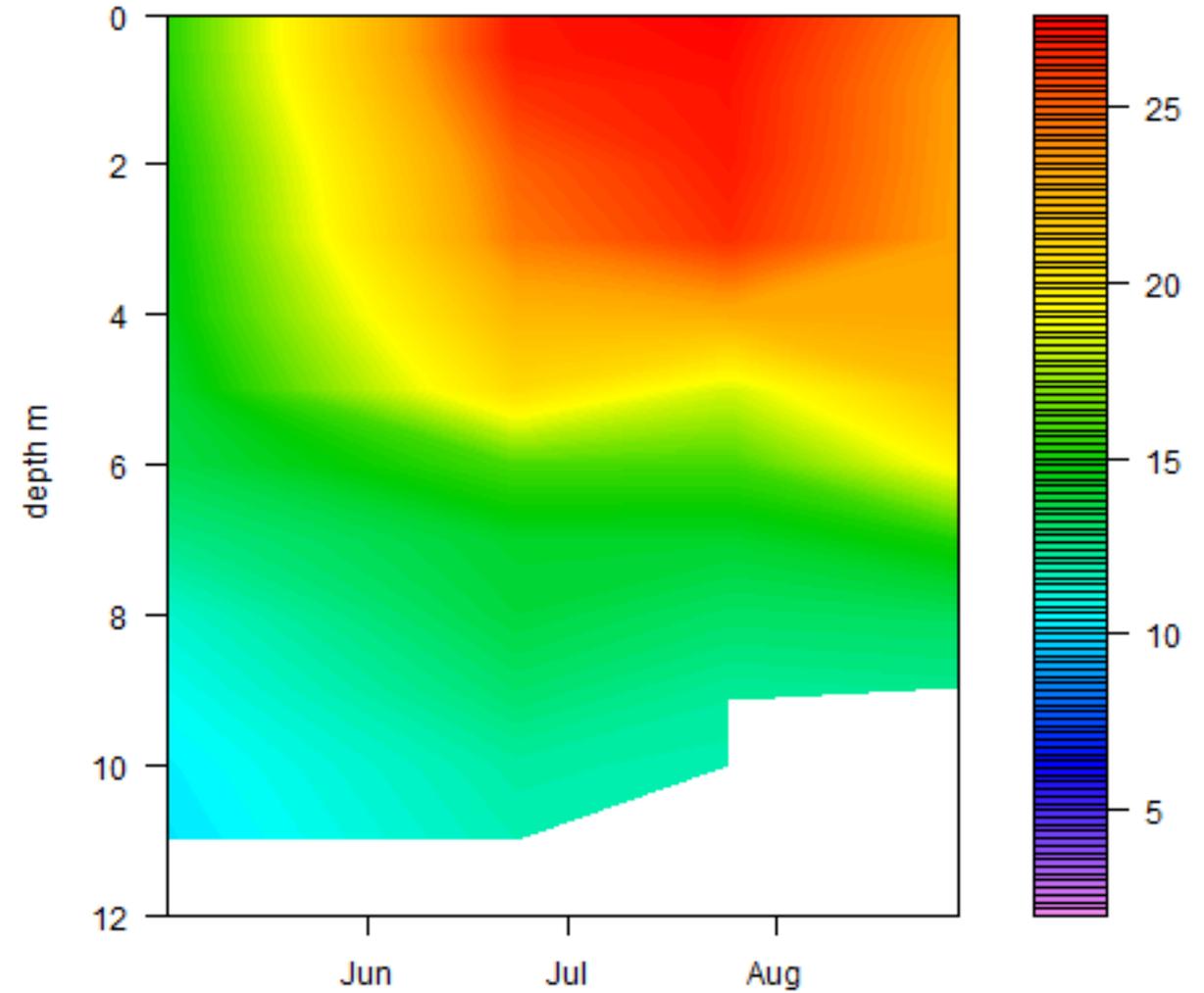
INSTRUMENTAL DATA - Temperature

2000-2024 Coventry Temperature C



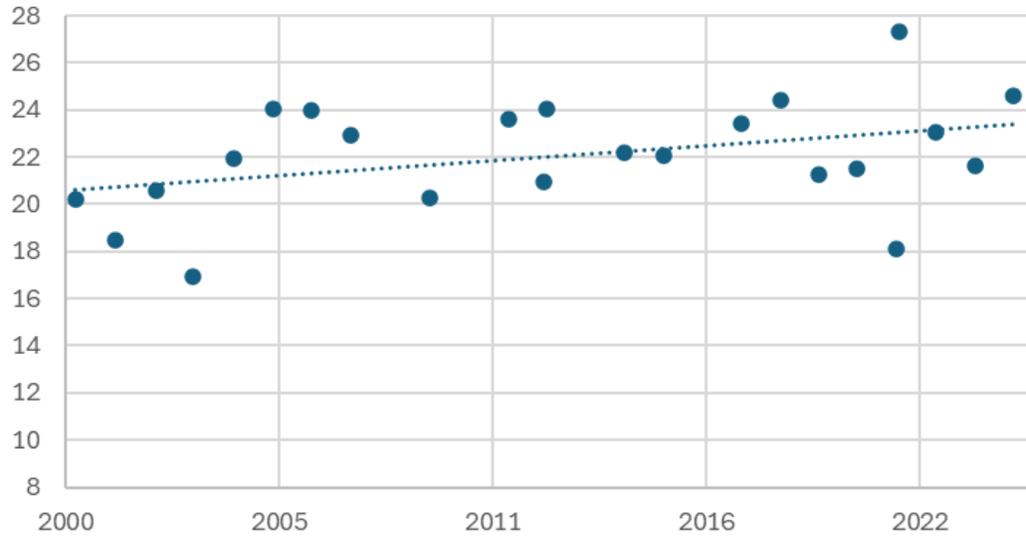
Historical

2025 Coventry Temperature C



2025

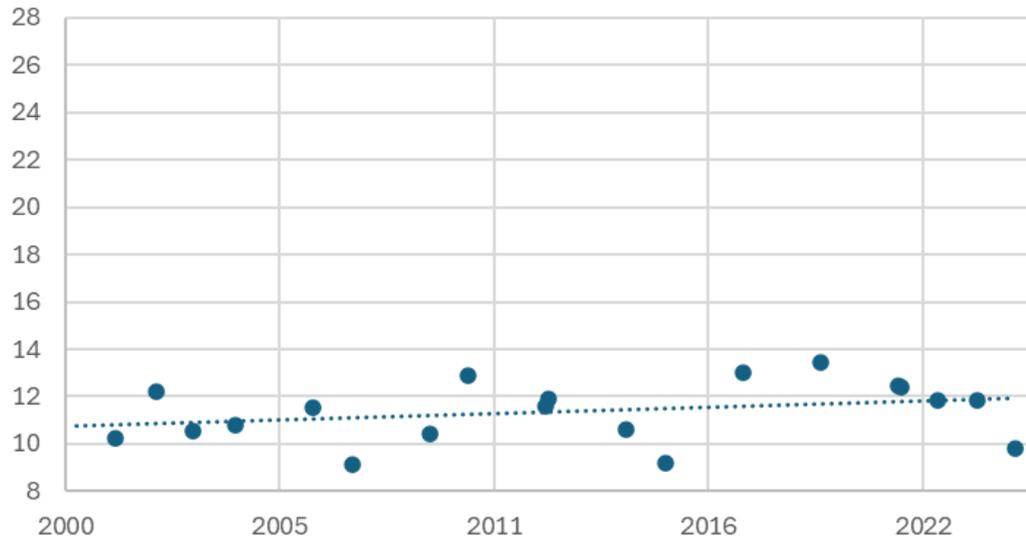
June Surface temperature (deg C) - Coventry Lake



Long-term data indicate that **Coventry Lake is warming**, especially in Spring

Most of that heat gain occurs at the surface, which has warmed by 3 degrees C since 2000 (in June)...

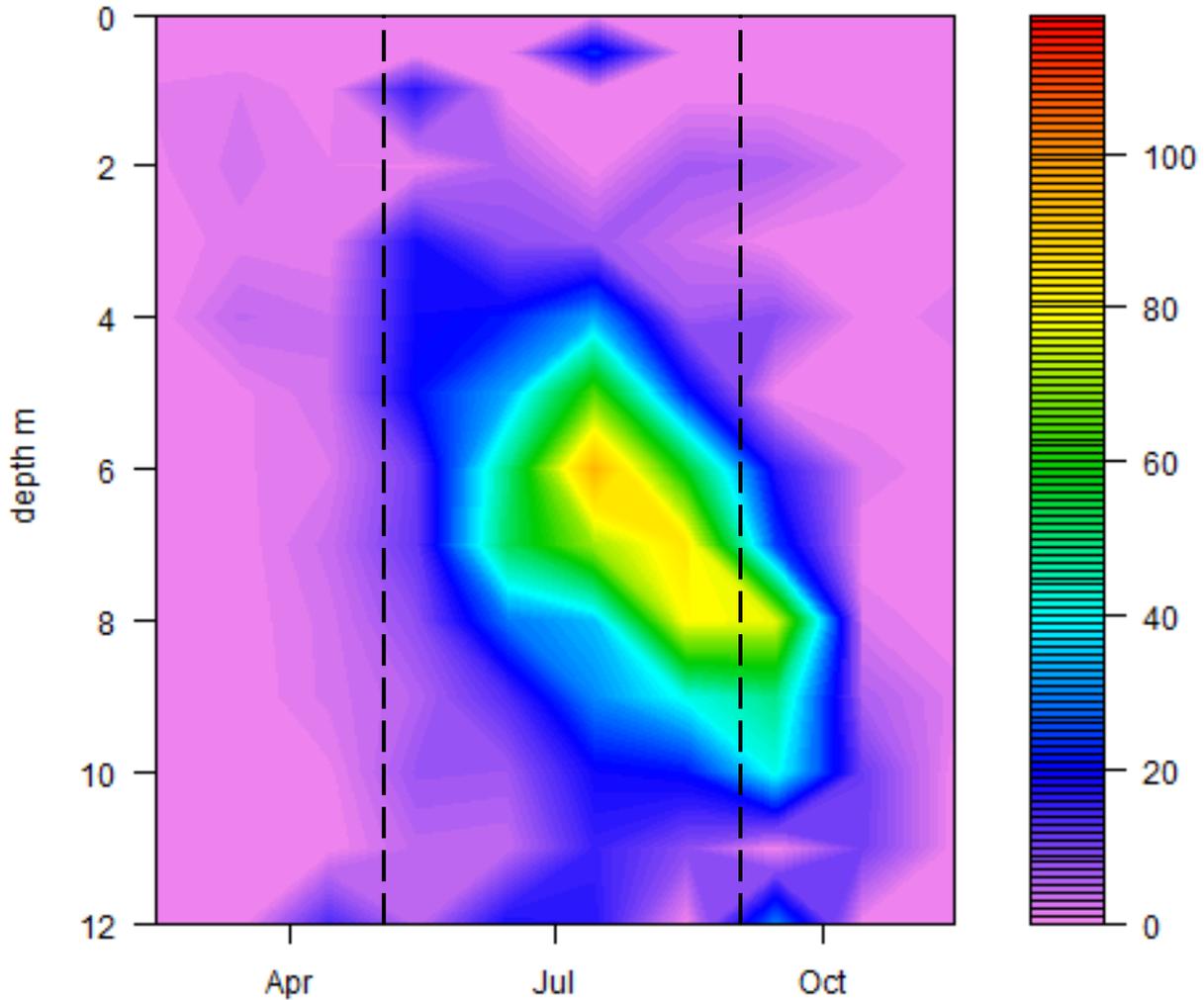
June OB temperature (deg C) - Coventry Lake



...though the bottom of the lake is warming, albeit at a slower rate—about 1 degree C since 2000 (in June).

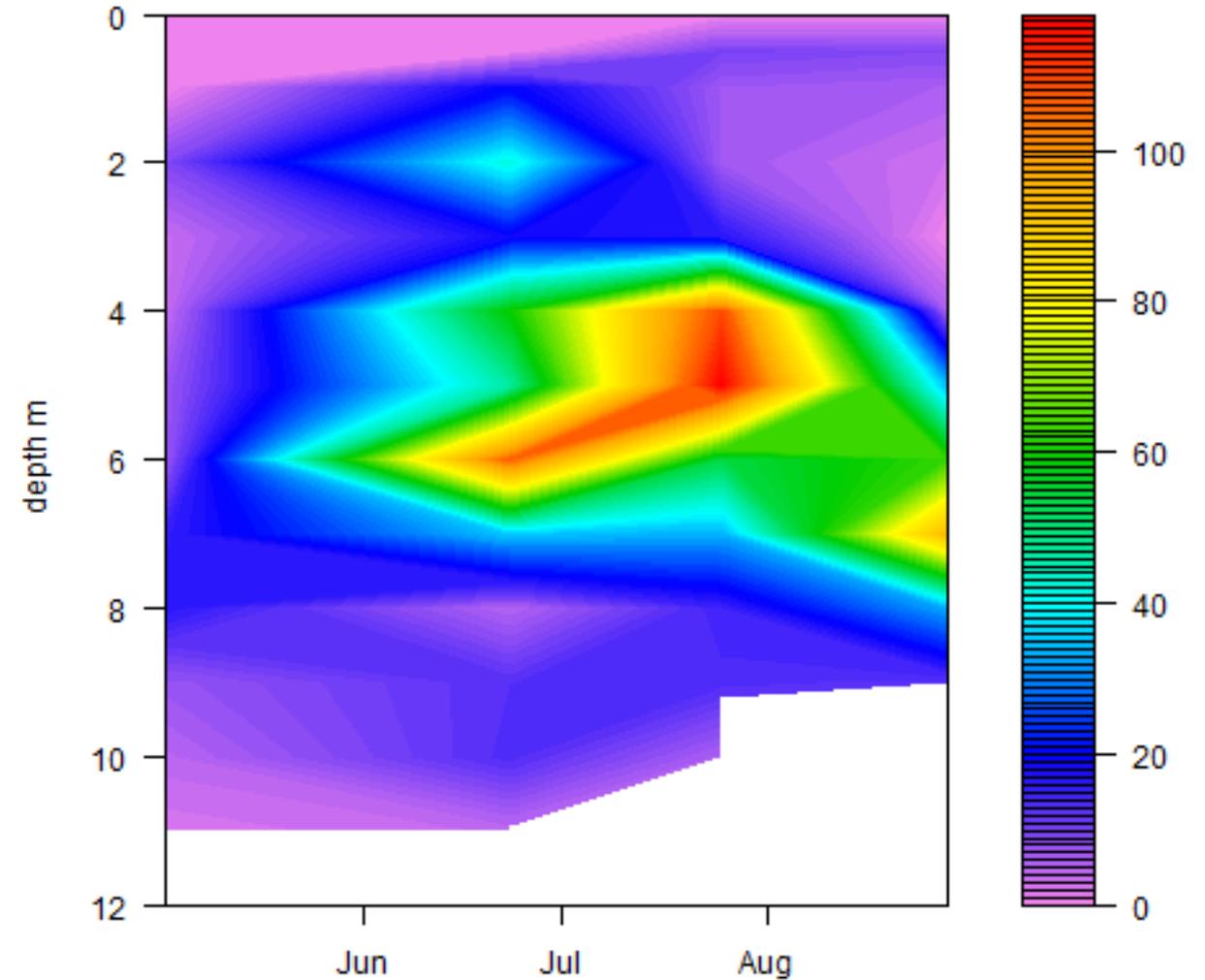
INSTRUMENTAL DATA – Stratification (relative thermal resistance to mixing)

2000-2024 Coventry Stratification (RTRM)



Historical

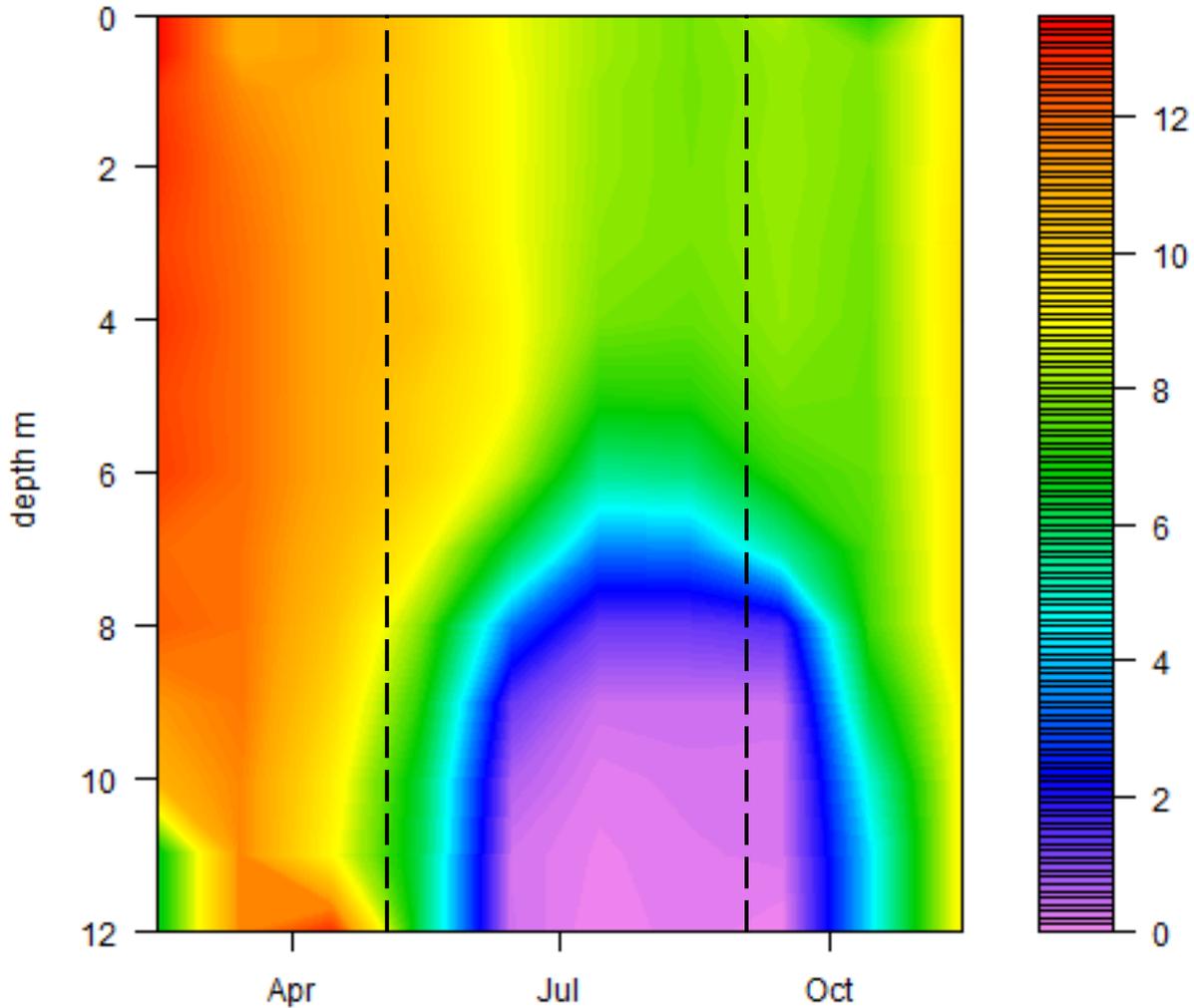
2025 Coventry Stratification (RTRM)



2025

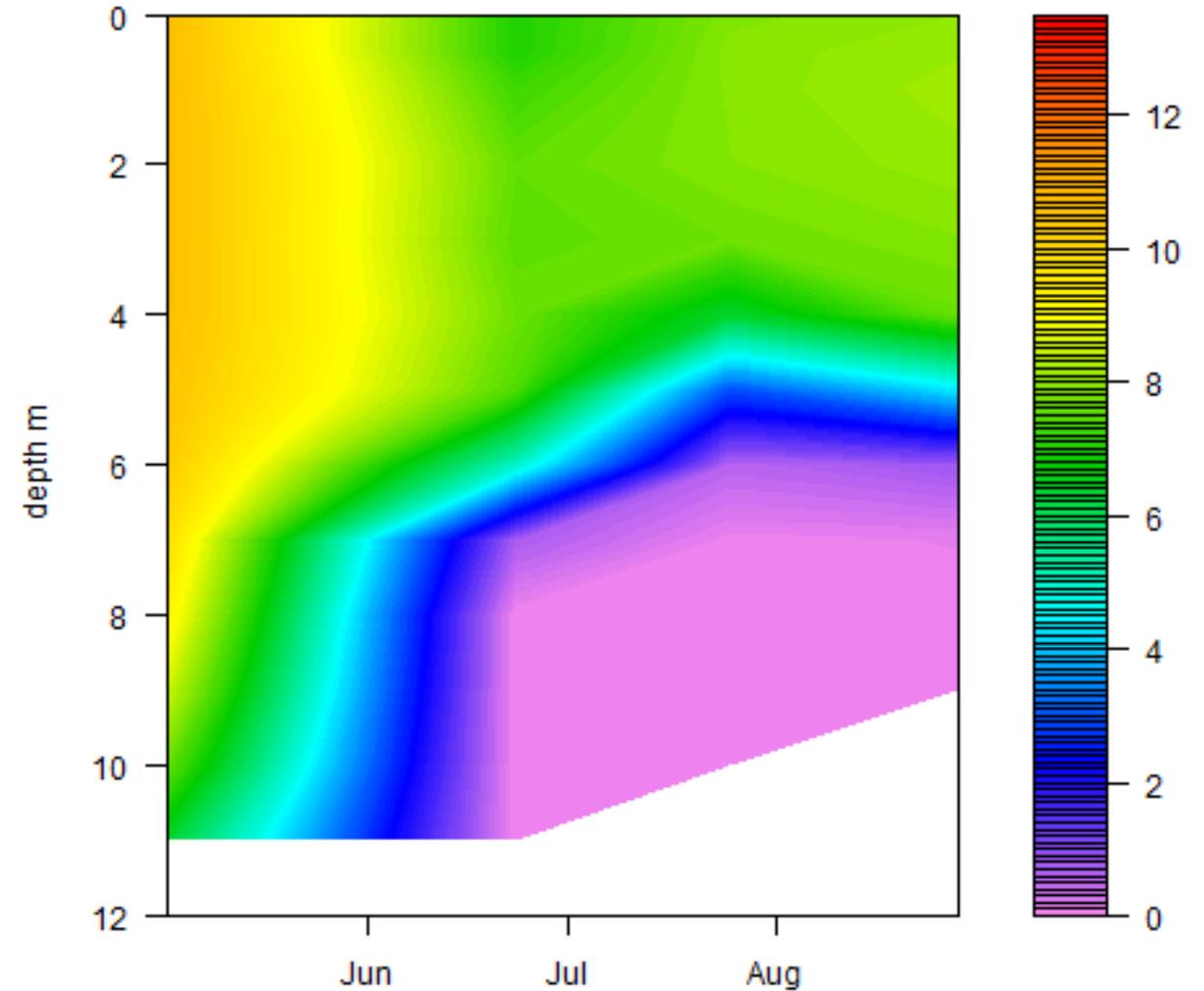
INSTRUMENTAL DATA – Dissolved Oxygen

2000-2024 Coventry Dissolved Oxygen (mg/L)



Historical

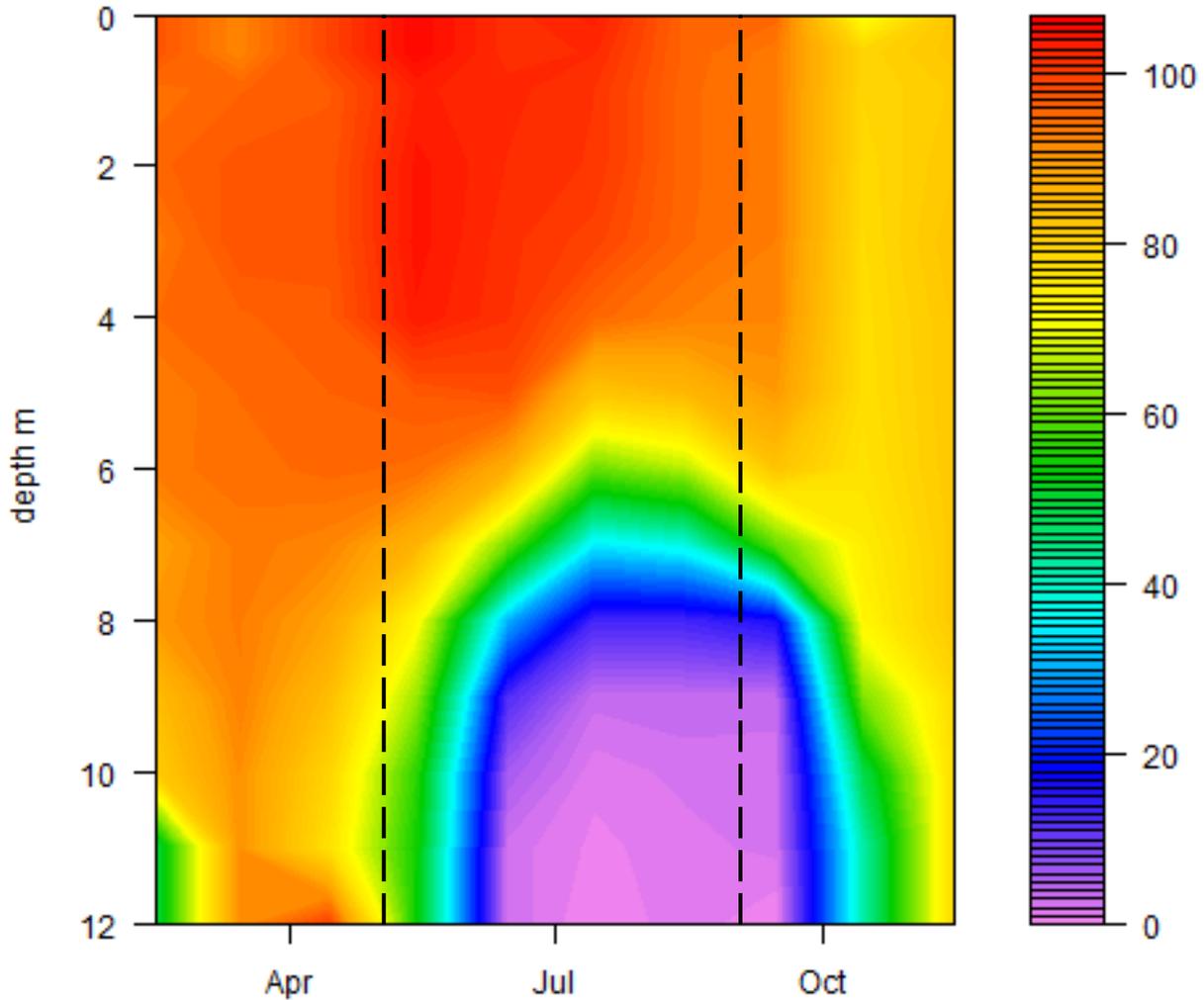
2025 Coventry Dissolved Oxygen (mg/L)



2025

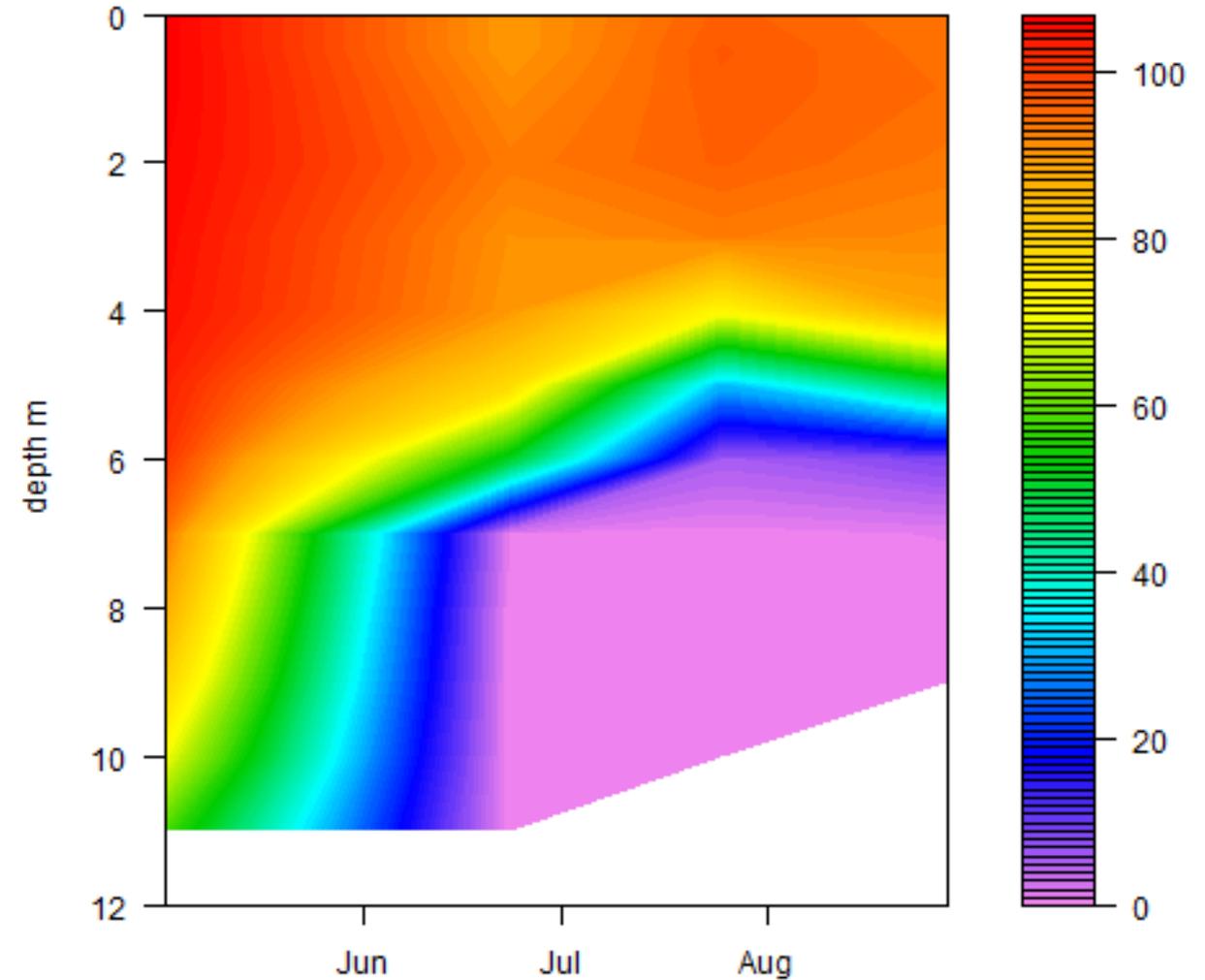
INSTRUMENTAL DATA – Dissolved Oxygen

2000-2024 Coventry Dissolved Oxygen (% Sat)



Historical

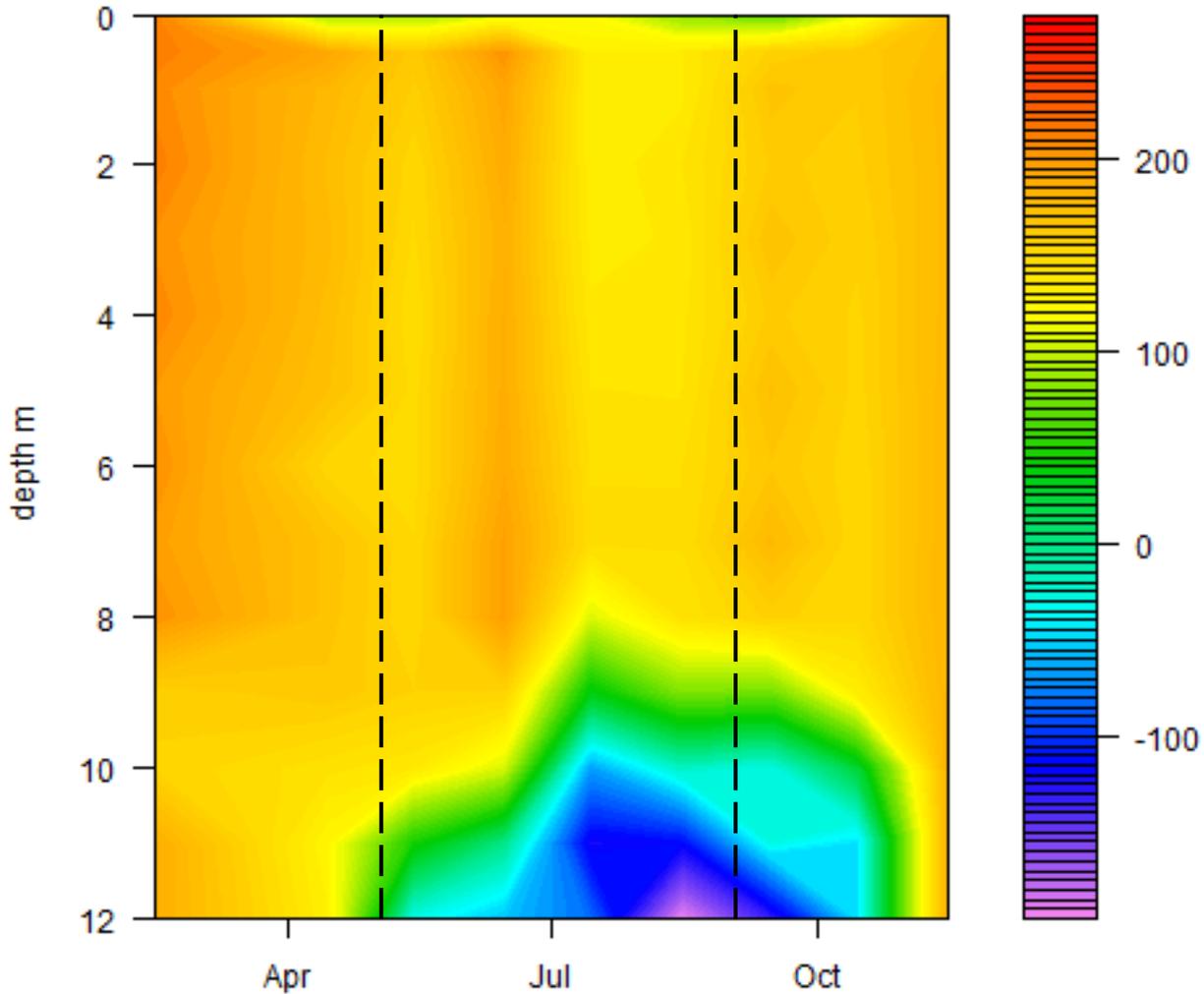
2025 Coventry Dissolved Oxygen (% Sat)



2025

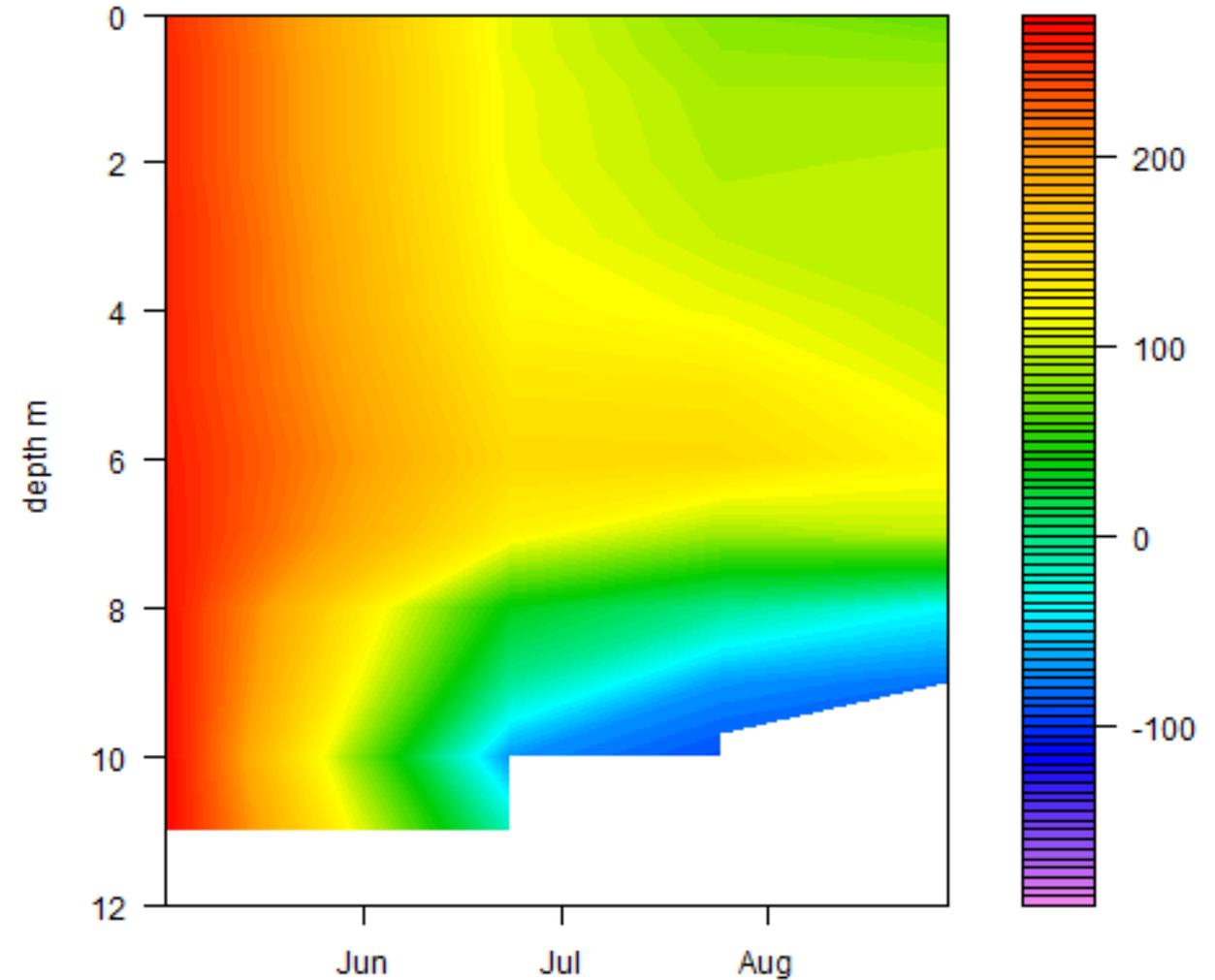
INSTRUMENTAL DATA – Oxidation-Reduction Potential (ORP)

2000-2024 Coventry ORP (mV)



Historical

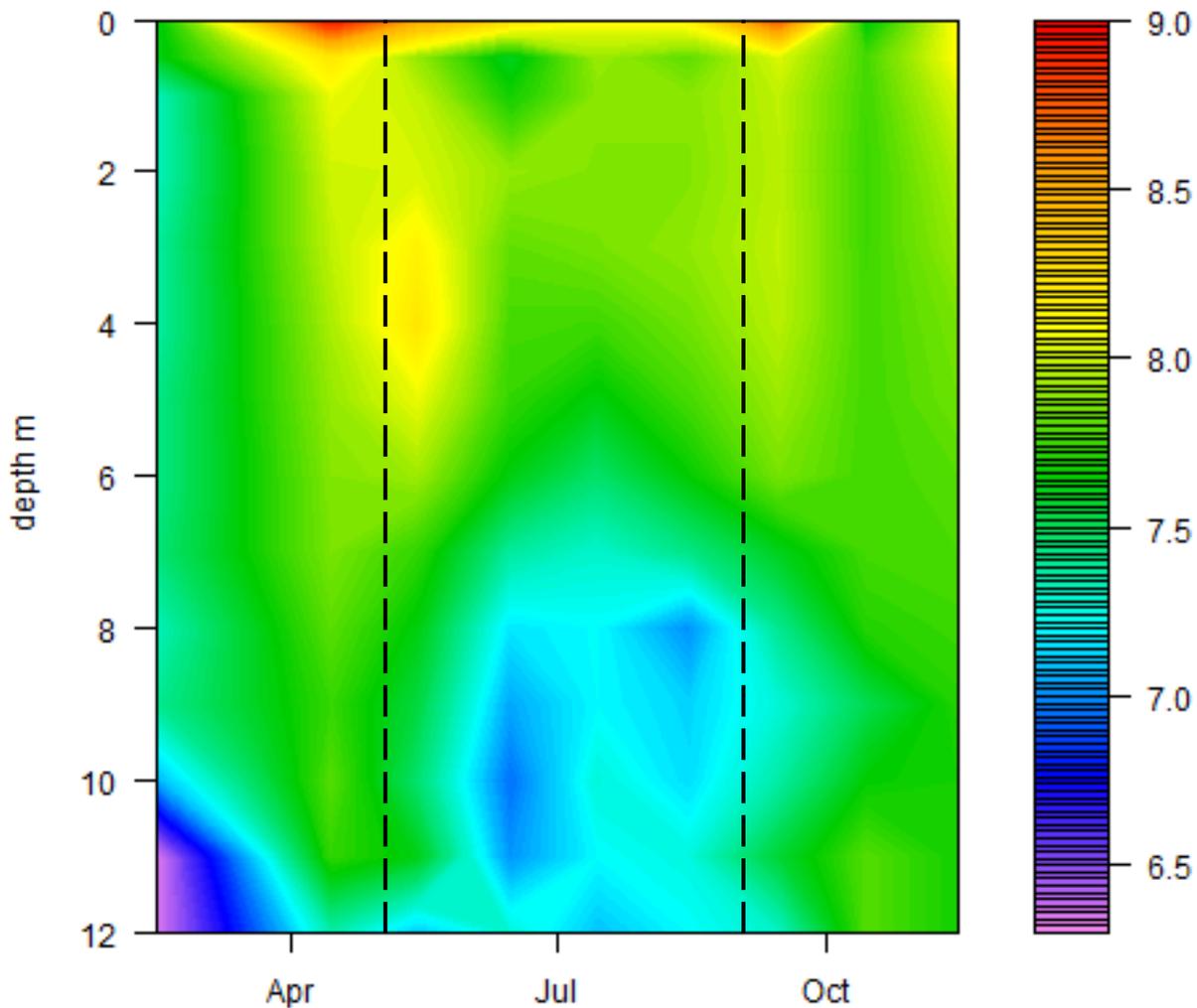
2025 Coventry ORP (mV)



2025

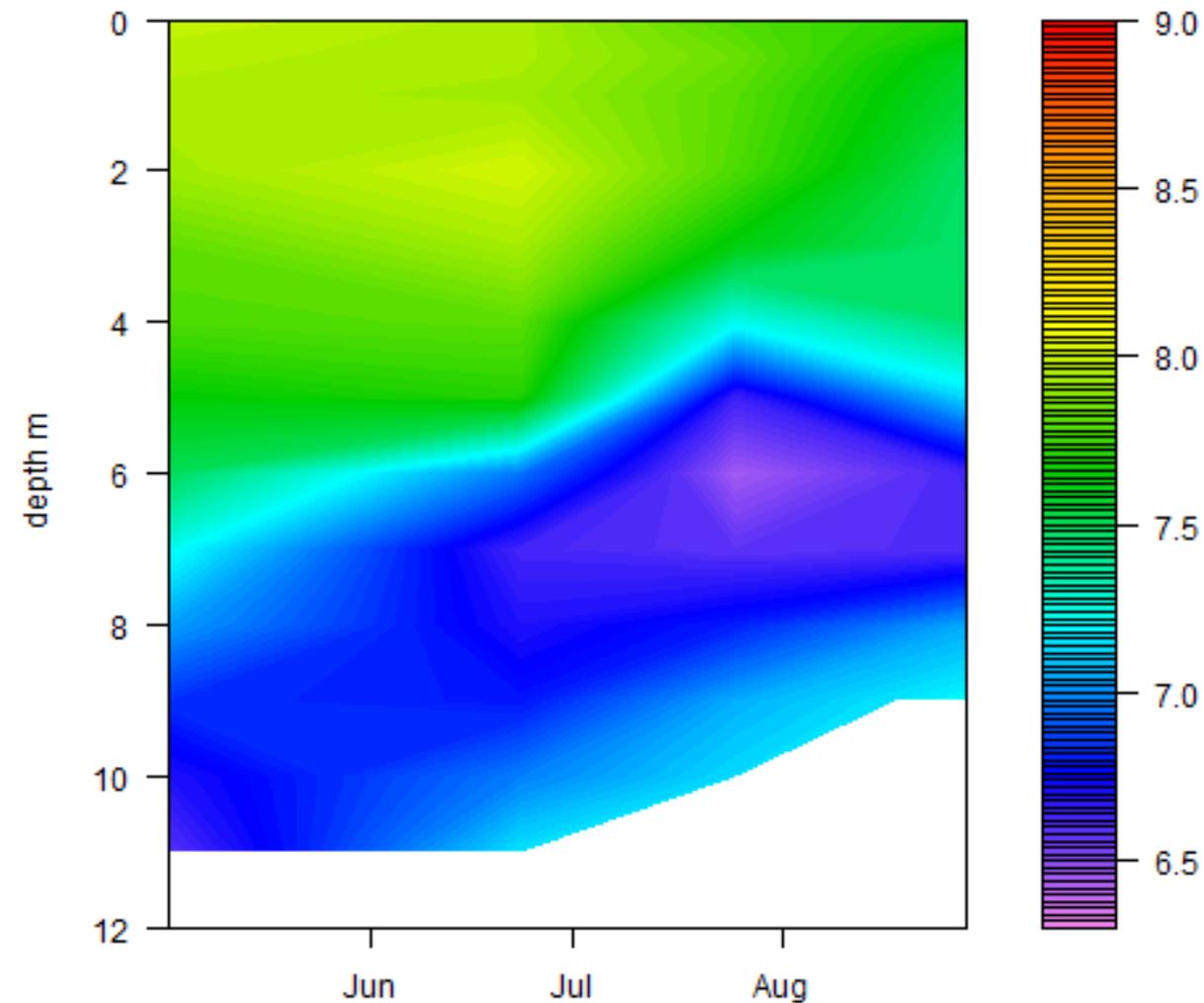
INSTRUMENTAL DATA – pH

2000-2024 Coventry pH



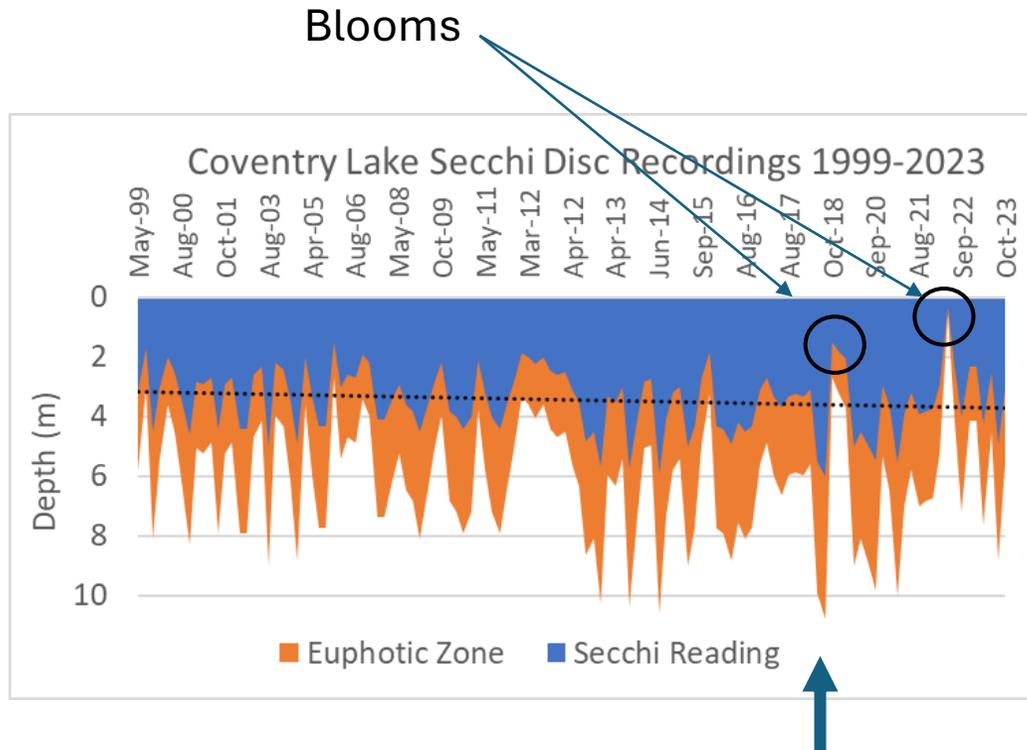
Historical

2025 Coventry pH

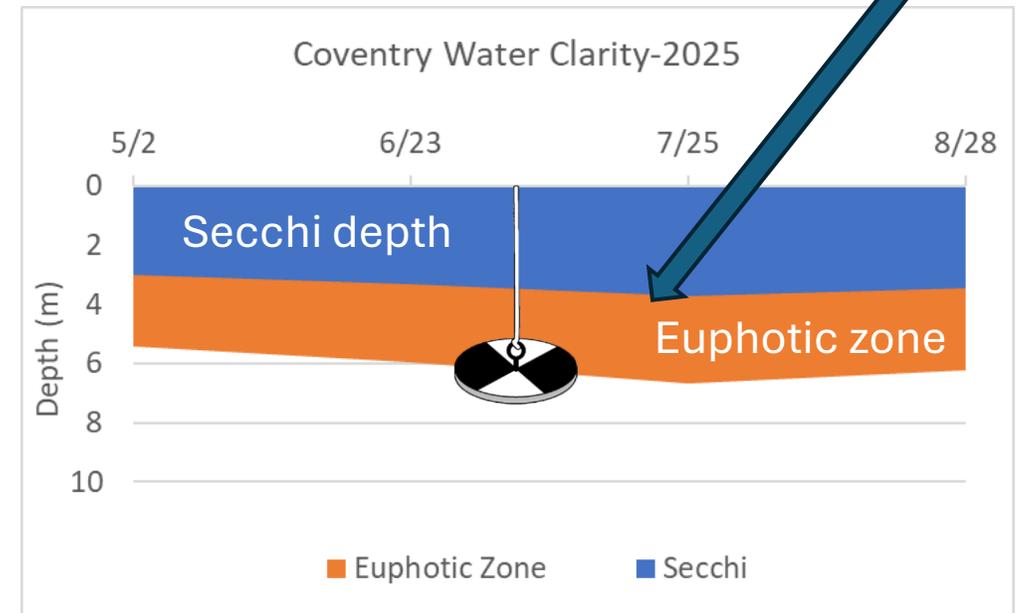


2025

INSTRUMENTAL DATA – Water clarity

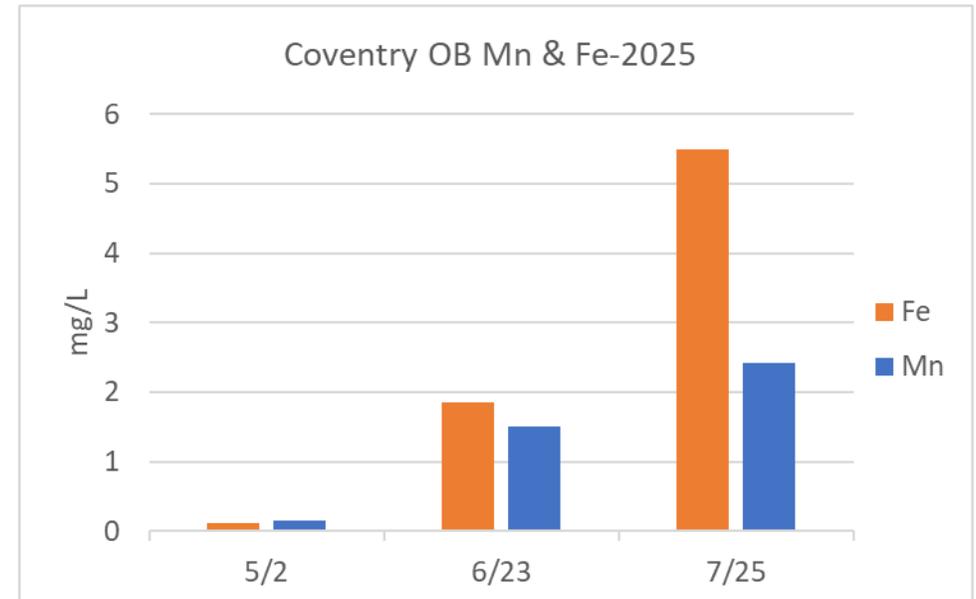
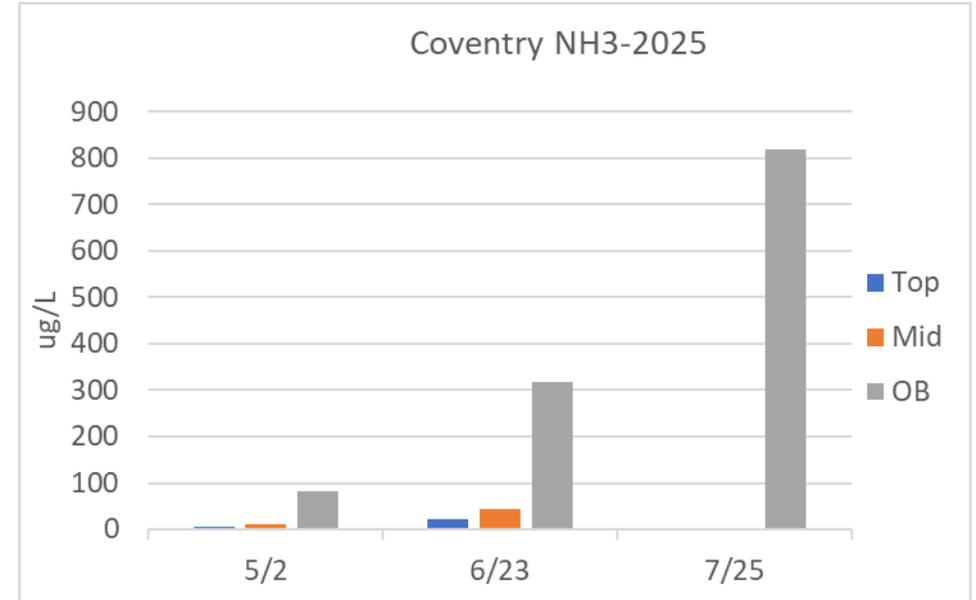
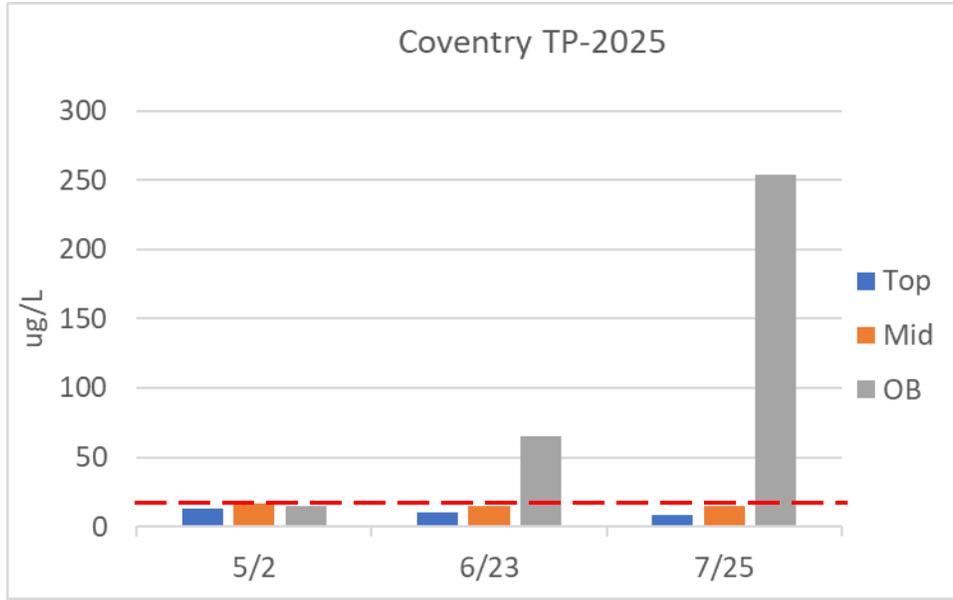


2018 exhibited the best Summer transparency and worst Fall transparency.



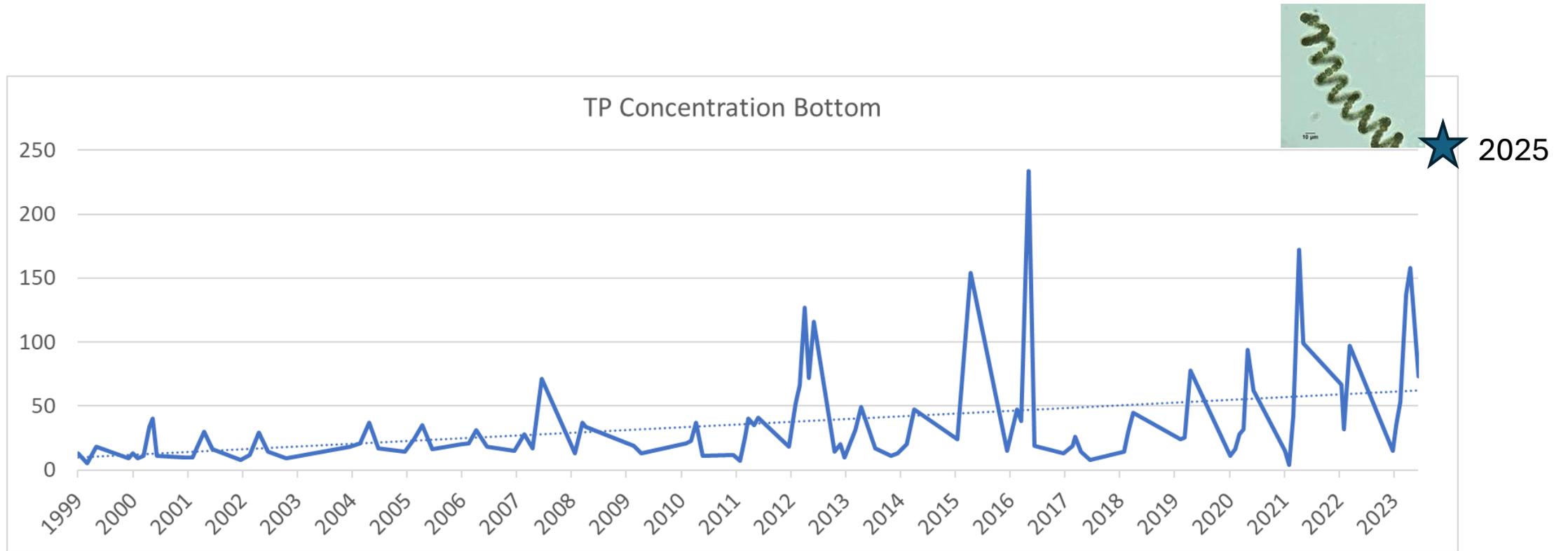
Lake clarity is good, and data suggest slight gains over past 20 years (though back in the 1930's Secchi depth was 6 m!)

CHEMICAL/ANALYTICAL DATA

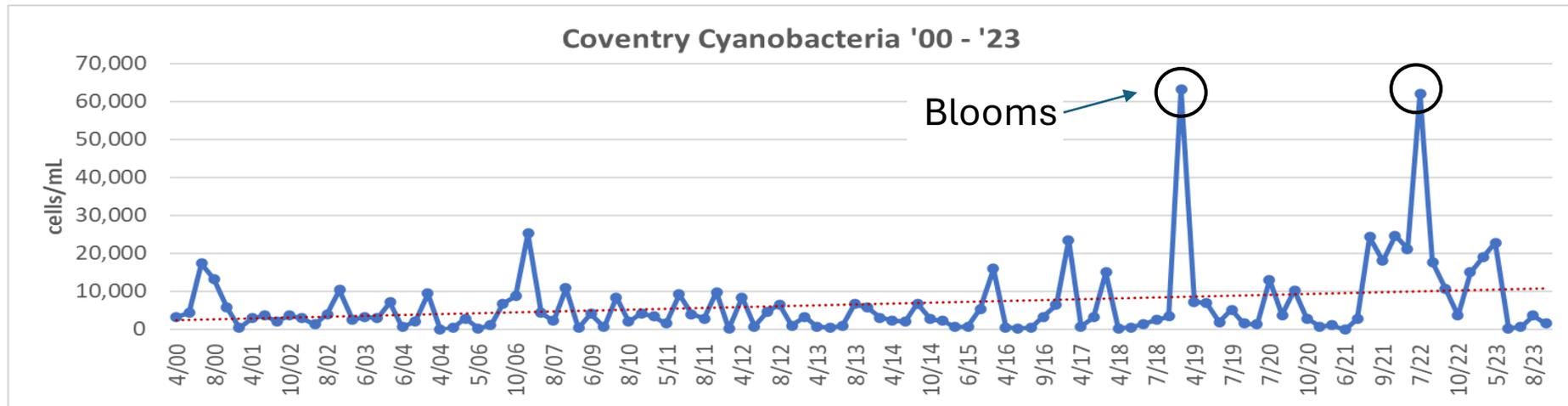
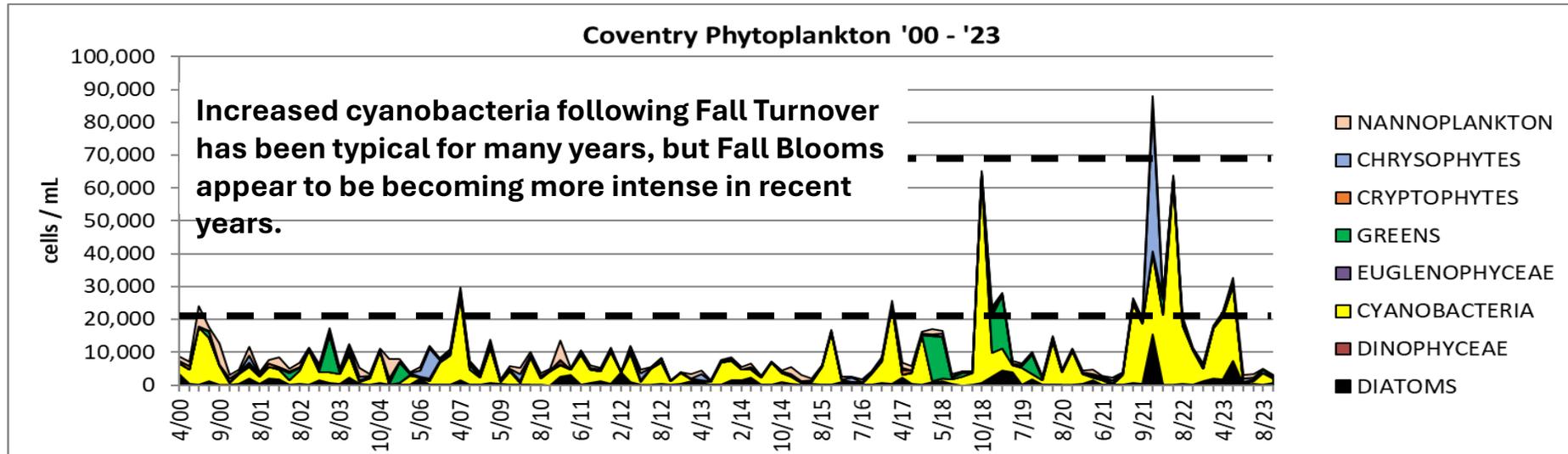


CHEMICAL/ANALYTICAL DATA

Total phosphorus is increasing over time, most rapidly at the bottom of Coventry Lake

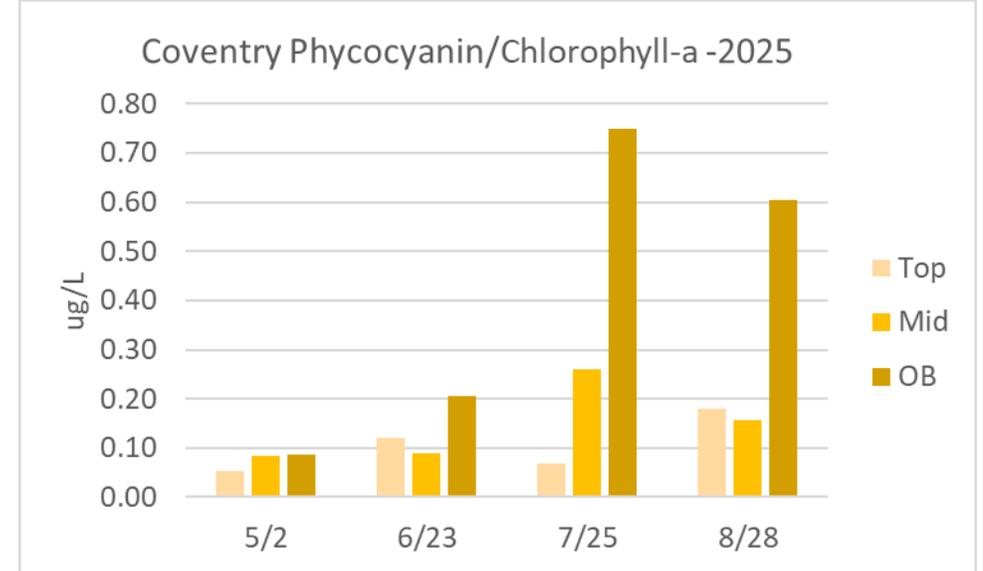
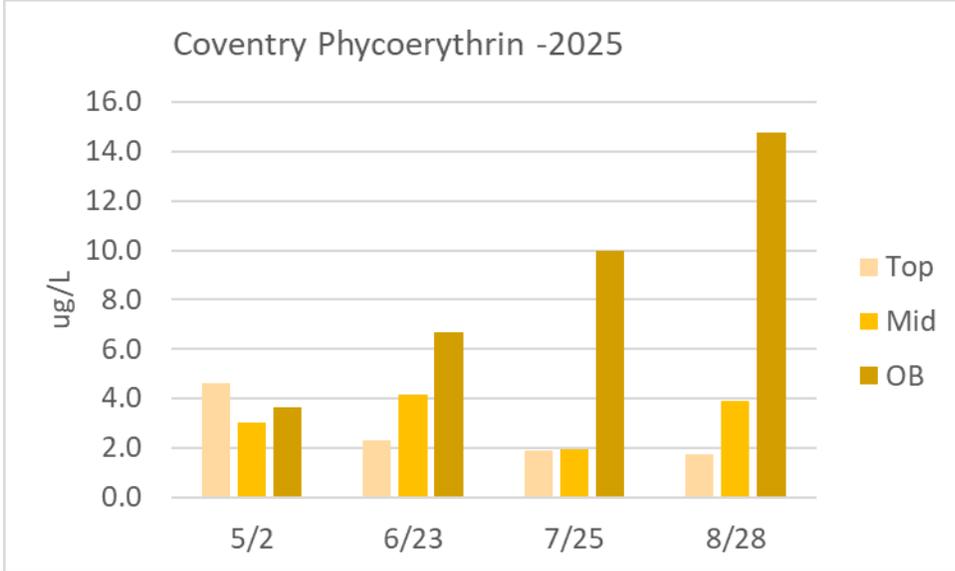
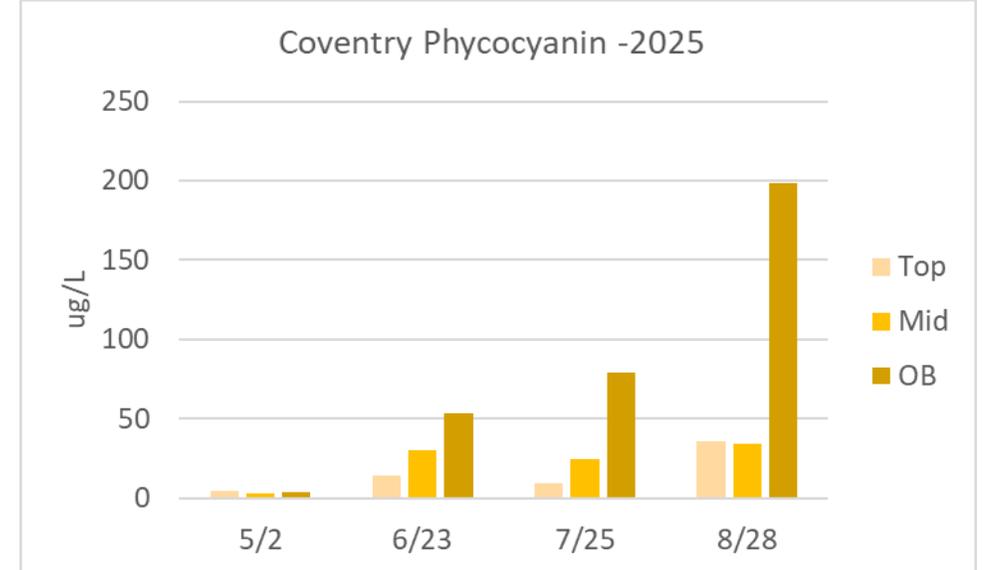
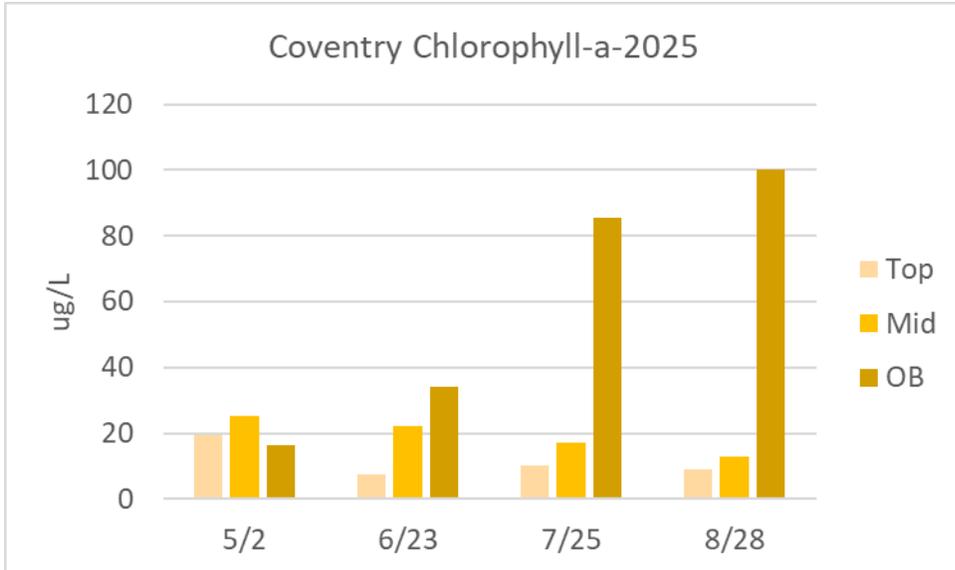


Some History and Recent Trends



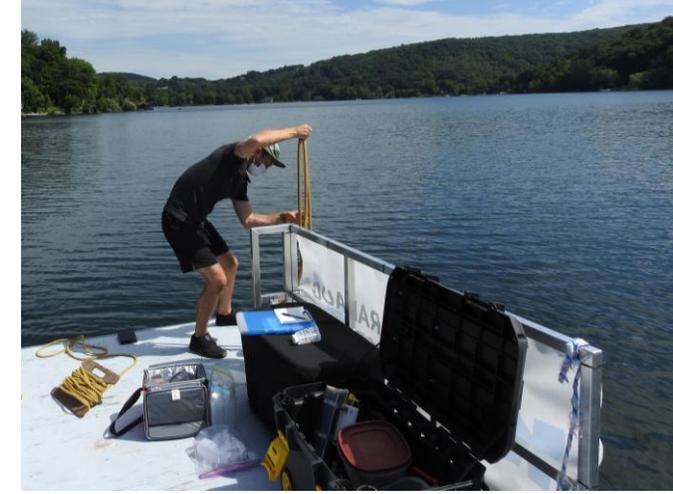
It appears that cyanobacteria are becoming more abundant and dominant in the phytoplankton assemblage, especially over the past decade.

BIOLOGICAL DATA – Phytoplankton Pigments

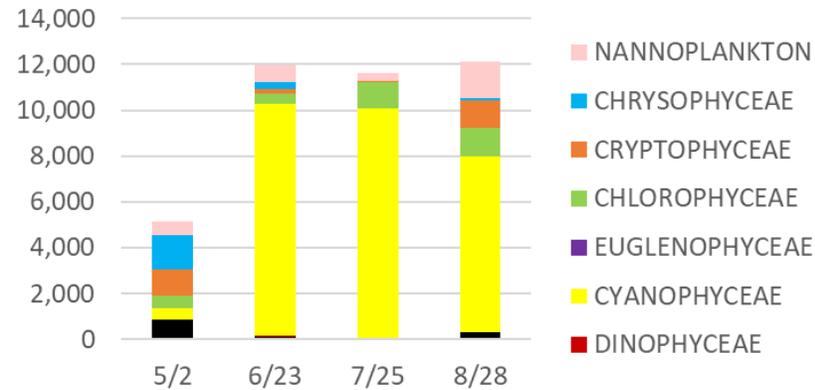


BIOLOGICAL DATA – Phytoplankton & Cyanobacteria

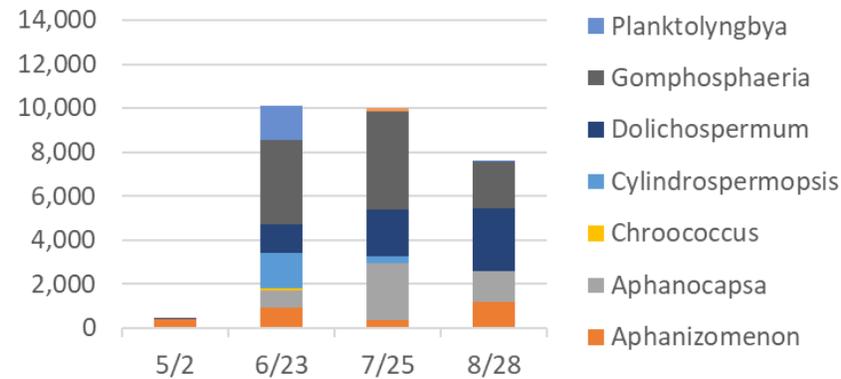
SHALLOW PHYTOPLANKTON (0 – 5 m)



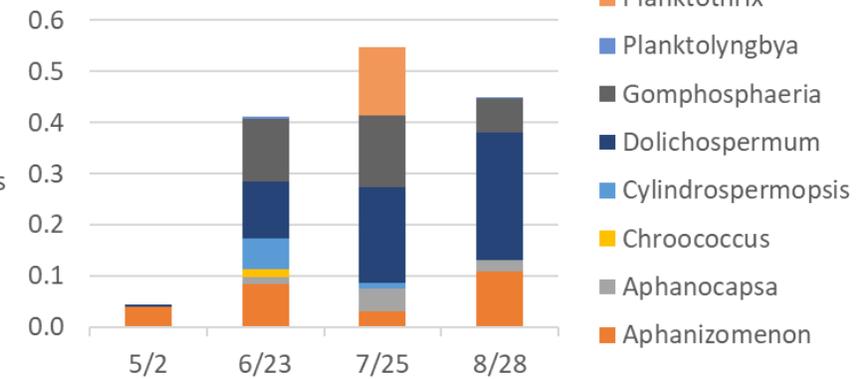
Coventry Lake 2025 0-5m Phytoplankton
Density, cells/mL



Coventry Lake 2025 0-5m Cyanobacteria
Density, cells/mL



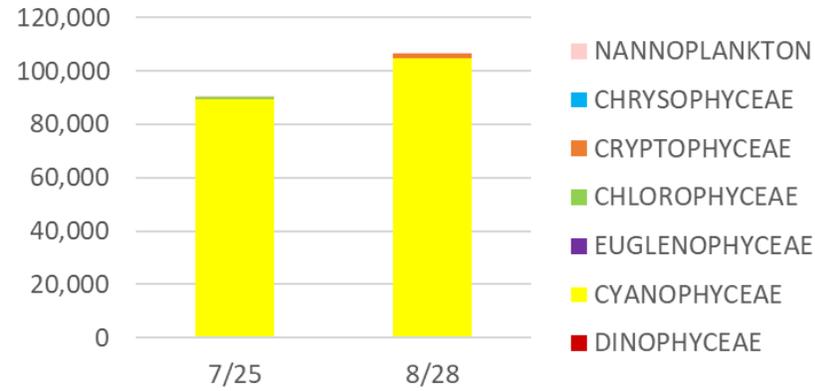
Coventry Lake 2025 0-5m Cyanobacteria
Biovolume, mm³/L



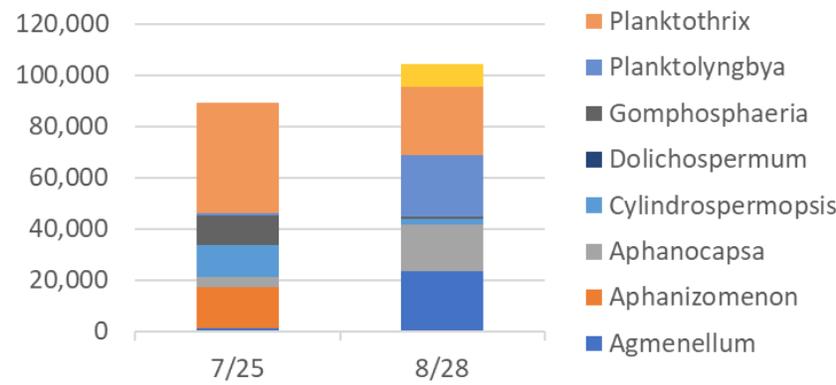
BIOLOGICAL DATA – Phytoplankton & Cyanobacteria

DEEP PHYTOPLANKTON (8-10 m)

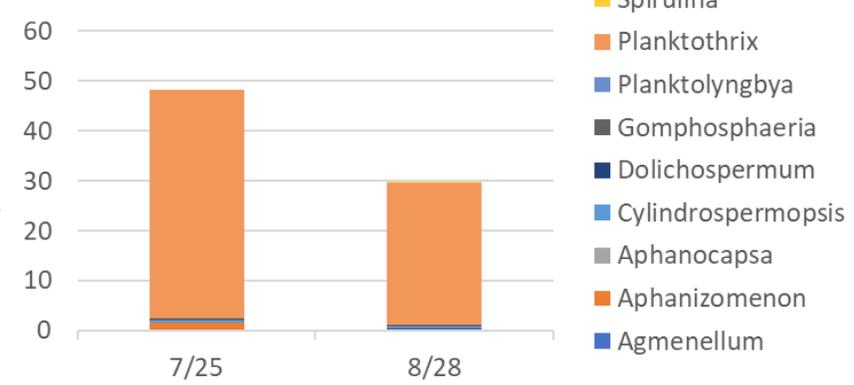
Coventry Lake 2025 Deep Phytoplankton
Density, cells/mL



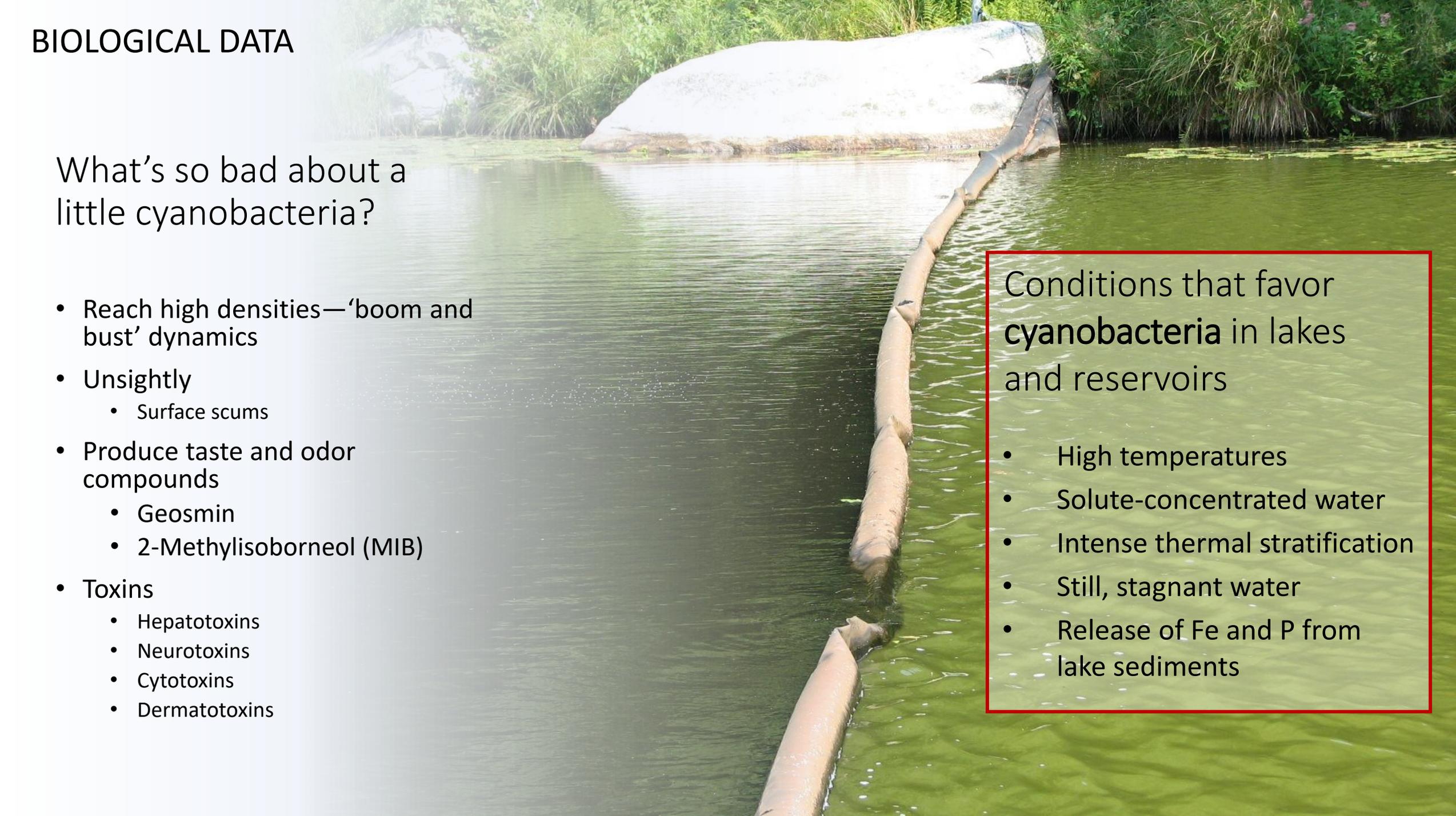
Coventry Lake 2025 Deep Cyanobacteria
Density, cells/mL



Coventry Lake 2025 Deep Cyanobacteria
Biovolume, mm³/L



BIOLOGICAL DATA



What's so bad about a little cyanobacteria?

- Reach high densities—'boom and bust' dynamics
- Unsightly
 - Surface scums
- Produce taste and odor compounds
 - Geosmin
 - 2-Methylisoborneol (MIB)
- Toxins
 - Hepatotoxins
 - Neurotoxins
 - Cytotoxins
 - Dermatotoxins

Conditions that favor **cyanobacteria** in lakes and reservoirs

- High temperatures
- Solute-concentrated water
- Intense thermal stratification
- Still, stagnant water
- Release of Fe and P from lake sediments



Original= 0.1349 lb P/yr



Target P Export = 0.0896 lb P/yr



- ReBuilt without Regulatory controls, % cover, etc.= 0.2792 lb P/yr
100% Increased P Export
- ReBuilt with Regulatory Controls= 0.2280 lb P/yr
70% Increased P Export
- Rebuilt Some Added BMPs= 0.1093 lb P/yr 20%
P Export Reduction; Not Target
Landscaping, Some Roof First Flush Capture
- Rebuilt More BMPs= 0.0877 lb P/yr Reached
Allocation Goal More First Flush BMPs

I am concerned with the trend I've seen, especially over the past decade- more development, loss of undisturbed woodland, and altering the character of the perimeter of the lake (the "ecotone", land-water interface).

That will result in a gradual, incremental, cumulative increase in watershed and internal nutrient loading and cyanobacteria blooms.

Regulations, and Town projects on right-of-ways, can only do so much. More can, and should, be done by private property owners on their property.

There is no better nutrient removal and retention system than an undisturbed woodland. Landscaping techniques can mimic the function of a woodland- reduce surface runoff, especially the first wash of a storm, and get as much rainfall into the ground where it falls as possible.



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Regulations, and Town projects on right-of-ways, can only do so much. More can, and should, be done by private property owners on their property.

Simply converting a part of a lawn to "simulated woodland", while maintaining view corridors, can reduce P export. ***Watershed management can be effective, but it needs to occur on individual private properties.***

OPINION: The “reasonable use of private property” for which the small lake area lots were created was “summer bungalow get-away”, today’s uses exceed that.



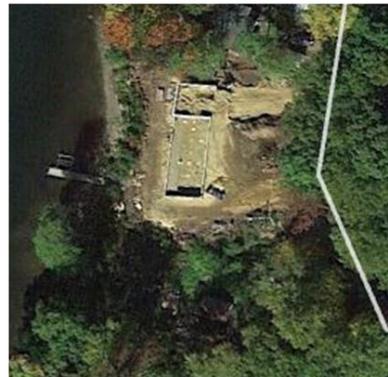
2011



2021



2013



2016



2017

Lakefront properties present additional challenges. Managing stormwater runoff is important, as discussed previously. However, the shoreline perimeter of the lake is an important “ecotone”. An ecotone is an area where two different habitat forms intersect, in this case the land-water interface. It is a particularly important habitat area. In the land-water ecotone the energy of wave action and littoral drift also need to be managed relative to both winter and summer lake levels (and wake waves are becoming larger).

**What will the perimeter of Coventry Lake look like in the future? 10 years? 50 years? And beyond?
Will there be any near-lake Nature left?**

Questions/Discussion

benjamin.burpee@gza.com

Special thanks –Bob Kortmann, Lindsay Beutler, Debby Zeppa, and Scott Gallo



Photo: Ben Rach, sunset at Coventry Lake