

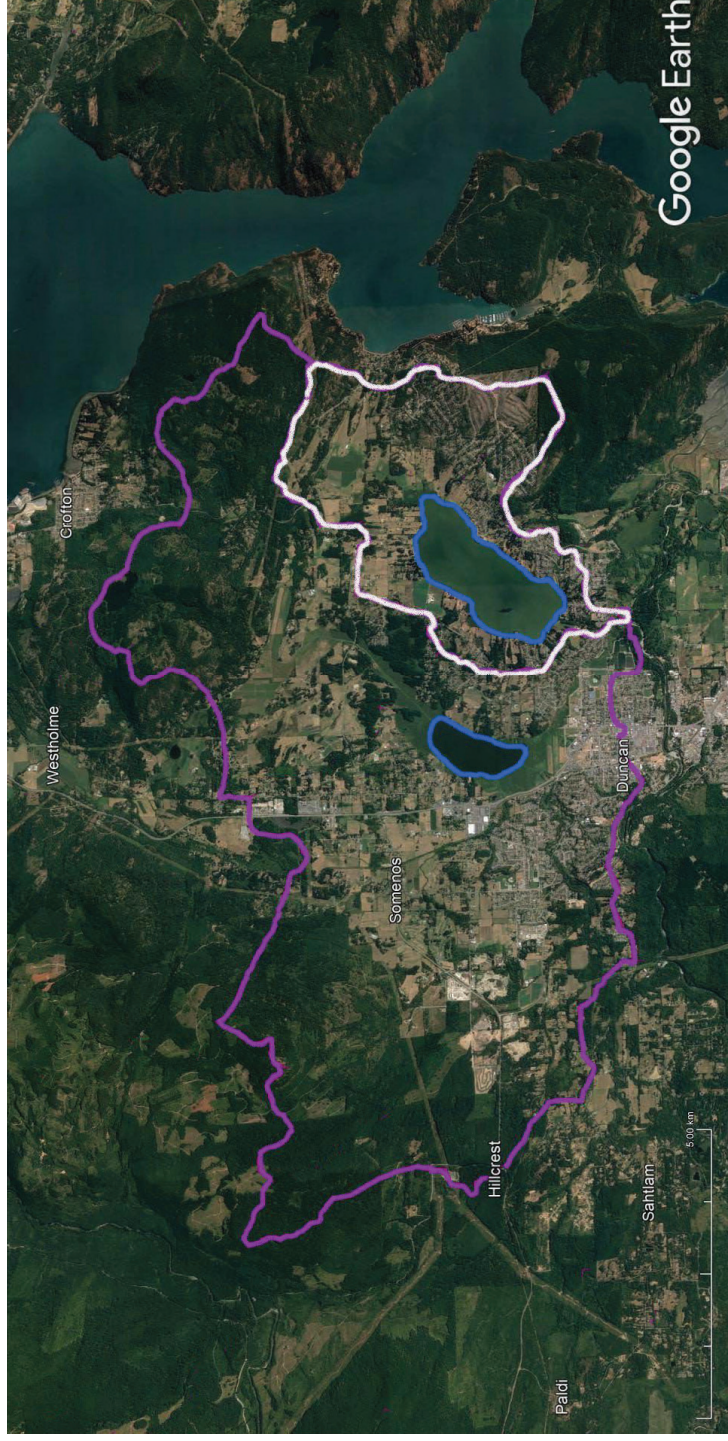
# Quamichan Lake monitoring update and options for mitigating cyanobacteria blooms, May 2025



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# Setting / Monitoring Program



Lake area: 310 ha  
Watershed: 1,400 ha

## Monitoring :

- Nutrients (monthly in winter, bimonthly in summer)
- Phytoplankton + coliform bacteria (monthly in winter, bimonthly in summer)
- Temperature (hourly)
- Oxygen (hourly)



# Ongoing Work

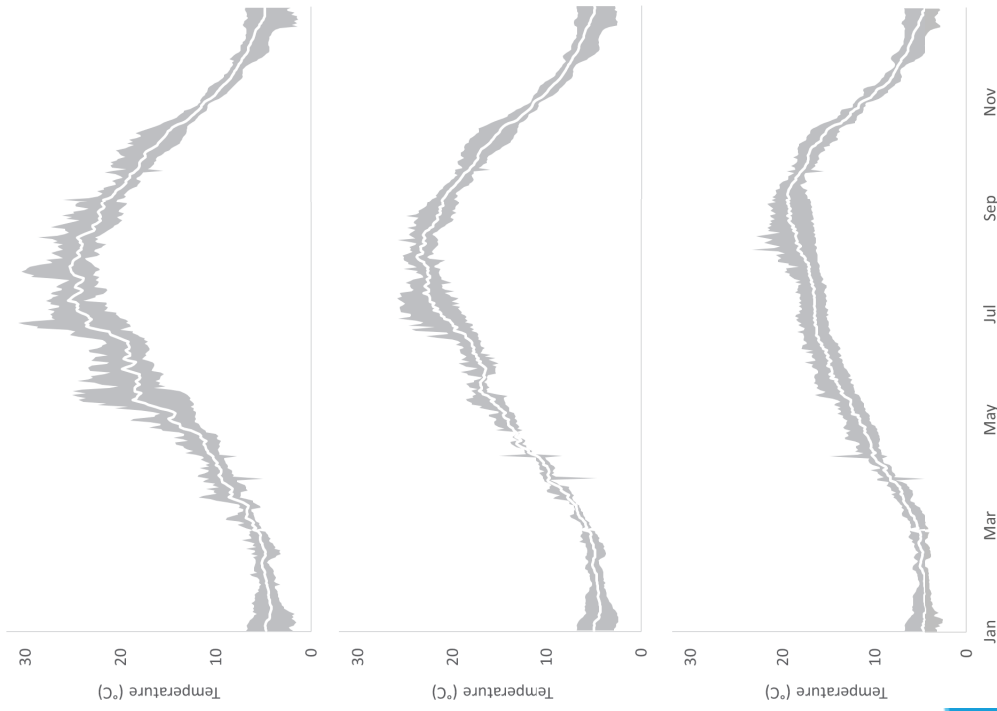
- Monitoring: nutrients, temperature, dissolved oxygen, phytoplankton
- Sediment sampling: 90-95% of the nutrients causing blooms come from lake sediment
- Oxygen demand study: anoxia in the summer causes nutrients to be released from the lake sediment
- Collaboration with RCA staff: to maintain North Cowichan gear and track lake conditions
- Waterfowl assessment: waterfowl are sources of fecal contamination and swimmer's itch
- Consulting with ecosystems staff at Ministry of Environment to assess and collaborate on lake enclosure experiments and next management steps



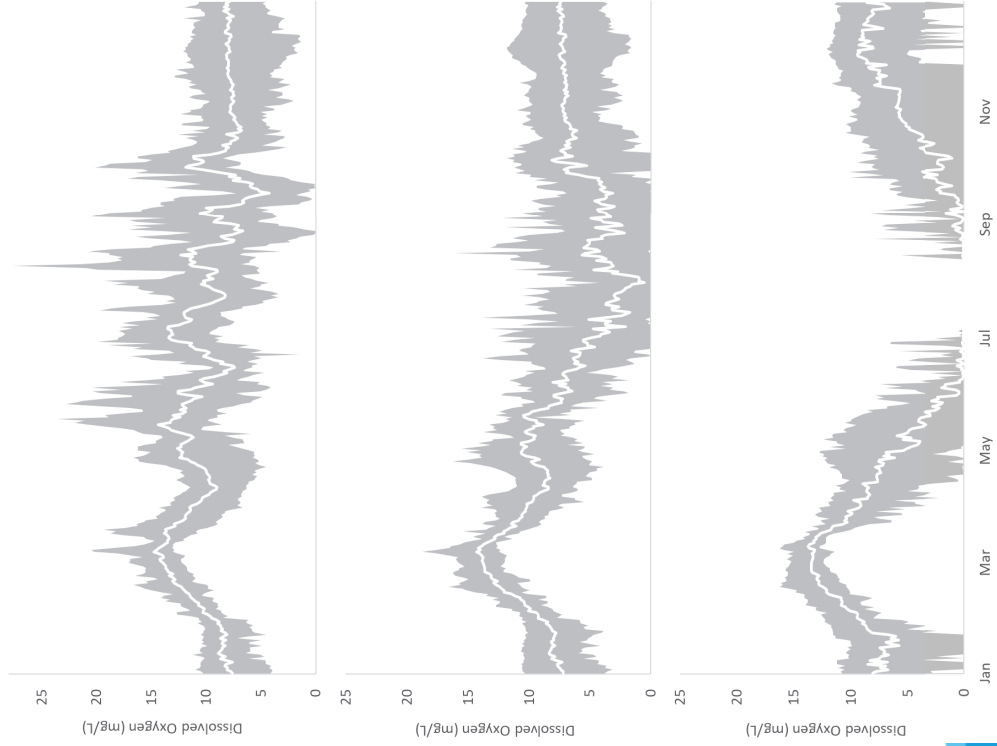
## What Have we Learned?

- Oxygen and temperature dynamics affecting nutrient chemistry and phytoplankton dynamics
- Lake sediment properties causing nutrients to enter water column and causing cyanobacteria blooms

### Temperature (°C)



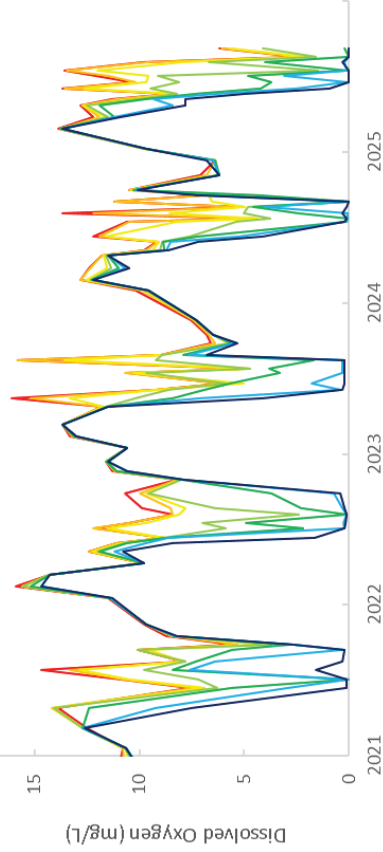
### Dissolved Oxygen (mg/l)





## What have we learned? Surface – RED 6m - BLUE

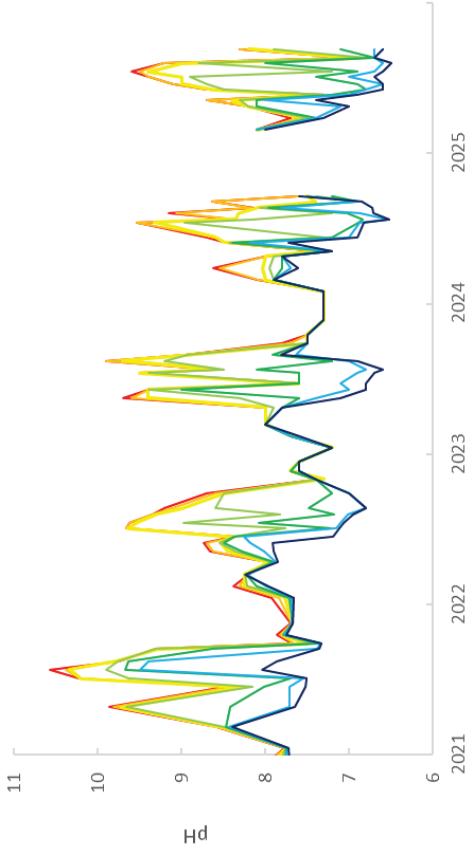
Temperature: Hottest summers were 2021+2025. Winter low is increasing. Turnover usually mid-September but 2025 turnover was mid-August



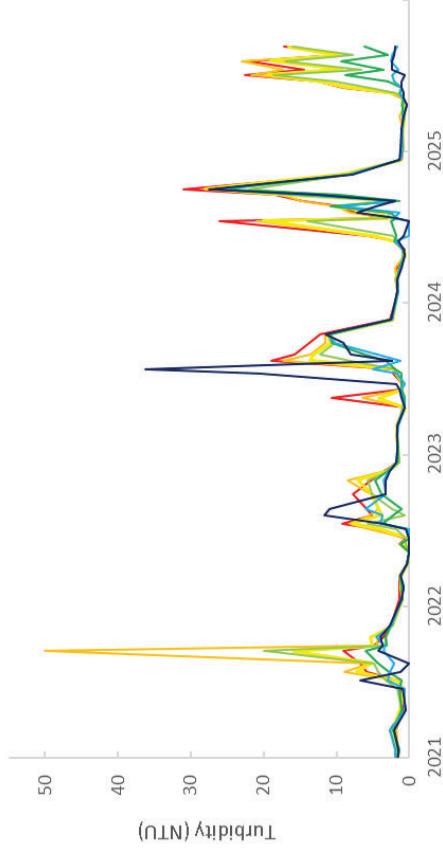
Dissolved Oxygen: chaotic annual and seasonal changes, anoxia in summer can vary from 60-100 days. Shortest anoxia summer 2024

## What have we learned?

pH: peaks in summer but declining over period of record. Winter 2024-25 gap due to sensor malfunction. pH of lake has declined from 2021-2025

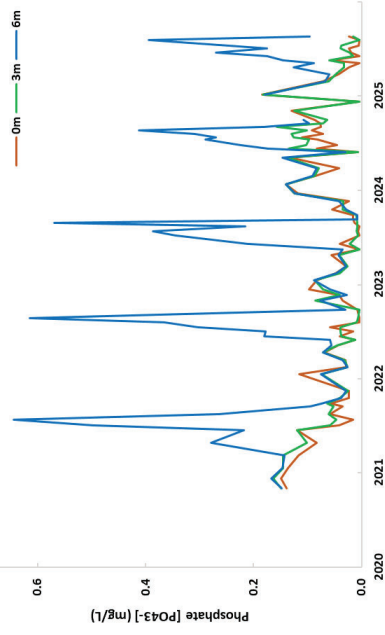
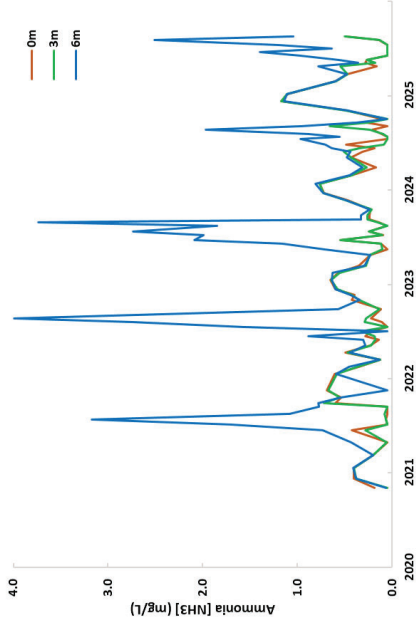


Turbidity: tends to be highest in summer and coincides with algae blooms



## What have we learned?

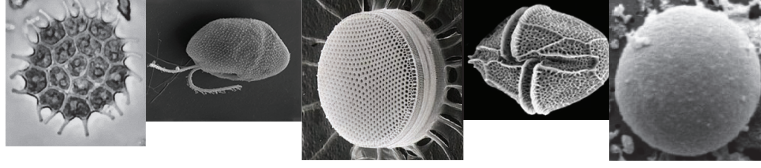
Ammonia: peak at 6m in August. Summer 2024/25 lower than previous 3 years at 6m but winter is higher



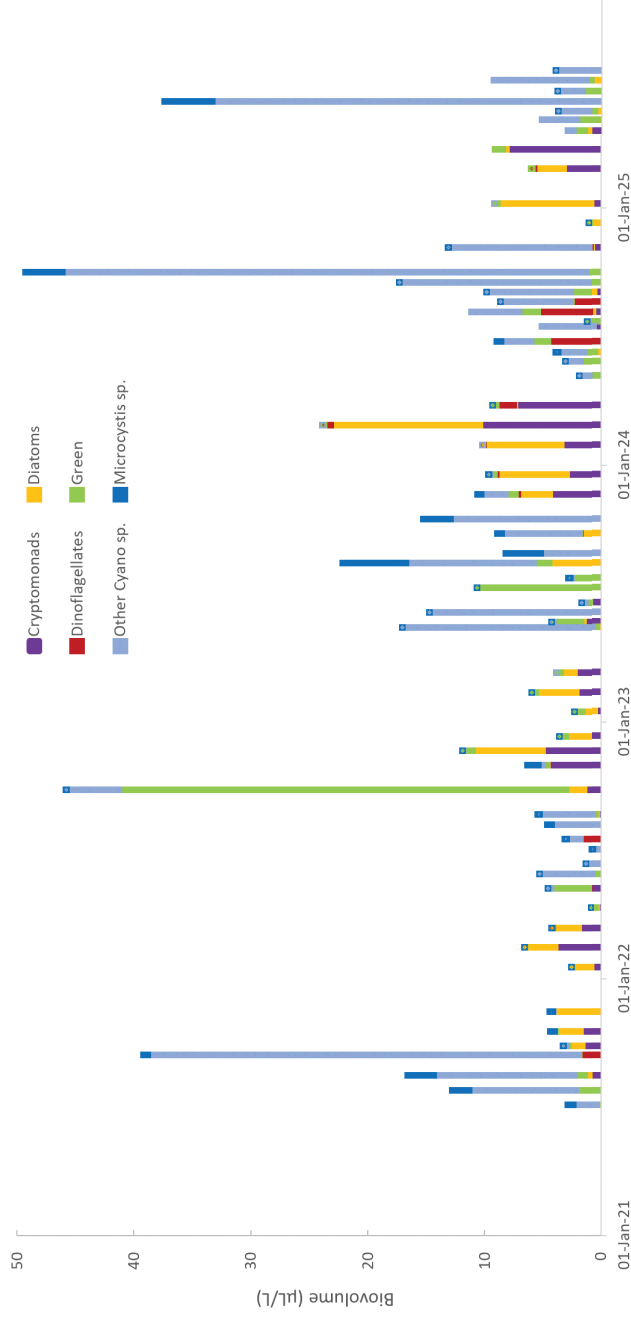
Phosphate: 6m late July-early August peak. 2024/25 lower than previous 3 years. Peak algal blooms coincide with period immediately following peak production of phosphate from lake sediment during summer anoxia



# Quamichan Lake phytoplankton community 2021-2025

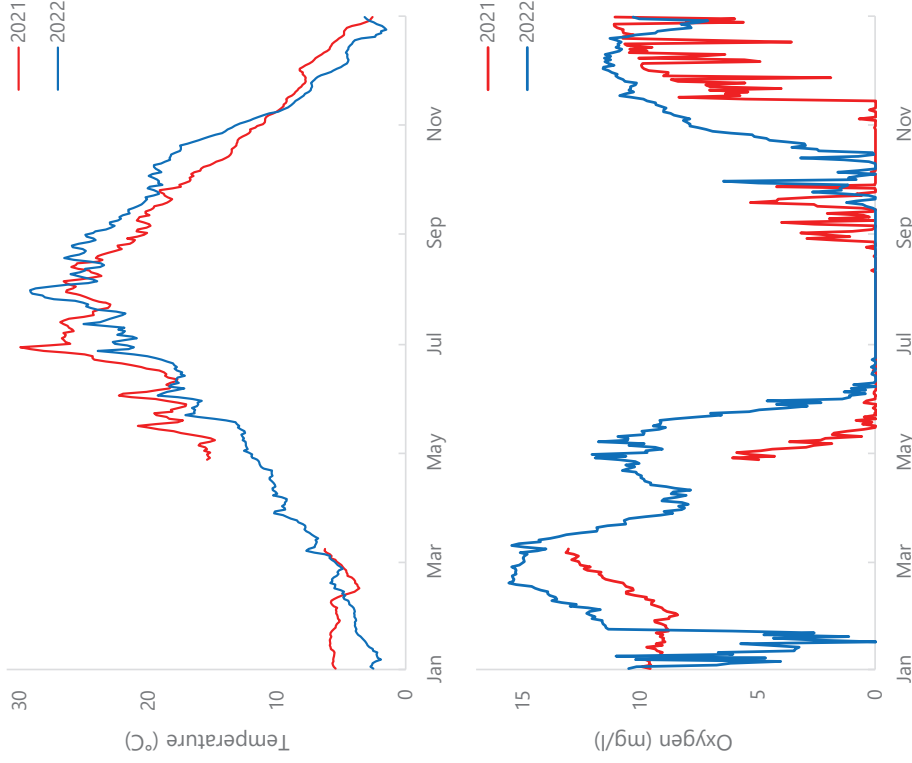


- Green: Usually a small part of community, big bloom in fall 2022
- Cryptomonad: Common in winter/spring
- Diatom: Seen late winter-early summer
- Dinoflagellate: most common in fall
- Cyanobacteria: Late summer and fall blooms



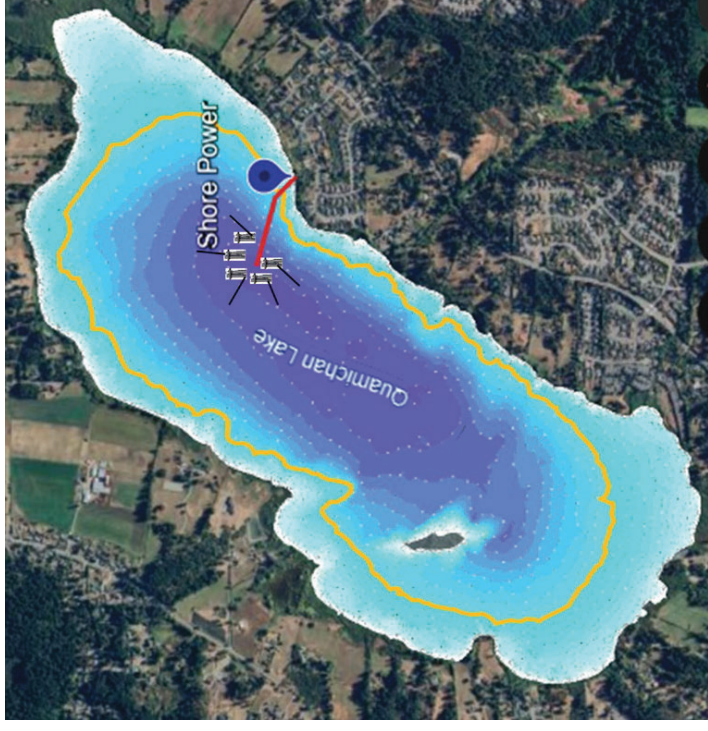
## What have we learned?

- High temperature lowers oxygen
- Nutrients released from lake sediment fuel algae blooms
- Phosphate freed sediment during anoxia
- ↑ Phosphate causes ↑ Cyanobacteria
- Years with more oxygen at depth associated with smaller blue-green algae blooms
- ~90-95% of lake phosphate from lake sediment, which is a legacy of historic land management



# What have we learned? Sediment Oxygen and Phosphate

- Updated Bathymetry survey provided data for estimating oxygen volume and aerator capacity required to offset anoxia
- Iron bound phosphate observed to be low. Lakes low in metals have greater tendency to releasing phosphate from sediment
- Addition of phosphate binding metals may be required, e.g., aluminum compounds very popular and successful to treat phosphate in lakes in US



## Next steps

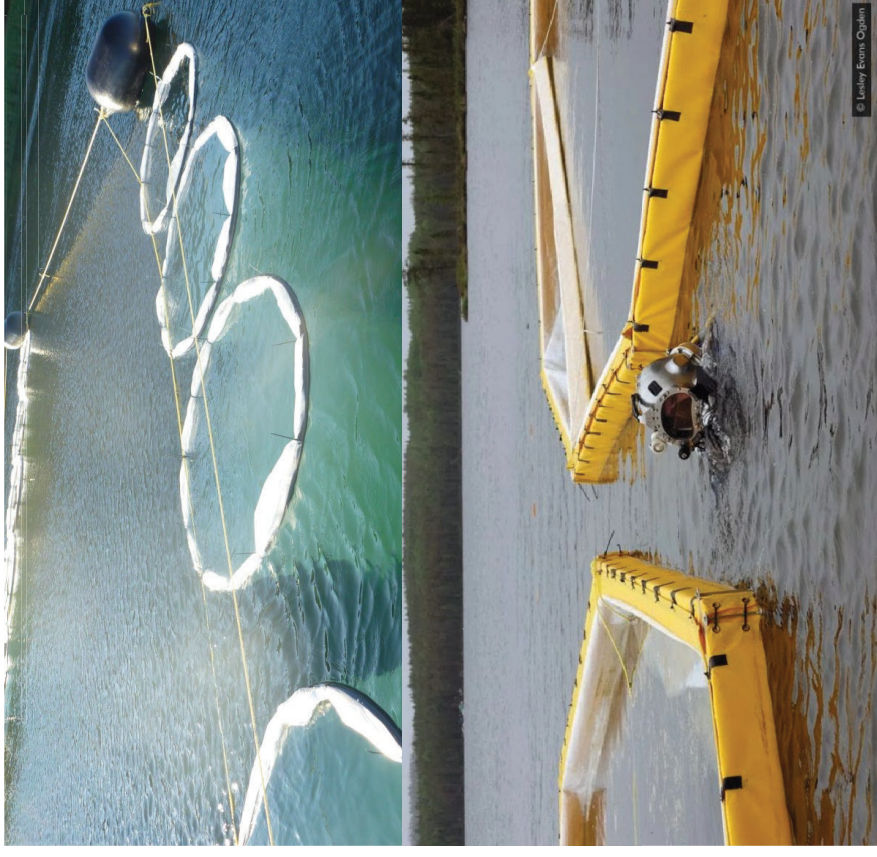
- Continue work to
  - **Restore** streams and wetlands
  - **Improve** riparian habitat
  - **Augment** stormwater features
  - **Engage** residents, and farmers
  - **Reduce** external phosphorus
  - **Stop** feeding waterfowl
  - **Enhance** E. coli sampling
- Assess aeration options, conduct experimental trials in the coming year in collaboration with Province
- Engage Cowichan Tribes on management collaboration
- Engagement with stakeholders, RCA, MBRC, QLNA, NCC





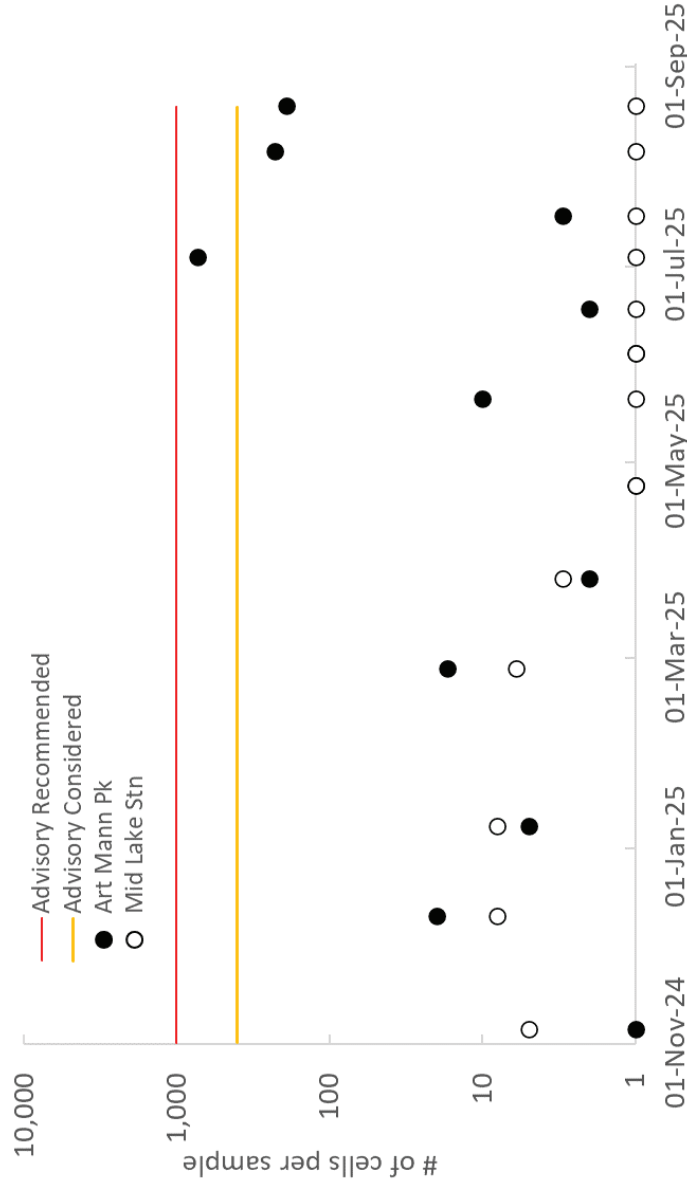
## Next steps: Enclosure experiments

- North Cowichan Environment staff have been working with staff at Ministry of Environment and the Ministry of Water, Land and Resource Sustainability to discuss permitting for experimental aeration in lake enclosures
- Lake enclosures will be 8m diameter and extend to the lake bottom
- 1 enclosure will have aeration, 1 enclosure will have aeration plus aluminum/iron amendment, and 1 enclosure will serve as a 'control' for untreated lake conditions
- Provincial staff have indicated they will allow experimentation to proceed. North Cowichan staff will start installation of enclosures in late winter 2026 and conduct aerator trial experiments in spring/summer 2026



## Next Steps: *E. coli* sampling

- Island Health stopped sampling in 2014 due to persistently high levels
- Given continued use of lake by RCA and others North Cowichan assesses *E. coli* at Art Mann Park and centre of Lake
- Sampling began fall 2024 *E. coli* numbers have been below Island Health recommended advisory threshold
- If low values continue to be observed we will work with Island Health to reinstate sampling program and help Island Health focus on cyanobacteria blooms



Huy ch q'u / Thank you

