

**REPORT TO REGIONAL PARKS COMMITTEE
MEETING OF WEDNESDAY, JULY 22, 2026**

SUBJECT Elk Lake Oxygenation System Update – 2025 Annual Report

ISSUE SUMMARY

To update the Regional Parks Committee on the annual operation and performance of the oxygenation system in Elk/Beaver Lake Regional Park.

BACKGROUND

In 2019, the Capital Regional District (CRD) Board endorsed a staff recommendation to remediate Elk Lake. In 2020, the Board committed partial funding for remediation, supplemented by a \$750,000 grant from the Province of British Columbia. A hypolimnion (deep-water) direct oxygenation injection system was selected, designed and constructed in Elk Lake to address water quality issues. The system was operationalized in November 2023 and fully commissioned in March 2024.

The objectives of the oxygenation system are to:

1. eliminate deep-water oxygen depletion (anoxia)
2. decrease internal phosphorus loading
3. maintain cold-water native fish habitat below 15°C
4. reduce the frequency and duration of blue-green algae blooms

Excess phosphorus is the primary driver of blue-green algae growth in the lake. About 30% of the phosphorus originates from external sources in the surrounding watershed, while roughly 70% is released under low-oxygen conditions from bottom sediments of the lake. The oxygenation system targets this internal source of phosphorus by adding oxygen to deep waters, helping keep phosphorus bound in the sediments and less available to fuel algae growth. Improved deep-water oxygen levels are also expected to improve deep-water fish habitat.

The system does not address phosphorus from shallow bays or external watershed sources. As such, the oxygenation system alone will not resolve all water quality issues in the lake. Lasting improvements require both continued operation of the oxygenation system and implementation of actions identified in the Board-approved 2020 Elk/Beaver Lake Watershed Management Plan.

DISCUSSION

The Elk Lake Oxygenation System Annual Report for 2025 (Appendix A) summarizes water quality data and compares it to oxygenation system objectives. The report, reviewed by external water quality experts, compares pre-installation conditions (2019–2023) with post-installation data (2024–2025).

Key Findings (2025 vs. pre-oxygenation system conditions)

1. deep-water oxygen levels improved, with the anoxia period reduced to approximately three months (from five months pre-installation).
2. total phosphorus in deep water decreased by approximately 80%.

3. average deep-water temperatures increased moderately in summer 2025 (10.5°C) compared to pre-oxygenation conditions (8°C) but remained below 13.9°C, maintaining optimal native fish habitat and improving on 2024 results.
4. one significant blue-green algae bloom occurred in 2025, along with several smaller, isolated blooms.

The oxygenation system generally performed as intended; however, a valve failure in July temporarily reduced oxygen delivery to 50%, contributing to approximately three months of low oxygen conditions (anoxia) compared to two months in 2024. The system resumed full operation in August, resulting in improved oxygen levels and substantial phosphorus reductions by fall. Staff, supported by technical advisors, continue to refine system operations to improve efficiency and manage long-term operating costs.

Water Quality Monitoring

Water quality indicators improved in both 2024 and 2025 following system implementation. Despite this, a large, prolonged blue-green algae bloom occurred in spring 2025, affecting recreational use and resulting in the cancellation of the swim portion of the May 2025 IRONMAN triathlon. This bloom was likely driven by environmental conditions, including heavy rainfall in March and warm, calm weather in April and May. Outside of this event, blue-green algae blooms were generally smaller, isolated events, and staff received positive feedback from lake user groups, including the Elk Lake Rowing Club.

Preliminary 2026 Results

Preliminary data as of June 17, 2026, show continued improvement:

- deep-water oxygen levels have improved
- phosphorus concentrations are well below historical averages
- public advisory days related to blooms are reduced by 67 days compared to the same time last year

Despite these improvements, external phosphorus inputs and weather variability remain key drivers of periodic algal blooms. Ongoing monitoring remains critical to optimize system performance and assess overall water quality in the lake (including Beaver Lake). Staff will continue annual reporting on system performance, with a comprehensive assessment of lake health planned for 2030 in alignment with the Elk/Beaver Lake Watershed Management Plan.

Monitoring Limitations and Improvements

Tracking blue-green algae blooms remains challenging due to their localized and dynamic nature. Current monitoring focuses on public health risks at key beaches rather than full-lake coverage. To address this gap, the CRD is partnering with the University of Victoria to trial satellite-based monitoring for more comprehensive bloom detection and tracking. This enhanced capability is expected by late 2027.

Short-term variability in water quality was anticipated following system installation in late 2023 as phosphorus sources in the lake stabilize. These findings reinforce the importance of continuing both the oxygenation program and watershed management actions to address nutrient inputs comprehensively.

IMPLICATIONS

Environmental Implications

Improvements in Elk/Beaver Lake water quality support important ecological values within the regional park, including critical habitat for the federally threatened western painted turtle (Pacific Coast population). Downstream ecosystems also benefit, including key habitat for native fish species such as coho salmon and coastal cutthroat trout in the Colquitz River.

Climate Implications

Climate change is expected to increase the prevalence of blue-green algae due to warmer temperatures and heavy rainfall events, which increase external nutrient runoff into the lake. While complete elimination of blooms is unlikely, reductions in frequency and duration are anticipated. Continued actions to reduce external sources of nutrients through the implementation of the Watershed Management Plan are critical to adapt to climate change.

Financial Implications

In 2026, staff plan to implement oxygenation upgrades to enable remote operation of the system, reducing the need for manual on-site system adjustments and improving overall efficiency. These one-time costs are funded by the Regional Parks conservation budget and are expected to reduce staff time costs beginning in 2027.

Annual operating and maintenance costs are outlined below and are subject to future increases due to inflation and tariffs:

Expense Category	2025 Anticipated Costs	2025 Actual Costs	2026 Anticipated Costs
Electricity	\$60,000	\$60,216	\$65,000
System maintenance	\$40,000	\$32,689	\$35,000
Water quality monitoring	\$30,000	\$25,040	\$30,000
Expert consultation	\$15,000	\$14,372	\$13,500
Staff time	\$30,000	\$27,791	\$30,000
Total Operating Cost	\$175,000	\$160,109	\$173,500
One-time System Upgrade	NA	NA	\$20,000

Intergovernmental Implications

CRD staff continue to collaborate with government partners to support water quality objectives, particularly in the implementation of the Elk/Beaver Lake Watershed Management Plan. Staff share knowledge of the system with jurisdictions across Canada, particularly within British Columbia, contributing to improved understanding of water quality issues and remediation options.

Service Delivery Implications

CRD staff manage the water quality monitoring program, including system operation, maintenance and oversight. They are also responsible for issuing public advisories when blue-

green algae blooms are detected and for providing public education through the CRD website and on-site signage. There are ongoing efforts to improve system efficiency and advance implementation of the Watershed Management Plan.

Social Implications

Blue-green algae blooms continue to affect recreational use in the park. However, this year, reduced algae bloom duration allowed events such as the IRONMAN Victoria to proceed without disruption.

Continued implementation of the watershed management plan and operation of the oxygenation system are expected to improve long-term recreational use.

Local experts and community groups, including Beaver Elk Environmental Stewards and Victoria Golden Rods and Reels Fishing and Social Club, have played a key role in data collection and stewardship. Staff meet regularly with these groups to share updates and coordinate actions.

CONCLUSION

The Elk Lake oxygenation system demonstrates measurable improvements in key water quality indicators, particularly deep-water oxygen levels and phosphorus reduction. While algal blooms continue to occur due to external nutrient inputs and environmental conditions, their overall duration and frequency show early signs of improvement. Continued operation of the system, alongside implementation of the Elk/Beaver Lake Watershed Management Plan, will be essential to achieving long-term water quality objectives and sustaining ecological and recreational values in the park. Staff will report to the Board annually on system performance and water quality progress.

RECOMMENDATION

There is no recommendation. This report is for information only.

Submitted by:	Mike MacIntyre, Senior Manager, Regional Parks
Concurrence:	Glenn Harris, Ph.D., R.P.Bio., Acting General Manager, Parks, Recreation & Environmental Services
Concurrence:	Ted Robbins, B. Sc., C. Tech., Chief Administrative Officer

ATTACHMENTS

Appendix A: Elk Lake Oxygenation System Annual Report 2025
Presentation: Elk Lake Oxygenation System Update